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Gender differences in parental mental health: A life course approach

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Under the Supervision of
Prof. Pablo Gracia

Declaration of authorship

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Study 1 – Gender differences in mental health following the transition into parenthood: Longitudinal evidence from the UK

> Sandrine Metzger is the first author of this paper. Sandrine Metzger developed the theoretical framework, conducted the literature review and the statistical analyses, and wrote the initial manuscript draft. Prof. Pablo Gracia assisted with the study's conceptualisation, the theoretical framework, and the writing and editing of further manuscript drafts.

Study 2 – The role of time use changes in first-time mothers' and fathers' mental health trajectories

> Sandrine Metzger is the first author of this paper. Sandrine Metzger developed the theoretical framework, conducted the literature review and statistical analyses, and wrote the manuscript draft. Prof. Pablo Gracia provided feedback on the study's conceptualisation and theoretical framework and assisted with editing subsequent drafts.

Study 3 – Mental health trajectories across parenthood transitions: A longitudinal cross-national study

> Sandrine Metzger is the first author of this paper. Sandrine Metzger developed the theoretical framework, conducted the literature review and the statistical analyses, and wrote the initial manuscript draft. Prof. Arnstein Aassve and Prof. Letizia Mencarini provided guidance and feedback on the study's conceptualisation and framing. Prof. Pablo Gracia provided feedback on the study's conceptualisation, theoretical framework, and subsequent versions of the manuscript.

Study 4 – Exploring the heterogeneity in first-time mothers' and fathers' mental health trajectories

> Sandrine Metzger is the author of this paper. Sandrine Metzger conceptualised the study, developed the framework and analytical approach, conducted the literature review and the statistical analyses, and wrote the manuscript draft.

Statement by the co-authors

I hereby confirm that the doctoral candidate's described contribution to the work where I am listed as co-author is correct, and I consent to including the work in the named dissertation.

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Summary

Mental health differences between men and women are well documented, but the timing, causes, and mechanisms driving these disparities across the life course remain insufficiently understood. The transition to parenthood is a key gendered life course event, involving substantial individual changes that tend to reinforce specialised gender roles. These parenthood-related changes may result in distinct mental health responses among men and women when becoming parents, potentially contributing to the existing gender gaps in mental health. Yet, evidence on whether and how the transition into parenthood shapes gendered mental health is mixed, suggesting important complexity in this relationship that still needs to be explored. This thesis, therefore, examines the dynamic association between parenthood transitions and gendered mental health, using large-scale panel data, a comprehensive mental health outcome measure, and robust longitudinal modelling. The primary aim is to (a) provide a cohesive analysis of the gendered processes surrounding parenthood transitions and (b) assess the extent to which parenthood serves as a key life course link between gender and mental health. This is achieved through four self-contained but interconnected empirical studies.

Study 1 examines gendered mental health trajectories across the transition to parenthood in the UK and assesses the extent to which parenthood affects different sub-domains of mental health, as well as trajectory differences by socioeconomic status (SES). The results show that, overall, women experience greater improvements in mental health after childbirth than men. However, results also show that despite increases in positive affect (e.g., happiness) and long-lasting improvements in role and social functioning, there are concurrent increases in negative affect (e.g., stress) and fatigue during the care-intensive years. Lastly, results show that higher SES women experience reduced mental health benefits from parenthood, suggesting a potential mental health disadvantage of motherhood in these groups. This study documents the complex and conflicting mental health consequences of parenthood among men and women.

Study 2 uses large-scale longitudinal Australian household data to examine the role of changes in time use in shaping gendered mental health trajectories across the transition to parenthood. Results show that after the birth of their first child, women experience significant reductions in paid work and large increases in housework time, whereas men's

time use is unchanged, and that these changes are disadvantageous for women's mental health. Results from longitudinal mediation analyses show that the changes in hours of housework and in the division of paid work time between partners suppress some of the positive effect of parenthood on women's mental health, but do not substantially affect their improving trajectories following birth. Overall, this study is the first to explore the dynamic relationship between time use and mental health in the transition to parenthood by assessing how co-occurring time use changes relate to gendered mental health trajectories.

Study 3 is the first to combine a cross-national approach with a longitudinal perspective to examine how gendered mental health trajectories around parenthood transitions compare across countries (Australia, Germany, United Kingdom) across socioeconomic groups and childcare use. Results show that mental health improves with the first child in all countries, especially for women, but also indicate greater cross-national variations as parity increases. SES-based heterogeneity in trajectories is minimal across all countries, but clearer trajectory patterns emerge when differentiating by the used childcare arrangements: women who never use formal childcare fare worse as parity increases in all countries than women who make use of in all countries. In general, the study suggests that policy-constrained choices, such as the use of formal childcare, may play a role in explaining differences in mental health trajectories among women.

While Studies 1-3 focus solely on within-individual mental health trends, **Study 4** explores between-individual heterogeneity in the mental health trajectories of first-time parents. It identifies several latent heterogeneous patterns of parental mental health trajectories using an explorative, data-driven approach. Results show that the majority of first-time parents share a stable mental health trajectory across the transition to parenthood, while the remaining parents are distributed across groups characterised by lower average levels of mental health, with dissimilar trajectory patterns and greater fluctuations around birth. First-time mothers are more likely than men to be in the groups with lower mental health that show steeper declines in the post-birth period, compared to the group with high and stable mental health. These findings support the need for greater support for the subgroup of more vulnerable first-time parents, and particularly mothers, with lower baseline mental health, who may be more likely to experience adverse parenthood-related changes.

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Chapter 1: Introduction

Mental health has become a prominent issue in recent decades following global rises in mental disorders (Collins et al., 2011; Whiteford et al., 2013). Between 15 and 20% of the global population experiences a mental health condition at any given time point, and around 50% of the population is estimated to experience a mental health condition at some point during their life. This has important social and economic consequences (WHO, 2022). In highly developed countries, the cost of mental health is estimated at around 4% of annual GDP, linked to healthcare spending and losses in productivity when workers suffer from mental distress (OECD, 2015). In the past decades, population mental health has therefore increasingly become a major policy target and public health priority. In 2015, the United Nations established the promotion of mental health and well-being as one of the 17 Sustainable Development Goals (SDG 3).

Importantly, beyond the economic burden of mental health, the experience of poor mental health has significant implications for every affected individual. Mental health is central to individuals' well-being and impacts and is impacted by all aspects of their lives, such as family relationships, social interactions, educational attainment, and employment circumstances. Addressing and supporting good mental health is therefore crucial to allow all individuals to enjoy high levels of emotional well-being, realise their potential and goals, be financially secure and independent, and reach a satisfactory quality of life.

However, mental health is far from being homogeneous across populations, making effective mental health support very complex. Critically, all countries show important gender differences in mental health prevalence and type of condition (Rehm & Shield, 2019). Additionally, mental health is not static but fluctuates across different life phases and does so differently for men and women. Yet, previous research lacks studies on gendered mental health from a dynamic life course perspective to address these questions.

This thesis examines the trajectory of mental health outcomes using long-running panel data from Australia, Germany, and the United Kingdom. It focuses on parenthood transitions as a specific life course stage with distinct implications for men and women to inform how gendered mental health develops over time. The thesis aims to provide a

more holistic perspective on population mental health and gain a better understanding of how long-term changes in family circumstances and social roles affect gendered mental health trends, which considers micro-level mechanisms, effect heterogeneity, and cross-national disparities. The thesis contains four self-contained empirical studies that are connected and contextualised in this chapter, which is structured as follows. First, the rationale and motivation of the thesis are presented. Second, the overall theoretical framework of the thesis is defined, and previous empirical findings are discussed. Third, the main objectives and research questions are outlined. Lastly, the datasets used, main variables, and analytical methods are described.

1.1 Research motivation

1.1.1 Why study gendered mental health?

Although both men and women experience mental health issues, they are not equally affected. Women are more likely than men to live with a mental health disorder, and show a higher prevalence of internalised disorders, such as depressive or anxiety disorders, whereas men have higher rates of externalized disorders, such as addictive disorders and substance abuse (Kuehner, 2017; Rehm & Shield, 2019). This raises the questions of why these disparities exist and what determines the differences in how mental health manifests for men and women at a societal level.

Previous research suggests that, beyond biological factors, pervasive gender inequality plays a significant role in shaping the distinct mental health experiences of men and women (Cabezas-Rodríguez et al., 2021; Riecher-Rössler, 2017). Men and women are unequally conditioned and pressured by the national, cultural, and policy contexts, developing dissimilar emotional and psychological responses. Structural and normative factors differently constrain men and women in their choices and opportunities, with direct and indirect repercussions on their mental health. Despite important changes in societal gender roles over recent decades, allowing women to leave the domestic sphere to access the previously male-dominated labour market, this shift towards gender equity remains incomplete. Men have not evenly taken on domestic and family duties in exchange for women's increased economic participation (England, 2010). This leads to

women facing unique challenges, such as balancing competing paid work and household responsibilities or reducing their labour market participation to meet domestic demands. These circumstances negatively impact women's mental health when (a) combining paid and unpaid work constitutes an important stressor or (b) when the trade-off between active labour participation for greater domestic work (often undervalued and more tedious than formal employment) is adversely perceived (Stevenson & Wolfers, 2009). On the other hand, men can be more largely impacted by their employment conditions and the financial responsibilities they have to assume (Pollmann-Schult, 2014).

The influence of cultural norms in affecting gendered mental health outcomes is further evidenced by existing cross-national disparities. Although the general patterns in gendered mental health are consistent across countries, the gender gaps and disorder prevalence vary depending on the level of gender equity in a given society. More gender-equal societies tend to have protective effects on men's and women's mental health and show smaller gender differences (Bracke et al., 2020; Tesch-Römer et al., 2008; Van de Velde et al., 2013). This shows that societal conditions determine, to some extent, the processes affecting gendered mental health outcomes. Understanding when and how these processes occur is crucial for promoting gender equity in mental health.

1.1.2 Why take on a life course approach?

Individuals' mental health is not in a fixed state but shifts across the life course, influenced by ageing and in response to certain life situations, changing circumstances, or specific stressors (WHO, 2022). Much previous research that examines mental health and differences by gender focuses on determined time points that capture a snapshot of mental health states but do not reflect the progression and fluctuation of mental health across life stages. Yet, mental health shows distinct age effects with irregular trends that often reach a low point in early adulthood before improving and tend to worsen again as individuals grow older (Bell, 2014; Buecker et al., 2023; Kratz & Brüderl, 2021; Zhang et al., 2023). Certain life events also have uneven effects on mental health, depending on whether the impact is assessed immediately after the event or later on, sometimes with noticeable gender-based differences (Anusic et al., 2014; Clark & Georgellis, 2013).

A life course approach is therefore essential for a more comprehensive understanding of gendered mental health. This approach provides a holistic, long-term perspective that

acknowledges the cumulative, path-dependent, and malleable nature of individuals' mental health and its time-varying specificities by gender. It allows for an examination of how mental health changes for men and women at critical life course junctures, revealing potential mechanisms that operate differently across genders.

1.1.3 Why focus on parenthood?

The transition to parenthood is a particularly relevant life course stage for understanding the role of gender in mental health. Becoming a parent marks a major deflection point that differentiates men's and women's life trajectories. This is primarily linked to the behavioural shifts that reinforce specialised gender roles following childbirth, with men focusing on economic contributions while women recentre around the home and childrearing. New mothers often reduce their labour market participation and hours worked, leading to decreased earnings, lower hourly wages, and losses in career progression and prospects, whereas fathers' outcomes remain unaffected (Gjerdingen et al., 2001; Kleven et al., 2024; Kleven, Landais, Posch, et al., 2019; Kleven, Landais, & Søgaard, 2019). Similarly, highly gendered patterns at the household and couple level develop following birth. Women increase their housework hours and take on a large share of the domestic load, which includes performing the majority of childcare. In contrast, men only show modest increases in time spent on the additional housework and caregiving tasks (Baxter et al., 2008; Bianchi et al., 2000, 2012).

Further, parenthood carries distinct health consequences for men and women. Due to the physical demands of pregnancy, giving birth, and breastfeeding, women experience more health challenges, such as physical discomfort, weight gain (including gestational weight), reduced physical activity, changes in eating habits, and decreased sleep quality compared to men (Asselmann et al., 2022; Kröger & Leopold, 2020; Saxbe et al., 2018). These physical challenges are compounded by specific mental health disorders that are more likely to appear around birth among women. Notably, around 11% of women are estimated to experience perinatal depression (Woody et al., 2017). Parenthood, mental health, and gender are therefore intricately linked, yet the extent and the nature of these associations are still not fully understood. Research on the connection between parenthood and mental health has often focused on these short-term, perinatal, and clinical perspectives, examining symptoms specific to pregnancy and the immediate postpartum period. However, the changes following parenthood are much more far-

reaching, with complex short- and long-term gendered consequences that may impact men's and women's mental health.

1.1.4 Why is this line of research important?

Gaining a better understanding of mental health, and specifically how parenthood relates to it, has several important implications. First, identifying how certain key events, such as parenthood, contribute to mental health is essential for policymakers to improve population well-being through well-designed interventions that address the consequences of such events. To maximise the efficiency and efficacy of these interventions, it is important to target the most appropriate timing and tailor them according to gender differences, work-family circumstances, socioeconomic context, and the level of vulnerability to mental health risks in specific subgroups. Research in this area is imperative in order to build a substantial body of evidence to inform these policy decisions.

Second, ensuring good mental health among those of childbearing age is crucial to tackling rising demographic challenges. Fertility rates in most highly developed countries are falling, with many reaching sub-replacement levels. This decline raises concerns about economic continuity as the younger, smaller cohorts will struggle to support a growing retired and ageing population. Although these demographic trends align with the Second Demographic Transition (SDT) –characterised by the rise in female employment, changing union stability, shifting social norms and attitudes, prioritisation of individualistic self-realisation over family-oriented fulfilment, and the ability to postpone childbirth and have control over the number of desired children– current fertility tendencies go beyond the predicted transformations associated with the SDT (Esping-Andersen & Billari, 2015; Lesthaeghe, 2010). Notably, these steeper-than-anticipated declines partly stem from a disconnect between fertility intentions and actual fertility. The realities of parenthood, such as the financial, emotional, social, and time-related costs, can deter individuals from having a(nother) child. This is exacerbated by institutional barriers and insufficient support for modern dual-earner couples seeking to balance work and family life (resulting in an inequitable double burden for women) and contributes to the increasing reluctance to expand families, despite family size preferences consistently remaining above replacement levels in the past three decades (Aassve et al., 2015; McDonald, 2013; Mills et al., 2008; Sobotka & Beaujouan, 2014).

Addressing these structural inequalities by designing and implementing appropriate policies based on precise knowledge of how, when, to what extent, and under what circumstances parenthood affects men and women is therefore essential to allow individuals to realise their fertility and family goals while supporting favourable demographic trends.

Third, good parental mental health is not only consequential for parents themselves but also for their children. Maternal depression can lead to parenting dysfunctions that have immediate as well as long-lasting impacts on children throughout childhood, adolescence and into early adulthood. It can influence infant neurodevelopment and is associated with impairments in children's executive functions, lower school performances, and higher risks of developing depression up to age 18 (Choe et al., 2023; Gerhardt, 2014; Murray et al., 2011; Netsi et al., 2018). Although less studied, paternal depression also negatively affects parenting behaviours and is similarly linked to longer-term depression risks for children (Pearson et al., 2013; Wilson & Durbin, 2010). Given these detrimental implications of poor parental mental health on children's developmental, educational, and long-term health outcomes –from the antenatal period through adulthood– it is crucial to contribute to a richer understanding of parental mental health dynamics, focusing in equal measures on men and women, to support the well-being of future generations.

1.2 Theoretical framework

The following section outlines the theoretical framework in which this thesis and its empirical studies are situated. Figure 1.4 visually summarises the framework.

1.2.1 Definition of mental health

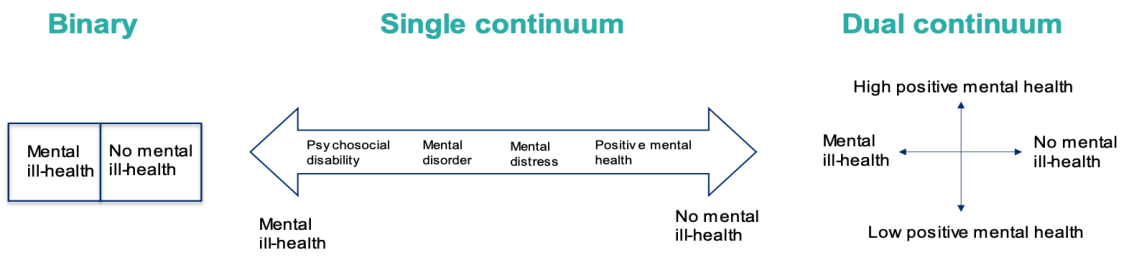
Throughout this thesis, *mental health*[1] is defined as a multidimensional concept, encompassing various domains that all contribute to overall well-being, following the World Health Organisation definition:

> *"Mental health is a state of mental well-being that enables people to cope with the stresses of life, realise their abilities, learn well and work well, and contribute to their communities. Mental health is an integral component of health and well-being and is more than the absence of mental disorder." (WHO, 2022)*

This definition distinguishes between mental health and mental illness, emphasizing that good mental health is not simply the absence of a disorder. It conceptualises mental health along a *dual continuum* which reflects both the presence of mental disorders and the degree of good (i.e., positive) mental health along two separate but connected dimensions, as opposed to a binary indicator of mental illness or a single spectrum that places severe mental illness and positive mental health on opposite ends (see Figure 1.1 for an illustration of the different mental health conceptualisation). In this framework, good mental health can coexist with a mental disorder, and poor mental health does not necessarily indicate experiencing a mental disorder, although the two are often closely related (OECD, 2023d).

[1] This thesis focuses on mental health as defined in this section. The term 'well-being' may be occasionally used to collectively refer to mental health and subjective well-being. While subjective well-being is closely related to mental health, it is distinct in that it represents a one-dimensional assessment of an individual's overall life satisfaction or happiness (OECD, 2023d). In contrast, mental health encompasses a broader range of psychological and emotional states. Both mental health and subjective well-being, along with other factors such as economic well-being, contribute to an individual's overall well-being (WHO, 2022).

Figure 1.1 Illustration of different conceptual frameworks of mental health



Source: OECD (2023d).

This allows for a more fine-grained examination of the different components that define overall mental health, focusing either on mental health conditions, illnesses or disorders, or on the level of good mental health. This thesis focuses on the second aspect, i.e., on positive mental health rather than ill-health. It operationalises mental health to evaluate positive mental health, which includes factors such as the frequency of positive and negative affect (e.g., feeling happy, calm, downhearted, nervous, etc.), experiences of psychological distress (i.e., negative emotional states that reduce positive mental health without constituting a clinical case), healthy psychological and social functioning, and whether day-to-day functioning is impaired by negative affect and distress.

Accordingly, this thesis does not assess parental mental health through symptomatology, screening tool scores, or the results of clinical diagnoses of specific conditions such as depressive, anxious, or behavioural disorders. Instead, it responds to a demand to acknowledge the importance of positive mental health separately from mental ill-health to promote the mental health of all individuals, including those not affected by mental illness but who may still experience suboptimal well-being (OECD, 2023c).

1.2.2 The life course approach

Studying the consequences of significant life events, such as the transition to parenthood, requires a dynamic approach that considers these changes as part of an ongoing process rather than an isolated experience, to offer a more comprehensive and accurate understanding of their impact on individuals. This thesis employs the *life course* paradigm to frame the conducted research (Bernardi et al., 2019; Elder, 2003; Fasang,

Gruijters, et al., 2024; Huinink & Kohli, 2014; Macmillan & Copher, 2005; Piccarreta & Studer, 2019). This framework posits that individuals' lives unfold within a broader structural, institutional, and societal context that guides, constrains, and shapes the sequencing (order of events) and timing (when events occur) of their life pathways. It further conceptualises the life course as comprising multiple domains, such as education, employment, and family, that follow distinct yet interconnected trajectories. These domains can influence each other and even compete if investing in one domain takes away from another (e.g., if becoming a parent leads to spending more time with family and less time in employment). This complex interplay can occur both within individuals and between them (e.g., partners affecting each other's employment or family trajectories).

Further, the life course approach defines events that represent noticeable shifts, deflections, or transitions in individuals' trajectories as *turning points*. A turning point in one trajectory can then be used to examine the consequences of an interrelated time-dependent process. In the case of this thesis, the parenthood transition (i.e., the birth of a child and expansion of the family) represents a turning point in individuals' family trajectory and is exploited to (a) examine the co-occurring changes in their mental health trajectory around this event, and (b) examine the role of related changes in paid and unpaid work patterns, with a focus on systematic gender differences.

1.2.3 Theoretical predictions linking gender, parenthood, and mental health

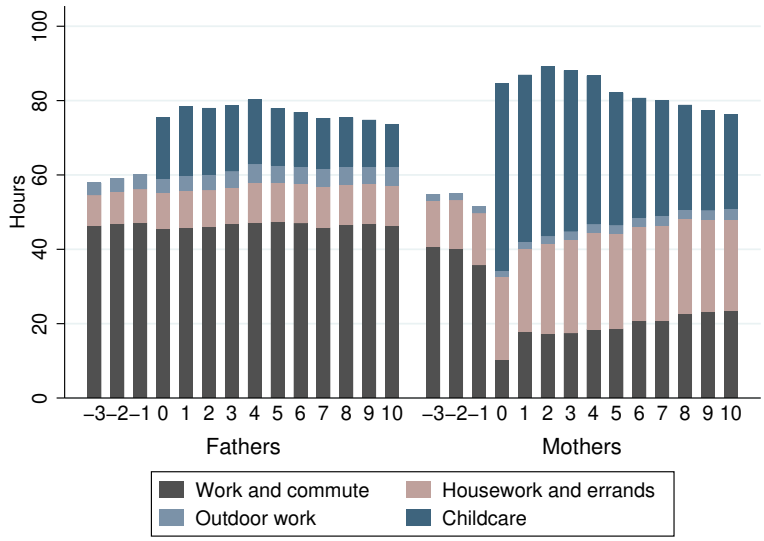
The study of parenthood and gendered mental health integrates several theoretical perspectives. This includes theories on how individual well-being fluctuates in response to significant life events, the psychological and emotional effects of parenthood, the influence of social roles, and how gender is enacted across the life course, as well as perspectives on how contextual factors and circumstances shape the relationship between parenthood and mental health. Together, these perspectives offer a detailed framework to map out the complex interplay between gender, parenthood, and mental health.[2]

[2] This thesis's scope is restricted to the study of parenthood transitions in the context of heterosexual partnerships, which respond to gender constraints, norms, and rationales that significantly influence fluctuations in gendered mental health across the broader population.

1.2.3.1 How and why is parenthood gendered?

From a life course approach, parenthood is a critical turning point differentiating men's and women's trajectories. This is most evident in the behavioural changes that follow parenthood across different domains. Women often seek more flexible arrangements, including switching to more family-friendly employment, reducing their working hours, or even exiting the labour market, either temporarily or permanently, to accommodate family responsibilities (Kleven, Landais, Posch, et al., 2019; M. Young & Schieman, 2018). This is compounded by women concurrently increasing their domestic workload (i.e., unpaid work which includes housework and caregiving) to meet the additional demands (Baxter et al., 2008). By contrast, men typically do not alter their work schedules or arrangements, and only marginally contribute to the greater domestic load. Figure 1.2 illustrates this pattern in Australia, showing the similarity in time allocation between men and women pre-birth, followed by the drastic shift post-birth, where women significantly reduce their hours at work while doubling their time spent on housework and performing three times more childcare than men.

Figure 1.2 Average yearly time allocations (in weekly hours) over the transition into parenthood for Australian men and women



Notes: 0 = birth year of first child.
Source: HILDA release 21. Own elaboration.

This results in a gender-based imbalance within couples and at the societal level, wherein fathers almost exclusively focus on their paid work while mothers split their efforts between paid and unpaid work, leading to a double burden and difficulties balancing both (Hochschild & Machung, 2012). Moreover, the combined time women spend on paid and unpaid work often exceeds that of men, leading to a systematic overload for women. Figure 1.3 illustrates this pervasive gendered pattern (which is exacerbated following parenthood and is common across most OECD countries), showing that men spend more time in paid work than women, women dedicate more time to housework, but when both are combined, women generally perform more total work than men. It can be assumed that these changing patterns will play a role in shaping the parenthood experience if this overload affects mental health.

Figure 1.3 Gender-relative time spent in paid work, unpaid work, and combined paid-unpaid work (in minutes per day) across OECD countries

Source: OECD (2020).

Several theoretical approaches predict how these gendered behaviours form within couples. One perspective posits that individuals act according to a specialisation rationale, where the partner with better labour market prospects –typically the male partner– specialises in paid work, while the other focuses on household production to

optimise financial benefits (Becker, 2009). Another approach argues that partners negotiate time allocations based on their resources, with the partner holding more economic bargaining power –typically the male partner– securing a more favourable division of labour, particularly avoiding undervalued unpaid work (Lundberg & Pollak, 1996). Yet, extensive studies of gendered choices and behaviours favour a normative explanation whereby men and women make decisions allowing them to enact established gender roles, i.e., *doing gender*, rather than following economic considerations (Grunow et al., 2012; Killewald & García-Manglano, 2016; Kühhirt, 2012; Nitsche & Grunow, 2016; West & Zimmerman, 1987).

The transition to parenthood reinforces gendered roles and the normative construction that women care while men provide, often regardless of circumstances (Fox, 2001). Motherhood expects women to restructure their lives to be consistently present and nurture their children, while fatherhood emphasises men's role to provide the family with economic resources and stability (Baxter et al., 2015; Evertsson & Boye, 2016; Perales et al., 2018; Yavorsky et al., 2015). These expectations explain the ubiquitous gendered adjustments after parenthood, aligning with the *doing gender* framework, that lead to significant economic, professional, and lifestyle changes. These effects tend to disproportionately affect women, who experience most of these changes and endure greater normative pressures during this life course transition, with potentially adverse repercussions (Sear, 2021). Parenthood and mental health should therefore be systematically approached through a gendered lens.

1.2.3.2 Parenthood and mental health: unequal processes for men and women

Why become a parent?

Besides potential evolutionary and biological reasons driving fertility decisions, having children is considered a source of greater eudaimonic well-being, i.e., increased meaning and purpose, as well as increased happiness, fulfilment, and connectedness (Nelson et al., 2013). As individuals generally seek to optimise their well-being over their life course, becoming a parent often represents a logical step to take. This is particularly the case in a post-Second Demographic Transition context in highly developed countries where, in most cases, becoming a parent reflects a conscious decision made with careful consideration of the pros and cons (Cetre et al., 2016). Therefore, modern parenthood is often chosen with the expectation that it will be overall beneficial to individuals' lives

and well-being and should consequently enhance mental health through these positive psychological pathways. Yet, despite this general belief (that goes hand in hand with childlessness being viewed as sad, lonely, and unrewarding), the reality of parenthood reflects a much more complex and nuanced picture (Hansen, 2012; Umberson et al., 2010; Umberson & Gove, 1989).

Predicted consequences of parenthood on mental health

Although children are inherently perceived as a source of joy and fulfilment, having children is also very demanding, time-consuming, and strenuous. The physical, emotional, and cognitive labour required to care for and educate children, especially in their early years, can be exhausting and stressful (Saxbe et al., 2018). Moreover, the presence of children often alters couple dynamics (which can complicate the parental relationship), empties the social calendar, and imposes greater material and financial constraints (Keizer & Schenk, 2012; Pollmann-Schult, 2014). Overall, many of these changes occurring in daily tasks and responsibilities, lifestyle choices, and time allocation due to parenthood are negatively associated with good mental health and well-being. This stands as a contradiction to children being a positive addition to individuals' lives and, by extension, their well-being.

The *cost-reward* approach combines these two seemingly conflicting perspectives on the effect of children on parents. According to the costs and rewards theory, the benefits (i.e., fulfilment, joy, purpose, and meaning) and the drawbacks (i.e., strain, fatigue, and stress) of parenthood co-exist and simultaneously affect individuals' well-being (Nomaguchi & Milkie, 2003). In particular, the beneficial and detrimental processes around parenthood can offset each other's effects, blurring the overall net impact of parenthood on mental health.

These mixed effects of parenthood may also shift across parenting phases as the costs-rewards ratio changes depending on children's developmental stage, parenting needs, and autonomy levels (Nelson-Coffey & Stewart, 2019; Simon & Caputo, 2019). However, there are no definitive theoretical expectations regarding how parental mental health fluctuates over time. Only the *set-point* theory framework offers a dynamic perspective on how well-being trajectories are predicted to evolve across life course transitions. Following set-point theory, each individual has a baseline level of well-being determined through personal and environmental factors (Diener et al., 2006). Major life events would

lead to significant increases or decreases (depending on the nature of the event, e.g., marriage or widowhood) in the trajectory, which would peak before reverting to baseline (i.e., to the individual's equilibrium well-being state). Set-point theory suggests that the transition to parenthood leads to a temporary rise in well-being but gradually returns to initial levels after a few years of adaptation. However, the set-point perspective primarily pertains to individuals' subjective well-being, which is related but distinct to mental health, and therefore may not be applicable 1:1 to mental health outcomes.

Mechanisms shaping gendered parental mental health

Various theoretical mechanisms have been proposed to explain how parenthood influences the mental health of men and women. This section presents the key mechanisms relevant to the empirical studies conducted in this thesis.

A first approach considers the importance of social roles for individuals' mental health. *Role strain* theory suggests that holding multiple roles (e.g., as a worker, a volunteer, a spouse, and a friend) can translate into the accumulation of responsibilities likely to impose excessive and competing demands that can strain individuals' mental health (Goode, 1960a). In the context of parenthood, the addition of the parental role introduces a range of new caregiving responsibilities that compound pre-existing ones. This may increase the likelihood of role conflict as new parents struggle to balance work, social, household, and childcare demands, leading to stress and decreased well-being (Nomaguchi et al., 2005). This conflict may be more pronounced for women, as they are more likely than men to experience heightened role strain due to assuming the role of the primary caretaker, with larger amounts of housework and childcare duties while often also engaging in paid work, as shown in section 1.2.3.1 This specific issue has been extensively examined as the *work-family conflict* and can be particularly harmful to mothers' well-being (Hays, 1996; Matysiak et al., 2016). This approach through role strain –and how it manifests differently according to gendered roles and expectations– therefore contributes to explaining why women would be mentally and emotionally more adversely impacted by parenthood than men (McBride, 2009; Simon, 1992a).

Yet, an alternative approach proposes an opposing perspective on the addition of the parental role. According to the *role enhancement* theory, holding multiple social roles has beneficial effects on individuals as it provides multiple sources of fulfilment, increased self-esteem, self-efficacy and self-conception, reinforces social status and allows

combining or distributing efforts across the different roles to reach optimal levels of gratification, which may all be essential to mental health (Sieber, 1974). Consequently, the advantages of role accumulation after becoming a parent may outweigh the daily stresses associated with increased responsibilities, resulting in an overall positive experience (Nordenmark, 2004). In this scenario, women would be expected to derive greater benefits from parenthood than men, as they are more involved and can therefore profit to a greater extent from their different roles, including their role as a parent (Holton et al., 2010).

A closely related but slightly differing perspective to role strain theory focuses on the temporal constraints of parenthood and their impact on mental health. Specifically, it states that it is not strictly the cumulation of multiple roles that leads to strain, but rather the time pressures associated with fulfilling these roles (Roxburgh, 2002, 2004). As time is a finite resource, individuals must allocate tasks within the limited hours of each day. Time pressure, or *time squeeze*, arises when individuals struggle to meet the demands of one or more roles within that constrained time frame, resulting in time-based conflict between roles (Steiber, 2009). If such time squeezes persist over time, they may develop into a chronic stressor, which is directly linked to poor mental health outcomes, including increased risk of depression (Roxburgh, 2012). Following the transition to parenthood, women, as primary caregivers, can become more susceptible to these pressures compared to men (Buddelmeyer et al., 2018; Hewitt et al., 2022; Ruppanner et al., 2019). However, the impact is not necessarily uniform across all women. Those who combine multiple roles, such as full-time working mothers, may be particularly prone to time-based strains, implying differentiated effects of parenthood on mental health depending on employment or socioeconomic circumstances.

Lastly, a notable mechanism likely to co-determine mental health across parenthood transitions is the role of the partner. Specifically, how caregiving and domestic responsibilities are shared among partners and the perceived *fairness* of this distribution. When one partner is disproportionately burdened or perceives the division as inequitable, it can lead to deteriorating relationship quality, negative emotional responses such as resentment and frustration, and even depressive symptoms (Baranowska-Rataj, 2022; Carlson, 2022; Kalmijn & Monden, 2012; Williamson et al., 2023). Given that the division of household tasks shifts unfavourably for women following parenthood, it can

be expected to have repercussions on the relationship with their partner and exacerbate already existing challenges impacting maternal mental health (Hiekel & Ivanova, 2022).

1.2.3.3 Heterogeneity in parental mental health: the role of contextual factors

Although theories on how parenthood impacts gendered mental health are often more general, it is essential to recognise that these effects are not uniform. Instead, they can vary across different demographic groups and populations due to differences in social, economic, and cultural factors.

Socioeconomic context

Individuals' socioeconomic context is an essential determinant of individuals' life trajectories and is therefore indistinguishable from the experience of parenthood and its effects on mental health. The mechanisms contributing to shaping parental mental health described in section 1.2.3.2 can have varying degrees of impact across socioeconomic groups, particularly among women. Socioeconomic status (SES, measured by an individual's education, occupation, and income) has a greater influence on parental well-being for women than for men, as it more significantly differentiates women's behaviours, choices, and parenting practices following motherhood (Nomaguchi et al., 2005). Higher SES women are more likely to remain employed full-time after becoming parents due to stronger labour market attachment and higher opportunity costs associated with exiting the labour market (Joshi, 1998). According to *role enhancement* theory, they might benefit more from their varied roles and the positive mental health effects of employment. However, the *role strain* and *time squeeze* approaches would suggest that higher SES women are also more prone to experiencing role conflicts and time-related pressures, with more negative consequences for their mental health (Floderus et al., 2008; Mikucka & Rizzi, 2019; Sperlich et al., 2011; Treas et al., 2011).

These pressures can further be exacerbated due to higher SES women's distinct approach to parenting. Higher SES women are more engaged in childrearing, adhering to *concerted cultivation* practices characterised by a structured approach to children's education to cultivate their skills and abilities to set them up for future success (Lareau, 2003). This is frequently coupled with *intensive parenting*, i.e., time- and resource-intensive parenting practices with high levels of cognitive and emotional investment in the children's upbringing (Faircloth, 2014; Gimenez-Nadal & Molina, 2013; Gimenez-Nadal & Sevilla,

2016; Hays, 1996). Such high involvement increases time pressure, stress, and gives way to negative psychosocial processes (e.g., '*mother's guilt'* when struggling to balance work and family; Fortin, 2005; Henderson et al., 2016). Overall, it is expected that higher SES women who continue working full-time while being highly involved in childrearing are paradoxically more disadvantaged[3] by motherhood despite having more resources to navigate its challenges (Nomaguchi & Brown, 2011).

National context

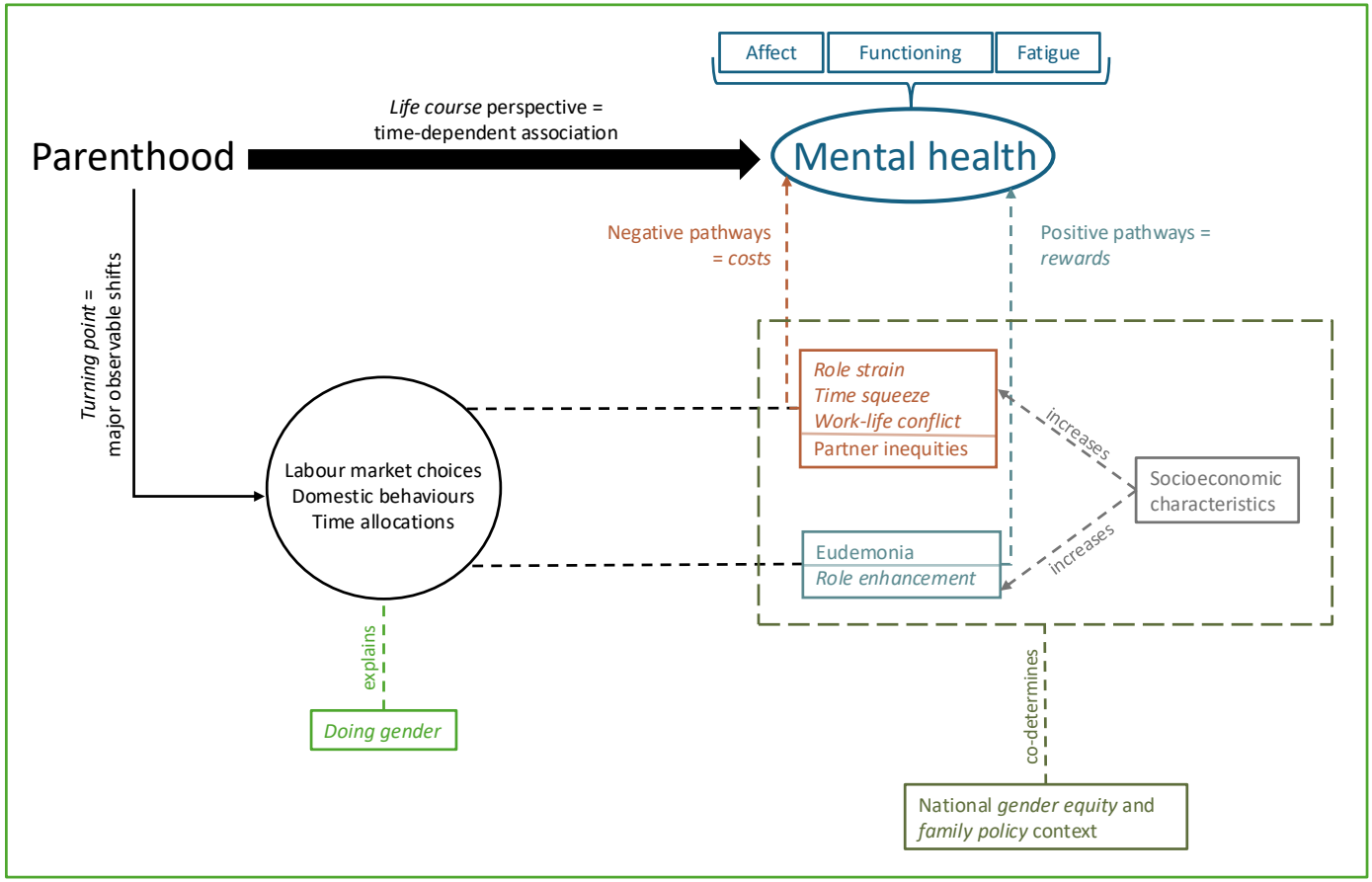
The experience of parenthood is strongly influenced by the national and institutional context, including welfare regimes, policy implementation, and cultural norms, all of which determine the level of support provided to families (Daly et al., 2023; Fasang, Andrade, et al., 2024). Countries with clear and targeted policies that support (dual-earner) parents by aiming to level out gender disparities (that adversely affect mostly mothers) can directly enhance maternal and parental mental health (Aassve et al., 2015; Nordenmark, 2021; Somogyi et al., 2021, 2022). These national policies minimise the *costs* of parenthood (time-wise, financially, mentally, etc,), allowing both parents to more fully enjoy the *rewards* of raising children, resulting in an overall net positive experience of parenthood. This is achieved through measures that directly address the mechanisms described in section 1.2.3.2 and facilitate smoother parenthood transitions (Nomaguchi & Milkie, 2017).

Effective measures include the provision of universal and affordable childcare services that offer all-day care of high educational quality (Cascio & Schanzenbach, 2013; Schmitz, 2020). This alleviates mothers' *time squeeze* and daily constraints, allowing them to pursue other nonchild-related activities and pursue formal employment, knowing that their children are well taken care of (e.g., reducing *mother's guilt*) while benefitting from employment (Bauernschuster & Schlotter, 2015). Protected (and paid) maternity leave during childbirth recovery and the first months of a child's life supports mothers' physical and mental health, leading to an easier adaptation to parenthood (Aitken et al.,

[3] This does not necessarily apply to the case of single mothers (which is not examined within this thesis), as their socioeconomic circumstances may operate on mental health through opposing mechanisms. Specifically, higher SES single mothers benefit from greater financial resources and social support, which can buffer against the adverse mental health effects of lone parenthood, compared to lower SES single mothers, who experience greater limitations that can lead to greater mental health issues (Crosier et al., 2007).

2015; Hewitt et al., 2017). Additionally, distributing leave between parents through the introduction and enforcement of paternal leave and shared parental leave encourages men to actively contribute to childcare and the increased domestic load from the outset. This specifically allows parents to settle into a more equitable division of responsibilities, with positive effects on relationship quality and both partners' well-being (Almqvist & Duvander, 2014). Other key measures include child allowances or tax credits and adaptable work arrangements that allow for schedule flexibility to meet family demands. Countries that implement such comprehensive family policy packages –along with strategic combinations of these policies– would consequently show higher levels of parental well-being than those that do not, leading to cross-national heterogeneity in (gendered) parental well-being (Glass et al., 2016).

Figure 1.4 Summary graph of the theoretical framework



Notes: Solid lines represent observed associations; dashed lines represent theoretical associations.
Source: Own illustration.

1.3 Previous research

To review previous studies on parenthood and well-being in Family Sociology and Demography, it is essential to first distinguish the different approaches taken to examine this question[4]. Conceptual differences around parenthood and well-being lead to different analytical approaches and, consequently, a range of results. These results are not necessarily contradictory but may rather reflect different aspects of a larger picture. Because the effects of parenthood on well-being are complex, it is important to recognise how different methodological choices contribute to the varying findings in order to draw more accurate conclusions from the existing research.

1.3.1 Conceptual and methodological differences

1.3.1.1 Outcome

A first important difference lies in the way the consequences of parenthood are conceptualised, particularly in terms of which aspects of well-being are emphasised and whether parenthood is approached as a positive, negative, or mixed experience, i.e., as a source of *rewards*, *costs*, or a combination of both. Much of previous research has skewed towards a negative framing, emphasising the costs of becoming a parent, such as increased strain, mental distress, or depressive disorders, conveying a negative image of parenthood, especially for mothers. Recent studies have shifted their focus towards more positive aspects of well-being in relation to parenthood, such as life satisfaction or overall happiness, or adopted a more balanced approach that acknowledges both the positive and negative psychological consequences of parenthood (Nomaguchi & Milkie, 2020). As the costs and rewards of parenthood coexist, focusing exclusively on one without acknowledging the other may only give a one-sided assessment of parenthood that is not fully representative of the experience.

[4] Studies from the medical and economic fields also provide valuable perspectives on the parenthood-well-being relationship. Medical research tends to focus on objectively measurable mental health consequences of parenthood based on conducted clinical assessments or biological markers (e.g., cortisol levels), whereas economic studies focus on economic-related outcomes such as economic well-being. Although these perspectives contribute to a comprehensive understanding of the consequences of parenthood, they fall outside the scope of this thesis's review.

These differences in the conceptual approach to parenthood and well-being translate into the choice of the examined outcomes that reflect which aspect of the parenthood experience is being focused on. There are two main categories of outcome measures to examine parental well-being: unidimensional measures of *subjective well-being* (i.e., single-scale life satisfaction or happiness evaluations) and measures of *mental health* (OECD, 2023d). Mental health indicators include multidimensional measures of positive mental health (e.g., multi-item scales such as the SF-36 MCS that compute positive and negative aspects into a composite score, with higher values reflecting better mental health), multi-item measures of mental distress (e.g., MHI-5), screening tools for specific disorders (e.g., CES-D for depression), self-reported clinical diagnosis of mental health disorders, or through prescription data from healthcare systems linked to individual records (e.g., antidepressant prescription). Consequently, certain measures reflect the costs of parenting (mental distress indicators, screening tools, self-reported clinical diagnoses, and prescription data) whereas others allow incorporating its rewards (multidimensional indicators of good mental health), leading to capturing very different effects.

1.3.1.2 Data and analytical strategy

Second, the type of data used results in different evaluations of the parenthood effect. *Cross-sectional* data estimates the effect of *being* a parent compared to *not being* a parent, by contrasting parents with nonparents to estimate outcome differences between the two groups. This offers a status-based estimation of parenthood effects, considering parenthood as a binary state and as being an established and integrated role fixed in time. By contrast, *longitudinal* data allows for a process-based approach by estimating the impact of *becoming* a parent. This perspective focuses on the transformative phase when individuals transition into parenthood to examine the time-dependent impacts of parenthood and assess whether they have a lasting influence relative to a pre-parenthood comparison point. Thus, longitudinal approaches reflect a dynamic *life course* perspective on the parenthood process that cross-sectional data cannot capture.

The two main approaches for modelling the transition to parenthood longitudinally are *fixed effects* and random effects models. Random effects models exploit both within- and between-individual changes, capturing how the transition affects a single individual's trajectory, and how it compares to others. In contrast, fixed effects models exploit only

within-individual changes, discarding any between-individual level differences in the outcome to isolate the effect of a change in the transition variable (e.g., becoming a parent) on a change in the outcome (e.g., changes in mental health). In doing so, fixed effects models remove unobserved factors and correct for self-selection, resulting in mostly unbiased (under certain assumptions) estimates, often making them the most appropriate method of the two to examine the consequences of life course transitions (Allison, 2009; Brüderl & Ludwig, 2015). Yet, even when using the same type of model, methodological choices can vary, potentially influencing results.

The way the time-dependent process is defined in a longitudinal study can determine how parenthood transition effects are estimated (Perales, 2019). This depends on how the parenthood transition variable is specified. A single dummy variable indicating becoming a parent estimates an average effect in the post-birth period compared to the pre-birth period. Alternatively, parenthood effects can be modelled more precisely over time using a *nonparametric time specification* (e.g., yearly dummy variables around the transition) or, for parsimony reasons, a polynomial time specification. This then does not yield a single effect of becoming a parent but rather shows how the effect is distributed over time.

In addition, the choice of the baseline reference point in longitudinal models (i.e., the initial average level of well-being against which subsequent changes are compared) further influences the obtained results. If the baseline is defined close to the birth event, this point of comparison is likely to depend on the already ongoing parenthood process. For instance, if there is a positive, temporary peak of well-being just before or at birth, the following changes will necessarily show a decline in parental well-being post-birth. This could suggest that the transition to parenthood diminishes well-being, whereas the apparent decline should be attributed to unaccounted pre-birth dynamics. By contrast, setting the baseline at 3 (or more) years before birth (when well-being can reasonably be considered unrelated to parenthood) allows the estimated post-birth changes to more accurately reflect the long-term impact of parenthood on well-being (Ludwig & Brüderl, 2021).

Other methodological choices include the definition of the analytical sample (e.g., in the case of fixed effects models, whether a 'counterfactual' *control group* is included for more robust and representative estimates of model covariates, which would typically be

a group of childless respondents in the case of the first transition into parenthood) as well as the inclusion of various control variables (e.g., controlling for concurrent age trends in mental health to disentangle ageing effects on mental health from specific time-dependent parenthood effects). Both choices affect how the effects of parenthood on well-being are estimated.

1.3.1.3 Effect heterogeneity

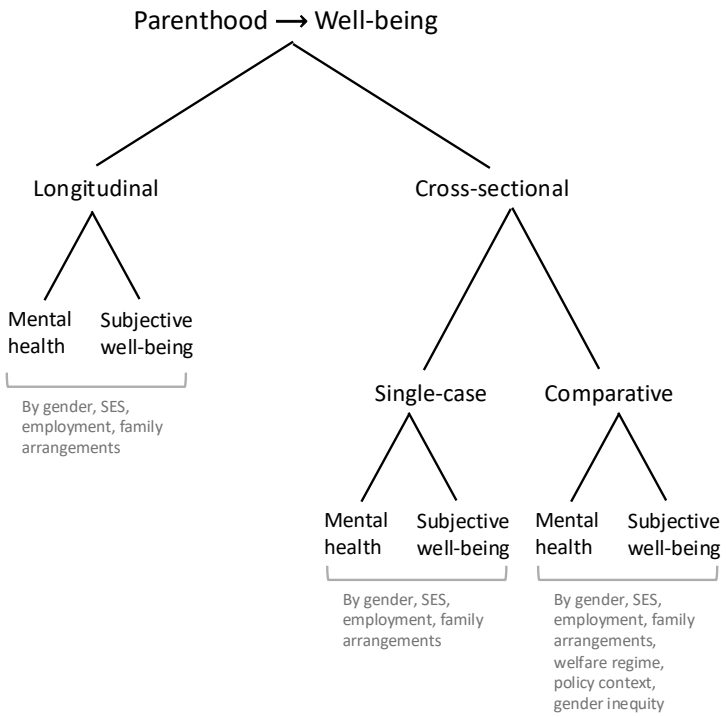
Lastly, the effects of parenthood on well-being can be considered from a single, population-level average perspective or through a differentiated approach that addresses *effect heterogeneity* across socioeconomic groups, conception method, employment conditions, work-family arrangements, etc. This approach evaluates the multiple effects of parenthood across various circumstances as opposed to an aggregate effect in the population. This is usually achieved through stratified models (separate models for each group) or by moderating the main effect by groups or certain characteristics to identify meaningful effect variations across these groups.

In summary, drawing conclusions on the exact impact of parenthood on well-being based on the literature is challenging because findings are dependent on: (1) how well-being is operationalised (i.e., the chosen outcome measure), (2) the available data format, (3) the specification of the parenthood variable, (4) the type of statistical model applied, (5) sample restrictions, (6) the selection of control variables, (7) the choice of the baseline period, and (8) whether effect heterogeneity is considered.

1.3.2 Empirical findings

Following the different approaches outlined above, previous studies on the impact of parenthood on well-being can be grouped based on (a) whether they use a longitudinal or cross-sectional design, (b) the employed outcome measure (general evaluative indicators or mental health-related measures), and (c) whether they estimate an average effect for the overall population or differentiate effects across multiple populations or subgroups. Figure 1.5 summarises the existing literature according to these criteria.

Figure 1.5 Chart of existing literature on the effects of parenthood on well-being



Source: Own illustration.

Cross-sectional single-case studies –that compare parents to nonparents to explore the difference in well-being levels by estimating a well-being 'gap' between the two groups– present mixed findings. Some studies report positive parenthood effects such as higher levels of positive emotions and eudaimonia (Nelson et al., 2013). Other studies find higher levels of strain, stress, or psychological distress compared to nonparents (Nelson et al., 2014). These contrasting results are not necessarily mutually exclusive as they may reflect the *costs* and *rewards* of parenthood. However, cross-sectional studies also find conflicting results even when examining the same outcome. For example, certain studies find more depressive symptoms among parents while others indicate that parenthood has protective effects against depression (Nomaguchi & Milkie, 2023; Simon, 2002). Differences by gender, SES, or parenting stage are also examined, finding that mothers fare worse than fathers but not always worse than nonmothers; lower SES parents face more overall disadvantages; and parents with younger children report lower well-being, but results are not always consistent across studies (Meier et al., 2018; Nelson-Coffey et al., 2019; Nomaguchi, 2012; Simon & Caputo, 2019; Sperlich et al., 2011).

Cross-sectional comparative studies confirm that there are national variations in the effects of parenthood on well-being and mental health although there is similarly no consensus on whether this effect is positive or negative, even across the same outcome measures. The gender gap in well-being is also shown to vary across countries depending on the level of institutional support for families and whether family policies promote gender equity between mothers and fathers (Blanchflower & Clark, 2021; Margolis & Myrskylä, 2011; Ugur, 2020). However, all studies consistently find that generous family policies, institutional adaptation to dual-earner families, and external support such as childcare provision improve both parental subjective well-being and mental health (Aassve et al., 2012, 2015; Glass et al., 2016; Nordenmark, 2021; Pollmann-Schult, 2018; Somogyi et al., 2021). However, these findings rely on cross-sectional evaluations of well-being differences between parents and nonparents and therefore do not reflect the dynamic effects of parenthood within different institutional and policy contexts.

Longitudinal single-case studies generally report positive overall trajectories for *subjective well-being*, regardless of how the time trend is defined. Typically, these trajectories display a positive anticipation effect followed by a positive impact at birth. However, there are variations in the duration of these effects. Some studies find that subjective well-being measures temporarily increase before reaching an adaptation phase a few years after birth, in line with *set-point* theory, whereas others find sustained improvements (Aassve et al., 2021; Anusic et al., 2014; Clark et al., 2008; Matysiak et al., 2016; Mikucka, 2016; Mikucka & Rizzi, 2019; Radó, 2020). This can be attributed to differences in sample selection and modelling decisions outlined in 1.3.1.2 ., as well as by the use of datasets from different countries with potentially distinct cultural and policy impacts on parenthood consequences. Yet, regardless of these differences, clear and consistent gender differences in trends appear in all studies: women have larger positive effects than men, who show little within-individual variation compared to women, suggesting that women's subjective well-being is more positively affected by parenthood transitions[5] (Baetschmann et al., 2016).

[5] Note that these results reflect experienced *changes* in well-being following birth, not the actual *levels* (i.e., women experience greater positive change than men but their average well-being starting levels are typically lower than men's).

Only a handful of studies examine longitudinal *mental health* trajectories using multidimensional indicators of mental health. Their analytical approaches are summarised and compared in Table 1.1. Clark & Georgellis (2013) find only a significant positive anticipation effect on mental health during pregnancy for women but a negative mid-term effect on mental health for men in the UK. For Germany, Giesselmann et al. (2018) find a negative effect of motherhood on mental health in year 6 post-birth compared to nonmothers' mental health trends. However, the model does not control for age, resulting in steeper negative trajectories for both mothers and nonmothers, making it unclear how much is due to ageing effects and how much to parenthood. Using more recent UK data, Tosi and Goisis (2021) find short-term positive effects of parenthood following natural conception on women's mental health, with no significant effects for men. However, as the study aims to compare these trajectories with those of individuals using medically assisted reproduction, it does not include a control group of nonparents. Lastly, Ruppanner et al. (2019) find overall positive mental health effects for the first birth for Australian men and women, with a particularly large anticipation effect for women, using a combination of a parenthood indicator and quadratic time trend to capture these dynamics.

Table 1.1 Comparison of analytical approaches in studies examining mental health trajectories around the transition to parenthood

Study	Data	Outcome	Sample	Model specification
Clark & Georgellis (2013)	BHPS	GHQ-12	First-time parents + nonparents	FE, distributed yearly effects, reference point -5 years
Giesselmann et al. (2018)	GSOEP	SF-12 MCS	First-time mothers + nonmothers	FE, distributed yearly effects, reference point -2 years, no age control
Ruppanner et al. (2019)	HILDA	MHI-5	All parents + nonparents	FE, birth indicator + quadratic time trend, reference period all years before birth
Tosi and Goisis (2021)	UKHLS	SF-12 MCS	First-time parents	FE, distributed yearly effects, reference period -3+ years

Notes: FE = Fixed effects, SF-12 MCS = Short-Form Mental Component Summary score (12 item version); GHQ-12 = General health questionnaire (12 items version); MHI-5 = Mental health inventory (5 item version).
Source: Own elaboration.

This illustrates that, despite all four studies using a very similar framework with fixed effects models and examining comparable mental health indicators, differences in sample, control variables, reference point, and time trend specification can still lead to differing estimations of the same association.

1.3.3 Research gaps

Previous literature on the effect of parenthood on well-being is extensive. However, only very few studies focus on the *trajectories* around parenthood transitions and *systematically compare* men and women using *multidimensional measures of mental health*. Only more recent research has adopted a dynamic life course perspective to assess the effects of parenthood on individuals' well-being patterns using fixed effects models, starting with the seminal study by Clark et al. (2008) followed by Frijters et al. (2011) and Clark & Georgellis (2013), with further consolidation by Myrskylä & Margolis (2014) in the Demography literature.

Following these studies, more research has explored the longitudinal impact of parenthood but without always comparing men and women side by side to specifically examine gender differences in this impact. Further, the examined outcome was generally a broad measure of subjective well-being which overlooks the complex interplay of the *costs* and *rewards* of parenthood, potentially leading to only a partial understanding of parenthood's effects on well-being. Very few studies employ more complex mental health indicators that can reflect the ambiguous psychological and emotional effects of parenthood and, with the exception of Ruppanner et al. (2019), do not aim to explicitly link them to systemic gender inequalities.

Further, only little is known about the mechanisms shaping parental mental health. Hypothesised mechanisms such as *role strain* or *role enhancement*, experiencing *time squeezes*, or *changing partnership dynamics* may play out at different stages of the transition. This requires a more in-depth evaluation of these processes and how they relate to mental health variations over the transition to parenthood.

Another important gap in the literature is the absence of comparative longitudinal studies on mental health trajectories across national contexts. This is primarily due to data limitations, as comparable household panels with identical outcome measures are scarce.

Nonetheless, it is well-established that national contexts significantly shape both the parenthood experience and the gender gap in parental well-being. Incorporating a longitudinal life course approach into a comparative cross-national framework would therefore offer an additional perspective into the question of how (gendered) parental well-being trajectories are determined.

Lastly, much previous research focused on population-level average effects of parenthood. While this provides valuable estimations for general conclusions, parenthood is not a monolithic experience across the population. Although some studies take into account the role of socioeconomic context or level of work-family conflict on parental trajectories, there is a lack of studies explicitly exploring the heterogeneity between all individuals, not just across large subgroups.

1.4 Research questions and aims

This thesis examines the dynamic association between parenthood and mental health for men and women. It has three main objectives: (i) to provide an in-depth examination of mental health across the transition to parenthood; (ii) to assess the heterogeneous effects and complex mechanisms behind the transition in parenthood on mental health for both men and women; (iii) to apply a consistent conceptual, theoretical and methodological framework throughout. This is achieved across four empirical studies that share a common focus on the effect of becoming a parent on mental health, but examine distinct aspects of this association to address the identified research gaps. The four studies are outlined below and summarised graphically in Figure 1.6.

Study 1 addresses the following research question:

1. *How does the transition to parenthood affect gendered mental health trajectories across different mental health dimensions and socioeconomic groups?*

This study examines how the first transition to parenthood affects gendered mental health trajectories. It further assesses how the transition to parenthood differently affects distinct domains of mental health such as positive and negative affect, psychological functioning and vitality. Additionally, it considers variations in mental health trajectories by socioeconomic characteristics among men and women. The study's objectives are to (i) provide an overview of long-term mental health trajectories following parenthood and

compare trends between men and women, (ii) assess whether the *costs* and *rewards* of parenthood transpose across different mental health domains for men and women, and (iii) consider mental health heterogeneity across socioeconomic groups among men and women.

Study 2 addresses the following research question:

2. *To what extent do changes in time use across the first transition to parenthood affect men's and women's mental health trajectories following birth?*

This study investigates the role of time use changes in first-time mothers' and fathers' mental health trajectories. It exploits the major gendered time use shifts in paid work and housework that occur following the transition to parenthood to assess whether *individual*, as well as *partner-relative* time reallocations, contribute to gendered patterns in mental health. This is motivated by the expected disadvantageous shifts in women's time use following parenthood (i.e., reduced work hours and increased domestic work time) that are potentially accompanied by adverse mental health consequences. This study is the first to examine time use changes as a specific mechanism that reflects *role strain* and *time squeeze*, to examine its role in shaping gendered mental health trends following parenthood.

Study 3 addresses the following research question:

3. *Do mental health trajectories around the first and second birth differ across countries by gender, socioeconomic groups, and formal childcare use?*

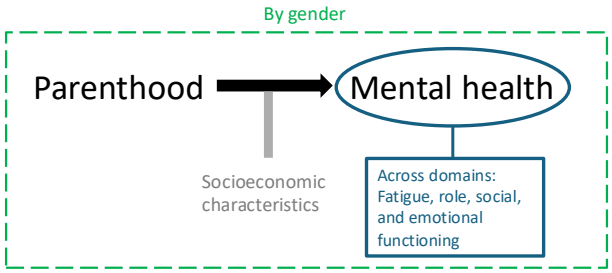
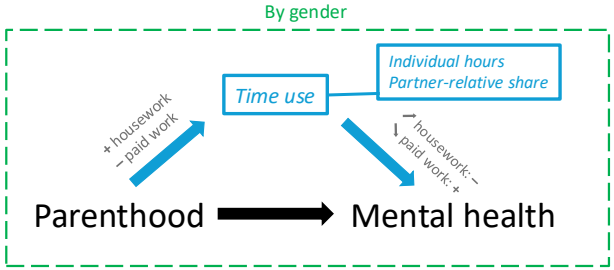
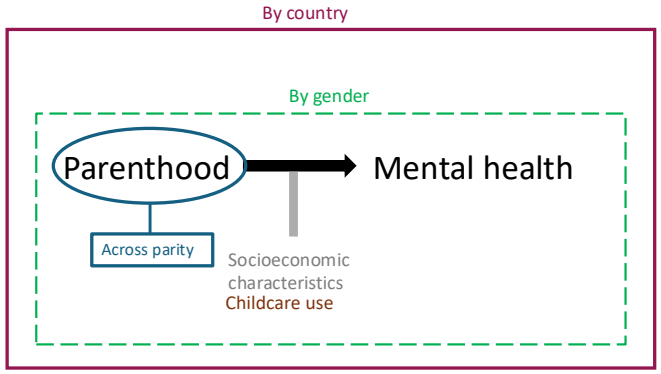
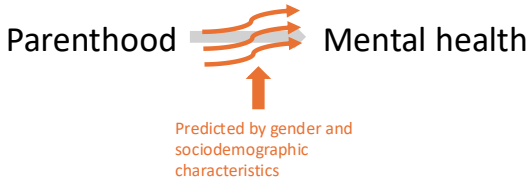
This study is the first to integrate a life course perspective with a cross-national approach focusing on mental health as a key outcome to examine parental well-being in Australia, Germany, and the United Kingdom. By adopting this approach, Study 3 introduces a comparative dimension to longitudinal studies on mental health outcomes, incorporating the potential influence of national context and specific policy use on parenthood transitions. This allows the exploration of both the universal and country-specific consequences of parenthood on mental health for men and women.

Study 4 addresses the following research question:

4. *Are there discernible differences in mental health trends around the transition into parenthood between individuals?*

This study uses complex longitudinal modelling to classify individual mental health trajectories across the first transition into parenthood into groups that share similar patterns. The study aims to explore the full *between-individual heterogeneity* in mental health trajectories without stratifying the sample by assuming pre-determined groups. Rather, this study takes on a data-driven approach to examine to what extent individual trajectories deviate from the predominant average population effect.

Figure 1.6 Conceptual graphs for each of the four empirical studies

Study 1 – Gender differences in mental health following the transition into parenthood: Longitudinal evidence from the UK	**Study 2 –** The role of time use changes in first-time mothers' and fathers' mental health trajectories
	
Study 3 – Mental health trajectories across parenthood transitions: A longitudinal cross-national study	**Study 4 –** Exploring the heterogeneity in first-time mothers' and fathers' mental health trajectories
	

1.5 Data and methodology

To address each research question across the four empirical studies, this thesis employs three longitudinal datasets with highly comparable structure, scope and sample size, near-identical outcome measures, and applies consistent longitudinal modelling approaches to map out mental health trajectories.

1.5.1 Datasets

The datasets used in this thesis include the Household, Income and Labour Dynamics in Australia (HILDA) survey, the German Socio-Economic Panel (GSOEP), and the UK Household Longitudinal Survey (UKHLS). All three surveys are large-scale representative household-based panels that collect extensive sociodemographic, economic, family, and health information of every household member on a yearly basis. Table 1.2 provides a detailed comparison of these datasets, outlining their pros and cons, as well as comparing them with other similar surveys that were not selected.

The UKHLS was selected for Study 1 due to its large sample size which is well-suited for the study's research question and stratified analyses. The HILDA was selected for Study 2 and Study 4 as it is the longest-running panel that provides both annual time use and mental health measures, along with comprehensive parenting information. The GSOEP was selected alongside the UKHLS and HILDA for the cross-national comparison in Study 3 as it includes the same mental health measure and offers a distinct welfare context to Australia and the UK.

Table 1.2 Comparison of major large-scale household panel surveys

Dataset	Country	Period	Sample size	Well-being measures	+	–
HILDA*	AU	2001 - 2022	N ≈ 9,000	SF-36; Life satisfaction; Parental well-being	Annual well-being measures; Annual time use measures	
SHP	CH	1999 - 2021	N ≈ 4,000	Life satisfaction	Not widely used	Inconsistent well-being measures; Small sample
GSOEP*	GE	1984† (1990 East G) - 2022	N ≈ 20,000	SF-12; Life satisfaction	Long running; Annual time use measures	Mental health reported every other wave
BHPS	UK	1991 - 2009	N ≈ 8,000	SF-36; GHQ-12; Life satisfaction	Long running; Annual well-being measures	Older data
UKHLS*	UK	2009 - 2022	N ≈ 40,000	SF-12; GHQ-12; Life satisfaction	Largest sample; Annual well-being measures	Time use measures reported every other wave
PSID	US	1968 - 2021	N ≈ 5,000	Life satisfaction; Frequency of positive & negative emotions	Longest running survey	Biannual after 1998; *Well-being supplement* only in 2015

* Selected datasets for this thesis.
† This thesis only uses GSOEP data from 2002 onwards, as mental health variables were only introduced that year.
Notes: Sample size refers to the number of included households. AU = Australia; CH = Switzerland; GE = Germany; East G = East Germany; US = United States.
Source: Own elaboration.

1.5.2 Measures and main variables

1.5.2.1 Mental health

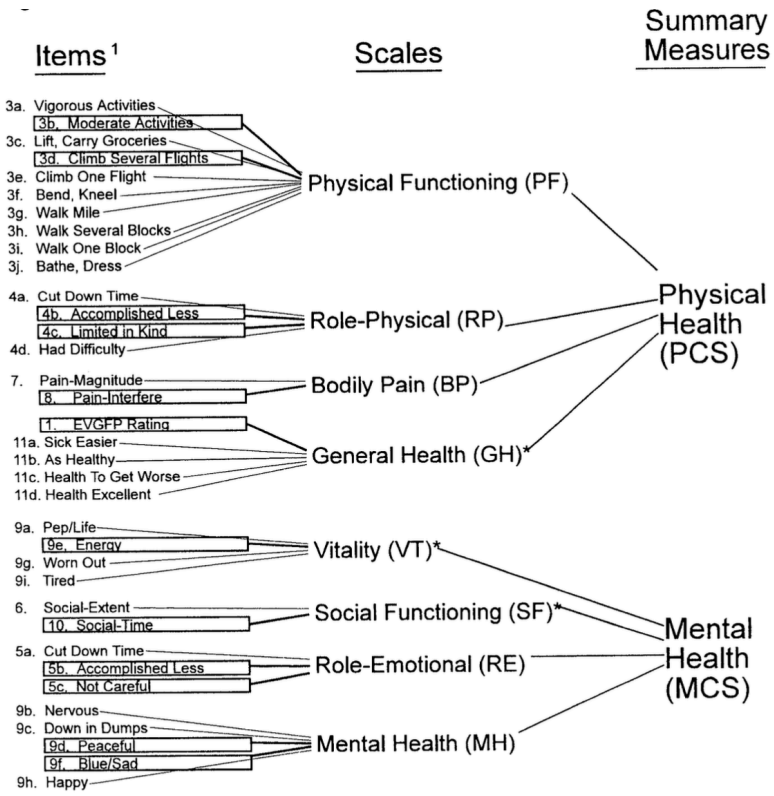
Throughout this thesis, mental health is assessed using the Mental Component Summary (MCS) score derived from the Short-Form Health Survey[6] (SF-36 or SF-12). The MCS score includes four domains (or subscales) that reflect different dimensions of mental health: role functioning, social functioning, emotional functioning[7], and vitality. Each subscale consists of several items related to that dimension. The MCS score ranges from 0 to 100 points, with higher scores indicating better mental health, and is derived from a weighted combination of these items. These construction weights are predefined and country-specific to adjust the scores and facilitate their interpretation with respect to the general population (Ware et al., 1994). The score is further standardised to have a population mean of around 50 and a standard deviation of 10 points. The SF-36 is the original score, with the SF-12 being a shorter alternative to the SF-36 to accommodate survey length constraints while retaining the same definition, dimensions and interpretation as the SF-36, and both are shown to be virtually identical (Jenkinson et al., 1997). The SF-12 contains a subset of 12 items that are identical to the original SF-36 items. Figure 1.7 shows the different SF-36 items, and those selected for the SF-12 within each subscale.

The SF-36/12 MCS is a suitable multidimensional indicator of mental health for the purposes of this thesis as it reflects multiple dimensions of mental health, including positive (e.g., feeling happy or calm) and negative (e.g., feeling downhearted or nervous) emotional states as well as daily functioning, capturing more complex psychological processes. The MCS is categorised as an indicator of positive mental health (i.e., higher scores equal better mental health) that does not consider mental ill-health, consistent with the *dual continuum* approach to mental health distinguishing the two concepts. As such, this measure aligns with the definition of mental health adopted in this thesis, following the recommendations by the WHO and OECD (OECD, 2023d; WHO, 2022).

[6] This measure also includes a Physical Component Summary (PCS) score (not used in this thesis).

[7] The original documentation of the measure calls this subscale 'Mental health' but this is confusing with the summary score being also termed as 'Mental health'. For this reason, this subscale is called 'Emotional functioning' instead and is also sometimes referred to as a scale measuring positive and negative affect.

Figure 1.7 Items, scales, and summary measures of the SF-36/12



Notes: Framed items are used for the SF-12.
Source: Ware et al. (2002)

1.5.2.2 Parenthood transition

Parenthood transitions are modelled the same way across the thesis by defining a parenthood timer variable recording the years before and after the birth event. This allows for a nonparametric specification of time to precisely capture the yearly trends of changes in mental health outcomes. The observation period for the parenthood transition always begins 3 years before birth as the reference time point and extends to either 3-, 6-, or 8-years post-birth, depending on the study's aim.

1.5.3 Empirical strategy

This thesis uses longitudinal methods for all empirical chapters to estimate time-dependent processes. Studies 1, 2, and 3 use fixed effects models separately for men and women that include control groups of childless respondents to obtain more robust estimations of model covariates, particularly age effects, in line with methodological recommendations and related studies examining consequences of life course transitions

(Anusic et al., 2014; Brüderl et al., 2019; Brüderl & Ludwig, 2015; Leopold, 2018; Ludwig & Brüderl, 2021; Mikucka, 2016, 2016; Mikucka & Rizzi, 2019; Perales, 2019; Ruppanner et al., 2019). Study 4 uses Growth Mixture Models to identify distinct subgroups that follow different mental health trajectories over time and explore underlying heterogeneous patterns by estimating multiple latent classes that present distinct patterns of mental health changes, and examines what characterises each class (van der Nest et al., 2020). Data analyses are performed in Stata 17 SE for Studies 1 and 2, Stata 18 MP for Study 3, and with R version 4.3.3 for Study 4.

1.6 Thesis structure and overview[8]

Chapter 1 introduces the thesis and outlines the overarching themes that connect the four empirical studies in the subsequent chapters. A summary of the empirical studies is provided in Table 1.3. Chapter 2 presents Study 1, which examines gender differences in mental health outcomes over the transition to parenthood in the UK. Chapter 3 contains Study 2, focusing on the role of changes in time use on gendered mental health following the transition into parenthood. Chapter 4 contains Study 3 which combines a longitudinal approach with a cross-national perspective to compare fluctuations in mental health following parenthood transitions across countries. Chapter 5 presents Study 4, which uses growth mixture models to explore heterogeneity in mental health trajectories between individuals having their first child. Finally, Chapter 6 summarises the key findings and contributions of this thesis, discusses their limitations, suggests future research avenues, and concludes the thesis.

[8] Note that the four empirical chapters in this thesis are self-contained studies and are prepared for independent submission to peer-reviewed journals but still share the same overarching theoretical framework and general empirical approach outlined in Chapter 1. As a result, some sections across chapters may present similar information, reflecting their connection to the common research topic that is addressed throughout this thesis.

Table 1.3 Overview of the four empirical studies

	Study 1	**Study 2**	**Study 3**	**Study 4**
Title	Gender differences in mental health following the transition into parenthood: Longitudinal evidence from the UK	The role of time use changes in first-time mothers' and fathers' mental health trajectories	Mental health trajectories across parenthood transitions: A longitudinal cross-national study	Exploring the heterogeneity in first-time mothers' and fathers' mental health trajectories
Research question	How does the transition to parenthood affect gendered mental health trajectories across different dimensions and socioeconomic groups?	To what extent do changes in time use across the transition to parenthood affect men's and women's mental health trajectories following birth?	Do parents' mental health trajectories differ across countries by gender, socioeconomic groups, and formal childcare use?	Are there discernible differences in mental health trends around the transition into parenthood between individuals?
Data	UKHLS	HILDA	HILDA, GSOEP, UKHLS	HILDA
Outcome	SF-12 MCS	SF-36 MCS	SF-12 MCS, SF-36 MCS	SF-36 MCS
Method	FE	FE mediation analysis	FE	GMM
Main findings	Women are more strongly affected by parenthood than men both positively and negatively; higher SES women experience diminished benefits from childbirth	Women experience disadvantageous shifts in time use following parenthood, which curtails their mental health increase around birth, whereas men are unaffected	Trends in mental health are similar across countries for men and women for the first child, but differ for the second child; women never using childcare fare worse	¾ of parents show high stable trajectories, whereas ¼ show considerable variations and lower average levels, with women more likely than men to be in these groups

Notes: FE = Fixed Effects; GMM = Growth Mixture Model.

Chapter 2: Study 1 – Gender differences in mental health following the transition into parenthood: Longitudinal evidence from the UK[9]

Abstract

Previous studies have largely omitted a dynamic analysis of how the transition into parenthood shapes gender differences in mental health trajectories. This study adopts a life course approach to examine how transitioning into parenthood affects men's and women's mental health across multiple domains over time, using large-scale panel data from the 'UK Household Longitudinal Study' (2009-2020). Results from fixed effects models with discrete-time trends show that: (1) women's mental health is more largely affected by parenthood than men's; (2) women's overall mental health shows stable improvements following childbirth, while men's shows mostly insignificant changes; (3) role and social functioning are largely improved among women following childbirth, but only marginally among men; (4) emotional functioning and vitality demonstrate the counteracting effects of parenthood for both genders, with increases in feeling happy but a deterioration in feeling calm and having energy, particularly during care-intensive years; (5) women show larger variations by socioeconomic characteristics than men, with women from higher socioeconomic backgrounds and working full-time experiencing smaller mental health benefits from parenthood compared to less privileged women or women with lower paid work constraints. Overall, transitioning to parenthood leads to distinct changes in mental health domains with heterogeneous effects across genders and socioeconomic groups.

Keywords: Parenthood; Mental health; Gender; Socioeconomic status; Longitudinal analysis

[9] This chapter has been published as: Gender differences in mental health following the transition into parenthood: Longitudinal evidence from the UK. *Advances in Life Course Research*, 100550. https://doi.org/10.1016/j.alcr.2023.100550.

2.1 Introduction

Gender inequalities persist strongly across multiple outcomes such as paid work, household labour or leisure (Bianchi et al., 2000; Budig & England, 2001; Hook, 2010; Kamp Dush et al., 2018). The effect of parenthood on gender inequalities in income and labour market outcomes has been well documented (e.g., Musick et al., 2020). Yet, how the transition to parenthood affects individuals' mental health trajectories, and particularly whether men and women are differently impacted by this life course transition, remains to be more precisely understood. The present study contributes to the health, gender, and life course literature by providing new dynamic evidence of how the transition to parenthood shapes men's and women's mental health outcomes over time.

Understanding whether and how parenthood impacts gender gaps in mental health has important societal implications. Women tend to experience higher levels of psychological distress than men and are more likely to be diagnosed with internalised mental disorders such as depression or anxiety (Kuehner, 2017; Otten et al., 2021), which have been linked to parenthood (e.g., postpartum depression). Gender disparities in mental health may partly reflect differences in gendered expectations, responsibilities, and behaviours, which may be amplified over the transition to parenthood, potentially leading mothers to experience greater pressures and strains than fathers (Baxter et al., 2015; Nomaguchi et al., 2005; Ruppanner et al., 2019).

To date, however, the literature has provided inconclusive evidence on how becoming a parent affects men's and women's mental well-being (Nelson et al., 2014; Nomaguchi & Milkie, 2020). Longitudinal studies generally find only short-term effects of childbirth on parental well-being (Clark et al., 2008; Mikucka & Rizzi, 2019; Myrskylä & Margolis, 2014), although most previous studies use a unidimensional evaluative measure of well-being, such as life satisfaction, which may not account for specific mental well-being dimensions. Conversely, multi-item mental health instruments allow capturing more precise dimensions, such as mental strains and benefits, by recording psychological functioning (e.g., ability to perform necessary tasks well) and emotional states (e.g., feeling stressed, feeling happy), which may be differentially affected by parenthood (Oyarzún-Farías et al., 2021). Studies examining specific mental well-being outcomes (e.g., strain, feelings of joy, fulfilment) suggest that parenthood has counteracting

positive and negative effects, which unequally affect mothers and fathers. However, these previous studies often rely on cross-sectional data, which do not capture the dynamic nature of the parenthood experience (Negraia & Augustine, 2020; Nomaguchi & Milkie, 2003; Roeters & Gracia, 2016). Only a few recent studies have specifically examined mental health longitudinally in the transition to parenthood (Clark & Georgellis, 2013; Giesselmann et al., 2018; Ruppanner et al., 2019), but without examining specific mental health areas as well as taking into account gendered and socioeconomic differences in these effects.

This study addresses gender differences in mental health trajectories of first-time parents in the UK. We combine a long-term longitudinal approach with a multidimensional measure of mental health, using the SF-12 Mental Component Summary (MCS) score. The SF-12 MCS captures relevant dimensions likely to be affected by the transition to parenthood, such as role and social functioning or stress and fatigue. Our study not only focuses on overall mental health but also adopts a domain-based approach to mental health trajectories following the transition to parenthood using the SF-12 MCS subscales. By making novel use of multiple mental health subscales (i.e., role, social, emotional functioning, and vitality), we can identify counteracting psychological effects of parenthood which are otherwise not detectable through the computed global score (e.g., becoming a parent may increase joy, but also fatigue or conflict with social life). This allows us to compare longer-term processes in adjacent but distinct areas of individuals' mental health following childbirth. We particularly focus on gendered differences within and across these domains as well as address heterogeneity in mental health by socioeconomic characteristics among both men and women following the first parenthood transition. We use large-scale panel data from the British *Understanding Society* survey (UK Household Longitudinal Survey, UKHLS), which provides repeated annual observations on mental health measures, family context, and socioeconomic indicators collected between 2009 and 2020 from a sample of over 40,000 households.

Our study contributes to the growing literature on parenthood transitions and mental health trajectories by (1) adopting a nuanced multidimensional approach using relevant subscales of mental health, (2) examining gender differences across this life course process, and (3) addressing socioeconomic heterogeneity.

2.2 Background

2.2.1 Mental well-being in the transition to parenthood: previous findings

Previous studies on parental mental well-being have adopted various methodological approaches (cross-sectional vs. longitudinal) and examined different types of outcomes (unidimensional subjective well-being measures vs. mental health assessment scores). Studies using cross-sectional data have yielded mixed results, finding either positive or negative effects of parenthood on mental health, with some pointing out higher levels of distress and depressive moods, dependent on social and marital context, as well as age at birth and parenting stage (Evenson & Simon, 2005; Mirowsky & Ross, 2002; Simon & Caputo, 2019). However, these studies may be subject to bias due to unobserved factors affecting results (e.g., (self-)selection into parenthood). By contrast, longitudinal studies examining parental well-being, which can account for individual-level unobserved heterogeneity, show a more consistent picture. Parenthood has been mostly found to have a positive effect on individual well-being, although effect duration varies across studies. Momentary increases have been documented for German, Swiss, British, and Australian data (Clark & Georgellis, 2013; Frijters et al., 2011; Mikucka & Rizzi, 2016; Myrskylä & Margolis, 2014), while longer-lasting positive trends were found in Russia and Hungary, which suggests some variations across cultural and policy contexts (Mikucka, 2016; Radó, 2020).

Most previous longitudinal studies examine parental well-being through global evaluative indicators such as 1-to-10 scales of life satisfaction or happiness, which reflect individuals' global perceptions of life quality (Clark et al., 2019). However, they do not necessarily reflect having good mental health or describe the complex and multi-layered mental and emotional processes taking place following childbirth. Only a few studies on parenthood transitions have adopted a long-term dynamic approach to study variations in mental health. Examining Australian longitudinal household data, Ruppanner et al. (2019) find positive effects of first birth on maternal mental health (measured by the SF-36 MCS), supporting an older study by Clark and Georgellis (2013) finding temporary positive effects of parenthood on mental health in the UK (measured by the GHQ-12). By contrast, Giesselmann et al. (2018) find a negative evolution of German mothers'

mental health (SF-12 MCS) following the transition into parenthood, while Tosi and Goisis (2021) find that (short-term) effects vary depending on whether parents had to go through medically assisted reproduction in the UK. However, these previous studies have not addressed (1) how specific mental health domains are affected by parenthood, (2) whether longer-term trajectories differ between men and women, and (3) whether trajectories show heterogeneity across socioeconomic groups. Our study contributes to filling these gaps.

2.2.2 Conceptual and theoretical approach

Mental health is conceptualised as a state which includes functioning, psychological well-being, and vitality, i.e., having good mental health translates into having the ability to carry out daily work and social activities without experiencing persistent strain and being able to manage emotional distress (WHO, 2022).

All mental health domains, as captured by the SF-12 MCS, may be affected by parenthood. First, role and social functioning (i.e., the ability to perform well in usual daily and social activities) may be negatively affected by parenthood, as the new parenting roles and responsibilities may induce performing less well due to role overload or strain, particularly for mothers (Goode, 1960a; Simon, 1992b). Second, emotional functioning (i.e., how emotions are experienced and expressed) may be affected by parenthood: negative emotions, such as feeling stressed, may increase due to feeling more pressured for time (Ruppanner et al., 2019), while positive emotions, such as feeling joyful or happy, may improve with a fulfilling family life (Nelson et al., 2013). Lastly, vitality (i.e., having energy and endurance) may deteriorate after childbirth due to the increase in strain and fatigue linked to the lack of sleep and having to provide intensive care in the early childrearing years, which may affect mothers more than fathers (Venn et al., 2008).

The predominant approach to studying parental well-being within the life course framework is the *set-point* theory. According to *set-point* theory, individuals have a stable baseline well-being level determined by genes, personality, and early environment (Diener et al., 2009). Important life events only temporarily increase or decrease –rather than redefine– well-being levels, having a short-term effect before individuals revert to their baseline (or set-point) and adapt to their new circumstances over time. Additionally,

in the case of expected life changes such as parenthood, an anticipation process is likely to be observed, raising well-being levels prior to the actual event (Frijters et al., 2011). Multiple studies find empirical evidence in support of *set-point* theory in relation to how parenthood transitions affect selected well-being outcomes (e.g., Anusic et al., 2014; Clark et al., 2008). Additionally, although *set-point* theory does not make explicit distinctions between men and women, some gendered differences are observed in effect size and adaptation periods following childbirth (Frijters et al., 2011; Mikucka & Rizzi, 2019).

Further, the *costs-rewards* approach to parenthood states that children simultaneously bring positive and negative aspects to parents' lives (Nomaguchi & Milkie, 2003). Being a parent is associated with feelings of fulfilment and happiness, as it brings psychological, emotional, and social benefits. However, parenthood also increases feelings of stress and fatigue due to financial and time-consuming commitments, as well as greater domestic responsibilities (Nomaguchi & Milkie, 2020). Depending on the stressors experienced by parents (e.g., work-family conflict, financial burdens), those may offset the enjoyment of parenting (Pollmann-Schult, 2014). The *cost-rewards* approach acknowledges the mixed and sometimes contradictory experience of parenthood, suggesting that transitioning into parenthood may combine both positive and negative mental health elements, particularly during the early, care-intensive childrearing years.

To date, however, the *set-point* and *costs-rewards* theories have not been combined to examine gendered mental health dynamics over multiple years following childbirth. The *costs-rewards* theory justifies a domain-based approach to parental mental health, while *set-point* theory justifies a long-term and yearly approach to examining mental health outcomes as trends evolve rapidly around birth. We test whether the expectations drawn from *set-point* theory also apply to mental health and its specific domains, as measured by the SF-12 MCS, and examine whether parenthood's costs and rewards are reflected in mothers' and fathers' mental health outcomes.

2.2.3 Gender, parenting, and mental health

Men and women face different demands when becoming parents (Scott & Alwin, 1989). With the arrival of a child, new tasks and responsibilities need to be carried out, adding

to existing obligations. As mothers and fathers are not subjected to the same societal expectations, the transition to parenthood prompts different normative, behavioural, and well-being responses from men and women.

Gendered behaviours within couples increasingly emerge following childbirth. Mothers often shoulder larger amounts of housework and childcare, which results from a shift towards more traditional gender behaviours and divisions of labour after entering parenthood (Baxter et al., 2015). Mothers continually take on a greater parenting role than fathers as the primary caretaker, which involves higher time commitments and constraints leading to increased time pressures (Offer & Schneider, 2011; Ruppanner et al., 2019). This has been accentuated by emerging 'intensive parenting' ideologies according to which parents –in particular mothers– over-invest time, energy, and resources for their children to secure them the best educational and economic outcomes, even at their own expense (Hays, 1996). This has led to an increase in childrearing involvement and perceived parenting pressure, which may be particularly detrimental to maternal mental well-being (Henderson et al., 2016; Rizzo et al., 2013).

Despite this, longitudinal studies on parental subjective well-being find mostly moderate, short-term differences between mothers and fathers when having a first child (Clark et al., 2008; Clark & Georgellis, 2013; Myrskylä & Margolis, 2014). Some studies find that mothers of young children are happier (Baranowska & Matysiak, 2011; Radó, 2020), while others indicate that fathers are happier (Nelson-Coffey et al., 2019). We expand on these results by assessing gendered differences in mental health and its domains over time.

2.2.4 Socioeconomic characteristics as moderators of parental mental health

Socioeconomic characteristics are important markers of parental well-being. The experience of parenthood can differ significantly depending on the socioeconomic context of parents (Pollmann-Schult, 2014). We consider the role of socioeconomic status (SES) –including education, occupation, and income– and paid work time constraints on mothers' and fathers' mental health trajectories.

Having children is costly, both financially and timewise. On the one hand, higher SES individuals have higher levels of education and more often work in higher paid managerial or professional occupations. Higher income provides easier access to external childcare and outsourcing housework, which may help relieve parental time pressures, especially for mothers. Moreover, higher SES is associated with more egalitarian family ideologies and arrangements, which are positively linked to mothers' well-being (Kulik, 2020). Higher SES is also associated with better overall health outcomes (Smith, 2007).

On the other hand, higher SES individuals may also experience greater work-family conflict due to more career-oriented occupations and demanding work responsibilities. Managerial and professional occupations typically involve longer and heavier workloads and work-life conflict has been found to reduce well-being outcomes during the transition to parenthood (Matysiak et al., 2016). Moreover, higher SES parents are more likely to parent according to the 'concerted cultivation' approach, which involves close monitoring of children's social and educational activities to nurture and develop their abilities (Lareau, 2003). Similarly, higher SES parents adhere more strongly to intensive parenting ideologies, which further increases societal pressure on parents to be very actively involved in childcare, even when work demands are high (Gimenez-Nadal & Sevilla, 2016). As a result, it could be argued that higher SES individuals' mental health, particularly mothers', is harmed disproportionately by the transition to parenthood. A study by Nomaguchi & Brown (2011) finds evidence of the duality of the role of education for parents, which provides resources for childrearing but also increases competing parenting and career demands. This scenario may lead to expect that higher SES parents, and particularly higher SES mothers, see greater changes in their mental health than lower SES parents.

Additionally, individuals who combine high work constraints with the arrival of a first child may experience more negative feelings following parenthood than those with lower work constraints, as the former have less leeway to organise and complete housework and childcare, leading to increased stress (Chandola et al., 2019). The effects of work constraints may be particularly salient for women as previous studies show that high work constraints particularly disadvantage the well-being of mothers on full-time schedules (Hewitt et al., 2006).

2.2.5 Transition into parenthood: The UK context

The early 2000s in the UK marked a shift from low state support to increased family policy interventions. Over this period, family policy was rapidly expanded by implementing new (and enlarging existing) measures to protect parental well-being and facilitate work-family life reconciliation (Lewis & Campbell, 2007). Yet, the UK remains classified as an improved breadwinner model ('male breadwinner, female part-time carer model') with persistent gendered caregiving roles (Andrew et al., 2021; Chanfreau, 2022).

The current parental leave and childcare systems reinforce gendered divisions of labour, with possible differentiated consequences on men's and women's mental health after becoming parents. Mothers are *de facto* designated as the primary caretaker due to unequal parental leave regulations. While maternity leave duration was gradually increased to 52 total weeks, paternity leave still only comprises up to 2 weeks. Although this can be changed since 2015 through the Shared Parental Leave (which allows for transfers between parents to encourage fathers' involvement in early childcare), the actual uptake is very low, placing most early care pressure on mothers (Park et al., 2013). Additionally, despite the increase in universal free childcare provided to 3-4 year olds from part-time (15h/week) to full-time care (30h/week) for eligible families in 2016 (Brewer et al., 2022), childcare in the UK remains among the most expensive in Europe, as it largely relies on costly private provision for non-eligible families and infants (OECD, 2022). As a result, female employment is sharply reduced post-parenthood, with a high share of British mothers opting for part-time work to look after their children (OECD, 2021; Paull & Taylor, 2002). This reduction of paid work in order to provide childcare among new mothers, while there is little change for fathers, may translate into British women experiencing disproportionate changes in mental well-being, either positive (e.g., via better parent-child bonding) or negative (e.g., via reduced economic autonomy).

These institutional constraints could particularly disadvantage full-time working mothers. In the UK, working part-time allows mothers to retain a 'separate sphere' from their family through work while more easily adjusting their schedules around childcare needs and keeping a manageable work-life balance (Lyonette et al., 2011; Park et al., 2013). Comparatively, full-time employed mothers –who tend to be from higher SES

backgrounds (Dex et al., 2008)– are faced with equally high gendered caregiving expectations, while often having poorer work-life balance and higher childcare expenses (e.g., needing full-time day care), with possibly more adverse consequences on mental health. This may be exacerbated among higher SES mothers as higher SES parents – particularly mothers– increasingly spend more time with children than lower SES parents, following similar trends to other European countries (Gracia & Ghysels, 2017). Additionally, British parents show growing adherence to intensive forms of parenting, with demanding internalised mothering ideals (Faircloth, 2014), which may further pressure higher SES mothers, who are more active in intensive care activities.

Consequently, we expect that the experience of parenthood in the UK differs across genders, paid work constraints, and SES groups given the existing policy support, gendered caregiving roles, and parenting practices.

2.2.6 Hypotheses

We formulate the following hypotheses, based on our adaptation of previous scholarship and consistent with the UK context of the study.

First, we expect a positive anticipation effect of parenthood on mental health in the pregnancy year for both men and women, followed by a positive effect at birth and in the year following birth, consistent with *set-point* theory (*H1a*). However, consistent with the *costs-rewards* approach, parental mental health may subsequently display a negative trend during care-intensive years (i.e., when the child is between 0 and 4 years old and hasn't yet entered formal schooling) as a result of larger strain, fatigue, and pressure associated with the high demands of early childrearing (*H1b*). Due to mothers' larger parental involvement, constraints, and expectations leading to greater strains than for fathers, we expect any negative trend to be more apparent for women (*H1c*).

Second, we expect items accounting for role burden and overload (i.e., performing tasks as well and carefully as usual) to be negatively affected by parenthood due to the multiplication of tasks and chores following parenthood, particularly during care-intensive years (*H2a*). Consistent with the *costs-rewards* approach predicting counteracting effects, we expect parenthood to have positive effects on mental health items that account for fulfilment (i.e., feeling happy), but negative effects on items that

account for difficulties (i.e., feeling stressed, having low energy) for both men and women, with largest effects post-birth when parents emotionally adjust (*H2b*). Drawing on gender role models and previous evidence, we expect the effects of becoming a new parent on both negative and positive mental health items to be larger among women than among men (*H2c*).

Third, we anticipate socioeconomic characteristics to moderate the gendered effects of the transition to parenthood on overall mental health. We expect larger fluctuations in mental health among higher SES individuals following birth due to a higher adherence to intensive parenting ideologies (*H3a*), with more pronounced effects between mothers than between fathers (*H3b*). Similarly, we expect larger negative outcomes for mothers with high work constraints (i.e., working full-time) compared to mothers having lower paid work constraints (*H3c*).

2.3 Data and methods

2.3.1 Data and sample

We use the first 11 waves of the UK Longitudinal Household Survey (UKHLS), spanning every year between 2009 (wave 1) and 2020 (wave 11). The survey consists of over 40,000 British households interviewed annually, with every household member over 15 years old being interviewed separately, providing complementary data on family configurations. Questionnaires include rich modules on individual well-being and health, socioeconomic characteristics, and demographics.

We restrict the analytical sample to person-year observations in which female respondents are aged between 18 and 50 years and male respondents between 18 and 60 years to constrain it to adults in the typical age range for having younger children (n = 71,030 individuals). We further drop all person-year observations having missing values on the mental health outcome variables (n = 53,018)[10], the independent and control

[10] A large number of cases are lost due to missing values in the mental health variables. This is mainly because the base sample at each wave includes all household members, including temporary or absent members. Although the UKHLS aims to interview all household members at each wave, this is not always possible, and information for absent or unavailable respondents is collected through proxy interviews (i.e.,

variables (n = 51,786), and moderator variables (n = 39,616) along with respondents who are observed only once as they will not be used in the model estimations (n = 30,585). In line with the analytical strategy (described in section 3.4), we retain both the group of respondents transitioning into parenthood for the first time or experiencing aging of their first child aged 8 or younger during the survey ('young parents' sample, n = 8,304) as well as childless respondents ('control' sample, n = 11,110; Ludwig & Brüderl, 2021). The final sample includes 19,414 respondents, with 9,992 women (N = 51,479 person-year observations) observed on average for 5.2 waves and 9,422 men (N = 49,860 person-year observations) observed 5.3 times. Table 2.1 describes sample characteristics. All data analyses are conducted using Stata 17.0 SE.

Table 2.1 Sample description

	Young parents		**Controls**		**Total**	
	Women ***M (SD)*/ Prop**	**Men** ***M (SD)*/ Prop**	**Women** ***M (SD)*/ Prop**	**Men** ***M (SD)*/ Prop**	**Women** ***M (SD)*/ Prop**	**Men** ***M (SD)*/ Prop**
Nb. of waves	5.4 (2.7)	5.4 (2.7)	4.9 (2.7)	5.2 (2.9)	5.2 (2.7)	5.3 (2.8)
Age*	29.7 (6.5)	32.7 (6.9)	25.4 (9.0)	28.6 (11.9)	27.4 (8.2)	30.2 (10.4)
Health impairment*	0.17	0.17	0.18	0.18	0.18	0.17
Higher education	0.43	0.38	0.44	0.36	0.44	0.37
Manag./prof.	0.43	0.48	0.34	0.34	0.38	0.40
High income	0.37	0.41	0.43	0.41	0.40	0.41
Weekly work hours	25.0 (17.0)	40.2 (14.8)	28.9 (18.8)	30.5 (19.7)	27.0 (18.1)	34.4 (18.6)
N	4,587	3,717	5,405	5,705	9,992	9,422

* At first observation.
Note: 'Young parents' refers to the group of parents whose first child is aged 8 or younger, 'Controls' refers to the control group of childless respondents. *M* = mean, *SD* = standard deviation, Prop = proportion.
Source: UKHLS, waves 1-11, unweighted data.

2.3.2 Dependent variables

We measure mental health using the SF-12 health questionnaire. We use the Mental Component Summary (MCS) score of the SF-12, a validated and reliable measure of mental health (Gill et al., 2007; Ware et al., 1996). The overall SF-12 MCS score is

another household member responding on their behalf). While proxy interviews can reliably report certain objective information, they cannot replace individual questionnaires, which collect subjective measures such as mental health and well-being, leading to a large drop of cases (in addition to respondents who chose not to provide mental health information).

constructed from six items assessing the respondent's mental well-being out of the total twelve items in the SF-12 form. It consists of four subscales which measure the following mental health domains: limitations in *role functioning* due to emotional problems (2 items: 'accomplishing less than usual'; 'being less careful than usual'), *social functioning* (1 item: 'health or emotional problems interfering with social activities'), *emotional functioning* (2 items: 'feeling calm and peaceful'; 'feeling downhearted and depressed'), and *vitality* (1 item: 'having a lot of energy'). The items are assessed on a scale from 1 to 5 (expressed as 'all of the time' to 'none of the time') and computed into a global score. The final score ranges continuously from 0 (very poor mental health) to 100 (very good mental health), with 50 set as a general median score and a standard deviation fixed at 10. We use both the overall SF-12 MCS score and all six items separately[11]. We compute Cronbach's alpha for each wave to assess the internal reliability of the SF-12 MCS in our analytical sample. The values all range from 0.82 to 0.86, indicating strong internal consistency and very good reliability of the score. All dependent variables are treated as continuous variables. Negatively coded (or worded) items were reverse coded (or rephrased) so that higher scores indicate better outcomes across all items. Table 2.2 describes and summarises the distribution and meaning of all main dependent variables used[12].

2.3.3 Independent, moderation, and control variables

The independent variable throughout this study is the first transition to parenthood. To model the dynamic nature of this process on individual well-being, the variable is constructed to take into account discrete-time trends surrounding the first birth event (e.g., used in Myrskylä & Margolis, 2014). We identify a first birth using the survey variable indicating if the respondent is the parent of a new entrant baby (i.e., a baby born

[11] The SF-12 is a shortened version of the original SF-36 measure but retains the same dimensions and subscales (Ware et al., 1998). The SF-36 MCS is a multidimensional measure which evaluates all main domains of mental well-being, i.e., role, social, emotional functioning, and vitality. Each subscale was adapted from former validated and reliable instruments, permitting the use of each subscale separately as a valid measure of a specific domain (Ware Jr & Sherbourne, 1992). The high correlation between the SF-12 and the SF-36 has been established for its UK adaptation (Jenkinson et al., 1997; Ware et al., 1998). This study makes use of both the global SF-12 MCS score and its items to explore each domain in detail.

[12] For comparison purposes with previous studies, we contrast the results of our mental health outcome measure (SF-12 MCS) with a life satisfaction measure as an additional analysis using the same model specification (see Appendix Table 2.4 for details).

between the latest and current wave)[13]. We cross this variable with a lagged variable of the number of children in the respondent's household. We mark a first birth if (1) the (lagged) number of children increases from 0 to 1 (or 2, in the case of twin births) and (2) it coincides with being a new parent. The time trend variable is then coded into a categorical variable ranging from -3 years (or more) before birth to +8 years after birth. This observation window is defined to include average baseline effects before birth (when estimated outcomes are considered unrelated to the parenthood transition, i.e., before any anticipation effects) and up to 8 years, to capture all early parenthood stages. For individuals becoming parents during the observation period, the variable takes the value of the number of years around the birth of the first child. For individuals already entering the panel as parents, but whose first child is 8 years or younger (i.e., left-censored observations), the time trend variable takes on the value of the first child's age. Respondents included in the control group are coded to -3 as a default time-invariant value (Perales, 2019). See Appendix Table 2.10 for a fictitious illustration of the data file structure.

For moderation analyses we define four time-invariant dummy variables: obtained a degree in higher education; held a managerial or professional occupation during most years of the observed period; average personal monthly income over the observed period exceeded the average income in the sample; average working hours exceeded 30 weekly hours during care-intensive years (i.e., in years 0 to 4 post-birth) for young parents, or over the whole period for the control group.

Across all models, we control for: age and age squared as it is an important confounder affecting both mental health and first birth; employment status (full-time, part-time or no employment) as employment changes are linked to parenthood status and impact mental well-being (Gebel & Voßemer, 2014); relationship status (partnered, separated/widowed or single) to account for changes in household configurations; household monthly total net income to account for changes in financial security and resources; and long-term health impairment to control for the effect of changes in health status (e.g., developing a

[13] As we are using UKHLS data under the End User Licence (EUL), we cannot access the variable that records the time between the month of interview and the month of birth, as this information is only available with Special Licence (SL) access. However, given that respondents are interviewed annually, and our analyses rely solely on yearly variables, this level of detail is assumed to be sufficient for our study.

chronic condition). We do not control for the birth of a second child due to endogeneity concerns, as adjusting for variables that are a consequence of the main independent variable could introduce endogenous bias (Elwert & Winship, 2014). By omitting the variable for the birth of second child to avoid introducing bias, our models aim to capture mental health changes associated with *entering parenthood* rather than to disentangle the complexities introduced by subsequent births.

2.3.4 Empirical strategy

We apply fixed effects models to study the trajectories around the birth of a first child, which exploit within-individual variations of time-dependent variables. The estimated parameters capture the average effect of change in the variable of interest (i.e., the arrival and ageing of the first child) on a change in the outcome (i.e., mental health). Fixed effects models produce unbiased, consistent estimations by removing unobserved time-constant individual heterogeneity (Allison, 2009), which partly eliminates self-selection bias (e.g., selection into parenthood based on unobserved factors), conditional on no confounding by time-varying variables.

Fixed effects model are also less impacted by panel attrition issues such as endogenous selection bias linked to mental health levels (e.g., respondents with low overall mental health dropping out) as the within-person estimations (i.e., estimating mental health changes within the same person over time) are not affected by compositional change in the sample (Kratz & Patzina, 2020). However, fixed effects models may still be affected by endogenous selection bias if attrition occurs due to a sudden change in mental health trajectories. We conduct additional analyses to assess this possibility. First, descriptive comparisons between the 'dropout' and 'nondropout' groups in the sample show that respondents dropping out before wave 11 have slightly higher average mental health than those not dropping out. Further, logistic models predicting next-wave dropout (whether definitive or 'skipping a wave') indicate no (or very weak) associations between mental health and next-wave dropout. Lastly, including average person weights has no notable effect on mental health trajectory estimations, therefore these weights are not included in

the final models[14]. Overall, we find little evidence that selective attrition on mental health may affect model results.

We include both the group of young parents to estimate the treatment effect (i.e., experiencing the birth and/or ageing of a first child until 8 years) as well as childless respondents as a control group. Respondents in the control group do not contribute to the estimations of the treatment variable (i.e., the parenthood timer) as they are assigned a time-constant default value. However, the control group contributes to the estimation of all other included covariates (e.g., disentangling and controlling for age effects on mental health), making estimations more robust and representative of the study population (Ludwig & Brüderl, 2021; Perales, 2019).

We stratify our analyses by gender and use separate models for men and women, as processes surrounding well-being and parenthood are very gender specific. We overlay graphically the separately estimated trajectories of men and women to compare magnitude, scope, and level of each examined well-being outcome around the event, separately controlling for covariates. Additionally, we estimate fully interacted models for each outcome to include significance tests of gender differences in the parenthood transition variable (see Leopold, 2018 for a similar strategy). The fixed effects framework allows for interactions of time-varying variables with a time-constant variable (Giesselmann & Schmidt-Catran, 2020), although the time-constant variable will not be included in the model outside of the interaction terms.

The fixed effects regression model is specified in the following way for men and women, with clustered (robust) standard errors:

$$Y_{it} = \beta_0 + \beta_1' \cdot TP_{it} + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

Where TP is the categorical discrete-time variable for first-time parenthood with values from -3 (reference category) to +8, $\boldsymbol{X}$ contains all time-dependent individual control variables, and α_i is the individual fixed effect.

[14] Longitudinal survey weights are provided by the UKHLS only for original sample members having participated in all 11 current survey waves without skips (balanced sample). Using these weights would severely reduce our sample size and impact the quality of model estimations. For this reason, we instead employ the aforementioned set of average person weights for robustness checks.

Table 2.2 Description of dependent variables

		Women		Men				
		M	***SD***	***M***	***SD***	**Range**	**Description/*Item question*[1]**	**Meaning[2]**
SF-12 Mental Component Score (MCS)		47.13	10.17	49.37	9.29	0-100	Computed global score	Higher global scores indicate better overall mental well-being and functioning
Subscale	***Item***							
Role functioning	***Accomplishing tasks***	4.33	0.95	4.47	0.87	1-5	*How much of the time have you accomplished less than you would like as a result of any emotional problems?*	Lower scores indicate issues with performing work and/or other usual daily activities resulting from emotional problems; Higher scores indicate no such problems occurring
	Carrying out tasks carefully	4.43	0.87	4.54	0.80	1-5	*How much of the time did you work or do other regular daily activities less carefully than usual as a result of any emotional problems?*	
Social functioning	***Doing social activities***	4.34	0.95	4.49	0.87	1-5	*How much of the time has your physical health or emotional problems interfered with your social activities?*	Lower scores indicate issues with usual social activities due to physical or emotional problems; Higher scores indicate no such problems occurring
Emotional functioning	***Feeling calm****	3.30	0.89	3.48	0.88	1-5	*How much of the time have you felt calm and peaceful?*	Lower scores indicate experiencing stress and depressive emotions; Higher scores indicate feeling peaceful, calm, cheerful, and happy
	Feeling happy and cheerful*	3.94	0.97	4.08	0.94	1-5	*How much of the time have you felt downhearted and depressed?*	
Vitality	***Having energy****	3.24	0.90	3.44	0.87	1-5	*How much of the time did you have a lot of energy?*	Lower scores indicate feeling low in energy (tired, worn out); Higher scores indicate feeling energetic

[1] Items range from 1 = "all of the time" to 5 = "none of the time" and refer to a 4 week time frame.
[2] Adapted from Ware & Sherbourne (1992).
*Negatively coded (worded) items were reverse coded (rephrased) so that higher scores indicate better outcomes across all items.
Note: Pooled total sample. *M* = mean, *SD* = standard deviation. *Source:* UKHLS, waves 1-11, unweighted data.

The fully interacted model is specified similarly to Equation 1, with gender interactions on all variables:

$$Y_{it} = \beta_0 + \beta_1' \cdot TP_{it} + \beta_2' \cdot TP_{it} \times female_i + \boldsymbol{\gamma_1}' \cdot \boldsymbol{X}_{it} + \boldsymbol{\gamma_2}' \cdot \boldsymbol{X}_{it} \times female_i + \alpha_i + \varepsilon_{it} \quad (2)$$

In Equation 2, β_2 indicates whether and by how much the trajectory coefficient for women at time t significantly differs from the trajectory coefficient β_1 for men at time t.

Lastly, moderation analyses add an interaction term between the independent variable and the time-invariant moderator M for men and women separately:

$$Y_{it} = \beta_0 + \beta_1' \cdot TP_{it} + \beta_2' \cdot TP_{it} \cdot M_i + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \quad (3)$$

In Equation 3, β_2 indicates whether and by how much the trajectory coefficient for the second group (M=1) at time t significantly differs from the trajectory coefficient β_1 of the first group (M=0) at time t.

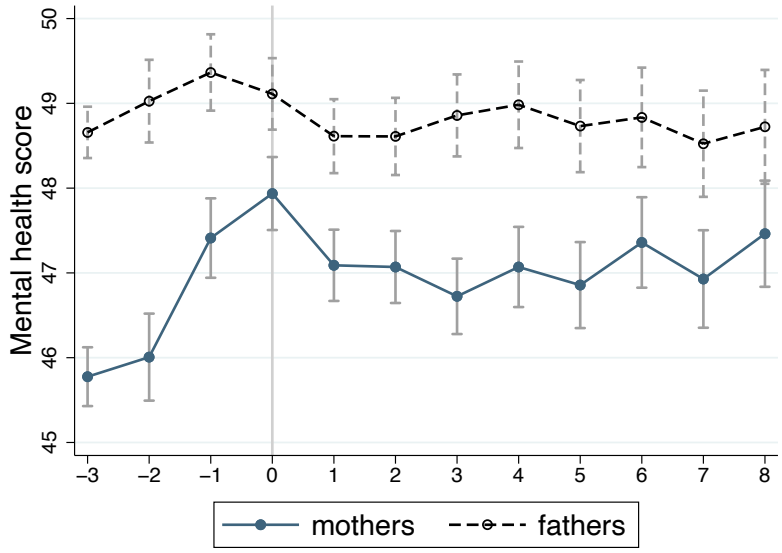
2.4 Results

2.4.1 Mothers' and fathers' mental health trajectories

Figure 2.1 presents the results of the fixed effects models for men's and women's individual mental health trajectories with full model results and coefficients presented in Appendix Table 2.4.

Figure 2.1 shows that, on average at baseline (defined at -3 years before the first birth), women becoming mothers score lower on mental health as measured by the SF-12 MCS than men becoming fathers. This is in line with existing research reporting persistent lower mental health for women compared to men among young adults (WHO, 2022). Women's mental health trajectory globally stays at a lower average level than men's during the complete observation frame, despite a reduction of the gap over time.

Figure 2.1 Predicted mental health trajectories (in years) around birth from fixed effects linear models



Note: Fixed effects models estimates with 95% confidence intervals with reference category at -3 years, separate models for men and women. Predicted effects were computed on respondents experiencing the transition to parenthood ('young parents' sample).
Source: UKHLS data, waves 1-11, unweighted data.

For women, we observe an anticipation effect, relative to pre-parental mental health 3 years prior birth, with a statistically significant positive effect on mental health during the year of pregnancy ($\beta_{TP=-1}$ = 1.64, p<.001). The trajectory reaches a peak at birth ($\beta_{TP=0}$ = 2.16, p<.001), before slightly reducing in the following years. However, the trajectory stays significantly positive with respect to baseline throughout all the observation windows ($\beta_{TP=8}$ = 1.69 p<.001). For fathers, the trajectory shows a smaller anticipation effect ($\beta_{TP=-1}$ = 0.71, p<.05) but no significant changes can be observed at birth or after, suggesting that men's overall mental health is on average not affected in the long-term by the first transition into parenthood.

To contextualise these results, although effect magnitude appears small in relation to the SF-12 MCS range (0-100), the SF-12 MCS within-individual standard deviation is around 6.5 points. Hence, a 2.16-point increase for women in mental health represents approximately 33% of the average within-individual variation in mental health over the survey, which is of moderate substantive significance, while men's anticipation

coefficient of 0.71 amounts to a much smaller 11%. Compared with the overall standard deviation of the SF-12 MCS in the sample of 9.81, a 2.16-point increase in score represents 22% of the total deviation for women and 7% for men. This suggests that the effect of parenthood is more impactful at the within-individual level than in the context of overall (i.e., including between-individual) variation. In other words, the estimated change in mental health is more substantial relative to the typical ups and downs of an individual's mental health than relative to the spread of mental health levels across all individuals in the sample. In contrast, the effect for men remains small in both relative terms, indicating that the examined factor has a more pronounced impact on women's mental health than on men's.

Overall, results from Figure 2.1 do not fully support *set-point* theory for mental health as expected in *H1a* for men and women. Women show a positive anticipation effect followed by overall improvements in mental health after the birth of a first child without adaptation, while men are not significantly affected by the event itself. Further, we find no evidence of a negative pattern linked to the care-demanding years of raising a very young child after the positive effect of birth, as opposed to *H1b*. Lastly, contrary to *H1c*, no negative effect of parenthood is found for women's overall mental health compared to men. Rather, women are significantly and substantively more positively impacted by parenthood during pregnancy and across all observation years than men (see Appendix Table 2.7 for results of the fully interacted model).

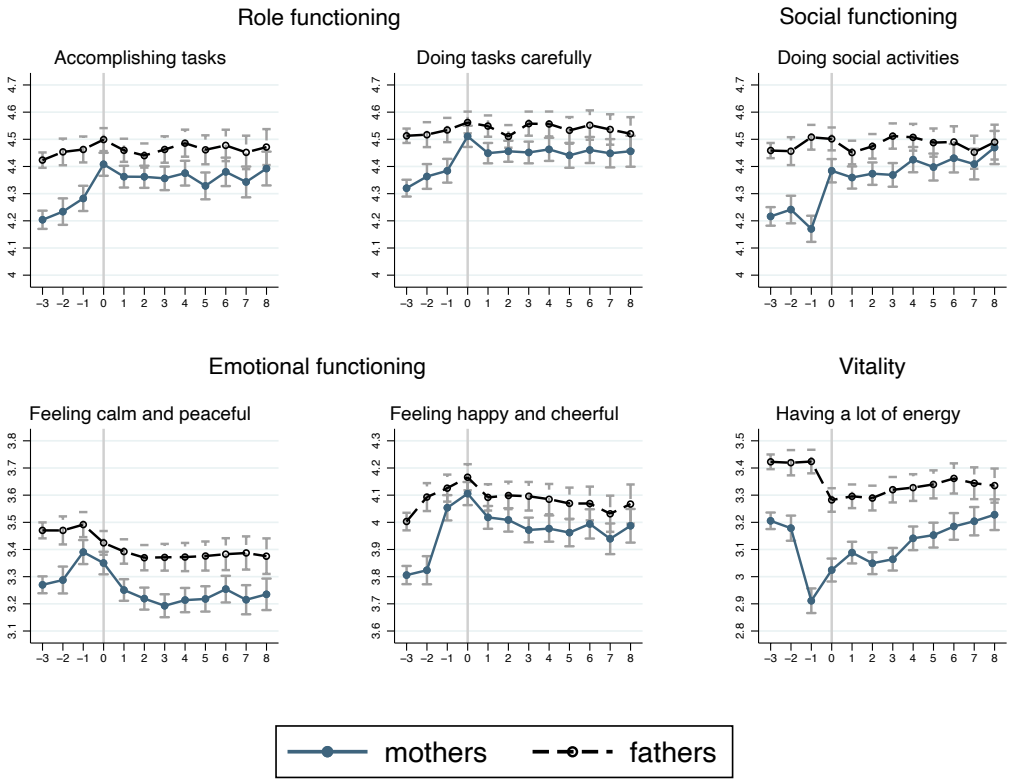
As an additional analysis, Appendix Table 2.4 compares results for mental health with life satisfaction to contrast both measures. Results for life satisfaction replicate findings from previous studies using a similar analytical strategy (e.g., Mikucka & Rizzi, 2019) showing distinct anticipation and adaptation effects for men and women, with a larger birth effect for women. This suggests that the multi-item SF-12 MCS measure of mental health captures additional dimensions, which drive a mostly positive longer-term effect of parenthood –for mothers– compared to life satisfaction.

2.4.2 The transition into parenthood and specific domains of mental health

Figure 2 shows results from the fixed effects models using all six SF-12 MCS items across its four subscales. Appendix Table 2.5 (for women) and Appendix Table 2.6 (for

men) present the complete models. Appendix Table 2.7 presents the fully interacted model for the same measures. The main results emerging from Figure 2.2 can be summarised as follows.

Figure 2.2 Predicted mental health domain trajectories (in years) around birth from fixed effects linear models



Note: Fixed effects models estimates with 95% confidence intervals with reference category at -3 years, separate models for men and women. Predicted effects were computed on respondents experiencing the transition to parenthood ('young parents' sample). Negatively coded (worded) items were reverse coded (rephrased) so that higher scores indicate better outcomes across all items.
Source: UKHLS, waves 1-11, unweighted data.

2.4.2.1 Role functioning

Mothers are more likely to have accomplished their usual tasks relatively to baseline starting in pregnancy, across birth ($\beta_{TP=0}$ = 0.20, p<.001) and the entire observation period at a stable level. By contrast, men's changes in this item are not statistically significant, except for an increase in accomplishing tasks in the birth year ($\beta_{TP=0}$ = 0.08, p<.01). Similarly, women are consistently more likely to indicate being more careful than

usual from pregnancy onwards across birth ($\beta_{TP=0}$ = 0.19, p<.001), with persistent significant effects over the observation period, while men are unaffected. This may be linked to mothers' greater parenting responsibility and load, which requires being more efficient, careful, and attentive than usual.

2.4.2.2 Social functioning

Difficulties in participating in social activities are reduced post-birth (i.e., social functioning is improved) on average for women only ($\beta_{TP=0}$ = 0.17, p<.001), while men show no changes. The significant improvement in mothers' social functioning lasts throughout the observation period, even showing an upwards trend ($\beta_{TP=8}$ = 0.25, p<.001), suggesting increasing social benefits to becoming a mother.

2.4.2.3 Emotional functioning

We observe a statistically significant increase in feeling calm among women in the year before birth compared to baseline levels ($\beta_{TP=-1}$ = 0.12, p<.001), followed by decreases (i.e., increases in feeling nervous or stressed) after birth which are however only significant in year 3 post-birth ($\beta_{TP=3}$ = -0.08, p<.05). Fathers' trajectory also displays a statistically significant drop in feeling calm a year after birth ($\beta_{TP=1}$ = -0.08, p<.05) which stabilises at this level throughout the observation period. Although mothers' trajectory in Figure 2 shows a more clearly defined decline pattern in feeling calm during early childrearing years (defined by higher parenting demands) than men, the predicted change in this outcome is similar between men and women post-birth (Appendix Table 2.7). Conversely, mothers' happiness increases sharply over the transition to parenthood (i.e., depressive moods are significantly reduced). This process starts from the pregnancy year, with a positive anticipation effect ($\beta_{TP=-1}$ = 0.25, p<.001), a peak around birth ($\beta_{TP=0}$ = 0.30, p<.001) followed by long-lasting improvements over the entire observation period ($\beta_{TP=8}$ = 0.18, p<.001). For men, an increase in feeling happy is also observed before and at birth ($\beta_{TP=0}$ = 0.16, p<.001), however –unlike mothers– adaptation occurs five years after childbirth. Hence, we find evidence of an improvement in positive feelings following childbirth, which is larger and longer lasting for mothers than fathers (Appendix Table 2.7).

2.4.2.4 Vitality

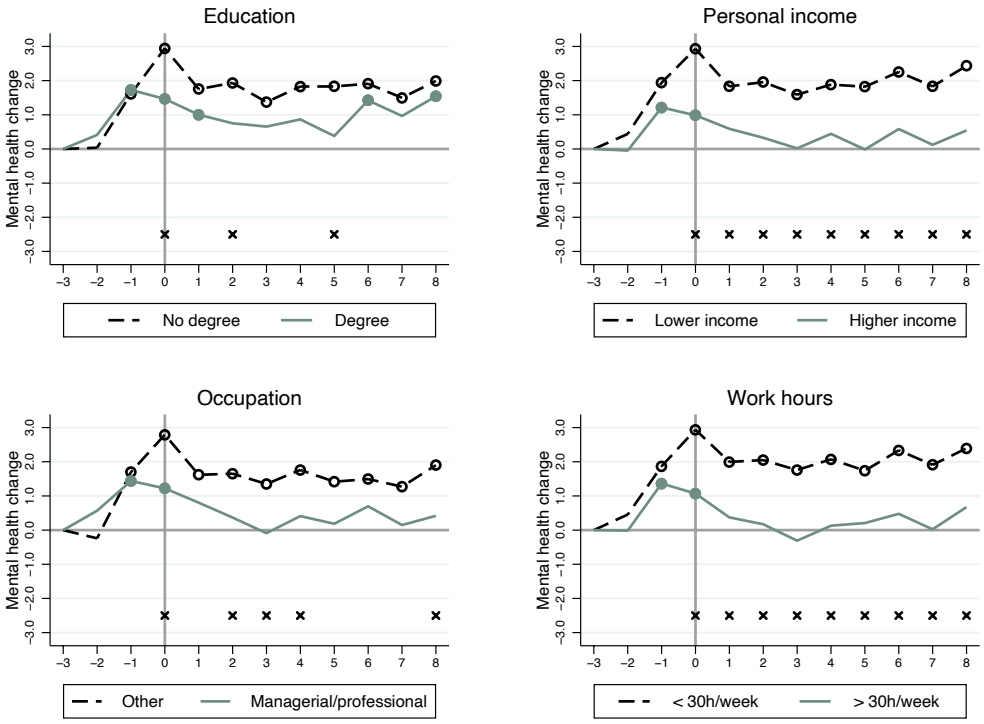
Energy levels display a statistically significant decrease for both men and women, but with a more pronounced pattern for women during care-intensive years ($\beta_{TP=3}$ = -0.14, p<.001) before they regain average pre-birth levels, while men maintain a stable lower level compared to their baseline across the post-birth period ($\beta_{TP=8}$ = -0.09, p<.05). A substantial and significant dip in energy levels relative to the baseline level is also observed for women in the year preceding birth ($\beta_{TP=-1}$ = -0.29, p<.001), most likely due to the discomforts of pregnancy.

Overall, we find stable improvements in role and social functioning for women following birth while men mostly show no changes, which goes against *H2a* predicting dysfunction due to the multiplication of responsibilities, particularly in early childrearing years. In line with *H2b*, we observe that vitality shows important deteriorations in care intensive years while emotional functioning is differentially impacted, with increased stress (i.e., feeling less calm) countered by positive and fulfilling emotions (i.e., feeling happier) with long-lasting effects. Subscales show a gendered process in mental health over the parenthood transition: women display stronger changes in strain (larger fluctuations in feeling calm pre- and post-birth; lower energy levels) but overall improve their functioning compared to men. However, gender gaps in mental health emerging from the transition to parenthood are generally not very strong. Gender inequalities in mental health seem to be partly linked to pre-childbirth gender gaps in levels, although women react more strongly to parenthood in line with *H2c*.

2.4.3 The moderating role of socioeconomic characteristics

Figure 2.3 (women) and Figure 2.4 (men) present moderation analyses to estimate the impact of socioeconomic status (SES) and work-constraints on mental health trajectories in the transition to parenthood. Model coefficients are presented in Appendix Table 2.8.

Figure 2.3 Changes in mental health (in years) around birth from fixed effects linear models by socioeconomic characteristics, women



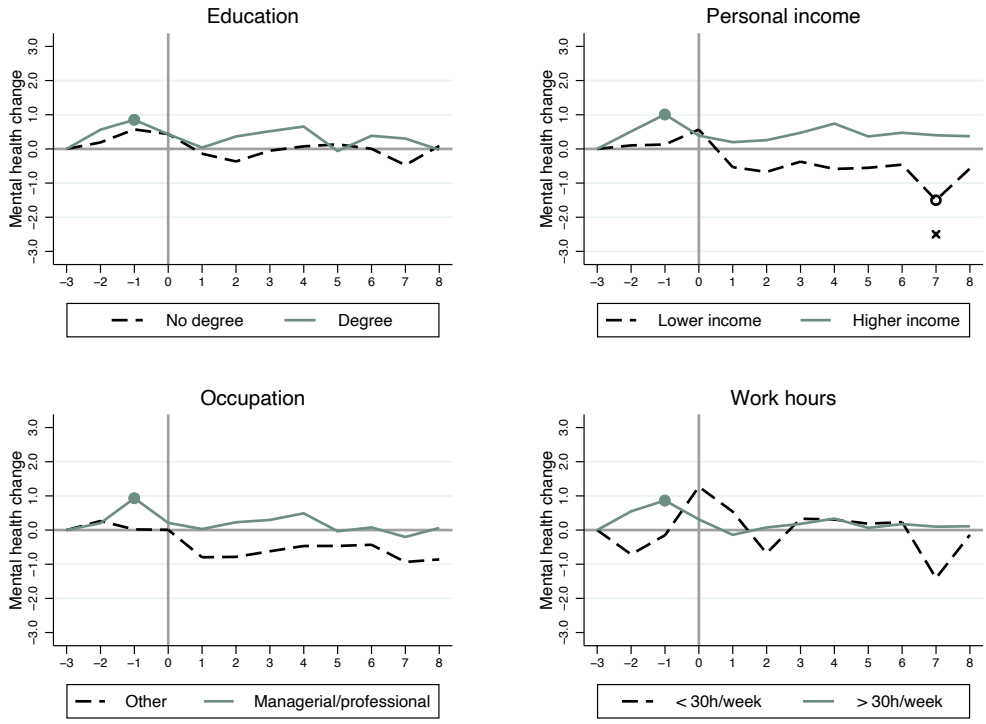
Note: Fixed effects models estimates with socioeconomic characteristics interactions with reference category at -3 years, separate models for men and women. Analyses are based on model results shown in Appendix Table 2.8. Points denote a statistically significant trajectory coefficient at the 0.05 level. Crosses (x) mark a statistically significant difference between the groups' trajectory coefficients at the 0.05 level. Trajectories are obtained based on Equation 3 $\beta_1$coefficients for the first group (M=0) and $\beta_1 + \beta_2$ coefficients (with a Wald test assessing statistical significance) for the second group (M=1). Graphs were produced similarly to Mikucka & Rizzi (2016).
Source: UKHLS, waves 1-11, unweighted data.

For women, Figure 2.3 shows a consistent pattern over all moderation analyses with higher SES groups displaying overall smaller mental health changes following parenthood. Across all SES indicators, positive anticipation effects do not significantly differ between groups. Differences in trajectories only appear and persist following birth, suggesting that the pregnancy period is overall similar between groups, but that trends start diverging during the actual experience of parenthood. Higher educated mothers experience a statistically significantly lower positive birth effect than less educated women ($\beta_{TP \cdot M=0}$ = -1.48, p<.05) as well as in subsequent years (years 2 and 5 post-birth). However, the difference in effect does not translate into the parenthood transition being

negative, rather higher educated mothers mostly miss out on the positive impact of having a first child during early childrearing years but seem to recover in later stages (years 6-8 post-birth). For mothers in managerial/professional occupations, parenthood similarly translates into low mental health changes across most years of early childrearing ($\beta_{TP \cdot M=4}$ = -1.35, p<.05) after a reduced (by almost half) positive birth effect. While higher income could be associated with better outcomes due to disposing of more resources to ease the strains of parenthood, mothers with higher-than-average incomes also experience a smaller positive change in their mental health compared to lower earning mothers, throughout all the post-birth period.

Further, we find that working full-time (i.e., working over 30 hours per week on average during care-intensive years) was equally associated with significantly lower mental health changes across the post-birth observation period, displaying similar trends than SES analyses which suggests a link between SES and work constraints.

Figure 2.4 Changes in mental health (in years) around birth from fixed effects linear models by socioeconomic characteristics, men



Note: see Figure 2.3.
Source: UKHLS, waves 1-11, unweighted data.

For men, Figure 2.4 shows that differences across SES and work-constraints groups are small and mainly nonsignificant, except when comparing higher earning with lower earning fathers in later parenting stages ($\beta_{TP \cdot M=7}$ = 1.90, p<.05). However, the trajectory pattern is reversed for men compared to women: fathers with lower earnings experience a decline in mental health which is offset for higher earning fathers.

Overall, women are found to have more heterogeneous experiences of parenthood than men across socioeconomic characteristics. In line with *H3a*, women with higher SES experience a reduced positive experience gained by their counterparts following the arrival of the first child. By contrast, differences among fathers are mostly not significant, consistent with *H3b*. Lastly, we find that mothers with larger work constraints experience lower mental health outcomes, in line with *H3c*.

2.4.4 Additional analyses: Ceiling effects in SES-specific mental health changes?

We conduct additional analyses to assess whether the smaller mental health benefits observed for higher SES women compared to lower SES women after birth could be due to ceiling effects. If higher SES women have better mental health pre-birth, their potential for post-birth improvement may be limited as they may already be at more optimal mental health levels, whereas lower SES women who start from a lower baseline may experience a larger boost. We investigate this question using descriptive comparisons of average mental health levels (presented in Table 2.3) and within-between model estimations (presented in Appendix Table 2.9).

First, we examine baseline (three years before birth) and post-birth (5 years after birth) differences in average mental health across socioeconomic groups for men and women. Higher SES women initially report significantly (p<.001) higher average mental health levels regardless of the examined characteristic (education, income, occupation, or work time), potentially indicating an initial social gradient in mental health outcomes. However, by 5 years after birth, these differences become statistically non-significant as mental health appears to converge to comparable levels between groups. We also observe that average mental health levels decline for both groups five years post-birth, however, the rate of decrease in mental health levels may have been slower for lower SES mothers than for higher SES mothers. For men, differences in mental health levels seem more

pronounced between groups with different incomes and work hours at baseline. The difference by income group remains significant at 5 years post-birth, which is consistent with the results from fixed effects.

Table 2.3 Differences in average mental health levels across socioeconomic characteristics before and after birth

	3 years before birth							
	Women				Men			
	Low	**High**	**diff.**	**sign.**	**Low**	**High**	**diff.**	**sign.**
Education	47.27	48.72	-1.45	***	50.72	51.15	-0.43	ns
Income	47.34	49.27	-1.94	***	49.97	51.47	-1.50	***
Occupation	47.16	48.93	-1.77	***	50.94	50.92	0.02	ns
Work hours	47.37	49.03	-1.66	***	49.41	51.19	-1.79	**
	5 years after birth							
	Women				Men			
	Low	**High**	**diff.**	**sign.**	**Low**	**High**	**diff.**	**sign.**
Education	47.22	47.21	0.01	ns	49.56	49.17	0.38	ns
Income	47.29	47.09	0.2	ns	48.72	49.66	-0.94	*
Occupation	46.91	47.61	-0.7	ns	49.44	49.37	0.07	ns
Work hours	47.07	47.56	-0.49	ns	48.82	49.51	-0.69	ns

Note: *** p<0.001, ** p<0.01, * p<0.05. ns = non-significant; diff. = difference between 'Low' and 'High'; sign. = significance level of p-value. *t-test* mean-comparison results between socioeconomic groups. For education 'Low' and 'High' refer to 'No degree' and 'Degree', for income 'Low' and 'High' refer to low and high individual income, for occupation 'Low' and 'High' refer to 'Other' and 'Managerial/professional occupation', for work hours 'Low' and 'High' refer to '≤30h/week' and '>30h/week'.
Source: UKHLS, waves 1-11, unweighted data.

Second, we estimate hybrid models (i.e., within-between models, see Appendix) that capture both within-individual effects (equivalent to fixed effects estimates) and between-individual effects of time-invariant predictors. This allows us to assess whether the time-invariant SES and work constraint moderators are associated with differences in mental health levels across socioeconomic groups over the analytical observation window. Results from this additional analysis show that: (1) women experience larger and statistically significant within-individual increases in mental health (W_P = 0.80, p<.001)[15] compared to men, for whom the effects are slightly negative but nonsignificant; (2) between-individual estimates show that mothers have significantly higher mental

[15] W_P = Within-individual (W) effect of parenthood (P).

health levels than nonmothers, though the effect size is small ($B_P \approx 0.60$, $p<.05$)[16], while no significant effect of fatherhood is observed among men; (3) within the analytical observation window, no significant differences in mental health levels are found between women of different socioeconomic groups, though among men, those with higher education and managerial/professional occupations exhibit lower overall levels.

These additional analyses, combined with the fixed effects results, which show greater mental health gains for lower SES women across the transition to parenthood, indicate that parenthood may act as a protective factor for this group's mental health over time. Rather than being driven by ceiling effects, this pattern suggests that parenthood could serve as a potential equaliser of mental health levels and trends once women enter parenthood.

2.5 Discussion

This study has investigated women's and men's mental health trajectories around the first transition into parenthood in the UK between 2009 and 2020. To widen the scope of previous parental well-being research, we examined gender differences in specific mental health areas over a long observation period. Our multidimensional approach allowed us to capture additional key components of individuals' mental well-being, providing new empirical evidence on parenthood transitions.

The main findings of our study can be summarised as follows. First, we show that parenthood has overall significant and stable positive effects for women, but not for men. While average mental health levels are consistently lower for women than for men, we find no obvious mental health disadvantage for women after the transition into parenthood, as could have been expected due to higher societal constraints and expectations surrounding motherhood. However, our findings also show important variations across different mental health domains. We find evidence of counteracting effects following birth, indicating the presence of both positive and negative aspects of

[16] B_P = Between-individual (B) effect of parenthood (P).

parenthood, consistent with the *costs and rewards* approach to parenthood, with larger fluctuations among women than men.

Second, moderation analyses show larger heterogeneity across socioeconomic groups in mental health trajectories following parenthood among women than among men. Women from higher SES backgrounds experience reduced positive mental health effects whereas lower SES women are comparatively more positively affected by the transition into motherhood. Among men, socioeconomic characteristics are not a significant differentiator of mental health trajectories, although small trends indicate an inverse process, where higher SES men display more favourable trajectories compared to their lower SES counterparts (differences are however mostly not statistically significant).[17]

These results add to the literature in various directions. While supporting previous longitudinal studies finding positive effects on mental health for a first birth in the UK (Clark & Georgellis, 2013; Tosi & Goisis, 2021), our analyses also demonstrate the importance of a multidimensional approach to capture the complex mental processes surrounding the transition into parenthood. Beyond the UK context, Ruppanner et al. (2019) similarly find positive effects of a first child on women's mental health in Australia, whereas Giesselmann et al. (2018) show negative trends in Germany. Although both studies did not examine gender differences across various mental health dimensions, our results on women's overall mental health can be compared to these findings. Germany, the UK, and Australia are similarly characterised as modified breadwinner models with large shares of mothers working part-time (OECD, 2021). However, variations in predominant mothering cultures, ideologies, and practices may result in differing effects across countries. For instance, working mothers were traditionally more strongly associated with being an uncaring parent in (West) Germany, which may have led to larger detrimental effects on maternal mental health compared to the UK where part-time working mothers have been embedded in the family policy strategy (Thévenon,

[17] These conclusions are based on the choice of -3 years before birth as the reference category to document changes in mental health over the parenthood transition. While an earlier reference category could have been chosen, previous studies on parental well-being find that earlier reference points (up to -8 years before birth, see for example Frijters et al., 2011) do not alter the trajectory shape, as anticipation effects consistently set in around 2 years before birth. The choice of -3 as the reference was made (a) following previous studies with comparable methods (e.g., Tosi & Goisis, 2021); (b) so that the reference is early enough to avoid capturing any premature positive anticipation effects, which would lead to underestimate positive or overestimate negative subsequent changes; but (c) not too early as to not capture other unrelated underlying mental health variations.

2011; Zimmermann, 2021). Moreover, the degree to which recently introduced family policies in the UK have successfully supported parents, and in particular mothers, might have differentially affected the transition into parenthood in the analysed period compared to other countries (Notten et al., 2017). The role of context-specific cultural parenting norms, expectations, institutional support, and policies in explaining country differences in the transition to parenthood should be further investigated in future comparative longitudinal studies.

Overall, our findings suggest that women react psychologically more to parenthood than men, with increases in women's mental health mostly driven by stable improvements in role and social functioning as well as happiness. This implies that women's greater parental role may have overarching positive effects in this strongly gendered life course transition, both emotionally and functionally. While parenthood comes with larger implications and demands for women, as well as fatigue and strains, it also fulfils internalised gender expectations with associated mental and social benefits. These results complement recent life course research showing that cumulating roles in early adulthood (e.g., partnership, parenthood, employment) carries life-long advantages (e.g., well-being premiums, lower late-life depressive risks; Comolli et al., 2021; Engels et al., 2021), although it does not exclude experiencing strain during childrearing years. This suggests that parenthood represents a significant mechanism with both immediate and cumulative effects on mental well-being throughout later life course stages, albeit with some variation by gender and SES groups.

Results further show larger heterogeneity among women than among men in the experience of parenthood, with higher SES women experiencing smaller mental health benefits from motherhood than lower SES women. These results may capture two complementary mechanisms. First, higher SES mothers are typically in occupations associated to greater responsibilities which can be harder to balance with added childcare responsibilities, both timewise ('time squeeze'; Milkie et al., 2004; Ruppanner et al., 2019) and psychologically ('mother's guilt'; Henderson et al., 2016). While higher income is associated to better parental life satisfaction (Cetre et al., 2016; Pollmann-Schult, 2014), material benefits may not be enough to offset potential psychological or emotional difficulties experienced by higher SES mothers (e.g., higher parenting pressures, greater work-life conflict). Second, higher SES mothers are more likely to

engage in intensive forms of parenting, conforming to the 'concerted cultivation' practice of closely monitoring child activities and development, and investing time, financial, and intellectual resources into childrearing to ensure the best outcomes for their children (Lareau, 2003). This double pressure affecting higher SES mothers stemming from both higher work and parenting constraints may reduce the enjoyment of motherhood, suggesting that motherhood has different implications, meanings, and constraints across social contexts. Future studies should further explore the exact mechanisms surrounding childbirth across socioeconomic groups in a large-scale longitudinal framework. Although we find no strong evidence for this being due to ceiling effects, there may be a protective mechanism buffering the age-related mental health decline over time among lower SES women following parenthood. Future research should further explore this question.

Our study presents two main limitations. First, although the SF-12 MCS is an effective assessor of mental health and functioning, it may not capture all strains and issues experienced by new parents, such as sleep deprivation or parenting-specific difficulties (e.g., 'parental burnout'; Roskam & Mikolajczak, 2020). Therefore, our conclusions on the lack of long-lasting negative effects of parenthood may be constrained by the available subscales in our measure, potentially leading to an optimistic assessment of the effects of parenthood on mental well-being. Thus, our findings should be complemented by other future studies addressing these parent-specific dimensions in a large-scale longitudinal framework. Second, the fixed effects models employed throughout the study exploit only within-individual change, discarding between-individual variation. While this allows to produce mostly unbiased estimations, it also means that information on individuals' (time-constant) social context –which could contribute to inform the effect of parenthood on mental health– is lost (Bell et al., 2019). We hope future studies will further explore these questions within the gender, parenthood, and mental health literatures by considering our dynamic multidimensional approach to gendered mental health trajectories over the transition to parenthood.

To conclude, and despite some shortcomings that should be addressed in future research, our study using high-quality panel data from the UK shows how transitioning into parenthood leads to distinct mental health changes with heterogenous effects across genders and socioeconomic groups.

2.6 Appendix

Table 2.4 Fixed effects linear regression models predicting changes in mental health and life satisfaction around birth

	Women				Men			
	(1) Mental health		(2) Life satisfaction		(3) Mental health		(4) Life satisfaction	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Time (years)								
-3	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
-2	0.23	0.29	0.01	0.04	0.37	0.27	-0.04	0.05
-1	1.64***	0.3	0.19***	0.04	0.71*	0.28	0.11*	0.04
Birth	2.16***	0.31	0.31***	0.04	0.45	0.28	0.15**	0.04
1	1.31***	0.32	0.13**	0.05	-0.04	0.3	0.02	0.05
2	1.29***	0.34	0.06	0.05	-0.05	0.32	0.01	0.05
3	0.95**	0.35	-0.01	0.05	0.2	0.34	-0.02	0.05
4	1.29***	0.37	-0.01	0.05	0.33	0.35	0.00	0.05
5	1.08**	0.39	0.02	0.05	0.07	0.37	-0.02	0.05
6	1.58***	0.41	0.01	0.06	0.18	0.4	0.00	0.06
7	1.15**	0.43	-0.03	0.06	-0.13	0.41	0.00	0.06
8	1.69***	0.45	0.02	0.06	0.07	0.43	-0.03	0.06
Age	-0.96***	0.08	-0.02*	0.01	-1.19***	0.07	-0.12***	0.01
Age squared	0.01***	0.00	0.00	0.00	0.01***	0.00	0.00***	0.00
Employment status								
Full-time	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Not employed	-0.97***	0.16	-0.02	0.02	-1.18***	0.17	-0.17***	0.03
Part-time	-0.25	0.14	-0.01	0.02	-0.17	0.18	-0.07*	0.03
Household income	0.18*	0.07	0.03**	0.01	0.15*	0.07	0.02	0.01
Health status								
No illness	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Long-term illness	-1.71***	0.15	-0.19***	0.02	-1.33***	0.14	-0.15***	0.02
Relationship status								
Single	*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Partnered	0.48*	0.21	0.14***	0.03	0.89***	0.22	0.22***	0.03
Separated/widowed	-0.33	0.49	-0.01	0.07	-0.67	0.51	-0.13	0.08
Person-year	51,479				49,860			
Nb. of individuals	9,992				9,422			

Note: Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05. Life satisfaction is measured on a scale ranging from 1 ('completely dissatisfied') to 7 ('completely satisfied') based on the question 'How do you feel about your life overall?' (M = 5.2, SD = 1.4). Separate models for men and women.
Source: UKHLS, waves 1-11, unweighted data.

Table 2.5 Fixed effects linear regression models predicting changes in mental health domains around birth, women

	(1) *Accomplishing tasks*		(2) *Being careful*		(3) *Social activities*		(4) *Feeling calm*		(5) *Feeling happy*		(6) *Having energy*	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Time (years)												
-3	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
-2	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.03	0.02	0.03	-0.03	0.03
-1	0.08**	0.03	0.06*	0.03	-0.05	0.03	0.12***	0.03	0.25***	0.03	-0.29***	0.03
Birth	0.20***	0.03	0.19***	0.03	0.17***	0.03	0.08**	0.03	0.30***	0.03	-0.18***	0.03
1	0.16***	0.03	0.13***	0.03	0.14***	0.03	-0.02	0.03	0.21***	0.03	-0.12***	0.03
2	0.16***	0.03	0.14***	0.03	0.16***	0.03	-0.05	0.03	0.20***	0.03	-0.16***	0.03
3	0.15***	0.03	0.13***	0.03	0.15***	0.03	-0.08*	0.03	0.17***	0.04	-0.14***	0.03
4	0.17***	0.04	0.14***	0.03	0.21***	0.04	-0.06	0.03	0.17***	0.04	-0.06	0.03
5	0.12**	0.04	0.12***	0.04	0.18***	0.04	-0.05	0.04	0.16***	0.04	-0.05	0.04
6	0.18***	0.04	0.14***	0.04	0.21***	0.04	-0.02	0.04	0.19***	0.04	-0.02	0.04
7	0.14***	0.04	0.13***	0.04	0.19***	0.04	-0.05	0.04	0.13**	0.04	-0.00	0.04
8	0.19***	0.04	0.14***	0.04	0.25***	0.04	-0.04	0.04	0.18***	0.04	0.02	0.04
Age	-0.06***	0.01	-0.06***	0.01	-0.06***	0.01	-0.05***	0.01	-0.07***	0.01	-0.06***	0.01
Age squared	0.00**	0.00	0.00***	0.00	0.00*	0.00	0.00***	0.00	0.00***	0.00	0.00***	0.00
Employment status												
Full-time	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Unemployed	-0.11***	0.02	-0.07***	0.02	-0.09***	0.02	-0.03*	0.01	-0.09***	0.02	-0.01	0.01
Part-time	-0.01	0.01	-0.02	0.01	-0.02	0.01	0.00	0.01	-0.04**	0.01	-0.01	0.01
Household income	0.01*	0.01	0.01*	0.01	0.01*	0.01	0.00	0.01	0.02**	0.01	0.00	0.01
Health status												
No illness	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Long-term illness	-0.21***	0.02	-0.17***	0.01	-0.24***	0.02	-0.14***	0.01	-0.15***	0.01	-0.16***	0.01
Relationship status												
Single	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Partnered	0.04*	0.02	0.03	0.02	0.04*	0.02	0.01	0.02	0.05*	0.02	-0.05*	0.02
Separated/widowed	-0.05	0.05	-0.06	0.04	-0.08	0.05	0.06	0.04	0.01	0.05	0.01	0.04
Person-year	51,479											
Nb. of individuals	9,992											

Note: Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05. *Source:* UKHLS, waves 1-11, unweighted data.

Table 2.6 Fixed effects linear regression models predicting changes in mental health domains around birth, men

	(1) *Accomplishing tasks*		(2) *Being careful*		(3) *Social activities*		(4) *Feeling calm*		(5) *Feeling happy*		(6) *Having energy*	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Time (years)												
-3	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
-2	0.03	0.03	0.00	0.03	-0.00	0.03	-0.00	0.03	0.09**	0.03	-0.00	0.03
-1	0.04	0.03	0.02	0.03	0.05	0.03	0.02	0.03	0.12***	0.03	0.00	0.03
Birth	0.08**	0.03	0.05	0.03	0.04	0.03	-0.05	0.03	0.16***	0.03	-0.14***	0.03
1	0.04	0.03	0.04	0.03	-0.01	0.03	-0.08*	0.03	0.09**	0.03	-0.13***	0.03
2	0.02	0.03	-0.00	0.03	0.02	0.03	-0.10**	0.03	0.10**	0.04	-0.13***	0.03
3	0.04	0.03	0.04	0.03	0.05	0.03	-0.10**	0.03	0.09*	0.04	-0.10**	0.03
4	0.06	0.03	0.04	0.03	0.05	0.03	-0.10**	0.04	0.08*	0.04	-0.09**	0.03
5	0.04	0.04	0.02	0.03	0.03	0.03	-0.09**	0.04	0.07	0.04	-0.08*	0.03
6	0.05	0.04	0.04	0.04	0.03	0.04	-0.09*	0.04	0.07	0.04	-0.06	0.04
7	0.03	0.04	0.02	0.04	-0.01	0.04	-0.08*	0.04	0.03	0.04	-0.08*	0.04
8	0.05	0.04	0.01	0.04	0.03	0.04	-0.09*	0.04	0.06	0.05	-0.09*	0.04
Age	-0.08***	0.01	-0.05***	0.01	-0.08***	0.01	-0.06***	0.01	-0.10***	0.01	-0.07***	0.01
Age squared	0.00***	0.00	0.00***	0.00	0.00***	0.00	0.00***	0.00	0.00***	0.00	0.00***	0.00
Employment status												
Full-time	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Unemployed	-0.14***	0.02	-0.09***	0.02	-0.13***	0.02	-0.01	0.02	-0.14***	0.02	-0.01	0.02
Part-time	-0.03	0.02	-0.00	0.02	-0.00	0.02	-0.01	0.02	-0.01	0.02	-0.03	0.02
Household income	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02***	0.01	-0.00	0.01
Health status												
No illness	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Long-term illness	-0.16***	0.01	-0.12***	0.01	-0.20***	0.02	-0.09***	0.01	-0.11***	0.01	-0.14***	0.01
Relationship status												
Single	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Partnered	0.06**	0.02	0.05**	0.02	0.10***	0.02	0.04	0.02	0.06**	0.02	0.01	0.02
Separated/widowed	-0.04	0.05	-0.07	0.04	-0.00	0.05	-0.07	0.06	-0.04	0.06	-0.12*	0.05
Person-year	49,860											
Nb. of individuals	9,422											

Note: Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05. *Source:* UKHLS, waves 1-11, unweighted data.

Table 2.7 Fixed effects linear regression models predicting changes in mental health domains around birth, fully interacted models

	(1)		Role functioning				Social functioning		Emotional functioning				Vitality	
	Mental health		(2) *Accomplishing tasks*		(3) *Being careful*		(4) *Social activities*		(5) *Feeling calm*		(6) *Feeling happy*		(7) *Having energy*	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Time (years)														
-3	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
-2	0.37	0.27	0.03	0.03	0	0.03	0.00	0.03	0.00	0.03	0.09**	0.03	0.00	0.03
-1	0.71*	0.28	0.04	0.03	0.02	0.03	0.05	0.03	0.02	0.03	0.12***	0.03	0.00	0.03
Birth	0.45	0.28	0.08**	0.03	0.05	0.03	0.04	0.03	-0.05	0.03	0.16***	0.03	-0.14***	0.03
1	-0.04	0.30	0.04	0.03	0.04	0.03	-0.01	0.03	-0.08*	0.03	0.09**	0.03	-0.13***	0.03
2	-0.05	0.32	0.02	0.03	0.00	0.03	0.02	0.03	-0.10**	0.03	0.10**	0.04	-0.13***	0.03
3	0.2	0.34	0.04	0.03	0.04	0.03	0.05	0.03	-0.10**	0.03	0.09*	0.04	-0.10**	0.03
4	0.33	0.35	0.06	0.03	0.04	0.03	0.05	0.03	-0.10**	0.04	0.08*	0.04	-0.09**	0.03
5	0.07	0.37	0.04	0.04	0.02	0.03	0.03	0.03	-0.09**	0.04	0.07	0.04	-0.08*	0.03
6	0.18	0.40	0.05	0.04	0.04	0.04	0.03	0.04	-0.09*	0.04	0.07	0.04	-0.06	0.04
7	-0.13	0.41	0.03	0.04	0.02	0.04	-0.01	0.04	-0.08*	0.04	0.03	0.04	-0.08*	0.04
8	0.07	0.43	0.05	0.04	0.01	0.04	0.03	0.04	-0.09*	0.04	0.06	0.05	-0.09*	0.04
Time * F														
-2 * F	-0.14	0.40	0.00	0.04	0.04	0.04	0.03	0.04	0.02	0.04	-0.07	0.04	-0.02	0.04
-1 * F	0.93*	0.41	0.04	0.04	0.04	0.04	-0.09*	0.04	0.10*	0.04	0.12**	0.04	-0.30***	0.04
Birth * F	1.71***	0.42	0.13**	0.04	0.14***	0.04	0.13**	0.04	0.13**	0.04	0.14**	0.04	-0.04	0.04
1 * F	1.36**	0.44	0.12**	0.04	0.09*	0.04	0.15***	0.04	0.06	0.04	0.12**	0.05	0.01	0.04
2 * F	1.34**	0.46	0.14**	0.04	0.14***	0.04	0.14**	0.04	0.05	0.04	0.11*	0.05	-0.02	0.04
3 * F	0.75	0.49	0.11*	0.05	0.09*	0.04	0.10*	0.05	0.02	0.05	0.07	0.05	-0.04	0.05
4 * F	0.97	0.52	0.11*	0.05	0.10*	0.05	0.16**	0.05	0.04	0.05	0.09	0.05	0.03	0.05
5 * F	1.01	0.54	0.09	0.05	0.10*	0.05	0.15**	0.05	0.04	0.05	0.09	0.06	0.03	0.05
6 * F	1.41*	0.57	0.12*	0.06	0.10*	0.05	0.18***	0.06	0.07	0.05	0.12*	0.06	0.04	0.05
7 * F	1.29*	0.60	0.11	0.06	0.11*	0.05	0.20***	0.06	0.03	0.06	0.10	0.06	0.08	0.05
8 * F	1.62**	0.63	0.14*	0.06	0.13*	0.06	0.22***	0.06	0.06	0.06	0.12	0.06	0.11	0.06
Controls * F	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Person-year							101,339							
Nb. of ind.							19,414							

Note: F = Female. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05. *Source:* UKHLS, waves 1-11, unweighted data.

Table 2.8 Fixed effects linear regression models predicting changes in mental health around birth by socioeconomic characteristics

	SEC = Higher education				SEC = Managerial/professional				SEC = High personal income				SEC = Over 30h work per week			
	(1) Women		(2) Men		(3) Women		(4) Men		(5) Women		(6) Men		(7) Women		(8) Men	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Time (years)																
-3	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
-2	0.04	0.46	0.19	0.39	-0.24	0.47	0.27	0.47	0.44	0.39	0.10	0.51	0.45	0.39	-0.71	0.72
-1	1.61***	0.45	0.57	0.4	1.70***	0.45	0.02	0.49	1.94***	0.39	0.13	0.51	1.87***	0.39	-0.15	0.81
Birth	2.95***	0.45	0.44	0.4	2.79***	0.48	0.01	0.46	2.93***	0.40	0.57	0.5	2.94***	0.40	1.27	0.72
1	1.75***	0.47	-0.14	0.42	1.62**	0.52	-0.80	0.50	1.83***	0.42	-0.53	0.54	2.00***	0.41	0.54	0.82
2	1.93***	0.48	-0.37	0.44	1.65**	0.51	-0.79	0.52	1.96***	0.43	-0.67	0.56	2.05***	0.42	-0.68	0.84
3	1.37**	0.51	-0.05	0.46	1.35*	0.57	-0.62	0.54	1.59***	0.45	-0.37	0.59	1.76***	0.44	0.33	0.88
4	1.83***	0.51	0.07	0.48	1.76**	0.56	-0.47	0.55	1.88***	0.47	-0.59	0.63	2.07***	0.46	0.31	0.90
5	1.83***	0.53	0.13	0.5	1.42*	0.58	-0.46	0.57	1.82***	0.49	-0.55	0.66	1.74***	0.48	0.19	0.97
6	1.91***	0.55	0.00	0.53	1.49*	0.61	-0.43	0.60	2.25***	0.50	-0.46	0.71	2.33***	0.49	0.23	1.01
7	1.50**	0.57	-0.47	0.55	1.27*	0.63	-0.93	0.63	1.83***	0.52	-1.50*	0.72	1.91***	0.51	-1.41	1.04
8	1.99***	0.59	0.09	0.56	1.90**	0.65	-0.86	0.64	2.43***	0.55	-0.57	0.74	2.39***	0.53	-0.14	1.07
Time * SEC																
-2 * SEC	0.37	0.58	0.37	0.54	0.81	0.59	-0.06	0.57	-0.49	0.55	0.41	0.6	-0.47	0.57	1.26	0.78
-1 * SEC	0.11	0.57	0.28	0.54	-0.26	0.59	0.91	0.58	-0.73	0.57	0.88	0.59	-0.51	0.56	1.02	0.86
Birth * SEC	-1.48*	0.58	0.00	0.53	-1.57*	0.62	0.20	0.56	-1.95***	0.58	-0.18	0.58	-1.87**	0.58	-0.96	0.76
1 * SEC	-0.75	0.58	0.18	0.55	-0.82	0.63	0.83	0.59	-1.24*	0.57	0.73	0.61	-1.62**	0.58	-0.68	0.86
2 * SEC	-1.18*	0.59	0.73	0.57	-1.28*	0.63	1.01	0.61	-1.63**	0.59	0.93	0.64	-1.88**	0.60	0.75	0.88
3 * SEC	-0.72	0.61	0.57	0.59	-1.44*	0.67	0.92	0.63	-1.57**	0.60	0.85	0.67	-2.07***	0.62	-0.15	0.92
4 * SEC	-0.96	0.62	0.58	0.61	-1.35*	0.67	0.96	0.64	-1.44*	0.61	1.33	0.7	-1.94**	0.63	0.03	0.94
5 * SEC	-1.45*	0.64	-0.20	0.62	-1.23	0.68	0.43	0.65	-1.84**	0.63	0.92	0.73	-1.53*	0.64	-0.12	1.00
6 * SEC	-0.49	0.65	0.38	0.65	-0.80	0.70	0.51	0.68	-1.67**	0.64	0.93	0.77	-1.86**	0.65	-0.06	1.05
7 * SEC	-0.53	0.66	0.77	0.67	-1.12	0.72	0.73	0.70	-1.71**	0.65	1.90*	0.78	-1.89**	0.67	1.51	1.07
8 * SEC	-0.45	0.68	-0.12	0.69	-1.48*	0.74	0.92	0.72	-1.89**	0.67	0.94	0.8	-1.72*	0.69	0.25	1.10
Controls	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Person-year	51,479		49,860		40,770*		42,000*		51,479		49,860		51,479		49,860	
Nb. of ind.	9,992		9,422		9,401		9,013		9,992		9,422		9,992		9,422	

* Employed person-years only. *Note*: Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05. *Source:* UKHLS, waves 1-11, unweighted data.

Table 2.9 Hybrid models predicting within-individual changes and between-individual differences in mental health around birth by socioeconomic characteristics

	(1) Women Coef.	(2) Men Coef.	(3) Women Coef.	(4) Men Coef.	(5) Women Coef.	(6) Men Coef.	(7) Women Coef.	(8) Men Coef.
Within effects (W)								
Parenthood status								
Not parent	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Parent	0.80***	-0.21	0.80***	-0.21	0.80***	-0.21	0.80***	-0.21
Between effects (B)								
Parenthood status								
Not parent	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Parent	0.59*	0.17	0.58*	0.23	0.56*	0.19	0.57*	0.24
Education								
No degree	*Ref.*	*Ref.*						
Higher education	0.13	-0.49***						
Personal income								
Low			*Ref.*	*Ref.*				
High			-0.11	0.07				
Occupation								
Other					*Ref.*	*Ref.*		
Managerial/professional					-0.11	-0.45**		
Work hours								
≤30h per week							*Ref.*	*Ref.*
>30h per week							0.34	-0.20
Random slope (R)								
var(Parent)	14.78***	7.70***	14.78***	7.70***	14.78***	7.70***	14.78***	7.70***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Person-year	51,479	49,860	40,770*	42,000*	51,479	49,860	51,479	49,860
Nb. of ind.	9,992	9,422	9,992	9,422	9,992	9,422	9,992	9,422

Note: *** p<0.001, ** p<0.01, * p<0.05. Not parent/Parent = dummy variable indicating the transition into parenthood. *Source:* UKHLS, waves 1-11, unweighted data.

Table 2.10 Fictitious illustration of data file structure

id	Wave	Sample status	Age	Sex	Education	Work hours	Work hours*	Parenthood indicator	Number of children	1st birth	Time around first birth	Age of oldest child
1001	1	Original	22	Female	No degree	0	25	0	0	0	-3	.
1001	2	Original	23	Female	No degree	40	25	0	0	0	-3	.
1001	3	Original	24	Female	No degree	20	25	0	0	0	-2	.
1001	4	Original	25	Female	No degree	30	25	0	0	0	-1	.
1001	5	Original	26	Female	No degree	25	25	1	1	1	0	0
1001	6	Original	27	Female	No degree	25	25	1	1	0	1	1
1002	2	Temporary	24	Male	Degree	40	45	0	0	0	-2	.
1002	3	Temporary	25	Male	Degree	40	45	0	0	0	-1	.
1002	4	Permanent	26	Male	Degree	45	45	1	1	1	0	0
1002	5	Permanent	27	Male	Degree	45	45	1	1	0	1	1
1003	1	Original	33	Female	Degree	35	35	1	1	0	3	3
1003	2	Original	34	Female	Degree	35	35	1	1	0	4	4
1003	3	Original	35	Female	Degree	35	35	1	1	0	5	5
1003	4	Original	36	Female	Degree	40	35	1	1	0	6	6
1003	5	Original	37	Female	Degree	20	35	1	2	0	7	7
1003	6	Original	38	Female	Degree	20	35	1	2	0	8	8
1003	7	Original	39	Female	Degree	20	35	1	2	0	.	9
1003	8	Original	40	Female	Degree	20	35	1	2	0	.	10
1005	1	Original	19	Male	No degree	15	28	0	0	0	-3	.
1005	2	Original	20	Male	No degree	17	28	0	0	0	-3	.
1005	3	Original	21	Male	No degree	39	28	0	0	0	-3	.
1005	6	Original	24	Male	No degree	39	28	0	0	0	-3	.

*Average work hours over the observed *post-birth* period, used for moderation analyses.

Chapter 3: Study 2 – The role of time use changes in first-time mothers' and fathers' mental health trajectories[18]

Abstract

The transition into parenthood is a key life course event with important consequences for individuals' and couples' activity patterns. Yet, whether changes in time use are linked to men's and women's mental health during the transition to parenthood remains unclear. This study examines the role of time use dynamics on first-time mothers' and fathers' mental health trajectories. Using large-scale panel data from the Australian HILDA survey for men and women in different-sex couples (2002-2022; N=5,932 individuals), we apply a longitudinal mediation framework with fixed effects models to determine the extent to which mental health trajectories are affected by time use changes across the first transition into parenthood, considering both *individual* and *partner-relative* paid work and housework hours. Results show that individual and partner-relative paid work hours are positively related to mental health for both men and women, but individual housework hours negatively impact only women. Following parenthood, women experience large reductions in paid work and increases in housework hours, while men's time use remains largely unchanged. Accordingly, despite overall improvements in women's mental health trajectories post-birth, these changes in time use slightly diminish motherhood's positive effects, whereas men are left unaffected. Overall, the transition to parenthood markedly reinforces gendered time use patterns within couples with disadvantageous shifts for women. Yet, these shifts result in only minor reductions in first-time mothers' mental health trajectories. The potential factors underlying these findings are discussed.

Keywords: Parenthood; Mental health; Gender; Time use; Longitudinal; Life course theory

[18] This chapter is currently under review (third round of revision) at the *Journal of Marriage and Family* as of September 2024.

3.1 Introduction

Studies on individual mental health and well-being find persistent and systematic gender differences: women are shown to have higher levels of psychological distress and affective disorders than men (Otten et al., 2021). This finding holds across various national contexts (Van de Velde et al., 2010) and is typically attributed to the societal expectations and gender roles imposed on women (Bird & Fremont, 1991; Cabezas-Rodríguez et al., 2021). Recent scholarship has been particularly interested in the way gendered well-being is shaped by and evolves following the transition into parenthood as it pushes couples into more gender-typical roles, often with an uneven distribution of responsibilities between mothers and fathers which may exacerbate existing disparities (Gjerdingen & Center, 2005; Grunow et al., 2012; Yavorsky et al., 2015). Our study contributes to this growing literature by disentangling the extent to which time allocations play a role in shaping mental health across the transition to parenthood, with a focus on gender differences.

Previous research identifies parenthood as a defining life course event that carries substantial effects on individuals' well-being (Myrskylä & Margolis, 2014), yet the clear-cut effects are not well understood due to the complexity of the parenthood experience (Nomaguchi & Milkie, 2020). Longitudinal studies find that parenthood generally enhances mental well-being around the time of birth through increases in feeling happy and fulfilled, but equally point out adverse implications such as heightened stress and fatigue (Aassve et al., 2021; Metzger & Gracia, 2023; Mikucka & Rizzi, 2019; Ruppanner et al., 2019). This heterogeneity is particularly pronounced for women who tend to experience both larger benefits and greater strains from parenthood (Nomaguchi & Milkie, 2003). A hypothesized mechanism that may operate on gendered variations in individual well-being following parenthood is the unequal change in time constraints and allocations resulting from the heavier workload after having a child (Boye, 2009; Craig & Brown, 2017). New mothers typically make more time for domestic responsibilities by reducing their employment hours and have to accommodate a greater set of work and family obligations than fathers (Bianchi et al., 2012). These changes in time use following parenthood could particularly influence gender gaps in mental health as the new time constraints may disproportionally burden mothers, potentially impacting the

types of mental health conditions women are already more likely to experience (such as stress or anxiety disorders) as well as reducing their enjoyment of this event.

However, the exact ways in which schedule and time use changes affect mothers' and fathers' well-being –and specifically mental health– trajectories following parenthood transitions remain unclear. Most research on the link between time use and parental well-being was carried out cross-sectionally making use of time diary surveys (e.g., Meier et al., 2018; Musick et al., 2016; Roeters & Gracia, 2016). Although this provides important insights into how mothers and fathers differently experience daily activities, the cross-sectional design does not allow for identifying patterns of change in time use nor the consequences of those changes over critical life events, such as childbirth, on well-being trajectories.

Further, there is a lack of studies focusing on mental health outcomes in relation to time use, particularly around parenthood. Mental health encompasses not only individuals' state of mental well-being but also their ability to cope with life stressors, function normally at work and home, and maintain social connections (WHO, 2022). Examining mental health measures may therefore more extensively capture the variations in individuals' well-being linked to the professional, domestic, and interpersonal adjustments following childbirth. One recent longitudinal study by Ruppanner et al. (2019) finds that parenthood increases experiencing subjective time pressures which is associated with diminished mental health following birth. Yet, experiencing time pressure is not necessarily equivalent to actual involvement in specific tasks. Actual time use may have distinct implications for mental health as it indicates the tangible allocation of time linked to external factors, such as work obligations and daily routines, and effectively reflects the demands that new parents face. To date, however, no study has dynamically analyzed the direct link between changes in time use and gendered mental health following childbirth.

This study addresses these gaps by investigating the relationship between changing dynamics in time use (i.e., how the number of hours spent on certain activities changes after parenthood) and subsequent trajectories in men's and women's mental health (measured by the multi-item SF-36 Mental Component Summary score) across the transition into parenthood. Using large-scale contemporary Australian household panel data with yearly recorded time use information from both partners, we examine whether

exact time allocations (i.e., in paid and domestic work) operate as a mechanism linking the transition to parenthood with men's and women's mental health outcomes. We adopt a longitudinal framework that focuses on the years surrounding the first transition into parenthood, as this period marks one of the most important shifts in gendered time use over individuals' life courses, providing an ideal context for examining how major changes in time use impact gender-specific mental health trajectories (Baxter et al., 2008).

We additionally contribute to previous literature by not only examining individual time use changes but also by including a partner-relative dimension to take into account the reallocation of time between partners as a possible distinct mechanism to individual-level changes in defining mental health trajectories. This dynamic couple-level approach allows us to document whether gendered redistribution of time within couples (e.g., how equally the division of paid and unpaid labour is shared) influences men's and women's mental health trajectories over the transition into parenthood, which has been omitted so far from prior studies.

3.2 Background

3.2.1 Parenthood, time use, mental health, and gender in Australia

Australia presents a relevant national context to study the links between time use, parenthood, and mental health as it combines an important gender-based variation in time use following the transition into parenthood with a relatively high total fertility rate (OECD, 2023b). Although policy support has improved in the past decades, Australia remains characterized as a liberal welfare regime –with comparatively lower family support than in other developed countries– that primarily supports families through financial means (e.g., income-tested tax benefits, punctual maternity allowance) over in-kind support (e.g., formal childcare services; Luci-Greulich & Thévenon, 2013). This encourages seeking out individual, private solutions to combine work with family, and Australian workers tend to directly negotiate with their employers to reach agreements about family-friendly arrangements instead of relying on state-provided solutions (McDonald & Moyle, 2010). Additionally, following the expansion of female labour

force participation, norms have shifted towards women increasingly combining parenthood with work (55% of Australian mothers were employed in 1998 vs. 69% in 2019; OECD, 2023a). Along with relatively persistent traditional family and gender attitudes anticipating women to take on the greater domestic and parenting role following birth (Craig et al., 2010; Hill, 2007), this context predominantly leads to new mothers adapting their work schedules to family obligations, often switching to part-time hours to accommodate both these expectations, while new fathers are mostly unaffected (Craig et al., 2010). Consequently, Australian families are heavily characterized by a prevailing 1.5-earner model (i.e., 'male full-time, female part-time'; OECD, 2023b).

Yet, the 1.5-earner arrangement does not necessarily equate to Australian women experiencing less stress or pressure by allowing them to better combine work and family duties. In fact, studies on Australian women's part-time employment find that it does not significantly reduce experiencing time pressure as reduced work hours mostly translate into an increased domestic load (Rose et al., 2013). Additionally, scaling back on work and going part-time often means (temporarily) limiting career progression or accepting uncertain employment while replacing it with more tedious domestic work, with uncertain consequences for Australian mothers' mental health. Studies on perinatal mental health in Australia show that the most common consequence of childbirth is postnatal depression, with one in six women affected in the 12 months following birth compared to one in 10 men (Austin et al., 2017). However, these outcomes pertain mostly to temporary circumstances closely linked to pregnancy and are usually resolved within a year post-birth. It remains unclear –in Australia and elsewhere– in which ways longer-term changes surrounding parenthood such as time use variations (e.g., women's decline in paid work hours and increase in domestic work) relate to mental health outcomes.

3.2.2 Parenthood and well-being: Previous research

Previous research has extensively examined the impact of becoming a parent on well-being using different approaches (Nomaguchi & Milkie, 2020). First, studies have varied in their empirical strategy depending on the employed datasets (i.e., cross-sectional vs. longitudinal data). Studies using (repeated) cross-sectional data generally contrast parents with nonparents to assess differences in well-being *levels* whereas longitudinal studies exploit within-individual *changes* in well-being over time, with differing results. Second, studies have operationalized well-being through different measures. The often-

used unidimensional *subjective well-being* measures (e.g., life satisfaction or happiness scales) have been complemented by more comprehensive multidimensional *mental health* scores. Although measures such as life satisfaction and happiness respectively reflect an evaluative dimension of overall well-being and the frequency of positive emotion, multidimensional mental health scores allow capturing the complex –and sometimes conflicting– mental processes arising during the parenthood experience (e.g., feeling both stressed and joyful) and the extent to which they impact good mental functioning.

Cross-sectional studies have overall reached mixed conclusions on whether the association between parenthood and well-being is positive or negative, pointing out notable cross-national and period-based variations, both for subjective well-being (e.g., Aassve et al., 2012; Blanchflower & Clark, 2021; Glass et al., 2016; Herbst & Ifcher, 2016) and mental health (e.g., Nordenmark, 2021; Somogyi et al., 2021). In a recent study, Nomaguchi and Milkie (2023) demonstrate that results depend on the considered outcome: although parenthood decreases happiness levels among US women, it also offers protective benefits against depression, highlighting the complexity and ambiguity of the parenthood experience. By contrast, longitudinal studies find more consistent results. Myrskylä and Margolis (2014) identify an increase in within-individual happiness around the transition to parenthood in the UK and Germany in the 1990s and early 2000s. This result has been compounded by subsequent studies examining both types of well-being outcomes (Baetschmann et al., 2016; Baranowska & Matysiak, 2011; Mikucka & Rizzi, 2019; Ruppanner et al., 2019; Tosi & Goisis, 2021) which find similarly positive trajectories around birth**,** but equally point out contradictory effects on well-being (e.g., increased positive affect but also increased fatigue and diminished leisure or relationship satisfaction following parenthood; Aassve et al., 2021; Metzger & Gracia, 2023).

Further, previous studies identify clear gender-based differences in the consequences of parenthood on well-being. Longitudinal findings show larger changes among women and smaller, more inconsistent changes among men after childbirth, both for subjective well-being and mental health across different national contexts, including Australia (Aassve et al., 2021; Ruppanner et al., 2019). In particular, they show that parenthood transitions come both with greater strains and greater benefits for women (Nomaguchi & Milkie,

2003). This gendered duality of parenthood (in which costs and benefits offset their respective impacts on well-being) is attributed to the restrictive effects of parenthood demands (including new time demands) which reduce the rewarding consequences of children on well-being in different ways for men and women (Pollmann-Schult, 2014). Specifically, women's time and schedules are much more extensively affected by children than men's, with potentially adverse impacts on their well-being. Yet, the mechanisms that shape the effect of parenthood on mental health still need to be better understood. This motivates a study focusing on the (gendered) time-related costs linked to parenthood and its effect on (gendered) well-being outcomes. We expand on and go beyond previous studies examining the consequences of parenthood on well-being by exploring whether this specific mechanism (i.e., changes in time allocations) plays a relevant role in these associations using a comprehensive mental health measure.

3.2.3 Changes in time use following the transition into parenthood

Following the arrival of a child, individuals' time use patterns are majorly affected as additional household tasks need to be added and redistributed within couples across different areas. Although different theoretical approaches predict how cohabiting couples allocate their time, studies indicate that normative explanations most accurately describe gendered divisions of time and labour once couples become parents (Baxter et al., 2008; Grunow et al., 2012; Kühhirt, 2012; Yavorsky et al., 2015). Specifically, partners tend to organize their time and tasks mostly according to specialized gender roles, as hypothesized by the '*doing gender'* theory (West & Zimmerman, 1987), rather than strictly following economic rationales or time availability considerations (Killewald & García-Manglano, 2016; Nitsche & Grunow, 2016).

Empirical research on different-sex couples documents these persistent gendered trends in time use following the transition to parenthood. New mothers generally reduce working hours, either temporarily by taking up longer parental leave, or more permanently by (a) transitioning to part-time work hours or (b) withdrawing from the labour market during early childrearing years or indefinitely, with long-term negative consequences on their labour market outcomes (Kleven, Landais, & Søgaard, 2019). By contrast, fathers' work hours and employment outcomes are generally unaffected by the birth of a (first) child. Simultaneously, women disproportionately increase their unpaid housework hours following parenthood. Mothers are predominantly considered

responsible for the organizational and managerial duties in the home and perform the most time-consuming housework tasks (Umberson & Gove, 1989). Cross-country time use comparisons show that mothering consistently involves larger time commitments, tighter time constraints, more physical work, and greater managerial responsibilities in the home, regardless of national context (Craig & Mullan, 2010; Offer & Schneider, 2011). It follows that partners' contributions shift according to these individual-level changes, with an increased share in domestic work time along with a decreased share in paid work of the female partner after parenthood (Grunow et al., 2012). Overall, previous literature on the impact of the transition to parenthood on time use patterns suggests that men's and women's time allocations follow a highly gendered logic with larger implications for women than for men.

3.2.4 The role of time use changes in parental mental health trajectories

3.2.4.1 Individual-level changes in time use and mental health

We expect that the anticipated changes in paid and unpaid work hours will play a role in shaping mental health trajectories over the transition to parenthood due to existing associations between time use and well-being. First, each time use activity is distinctly related to individual mental health and well-being. Although the relationship between paid work and well-being is complex and may be moderated by a number of factors such as employment stability, job quality or satisfaction (Pereira & Coelho, 2013), studies find paid work to be overall associated with positive mental health and well-being outcomes for men and women. This positive association is attributed to the economic, social, and psychological benefits linked to increased autonomy, resources, and social status gained from employment (see Modini et al., 2016 for a review). However, this relationship is further argued to be curvilinear, with a threshold of hours (found to be lower for women than men) beyond which adverse effects for both mental and physical health can be observed, such as depression, sleep disruption, or cardiovascular diseases (Glass & Fujimoto, 1994; Virtanen et al., 2011; Virtanen & Kivimäki, 2018). By contrast, time spent on domestic work is consistently associated with negative mental health outcomes (see Ervin et al., 2022 for a review), as it is mostly constituted of repetitive, unpleasant tasks with little gratification (Foster & Stratton, 2019; Glass & Fujimoto, 1994).

Second, the effect of individual time use on well-being may extend beyond the type and duration of each single activity and its direct association with well-being, as it may also depend on how the various activities combine, interact, and compete with each other. According to *role strain* theory, the accumulation of roles (e.g., as a worker, a partner, or a parent) can have adverse effects when roles clash and overburden the individual – particularly time-wise– leading to tension, strain, or stress (Goode, 1960b). This may especially take effect in the context of the transition to parenthood as it introduces a substantial new role to individuals' lives, requiring a reorganization of time and energy. Role overload following parenthood may therefore exacerbate negative connotations to certain changes in time use linked to this transition by increasing feelings of time deficits and pressures, with subsequent impacts on mental health (Nomaguchi et al., 2005; Ruppanner et al., 2019). Specifically, employment hours may result in greater time pressures if they clash with competing domestic demands, which has been extensively researched as the work-family conflict issue and may particularly deteriorate mothers' well-being at high levels of conflict (Craig & Brown, 2017; Matysiak et al., 2016).

Given previous findings on time use changes across the transition to parenthood, women are thus more likely than men to modify their schedules in ways that may be disadvantageous for their mental health when they become parents. Women often reduce working hours, which means that they miss out on the benefits of full-time work, personal income, or career prospects, which could lead to frustration and adverse well-being consequences in the longer term. Meanwhile, men do not tend to modify their working schedules after childbirth. Therefore, the changes in paid work experienced by women should contribute to reducing the overall positive association between parenthood and their mental health, whereas men should not experience any work hour adjustments after parenthood that would subsequently affect their mental health (H1). At the same time, women increase their domestic load, which may have negative effects on their mental well-being. Women who keep working full-time could then be more likely to experience increased strain from role overload and work-life conflict, and even those who work part-time may not avoid some form of conflict and pressure. Although men might marginally increase their domestic participation following parenthood, it is not expected to affect their mental health as they typically do not carry the main responsibility. Consequently, the increase in housework hours is expected to diminish the positive link between parenthood and mental health for women, but should not be relevant for men as they

should only experience minimal changes with negligible mental health consequences (H2).

3.2.4.2 Couple-level changes in time use and mental health

The impact of parenthood on mental health may not solely be contingent upon individual-level time use. It may also be crucial to consider how an individual's time allocation compares to their partner's, particularly in the transition to parenthood when gendered relationship expectations get redefined (Hiekel & Ivanova, 2022; Keizer & Schenk, 2012). Individual and partner-relative hours may have different implications on mental health through separately operating mechanisms. Although a high number of individual hours dedicated to paid and unpaid work may lead to individual strain, role conflict and overload, the relative contributions between partners may also lead to negative effects on mental health if contributions are very unbalanced and perceived as unfair, or if the imbalance deteriorates the parental relationship quality (Glass & Fujimoto, 1994; Kalmijn & Monden, 2012).

Partner-relative contributions to paid and unpaid work are expected to become more unequal following parenthood due to the gendered dynamics at play. Women generally reduce their work hours to accommodate domestic responsibilities, resulting in less paid work compared to their partners, whereas men's schedules remain unchanged (Killewald & García-Manglano, 2016). Conversely, women increase their domestic load, which leads to them performing more housework than their partners, while men's housework contributions only marginally increase. Thus, the change in the contribution of paid work hours is expected to reduce the positive association between parenthood and mental health for women as it may capture a loss in bargaining power and economic independence from their partner, whereas no effects are expected for men who remain in an advantaged position (H3). Further, the increasing gender gap in partners' contributions in housework hours is likely to diminish the positive relationship between the transition to parenthood and mental health among women as this widening inequality may translate into growing strains and burdens but should not apply to men (H4).

3.3 Methods

3.3.1 Data and sample

We use data from the Household, Income and Labour Dynamics in Australia (HILDA) panel survey, covering every year from 2002 (wave 2) to 2022 (wave 21). We exclude wave 1 as it does not yet include time use. The HILDA annually surveys a sample of over 9,000 Australian households (including a sample top-up in 2011) constituting a large and long-running panel. The survey includes every household member over 15 years old and provides rich information on cohabitating partners. The questionnaire includes detailed time use indicators (e.g., time spent in paid employment, doing housework or household errands) and parental mental health and satisfaction indicators, along with precise socioeconomic and demographic variables at individual- and household-level.

Table 3.1 Sample description

	Women (N = 2,975)		**Men (N = 2,957)**	
	Mean (SD)	**Range**	**Mean (SD)**	**Range**
Age at first wave observed	26.78 (6.39)	18-50	28.96 (7.70)	18-60
No. of waves observed	6.16 (3.48)	2-20	6.33 (3.67)	2-20
SF-36 MCS	47.16 (10.07)	0-100	49.48 (8.89)	0-100
Individual hours				
Paid work	27.05 (17.86)	0-100*	41.49 (13.71)	0-100*
Domestic work	16.79 (12.70)	0-100*	9.20 (7.12)	0-100*
Partner-relative contribution				
Paid work	.37 (.24)	0-1	.64 (.24)	0-1
Domestic work	.62 (.20)	0-1	.38 (.20)	0-1
Log-household income	11.43 (0.62)	0-14	11.43 (0.62)	0-14
Long-term health impairment	.14	0-1	.13	0-1
Relationship dissolution	.03	0-1	.03	0-1

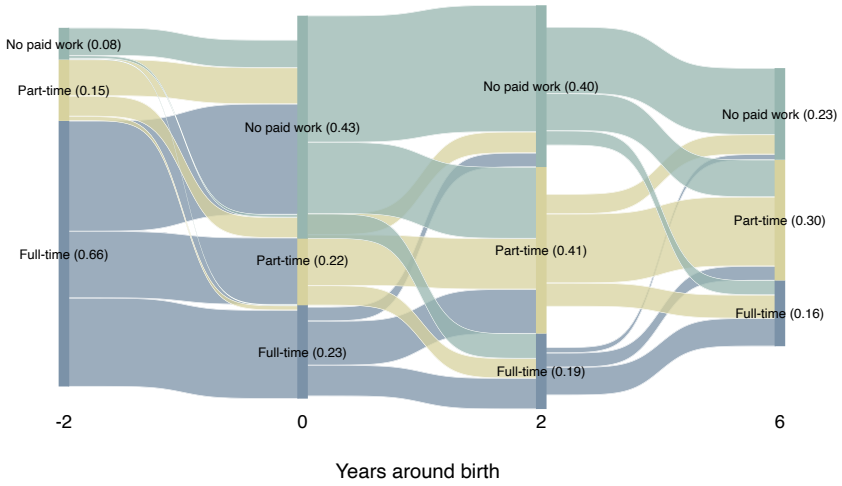
Notes: SD = Standard Deviation; MCS = Mental Component Summary score.
Source: HILDA, waves 2-21.
*Values are top-coded.

Our sample is restricted to respondents aged 18 to 50 years for women and up to 60 for men (i.e., the typical age range for having a first child and the subsequent years associated with early childrearing, restricting the initial sample from N=45,570 respondents to N=29,111). We further restrict the sample to individuals who have (a) complete

information on all model variables (N=23,188), (b) a different-sex cohabitating partner (N=16,123) with (c) available partner time use information (N=14,493), and who are observed at least twice over the survey (N=11,746). In line with the employed modeling strategy, we only keep respondents who transition into parenthood (N=3,378 first-time parents) and respondents who remain childless over the observation window (N=2,554 right-censored observations; see empirical strategy section for details) in the final sample (N=5,932; 2,975 women and 2,957 men). Table 3.1 describes sample characteristics.

Figure 3.1 and Figure 3.2 show the changes in labor market status in the years before and after the transition to parenthood for women and men in the selected sample of first-time parents.

Figure 3.1 Changes in labor market status in the years around the transition to parenthood, women

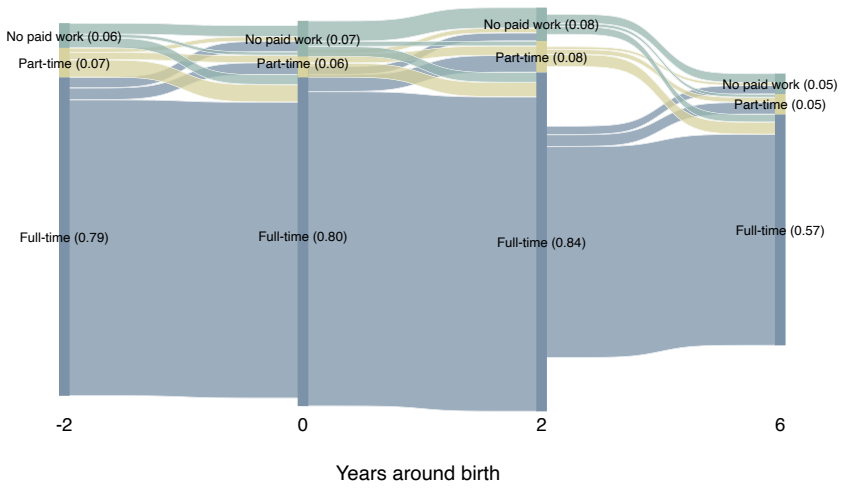


Notes: Distribution of employment status categories among first-time mothers across different time points. 0 = Birth year. Full-time is defined as working 35 hours or more per week, part-time as 34 hours or less. Values in parentheses indicate the proportion of the total sample of first-time mothers in each category. Differences in category sizes over time reflect the unbalanced sample.
Source: HILDA, waves 2-21.

Women's employment status shifts significantly following parenthood, whereas men's remains stable. Pre-birth, a large majority of women work full-time, but this declines sharply after birth. During the birth year, over half are not in paid work (including

maternity leave periods). Two years post-birth, only 20% work full-time, with the rest evenly split between part-time work and no formal employment. This pattern persists up to six years post-birth, though part-time work becomes slightly more common. In contrast, nearly all men remain in full-time employment over the observation window. These patterns are consistent with general population trends of parental employment in Australia and highlight that women are far more likely than men to adjust their paid work arrangements after becoming parents within that context.

Figure 3.2 Changes in labor market status in the years around the transition to parenthood, men



Notes: Distribution of employment status categories among first-time fathers across different time points. 0 = Birth year. Full-time is defined as working 35 hours or more per week, part-time as 34 hours or less. Values in parentheses indicate the proportion of the total sample of first-time fathers in each category. Differences in category sizes over time reflect the unbalanced sample.
Source: HILDA, waves 2-21.

3.3.2 Variables

3.3.2.1 Dependent variable

We use the SF-36 Mental Component Summary score (SF-36 MCS) to measure (positive) mental health, a reliable and valid instrument suited for the Australian population (Jenkinson et al., 1994; McCallum, 1995; OECD, 2023d). The SF-36 MCS assesses various aspects of mental health across four subscales, each based on multiple items:

social functioning, role functioning, emotional functioning, and vitality (see Appendix for a summary of the questions and items included in the SF-36). The overall score ranges from 0 to 100 points –with higher scores indicative of better overall mental health– and is derived from a standardized, weighted combination of these items. These construction weights are predefined and country-specific to adjust the scores relatively to national characteristics and facilitate their interpretation with respect to the general population (Ware et al., 1994). Although the HILDA survey includes the complete SF-36 questionnaire, it does not include the fully computed SF-36 MCS. We therefore derive it based on the individual responses to questionnaire items using the Stata module 'sf36' (Ryan, 1999) which follows the computational steps in accordance with the SF-36 construction manual by Ware et al. (1994) and allows setting Australia-specific weights (Australian Bureau of Statistics, 1995) to obtain the standardized SF-36 MCS for the full survey sample. The advantage of using the SF-36 MCS is that it captures both emotional states and daily functioning by taking into consideration the experience of specific symptoms (e.g., feeling nervous or happy), as well as whether they impact and restrict day-to-day life (i.e., the ability to perform usual routine or social tasks effectively).

3.3.2.2 Independent variables

The main variable of interest is the first transition to parenthood. To capture the dynamic, nonlinear nature of this process and obtain the distributed effects of becoming a parent over time, we define a discrete-time trend variable around the event of the first childbirth ranging from -3 (baseline category, when the outcome is considered unrelated to the parenthood transition, i.e., prior to any anticipation effects) to +6 years post-birth, to model the adaptation period to parenthood and early childrearing years. For respondents becoming parents during the survey, the variable takes on the value of the number of years around the birth of their first child. For respondents who do not experience this transition (i.e., who remain childless during the survey), the variable takes on a default time-invariant value (set to -3).

3.3.2.3 Mediating variables

Time use variables are used as mediators between the transition to parenthood and mental health. We define two time use variables for paid and unpaid work described in Table 3.2. Time spent in paid work is defined as the weekly hours the respondent spends in formal paid employment. Time spent in domestic work is defined as the weekly hours

spent doing housework and running household errands. The time use measures are defined both *individually* in absolute terms as well as at the *couple-level* in relative terms, i.e., as the proportion of hours the respondent does relative to the total combined hours with their partner.

Table 3.2 Description of time use variables

Time use activity	Description (based on survey questions)
Paid work	Weekly time spent in paid employment in a typical week
Domestic work	Weekly time spent doing housework (preparing meals, washing dishes, cleaning house, washing clothes, ironing, and sewing) combined with weekly time spent running errands (shopping, banking, paying bills, and keeping financial records) in a typical week

Although self-reported time use measures are less precise than measures collected through time diaries (Kan, 2008), previous studies making use of the HILDA time use measures have examined their accuracy by comparing the averages with those from the 2006 Australian Time Use Survey and found reasonable similarity permitting the use of these measures as accurate representations of individuals' time use (see Foster & Stratton, 2018, 2019). The time use variables described in this section are also punctually used as dependent variables to model associations between time use and mental health.

3.3.2.4 Control variables

We use the following time-variant covariates as controls in the fixed effects models: age (linear and squared) to account for the confounding effect of ageing on both the parenthood transition and mental health variations; (log) household income to account for changes in household resources; and a health impairment indicator to account for adverse effects of physical health deteriorations on mental health. We also include a dummy variable that indicates the year before a relationship dissolution occurs within the survey (as respondents are dropped when they are not partnered anymore) to account for the negative effect of separation on mental health.

We do not include a control for subsequent births due to endogeneity (Elwert & Winship, 2014). Endogenous selection bias results from conditioning on (i.e., controlling for) a collider variable which is an outcome of both the treatment (i.e., the transition into

parenthood in this study) and the outcome (i.e., mental health changes). Progressing into having a second child is both the consequence of having had a first child and is shown to be more likely following increased well-being and a positive experience following the first birth (Luppi & Mencarini, 2018; Mencarini et al., 2018) therefore potentially introducing endogenous selection bias as a collider variable. That is, conditioning on having a second child may (i) erroneously link the transition into parenthood with mental health changes or (ii) alter the association between the transition into parenthood and mental health changes, preventing an accurate identification of the effects of transitioning into having a first child and mental health variations (Infante-Rivard & Cusson, 2018). Our models should therefore be interpreted as aiming to capture mental health changes associated with *becoming a parent* rather than to disentangle the complexities introduced by subsequent births.

3.3.3 Empirical strategy

We apply fixed effects linear regressions to model the dynamic associations between time use, parenthood, and mental health. Fixed effects models exploit the within-individual change in time-varying variables, eliminating time-constant individual effects and unobserved heterogeneity, which produces mostly unbiased estimations (conditionally on no confounding by time-varying variables) in a modelling framework that requires few assumptions (Allison, 2009). The estimated parameters capture the average effect of a within-individual change in the variable of interest on the outcome i.e., the parenthood variable captures the effect of the change due to the arrival of the first child and the progression into subsequent years on individuals' mental health relatively to the baseline level before parenthood (i.e., 3 years before), everything else equal. We run models on men and women separately, as processes surrounding parenthood and mental health are highly gendered. We include both respondents who become parents during the observation period and a control sample of childless respondents, consistent with the empirical approach taken in related studies (e.g., Anusic et al., 2014; Giesselmann et al., 2018; Mikucka & Rizzi, 2019; Ruppanner et al., 2019). Although control observations do not contribute to estimating parenthood effects on mental health (as they take on a time-invariant default value for the parenthood transition variable), they do contribute to a more robust estimation of all other time-variant covariates. This is particularly important for age-related effects. Age effects (i.e., the impact of ageing on mental health)

may be inaccurately estimated when leaving out the control group, which may then be erroneously reflected in the parenthood transition coefficients (Brüderl & Ludwig, 2015; Ludwig & Brüderl, 2021; Perales, 2019).

To identify whether time use plays a role in the mental health trajectories of men and women during the transition to parenthood, we conduct a longitudinal mediation analysis. This follows the principles of standard mediation analysis but applies fixed effects linear regression modelling within-individual variation. The effect estimates are thus interpreted in terms of within-individual changes. The specific steps of the mediation analysis are outlined below (see also Table 3.3 for a graphical summary).

Step 1. Assess the association between the transition to parenthood and time use:

$$TU_{it} = a_0 + a_1 \cdot TP_{it} + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

Where TU represents time use, i.e., the number of weekly hours an individual i spent on paid or domestic work at time t, TP is the categorical discrete-time variable for first-time parenthood with values from -3 (reference category) to +6, $\boldsymbol{X}$ contains all time-dependent individual control variables, and α_i is the individual fixed effect. a_1 is the estimated effect of the transition to parenthood on changes in time use.

Step 2. Estimate the base model to assess the total effect of the transition to parenthood on mental health (i.e., without accounting for time use changes):

$$MH_{it} = c_0 + c_1 \cdot TP_{it} + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

Where MH represents the mental health score of individual i at time t and c_1 is the estimated total effect of the parenthood transition on changes in mental health.

Step 3. Estimate the mediated model to examine the role of time use in shaping parental mental health by adding time use into Equation 2:

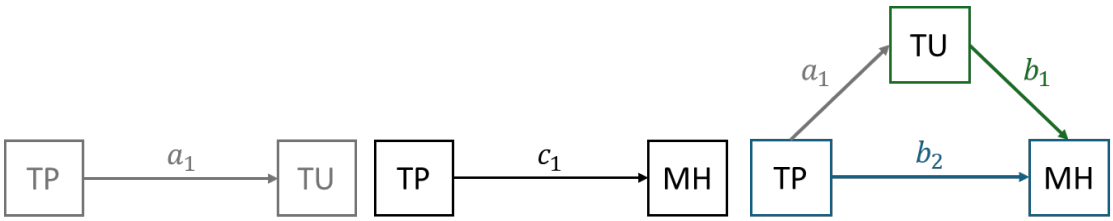
$$MH_{it} = b_0 + b_1 \cdot TU_{it} + b_2 \cdot TP_{it} + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \quad (3)$$

Where b_1 is the effect of time use changes on mental health variations, net of the parenthood transition, and b_2 is the direct effect of the transition to parenthood on mental health. For mediation conditions to be met, time use changes (TU, the mediator) must predict mental health changes (MH, the outcome) over and above the transition to

parenthood (TP, the predictor of interest), meaning we should observe $b_1 \neq 0$. The indirect effect –representing the part of the effect of parenthood on mental health that operates through time use– is given by $a_1.b_1$ (with a_1 estimated in Equation 1). The total effect c_1 from Equation 2 is the sum of the direct (b_2) and indirect ($a_1.b_1$) effect in Equation 3, i.e., $c_1 = b_2 + a_1.b_1$. Consequently, the indirect effect can be obtained by computing the difference between the total and direct effects of parenthood, i.e., $a_1.b_1 = c_1 - b_2$ from Equations 2 and 3.

Practically, we first estimate Equation 1 to examine the effect of becoming a parent on changes in individual and partner-relative paid and domestic work. Second, we estimate Equation 2 as the baseline model (M0), followed by multiple specifications of Equation 3 that incorporate the different time use variables (models M1-M4) to assess their potential mediating effect on parental mental health changes. To determine mediation, we compare the TP coefficients between M0 and M1-M4 (i.e., $c_1 - b_2$, the indirect effect). We then test whether this indirect effect is statistically significantly different from zero by applying bootstrapping that generates 95% confidence intervals for the difference terms to obtain p-values.

Table 3.3 Conceptual graphs of 3-step mediation analysis

Step 1	**Step 2**	**Step 3**
		
a_1: effect of the transition to parenthood on time use changes	c_1: total effect = effect of the transition to parenthood on mental health changes	b_2: direct effect $a_1.b_1$: indirect effect $b_2 + a_1.b_1$: total effect

Notes: TP = Transition to parenthood; TU = Time use; MH = Mental health.
Source: Own elaboration.

Based on the hypotheses, we expect to find evidence of competitive mediation through time use changes for women (Zhao et al., 2010). That is, we expect both the indirect (or

mediated) effect ($c_1 - b_2$) and the direct effect (b_2) to be present but to point in opposite directions. Specifically, we expect the direct effect (i.e., the effect of the transition to parenthood on mental health) to be positive, but the mediated effects through time use to be negative (due to the disadvantageous shifts in both paid and domestic work linked to parenthood transitions).

All equations are estimated using fixed effects linear regression models with clustered (robust) standard errors for men and women separately. Full model results tables can be found in the Online Appendix.

3.4 Results

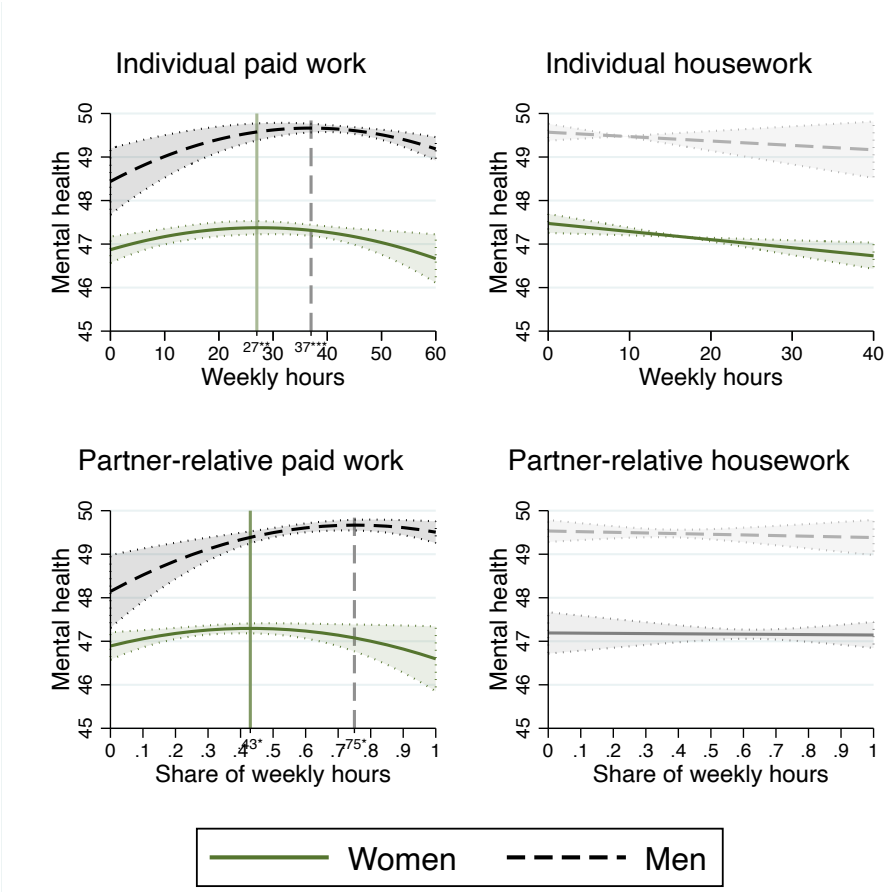
3.4.1 Time use and mental health: General associations

In a preliminary step to the mediation analysis, we quantify the overall effect of time use on mental health to establish the general relationship between changes in individual paid and domestic work hours, partner-relative contributions, and mental health variations. Results from separate fixed effects models for men and women are presented in Figure 3.3.

We find that individual paid work hours have a statistically significant nonlinear effect on mental health for both men and women, although the relationship is steeper for men. This translates into an inverse U-shape association which we formally test through a *t*-test with a quadratic specification between the work hours variable and the outcome (Lind & Mehlum, 2010), which is significant for women (p<.01) and men (p<.001). The computed extreme points (i.e., the highest point of the inverse U) are plotted (vertical lines) at 37 hours for men and 27 hours for women. To contextualize results, the average within-individual mental health variation over the survey (which encompasses up to 20 years) is only about 6.1 points out of the 0 to 100 SF-36 MCS scale. The effects of changes in paid work hours on mental health are approximately 0.04 for women and 0.07 for men, i.e., a change of 1 hour in paid work is linked to a 0.04 (or 0.07) SF-36 MCS point change. Although these effects are small given the full scale, they should be interpreted considering (a) the limited range of within-individual variation in mental health over time and (b) that major time use shifts still substantially affect individual

mental health. For women, switching from 27 weekly work hours (peak value from Figure 2) to no employment would lead to a -27 * 0.037 - 0.001 * 27^2 ≈ -0.3 point reduction in mental health. Similarly, for men, a change from 37 weekly hours to none would result in a -37 * 0.066 - 0.001 * 37^2 ≈ -1.1 point decrease. Therefore, relative to the average within-individual variation, large shifts in time use can represent sizeable changes in mental health.

Figure 3.3 Predicted change in mental health by time use (individual weekly hours and partner-relative contributions) from fixed effects linear models



Note: Fixed effects models estimates with 95% confidence intervals. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. Vertical lines indicate a statistically significant U-point in a quadratic association; the value and level of statistical significance of the U-point are indicated on the x-axis. Light grey confidence intervals and lines signify a statistically non-significant association at the 5% level. Separate models for men and women.
Source: HILDA, waves 2-21.

Partners' paid work contributions show similar trends and shapes to individual hours, with a much higher peak for men. The positive association between his paid work contribution and his mental health peaks at 75% ($p<.05$), whereas it peaks at 43% ($p<.05$) for her. Overall, these associations suggest that –on average– men derive most mental health benefits from full-time employment and being in 1.5-earner configurations (i.e., a 75% share of total work hours relative to their partner). Comparatively, women favour a lower workload and a more equal distribution of paid work (i.e., around 50% each).

For individual housework hours, we find a statistically significant linear negative effect on mental health for women only. Effect sizes are of a similar range –but slightly smaller– than for paid work (i.e., an increase of 1 hour in housework is linked to a 0.02 SF-36 MCS point decrease for women). By contrast, changes in the partner's housework contribution have no significant effect on men's or women's mental health. This suggests that the allocation of housework share may not be as important a factor for mental health as the actual number of individual hours. It may also be an indication of counteracting effects due to heterogeneity in how housework share affects mental health (e.g., some may find a 50-50% allocation ideal, whereas others prefer a 0-100% highly specialized allocation).

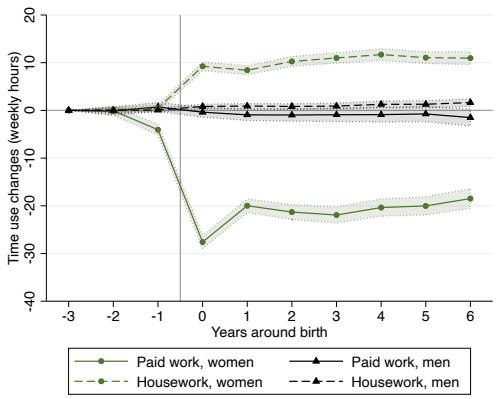
3.4.2 Longitudinal mediation: Do time use changes mediate the effect of the transition to parenthood on mental health trajectories?

3.4.2.1 Effects of the transition to parenthood on time use changes

We first model the effect of the transition into parenthood on changes in time use (Step 1), both for absolute individual hours and the partner-relative contribution, presented in Figure 3.4 and Figure 3.5. Results show that, on average, becoming a mother is associated with a decrease in weekly paid work hours of 18 to 27 hours post-birth (reflecting both large reductions in working hours and full exits from the labor force) and an increase in housework between 8 and 11 hours per week, relative to individual pre-birth levels (Figure 3.4). Consistent with these individual-level shifts, the average partner-relative share of paid work decreases, with a 20% reduction in her paid work contribution compared to her partner, against a 10% increase in her housework contributions (Figure 3.5). For fathers, there is no significant decrease in work hours compared to baseline and

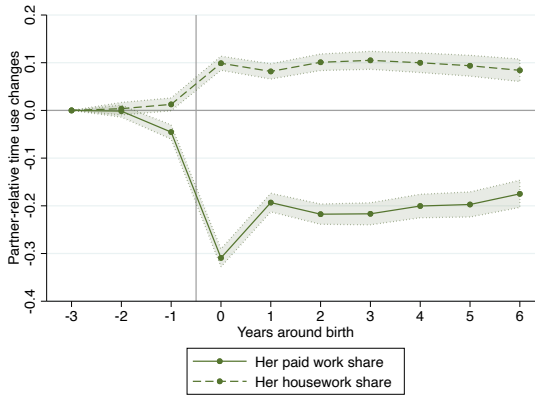
only a small increase in housework hours of about 1 hour (Figure 3.4). The increase and decrease in the contributions compared to their partner mirrors the women's changes.

Figure 3.4 Predicted change in time use (individual weekly hours) around birth



Note: Fixed effects models estimates with 95% confidence intervals with reference category at -3 years. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. Separate models for men and women.
Source: HILDA, waves 2-21.

Figure 3.5 Predicted change in partners' time use share (*her* share) around birth



Note: Fixed effects models estimates with 95% confidence intervals with reference category at -3 years. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. Only *her* share is displayed as *his* share mirrors *her* share (*his* share ≈ 1 - *her* share).
Source: HILDA, waves 2-21.

3.4.2.2 Effects of parenthood on mental health, accounting for time use

Results for the mediation analysis (Steps 2 and 3) that assess whether time use mediates the relationship between the first transition into parenthood and mental health are shown in Table 3.4 for women and Table 3.5 for men.

The base model M0 shows the total effect of the transition to parenthood on mental health trajectories (i.e., without time use), which we find to be consistent with previous research: women show statistically significant positive anticipation effects in the years leading up to birth ($b_{TP=-2}$ = 0.78, p<.05; $b_{TP=-1}$ = 2.62, p<.001), followed by a positive birth effect ($b_{TP=0}$ = 1.25, p<.001). To situate effect sizes, a 2.62 points anticipation effect represents around 43% of the total average intra-individual mental health variation, which denotes a substantial life course effect. The effects then reduce both in terms of magnitude and

significance level, suggesting a partial adaptation effect to parenthood. Men's mental health on the other hand is not significantly affected by the transition to parenthood.

Models M1-M4 include the different time use mediators at the individual- and couple-level estimating the direct and indirect effects of the transition to parenthood on mental health trajectories. M1 examines the mediating role of changes in individual paid work hours. For men, including paid work hours has no impact on results. For women, accounting for changes in paid work time does not change the anticipation effect coefficients (i.e., years -2 and -1), but increases all subsequent coefficients from birth onwards compared to M0 (e.g., from $b_{TP=0}$ = 1.25, p<.001 to $b_{TP=0}$ = 1.48, p<.001). This indicates that the indirect effect, i.e., the effect of parenthood mediated by changes in paid work hours, suppresses some of the positive direct effects of becoming a mother on mental health. However, these mediated effects (given by *M0-M1*) are small (ranging between -0.05 and -0.23) and not statistically significant. Therefore, although this goes in the direction hypothesized by H1, the lack of statistical significance does not fully support it.

M2 examines the mediating role of individual domestic hours. Similarly to M1, women's post-birth coefficients are increased compared to M0 (e.g., from $b_{TP=0}$ = 1.25, p<.001 to $b_{TP=0}$ = 1.40, p<.001) while anticipation effects stay the same. The indirect effects of parenthood on mental health through changes in housework hours range from -0.14 to -0.19 (given by *M0-M2*) and are statistically significant starting from the birth year for women. Results remain unchanged for men. This finding aligns with H2, which predicts the post-birth increase in housework hours to diminish the positive (direct) effect of becoming a parent for women only.

M3 examines the mediating roles of both domestic and paid work hours changes. For men, the parenthood coefficients remain insignificant in this specification, indicating no evidence of mediation. For women, the pre-birth effects are again unchanged, whereas all post-birth coefficients increase compared to M0, with mediating effects ranging from -0.13 to -0.27 (*M0-M3*), as well as to M2 and M3. Although this pattern could suggest a potential combined mediating effect of changes in paid and domestic work hours on mental health after the transition to parenthood, the effects are not statistically significant, preventing a definite conclusion.

M4 assesses the mediation operating through changes in partner-relative contributions following parenthood. We do not examine housework contributions separately, given that it has no statistically significant association with mental health for men or women and shows no mediation effects for parental mental health around birth (results not shown but available upon request). Consequently, including only paid work or both paid and domestic work contributions yields near-identical results. Similar to the previous models, the mediation effects in M4 occur only following birth and range from -0.12 to -0.29 (*M0-M4*). The birth and first year are most affected, with a statistically significant negative mediation effect in year 0, which indicates a significant short-term suppressive effect from the changes in partner contributions on mental health trajectories for first-time mothers (-0.29 reduction of the positive direct effect, $p<.05$). No changes or mediation effects are observed for men. This result supports H3, expecting changes in the contribution of paid work hours to reduce the positive association between parenthood and mental health for women only. By contrast, the lack of an effect from housework contributions suggests that the redistribution of domestic tasks following childbirth is not a co-determinant of parental (and specifically, maternal) mental health trajectories, thereby invalidating H4.

Overall, we find evidence of competing effects being at work when it comes to parenthood transition, particularly for women: while becoming a parent generally enhances mental health, it also increases housework and leads to shifts in partners' paid and domestic work contributions which exert a counteracting (i.e., negative) effect on mothers' positive mental health trajectories. These findings follow the hypothesized directions both at the individual- and the couple-level and align with the '*costs and rewards'* approach to parenthood, whereby parents simultaneously experience rewarding and challenging changes following birth. Despite this, the obtained effect sizes require cautious interpretations. The trajectory improvements found from accounting for the changes linked to parenthood-related time costs (i.e., women reducing rewarding paid work and increasing unpleasant housework) are modest when considered relative to the range of within-individual mental health variation and are only significant for changes in housework hours (M2) and partner-relative contributions (M4). This could indicate that time use changes are not one of the major determinants of mental health changes over the transition to parenthood.

Table 3.4 Fixed effects linear regression models predicting changes in mental health accounting for time use, women

	Mental health (SF-36 MCS)								
	M0	**M1**	***M0-M1*** †	**M2**	***M0-M2*** †	**M3**	***M0-M3*** †	**M4**	***M0-M4*** †
Years (*Ref.*: -3)									
-2	0.78*	0.77*	*0.01*	0.78*	*0*	0.78*	*0*	0.77*	*0.01*
-1	2.62***	2.63***	*-0.01*	2.63***	*-0.01*	2.62***	*0*	2.64***	*-0.02*
0	1.25***	1.48***	*-0.23*	1.40***	*-0.15* [a]	1.52***	*-0.27*	1.54***	*-0.29* [a]
1	1.39***	1.46***	*-0.07*	1.53***	*-0.14* [a]	1.52***	*-0.13*	1.54***	*-0.15*
2	0.68	0.77	*-0.09*	0.85*	*-0.17* [a]	0.85	*-0.17*	0.85*	*-0.17*
3	0.94*	1.03*	*-0.09*	1.12*	*-0.18* [a]	1.12*	*-0.18*	1.11*	*-0.17*
4	0.95	1.02*	*-0.07*	1.14*	*-0.19* [a]	1.12*	*-0.17*	1.10*	*-0.15*
5	1.12*	1.18*	*-0.06*	1.30*	*-0.18* [a]	1.28*	*-0.16*	1.26*	*-0.14*
6	0.94	0.99	*-0.05*	1.13*	*-0.19* [a]	1.08	*-0.14*	1.06	*-0.12*
Individual hours									
Paid work		0.04**				0.04*			
Paid work (sq)		-0.00**				-0.00**			
Housework				-0.02*		-0.01			
Partner-relative									
Paid work								2.34*	
Paid work (sq)								-2.44*	
Housework								0.13	
Controls	Yes	Yes		Yes		Yes		Yes	
No. observations	18,332	18,332		18,332		18,332		18,332	
No. individuals	2,975	2,975		2,975		2,975		2,975	

*** p<.001, ** p<.01, * p<.05. [a] p<.05 based on bootstrapped standard errors.

Note: Results from fixed effects models with robust standard errors. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. † Indirect (mediated) effects. sq = squared.

Source: HILDA, waves 2-21.

Table 3.5 Fixed effects linear regression models predicting changes in mental health accounting for time use, men

	Mental health (SF-36 MCS)								
	M0	**M1**	***M0-M1*†**	**M2**	***M2-M0*†**	**M3**	***M3-M0*†**	**M4**	***M4-M0*†**
Years (*Ref.*: -3)									
-2	0.23	0.23	*0*	0.23	*0*	0.24	*-0.01*	0.23	0
-1	0.31	0.33	*-0.02*	0.31	*0*	0.33	*-0.02*	0.29	0.02
0	0.19	0.19	*0*	0.20	*-0.01*	0.20	*-0.01*	0.14	0.05
1	-0.25	-0.24	*-0.01*	-0.24	*-0.01*	-0.24	*-0.01*	-0.32	0.07
2	-0.26	-0.27	*0.01*	-0.26	*0*	-0.26	*0*	-0.32	0.06
3	-0.38	-0.37	*-0.01*	-0.37	*-0.01*	-0.36	*-0.02*	-0.43	0.05
4	-0.70	-0.68	*-0.02*	-0.69	*-0.01*	-0.67	*-0.03*	-0.75	0.05
5	-0.42	-0.43	*0.01*	-0.41	*-0.01*	-0.42	*0*	-0.49	0.07
6	-0.61	-0.62	*0.01*	-0.60	*-0.01*	-0.61	*0*	-0.68	0.07
Individual hours									
Paid work		0.07***				0.06***			
Paid work (sq)		-0.00***				-0.00***			
Housework				-0.01		-0.01			
Partner-relative									
Paid work								4.10**	
Paid work (sq)								-2.71**	
Housework								-0.05	
Controls	Yes	Yes		Yes		Yes		Yes	
No. observations	18,712	18,712		18,712		18,712		18,712	
No. individuals	2,957	2,957		2,957		2,957		2,957	

*** p<.001, ** p<.01, * p<.05. [a] p<.05 based on bootstrapped standard errors.

Note: Results from fixed effects models with robust standard errors. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. † Indirect (mediated) effects. sq = squared.

Source: HILDA, waves 2-21.

3.4.3 Additional analyses: Considering childcare hours

Our main analyses focus on changes in time use before and after parenthood in paid work and housework without childcare. Yet childcare responsibilities represent a major addition to the unpaid workload. We estimate a jump from 0 hours (default pre-birth value) to 50 hours of weekly individual childcare hours on average post-birth for women, and around 20 hours for men (see Appendix Figure 3.6). However, despite childcare being such a large addition to first-time parents' time use, additional analyses (see Appendix Figure 3.7) indicate no statistically significant association between the change in total childcare hours and mental health variations (both individually and relative to the partner). This may be due to the ambivalent effects of childcare on mental health. Although increased childcare hours might enhance mental health (e.g., through more bonding and family time), they could also lead to poorer mental health due to the strains of excessive child-related responsibilities (Dotti Sani, 2022). This may further depend on the type, frequency, and duration of the conducted care activities. Previous literature suggests that childcare involves a range of diverse tasks, each carrying distinct levels of meaning, fatigue, and enjoyment. For instance, educational and recreational time (e.g., playtime) is typically considered enjoyable whereas routine tasks (e.g., physical care) can be more strenuous (McDonnell et al., 2019). Childcare may therefore have complex and dissimilar emotional implications for mental health. However, the HILDA questionnaire does not distinguish between leisure- and routine-oriented childcare, preventing a differentiated analysis to determine any heterogeneous impacts of childcare. Robustness checks show that including the available childcare variable (separately or combined with housework) in the existing models does not affect the described results, which is consistent with the absence of a direct empirical association with the outcome.

3.5 Discussion

This study investigates the role played by individual and partner-relative time use in women's and men's mental health trajectories around the first transition to parenthood using high-quality yearly panel data from Australian couples (2002-2022). Although prior studies have separately examined the consequences of parenthood on time use allocations and individual well-being, none has explored the joint relationships between

time use, mental health, and parenthood. We extend the scope of previous research by adopting a dynamic life course approach to examine whether and to which extent time use allocations in paid and domestic work act as a mechanism linking parenthood to mental health, combining an individual- and couple-level perspective.

Our findings can be summarized at three key levels. First, results show that individual and couple-level time allocations greatly change over the first parenthood transition. This change is almost exclusively driven by variations in women's time use with a large decrease in paid work and an increase in unpaid housework, which is reflected in partners' time contribution patterns. We further confirm a direct and gendered association between time use and mental health: changes in paid work hours are overall positively associated with mental health changes for both men and women, whereas changes in housework hours have a consistently negative association for women only. These effects may become more substantial in the case of larger time shifts such as switching between full-time, part-time, or no employment, which are likely to occur around parenthood transitions.

Second, we accordingly derive that time allocations shift in an unfavourable direction – on average– for women as they miss out on the mental health benefits of employment while concurrently increasing their more strenuous domestic load over the transition to parenthood. This asymmetrical shift supports previous research on the gendered '*costs and rewards*' of parenthood which argues that it is a heterogenous experience that implies fundamental benefits such as increased purpose, meaning, and joy but also carries considerable costs and strains, particularly for women (Nomaguchi & Milkie, 2003; Pollmann-Schult, 2014). We assume these disadvantageous shifts in time allocations to be linked to the time-related costs of parenthood which lead to a reduction of the enjoyment of this event through diminished mental health for new mothers. We find evidence for this from the longitudinal mediation analyses that show that time use changes linked to the parenthood transition –specifically, increases in housework hours– exert a compensatory effect on the otherwise positive effects of parenthood on women's mental health trajectories following birth while men's trajectories remain unchanged. We do not find any mediation effects of time use before birth (i.e., in years -2 and -1) which suggests that this mechanism only operates on mental health outcomes once the child

arrives, consistent with role strain theory which predicts adverse effects arising from the multiplication of conflicting responsibilities when becoming a parent (Goode, 1960a).

Third, we provide new evidence on how couple-level time allocations may affect the relationship between transitioning to parenthood and mental health. We observe that changes in paid work contributions may be linked to small reductions in maternal mental health around birth but find no impact of partners' housework division on mental health. This could suggest that, unlike paid work, the distribution of housework does not relate to mental health as directly as anticipated, potentially due to carrying more ambiguous effects linked to gender role ideology. That is, an unequal contribution in housework may be a source of strain and worse mental health for women within some couples whereas it may conform to gender norms and be considered appropriate in others. This could especially be the case in the Australian context, which is still characterized by specialized gender and family norms (e.g., prevalent male breadwinner or 1.5-earner models; Baxter & Hewitt, 2013). Subsequent studies should explore in more detail whether gender ideology informs the role of time use in shaping parental mental health, possibly making use of the extensive 'Attitudes and Values' module included in the HILDA survey.

Overall, our findings contribute to the existing literature by establishing a direct link between changes in time use and mental health. We offer empirical evidence on the association between 'objective' measures of time use and parental mental health which suggests that changes in actual time use undercut some of the positive relationship between childbearing and overall mental well-being for women. This complements prior research linking increased 'subjective' time pressures to lowered parental mental health outcomes and higher risks of depression (Hewitt et al., 2022; Roxburgh, 2012; Ruppanner et al., 2019). Our findings further align with previous studies indicating that women are overall more impacted by parenthood than men in terms of lifestyle changes and emotional responses (e.g., Baxter et al., 2008; Mikucka & Rizzi, 2019).

However, the small effect sizes may indicate that changes in time use only play a minor or negligible role in shaping parental mental health, particularly when compared to findings examining subjective time pressure (e.g., Hewitt et al., 2022; Ruppanner et al., 2019). This could suggest that actual time use matters less than subjectively perceived time pressures, constraints, or inequities. The same time allocation might be perceived as stressful by some individuals but not others depending on their stress resilience,

personality traits, or other context-related factors. Individually and subjectively perceived time pressure may therefore be a stronger determinant of parental mental health than the strict number of hours.

Alternatively, the small effect sizes may result from the exclusion of other time use domains that are closely linked to mental health and considerably impacted by parenthood, such as sleep and leisure time (Claxton & Perry-Jenkins, 2008; Plage et al., 2016). Sleep hours are only recorded in waves 13 and 17 of the HILDA survey, and leisure hours (e.g., hobbies, socializing) are not included, thus not allowing for their use in the current study. In addition, childcare hours had to be omitted due to their indeterminate link to mental health which potentially reflects the conflation of various childcare activities into a single variable in the survey questionnaire. Yet, adding routine childcare to the domestic load and recreational time with children to leisure time could offer a more complete picture of parenthood-related time use changes and how these link to parental mental health adjustments. As a result, our study does not capture any child-related or childcare-adjacent activities that are intricately linked to the experience of parenthood and may contribute to shaping mental health outcomes directly and/or in combination with the other co-occurring changes in time use. Future research with more comprehensive longitudinal time use data should further investigate these questions – either to confirm the weak link between time use and parental mental health or to uncover more nuanced associations including childcare– and provide empirical contextualization to our findings.

Lastly, our study presents the following shortcomings related to the employed analytical strategy. Although employing fixed effects models has important advantages, there are some drawbacks to this modelling framework. Firstly, we cannot infer anything about between-individual differences in mental health trends across the transition to parenthood when accounting for time use as we only estimate within-individual changes. It could be argued that the same time use configuration may differently affect parents' mental health trajectories between couple and family contexts, but fixed effects models would not indicate such differences. Second, we cannot conclude regarding the effect of the level of time use (i.e., the number of hours) in relation to parental mental health as fixed effects models only exploit change (e.g., the change in the number of hours), discarding initial starting levels for estimations which might restrict capturing the full effect of time use

on mental health. Third, by only exploiting within-individual variations in time use to predict within-individual changes in mental health, we largely reduce available model variance leading to small effect sizes. Our estimates on the role of time use in mental health trajectories over the transition to parenthood may therefore be more conservative. Fourth, due to including a couple-level approach and restricting our sample accordingly, our results pertain to individuals in different-sex cohabiting couples. Future studies should expand on the links between time use and mental health for other demographic groups. Lastly, while this study does not establish causal links, the longitudinal mediation estimations assume a unidirectional effect, where changes in time use influence mental health (i.e., 'one-sided' arrow, see conceptual graphs in Table 3.3). However, it is plausible that the relationship is bidirectional (i.e., 'two-sided' arrow), with mental health changes also affecting time use (e.g., severe mental health deterioration, such as a major depressive episode, could lead to reduced working hours). This potential reverse causality may introduce endogeneity, impacting our estimations. Future research could address this limitation by employing cross-lagged panel models, which allow for the examination of reciprocal effects between time use and mental health across different time points to determine whether bidirectional effects are present.

Despite these limitations, our study is the first to provide evidence on the role of both individual- and couple-level time use in determining mental health trajectories over the transition to parenthood within a large-scale longitudinal mediation framework. In doing so, we contribute to gaining new insights into a hypothesized mechanism affecting parental well-being. Findings indicate that large shifts in employment and domestic work hours can have substantial effects on mental health and that such disadvantageous changes take place for first-time mothers with some moderate negative consequences on mental health. We hope that future research will expand on this study and shed further light on the underlying determinants and processes shaping new parents' mental health.

3.6 Appendix

Table 3.6 Description of the SF-36 v1 Australian questionnaire

Subscale	Item question	Response range
Health transition	Compared to one year ago, how would you rate your health in general now?	1-5 (much better-much worse)
Mental health		
Role functioning (emotional)*	Have you cut down the amount of time you spent on work or other activities as a result of any emotional problems?	yes/no
	Have you accomplished less than you would like as a result of any emotional problems?	
	Did you not do work or other activities as carefully as usual as a result of any emotional problems?	
Social functioning*	To what extent have your health or emotional problems interfered with your normal social activities?	1-5 (not at all-extremely)
	How much of the time has your physical health or emotional problems interfered with your social activities	1-5 (all the time-none of the time)
Emotional functioning*	How much of the time have you been a nervous person?	1-6 (all the time-none of the time)
	How much of the time have you felt so down in the dumps that nothing could cheer you up?	
	How much of the time have you felt calm and peaceful?	
	How much of the time have you felt down?	
	How much of the time have you been a happy person?	
Vitality*	How much of the time did you feel full of life?	1-6 (all the time-none of the time)
	How much of the time did you have a lot of energy?	
	How much of the time did you feel worn out?	
	How much of the time did you feel tired?	
Physical health		
General health	In general, how would you say your health is?	1-5 (excellent-poor)
	I seem to get sick a little easier than other people.	1-5 (definitely true-definitely false)
	I am as healthy as anybody I know.	
	I expect my health to get worse.	
	My health is excellent.	
Physical functioning**	Does your health limit you in doing vigorous activities?	1-3 (limited a lot-not limited at all)
	Does your health limit you in moderate activities?	

	Does your health limit you in lifting or carrying groceries?	
	Does your health limit you in climbing several flights of stairs?	
	Does your health limit you in climbing one flight of stairs?	
	Does your health limit you in bending, kneeling, or stooping?	
	Does your health limit you in walking more than one kilometre?	
	Does your health limit you in walking half a kilometre?	
	Does your health limit you in walking 100 metres?	
	Does your health limit you in bathing or dressing yourself?	
Role functioning (physical)*	Have you cut down the amount of time you spent on work or other activities as a result of your physical health?	yes/no
	Have you accomplished less than you would like as a result of your physical health?	
	Were you limited in work or other activities as a result of your physical health?	
	Did you have difficulty performing work or other activities as a result of your physical health?	
Bodily pain*	How much bodily pain have you had?	1-5 (none-very severe)
	How much did pain interfere with your normal work?	1-5 (not at all-extremely)

* Questions refer to a 4-week time frame. ** Questions refer to a typical day.
Note: Based on the HILDA Self Completion Questionnaire (SCQ) and SF-36 user manual (Ware et al., 1994).

Table 3.7 Fictitious illustration of datafile

id	Wave	Age	Gender	Paid work	Paid work %	Unpaid work	Unpaid work %	Parenthood indicator	Years around birth	Relationship dissolution
1001	1	22	Female	0	.	4	.	0	-3	.
1001	2	23	Female	40	50	5	55	0	-3	0
1001	3	24	Female	20	25	5	55	0	-2	0
1001	4	25	Female	30	38	6	60	0	-1	0
1001	5	26	Female	0	0	20	83	1	0	0
1001	6	27	Female	0	0	22	85	1	1	0
1002	2	24	Male	40	66	4	20	0	-2	0
1002	3	25	Male	40	66	4	20	0	-1	0
1002	4	26	Male	45	100	5	10	1	0	0
1002	5	27	Male	45	100	5	10	1	1	0
1003	1	33	Female	35	46	10	66	0	-1	0
1003	2	34	Female	35	46	20	70	1	0	0
1003	3	35	Female	35	46	20	70	1	1	0
1003	4	36	Female	40	50	20	70	1	2	0
1003	5	37	Female	20	33	15	80	1	3	0
1003	6	38	Female	20	33	15	80	1	4	0
1003	7	39	Female	20	33	15	85	1	5	1
1003	8	40	Female	40	.	25	.	1	6	.
1003	9	41	Female	40	.	25	.	1	.	.
1005	1	19	Male	15	.	8	.	0	-3	0
1005	2	20	Male	17	.	9	.	0	-3	0
1005	3	21	Male	39	49	9	50	0	-3	0
1005	6	24	Male	39	49	10	50	0	-3	0

Note: Greyed-out cells represent person-year observations dropped in the fixed effects models due to missing data.

Table 3.8 Predicted change in time use (individual weekly hours) around birth

	Women		Men	
	Paid work	**Housework**	**Paid work**	**Housework**
	M1	**M2**	**M1**	**M2**
Years (*Ref.*: -3)				
-2	-0.069	0.132	-0.111	0.033
	(0.492)	(0.294)	(0.423)	(0.228)
-1	-4.042***	0.436	0.712	0.078
	(0.576)	(0.328)	(0.482)	(0.212)
0	-27.593***	9.246***	-0.371	0.828**
	(0.688)	(0.458)	(0.532)	(0.254)
1	-19.981***	8.424***	-0.930	0.908***
	(0.719)	(0.472)	(0.606)	(0.269)
2	-21.309***	10.260***	-0.963	0.831**
	(0.795)	(0.521)	(0.659)	(0.295)
3	-21.927***	10.998***	-0.907	0.913**
	(0.864)	(0.558)	(0.723)	(0.316)
4	-20.366***	11.702***	-0.887	1.278***
	(0.910)	(0.616)	(0.786)	(0.358)
5	-20.019***	11.062***	-0.735	1.291***
	(0.967)	(0.625)	(0.834)	(0.376)
6	-18.479***	10.958***	-1.502	1.645***
	(1.049)	(0.691)	(0.896)	(0.400)
Controls	Yes	Yes	Yes	Yes
No. observations	18,332	18,332	18,712	18,712
No. individuals	2,975	2,975	2,957	2,957

*** p<.001, ** p<.01, * p<.05. Robust standard errors in parentheses.

Note: Results from fixed effects models with robust standard errors. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. Separate models for men and women.

Source: HILDA, waves 2-21.

Table 3.9 Predicted change in partners' time use share (*her* share) around birth

	Women		Men	
	Paid work	**Housework**	**Paid work**	**Housework**
	M1	**M2**	**M1**	**M2**
Years (*Ref.*: -3)				
-2	-0.002	0.004	-0.002	-0.005
	(0.006)	(0.007)	(0.007)	(0.007)
-1	-0.045***	0.013	0.043***	-0.010
	(0.008)	(0.007)	(0.008)	(0.007)
0	-0.309***	0.099***	0.303***	-0.102***
	(0.010)	(0.008)	(0.010)	(0.008)
1	-0.193***	0.082***	0.185***	-0.082***
	(0.010)	(0.008)	(0.010)	(0.008)
2	-0.218***	0.101***	0.204***	-0.098***
	(0.011)	(0.009)	(0.011)	(0.009)
3	-0.217***	0.105***	0.204***	-0.103***
	(0.012)	(0.010)	(0.012)	(0.010)
4	-0.200***	0.100***	0.186***	-0.102***
	(0.013)	(0.010)	(0.013)	(0.011)
5	-0.197***	0.094***	0.189***	-0.100***
	(0.013)	(0.011)	(0.014)	(0.011)
6	-0.175***	0.084***	0.161***	-0.090***
	(0.015)	(0.012)	(0.015)	(0.012)
Controls	Yes	Yes	Yes	Yes
No. observations	18,332	18,332	18,712	18,712
No. individuals	2,975	2,975	2,957	2,957

*** p<.001, ** p<.01, * p<.05. Robust standard errors in parentheses.

Note: Results from fixed effects models with robust standard errors. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. Separate models for men and women.

Source: HILDA, waves 2-21.

Table 3.10 Predicted change in mental health by time use (individual weekly hours and partner-relative contributions) from fixed effects linear models

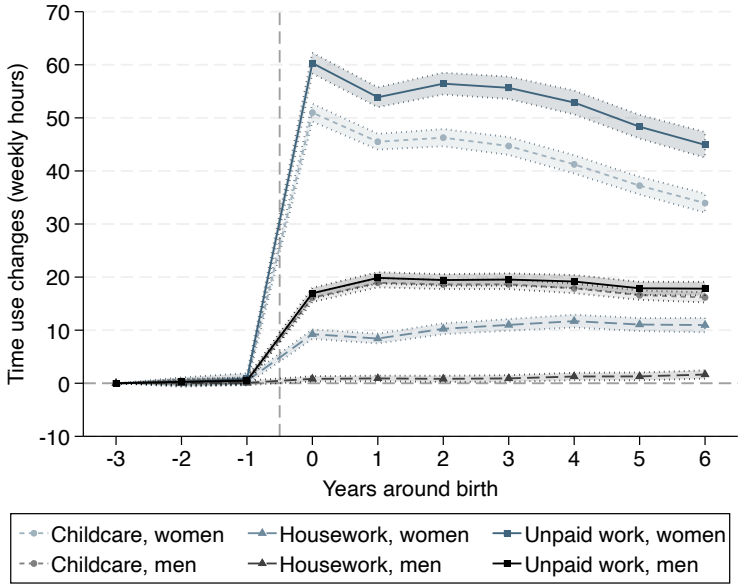
	Mental health (SF-36 MCS) Women				Mental health (SF-36 MCS) Men			
	M1	**M2**	**M3**	**M4**	**M1**	**M2**	**M3**	**M4**
Individual hours								
Paid work	0.037**				0.066***			
	(0.013)				(0.017)			
Paid work (sq)	-0.001**				-0.001***			
	(0.000)				(0.000)			
Housework		-0.019**				-0.010		
		(0.007)				(0.011)		
Partner-relative								
Paid work			1.874*				4.044**	
			(0.818)				(1.301)	
Paid work (sq)			-2.169*				-2.682**	
			(0.945)				(0.932)	
Housework				-0.047				-0.150
				(0.380)				(0.322)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. observations	18,332	18,332	18,332	18,332	18,712	18,712	18,712	18,712
No. individuals	2,975	2,975	2,975	2,975	2,957	2,957	2,957	2,957

*** p<.001, ** p<.01, * p<.05. Robust standard errors in parentheses.

Note: Results from fixed effects models with robust standard errors. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. sq = squared. Separate models for men and women.

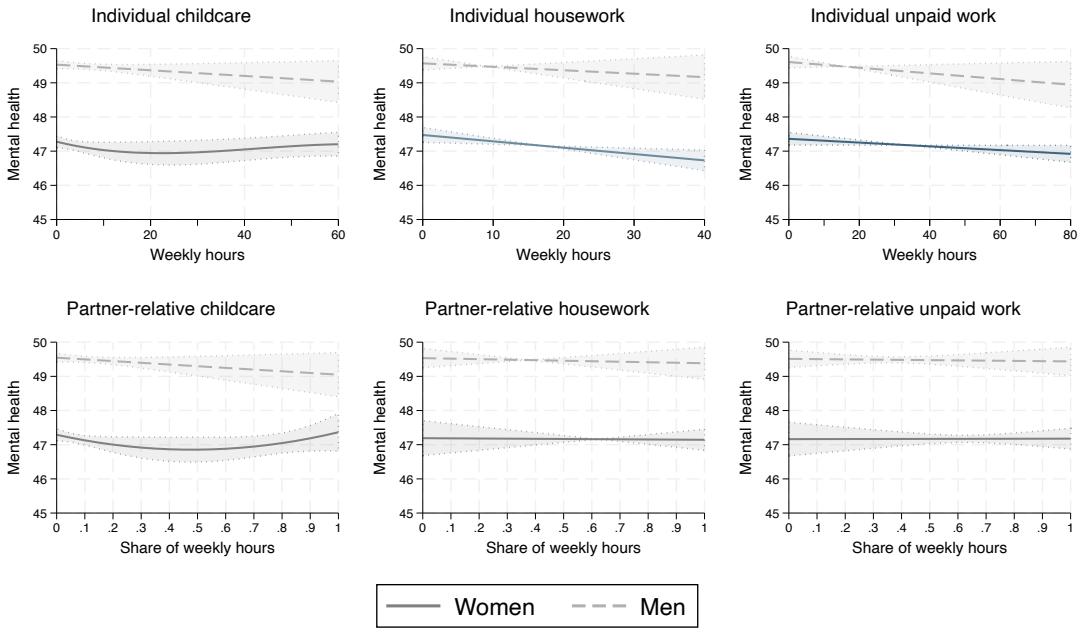
Source: HILDA, waves 2-21.

Figure 3.6 Predicted change in childcare, housework, and total unpaid work time (individual weekly hours) around birth



Note: Fixed effects models estimates with 95% confidence intervals with reference category at -3 years. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. *Childcare* includes weekly time spent playing with children, helping them with personal care, teaching, coaching or actively supervising them, or getting them to child care, school and other activities. *Unpaid work* combines time spent on childcare and housework. Separate models for men and women. *Source*: HILDA, waves 2-21.

Figure 3.7 Predicted change in mental health by time use (individual weekly hours and partner-relative contributions) from fixed effects linear models



Note: Fixed effects models estimates with 95% confidence intervals. Controls include age, age squared, household income, long-term health impairment, and relationship dissolution. *Childcare* includes weekly time spent playing with children, helping them with personal care, teaching, coaching or actively supervising them, or getting them to child care, school and other activities. *Unpaid work* combines time spent on childcare and housework. Light grey confidence intervals and lines signify a statistically non-significant association at the 5% level. Separate models for men and women.
Source: HILDA, waves 2-21.

Chapter 4: Study 3 – Mental health trajectories across parenthood transitions: A longitudinal cross-national study

Abstract

Previous cross-national research examining the impact of children on individuals' well-being shows substantial variations across contexts. However, there is a lack of cross-national comparisons of mental health changes following parenthood within a large-scale longitudinal framework that reflects the dynamic, nonlinear aspects of this life course transition. Using a cross-national life course design, this study compares mental health trajectories around the first and second parenthood transition in three countries for men and women, taking into account socioeconomic heterogeneity. It further examines whether formal childcare use is differentially associated with parental mental health trajectories across policy contexts. We employ fixed effects models with discrete-time trends using comparable household panels from Australia (N=13,612), Germany (N=21,148), and the UK (N=24,369) to examine mental health trajectories in each country. Results show that mental health improves with the first child in all countries, especially for women, but declines after the second child in Australia for both genders. SES-related heterogeneity in trajectories is minimal across countries, however, women never using formal childcare fare worse as parity increases in all countries, particularly in Germany. Overall, although mental health trajectories are mostly comparable across similar national contexts, cross-national variation in mental health increases with parity, with more pronounced effects among women than men. Additionally, childcare use is a clearer differentiator of mental health trajectories than SES for women in all countries. This study is the first to combine a comparative approach with a longitudinal perspective to study mental health trajectories around childbirth across countries, taking into account heterogeneity by socioeconomic context and childcare arrangements.

Keywords: Parenthood; Gender; Mental health; Life course; Longitudinal; Cross-national Comparison

4.1 Introduction

Parenthood transitions represent key life course events with significant economic, household, and health consequences (including mental health and well-being) that distinctly impact men and women. The experience of parenthood is also heavily embedded in the national context and may vary according to the prevalent societal family and gender norms, policy strategies, and welfare regimes. Existing cross-national research points out significant variations in (gendered) mental health and well-being by parental status across both Western and Asian contexts (Chao & Glass, 2020; Margolis & Myrskylä, 2011). These differences are attributed to the diverse levels of policy development and institutional support for families between countries, with supportive welfare regimes and policy strategies shown to benefit parental –and particularly maternal– mental health and well-being (Aassve et al., 2015).

Nevertheless, cross-national studies differ in their findings on the net impact of parenthood on individual mental health and well-being. Some studies indicate that parents fare better than nonparents across countries, whereas others report the opposite (e.g., Aassve et al., 2012; Nordenmark, 2021). These inconsistencies may partly stem from the cross-sectional approach of prior cross-national research on parenthood, which only allows for a static evaluation of mental health or well-being by comparing levels between parents and nonparents (Cetre et al., 2016). Yet, a distinct but closely related body of longitudinal research that examines within-individual changes in mental health and well-being over the transition to parenthood shows that the effects of parenthood are time-dependent and nonlinear, with peaks and decreases occurring across different time points (e.g., Baranowska & Matysiak, 2011; Mikucka & Rizzi, 2019; Myrskylä & Margolis, 2014). Therefore, previous cross-national research does not address whether differences in national policy context also affect the dynamic well-being processes that unfold following parenthood transitions. To bridge this gap, this study combines longitudinal and cross-national approaches to examine how trends in gendered individual well-being around parenthood compare across countries.

National context is argued to influence parental mental health and well-being mainly through the existing policy packages that allow parents –and specifically mothers, who experience the greatest disruptions following parenthood– to better adjust to their new

family role. Well-designed family policies facilitate smoother parenthood transitions by helping parents balance pre-existing obligations with new responsibilities and mitigating the financial and time-related costs associated with children, which can otherwise adversely affect well-being (Glass et al., 2016; Pollmann-Schult, 2018). High levels of institutional support, such as protected leave or formal childcare provision, are shown to be particularly effective strategies to enhance parental well-being (Aassve et al., 2015). However, these policies may operate across separate parenthood phases (e.g., around birth time or in later childrearing years). Therefore, the national policy context may impact parental well-being differently over time. This leads us to also consider whether diverging trajectory patterns can be observed based on the use of specific family arrangements provided by national policy, which has not been considered in existing studies so far.

Furthermore, previous cross-national research on parental well-being has typically relied on unidimensional indicators of subjective well-being. Although such measures (e.g., single life satisfaction or happiness scales) indicate how individuals evaluate their overall life quality, they do not account for the nuanced psychological consequences of parenthood as comprehensively as composite mental health measures (OECD, 2023d). Multidimensional mental health indicators reflect more precisely the processes around parenthood such as co-occurring positive and negative affect (i.e., specific feelings, emotions, or states), and changes in daily functioning –which may vary across parenting stages, as they require different emotional and psychological resources– allowing for a more fine-grained analysis. Composite mental health measures are especially relevant when examining men and women who become parents, as the complex, ambivalent, and contradictory effects (e.g., feeling joyful but strained) of parenthood tend to be dissimilar by gender (Nomaguchi & Milkie, 2003).

This study is the first to assess how parenthood shapes within-individual mental health in three distinct but comparable countries: Australia, Germany, and the United Kingdom. Leveraging long-running representative household panels with rich information on family structure and socioeconomic circumstances, we examine mental health trajectories across parenthood transitions –specifically, the years before and after the birth of the first and second child– using harmonised variables and near-identical

multidimensional mental health measures as the outcome. Observation windows are set during the same period (early 2000s to early 2020s) in all countries.

We not only take into account gender differences in patterns but also consider socioeconomic group heterogeneity across countries to inform whether normative and societal context shapes group responses to parenthood. Additionally, we investigate whether trajectories across countries differ by childcare arrangements –specifically, by formal childcare use– to assess whether there are discernible differences in trajectory patterns between groups making use of supplied external childcare and those with alternative arrangements across countries. In doing so, we aim to provide a richer understanding of the intersection between national context, gendered parental mental health trajectories, socioeconomic background, and family arrangements supported by existing family policy.

4.2 Background

4.2.1 Previous research

In highly developed countries such as Australia, Germany, and the UK, the decision to have children is assumed to carry positive consequences for individuals' well-being19 (Hansen, 2012). However, existing research does not provide such a straightforward picture of parenthood, partly due to differing approaches such as the examined outcome measure (e.g., evaluative well-being measures vs. composite mental health scores), analytical approach (cross-sectional vs. longitudinal data, sample selection, model specification), national context, and the consideration of effect heterogeneity (e.g., differences by socioeconomic groups). See Appendix Table 4.4 for a literature review summary.

[19] We use 'well-being' as an umbrella term encompassing both subjective well-being and mental health, which are related but distinct concepts. Subjective well-being involves an evaluative assessment of life quality, such as life satisfaction or the frequency of positive affect (e.g., general happiness). In contrast, mental health refers to a multidimensional state that includes affect, emotional distress levels, and daily functioning.

4.2.1.1 Single-case studies

Cross-sectional single-case studies (i.e., no cross-national comparison) compare parents to nonparents to assess the effect of parenthood on well-being. These studies overall find very mixed results (i.e., some find a positive impact of parenthood, others a negative effect; see Nelson et al., 2014 for a review) and suggest that the effects of parenthood on mental health and well-being vary depending on the considered outcome, socioeconomic context, parenting stage, and the total number of children (Evenson & Simon, 2005; Nomaguchi, 2012; Nomaguchi & Milkie, 2023). By contrast, longitudinal studies, which estimate how individuals' well-being varies before, during, and after parenthood transitions, and are less subject to self-selection bias, tend to find more consistent findings. Most studies show positive within-individual trends around the first birth but similarly identify co-occurring negative consequences on certain mental health dimensions, such as increased fatigue, stress, and feeling pressured (Cetre et al., 2016; Hewitt et al., 2022; Mikucka & Rizzi, 2019; Myrskylä & Margolis, 2014; Ruppanner et al., 2019; Tosi & Goisis, 2021).

These previous findings demonstrate the complex, dynamic relationship between parenthood and well-being, with the effects of parenthood –both positive and negative– shifting nonlinearly over time. This 'parenthood paradox' –stemming from the co-existing psychosocial rewards and the cognitive and material costs of parenthood (Nomaguchi & Milkie, 2003)– is further reflected with parity progression: although having a second child is often based on a positive first-time experience and greater well-being, it is shown to be more negatively associated with well-being due to increased parental responsibilities and time constraints (Luppi, 2016; Luppi & Mencarini, 2018; Mencarini et al., 2018; Ruppanner et al., 2019). However, most previous research has not fully captured these conflicting effects with the often-employed unidimensional measures of subjective well-being. Instead, multidimensional indicators that take into account both positive and negative mental processes may be more appropriate. Yet, such measures are still underutilised in longitudinal demographic studies.

4.2.1.2 Cross-national studies

Comparative studies stress the role of the national context in shaping parental well-being. Existing cross-national research on parenthood and well-being –which relies exclusively on cross-sectional designs– yields similarly mixed results to single-case studies: some

studies report positive overall effects of being a parent on subjective well-being or mental health across countries, while others find predominantly negative effects (Aassve et al., 2012; Blanchflower & Clark, 2021; Nordenmark, 2021; Somogyi et al., 2021). Further studies indicate that the positive association is only present for the first child, and diminishes with additional children, suggesting that family size is a significant factor affecting parental well-being across countries (Kohler et al., 2005; Margolis & Myrskylä, 2011).

Despite these divergent findings, all previous cross-national studies point to the role of family support and work-family reconciliation policies, as well as the predominant social and gender norms, in determining parental well-being. In particular, Aassve et al. (2015) show that mothers are happier than nonmothers within national contexts with appropriate institutional support that promotes gender equity, and Glass et al. (2016) show that the happiness gap between parents and nonparents found across countries can be fully explained by the welfare context and the presence of comprehensive policy packages with efficient measures that facilitate balancing work and family responsibilities for both parents, such as childcare subsidies and paid parental leave.

Yet, this previous cross-sectional evidence does not capture parenthood as a time-dependent life course process and does not systematically examine mental health. To date, there are no longitudinal cross-national examinations of mental health across parenthood transitions. One study by Myrskylä and Margolis (2014) compares well-being trajectories in Germany and the UK –finding temporary positive trends following the transition into parenthood in both countries– but only examines general happiness in earlier periods (1980s to 2000s). However, we can still draw indirect insights from existing longitudinal single-country studies that use data from different countries. For the first child, studies find positive mental health trends in Australia (Ruppanner et al., 2019) and the UK (Metzger & Gracia, 2023; Tosi & Goisis, 2021) as well as positive trajectories for subjective well-being measures in Australia (Aassve et al., 2021), Hungary (Radó, 2020), Poland (Baranowska & Matysiak, 2011), Russia (Mikucka, 2016), and Switzerland (Mikucka & Rizzi, 2019). This contrasts with negative findings in Korea (Rudolf & Kang, 2015) and maternal mental health in Germany (Giesselmann et al., 2018). For the second child, results are more mixed with studies reporting negative associations after the second birth in Australia (Aassve et al., 2021; Matysiak et al., 2016;

Ruppanner et al., 2019), positive effects in Hungary (Radó, 2020) and Switzerland (Mikucka & Rizzi, 2019), and no significant associations in Poland (Baranowska & Matysiak, 2011). Importantly, most of these studies find that women are both more positively and more negatively affected than men (Metzger & Gracia, 2023; Ruppanner et al., 2019).

However, these studies did not aim to compare (gendered) parental well-being trajectories across national contexts and consequently differ in terms of considered outcomes, sample selection, and analytical strategy, making precise comparisons difficult. This study contributes to this literature by combining cross-national comparative, and longitudinal approaches using a common time frame and identical outcomes to examine the dynamic association between the first and the second parenthood transition and mental health, addressing the role of (i) gender, (ii) socioeconomic characteristics, and (iii) formal childcare use.

4.2.2 This study: Parenthood transitions in a cross-national perspective

4.2.2.1 Policy context, parenthood transitions, and well-being in Australia, Germany, and the United Kingdom

This study adopts a cross-national life course approach to parenthood transitions and mental health by focusing on three national policy and welfare contexts: Australia, Germany, and the UK. Life course research that focuses on the dynamic processes of consecutive life events and trajectories in individuals' lives points out the important role played by the welfare regime, policy implementation, and the prevalent cultural norms that define the national setting. This context may determine the decisions taken by individuals that shape their life courses with significant consequences for their economic, family, and health outcomes (Daly et al., 2023). The experience of parenthood can therefore not be fully distinguished from the wider sociocultural, institutional and welfare context.

The studied cases of Australia, Germany, and the UK have comparable welfare regimes yet also present some distinctions (see Table 4.1 for an overview). Australia and the UK are defined as liberal regimes, whereas Germany is described as a conservative regime. This translates into Australia and the UK relying on market-led solutions to provide

welfare, placing individual responsibility over state intervention through low decommodification, whereas Germany's welfare provision relies primarily on the family but with higher decommodification levels to support it (i.e., greater financial state-support such as high family benefits and transfers; Fasang et al., 2024).

Table 4.1 Case comparison of the welfare and family policy contexts in Australia, Germany, and the United Kingdom

	National welfare context		
	Welfare regime	***Decommodification***	***Familisation***
AU	Liberal, market-oriented	Low decommodification	Gendered familialism
GE	Conservative, family-oriented	Mixed decommodification	Gendered familialism + some defamilisation
UK	Liberal, market-oriented	Low decommodification	Gendered familialism
	Family policy context		
	Leave	***Childcare***	***Flexible work***
AU	Statutory leave introduced in 2011 with up to 12 months	Universal entitlement to 15h/week a year before entering school since 2013	Right to request flexible arrangements for parents since 2009
GE	Statutory leave since 1986 (6 months), gradually increased to 36 months by 1992	Free part-time childcare for all families since 1996 for children over three years old	Negotiated, dependent on sector
UK	Statutory leave extended to all mothers in 1993, gradually increased from 7 to 33 weeks by 2007	Free part-time childcare for all families since 2008, free full-time for employed parents since 2017, for three/four-year-olds	Right to request flexible arrangements for parents since 2007

Notes: AU = Australia, GE = Germany, UK = United Kingdom.
Source: Own elaboration, based on Fasang et al. (2024), Lewis (2009), McDonald & Moyle (2010) and Thévenon (2011).

Family policies in all three countries were limited until the 1990s when governments gradually implemented more extensive measures to address the new family needs arising from increased female labour participation and dual-earner couples (Lewis & Campbell, 2007). Yet, in terms of family policy Australia, Germany, and the UK are still categorised as familising regimes today, in which main care responsibilities are left in the hands of the family. This is still particularly evident in the UK and Australia, where low family state support leads to families relying on their market income to access care provision, often turning to private solutions or negotiating directly with employers (McDonald & Moyle, 2010). By contrast, post-reunification Germany has moved towards more state-led welfare support, with specific reforms to defamilialise childcare (specifically taking

place in West Germany to converge more towards the Eastern German model of family support) by improving access to formal care provision for all young children from 1996 (and further expanded since), setting it apart from Australia and the UK (Scholz et al., 2019; Thévenon, 2011).

Despite these efforts, all three countries are still characterised as 'improved breadwinner' models where women's employment following parenthood is often limited to part-time hours or extended periods of withdrawal from the labour market to ensure childcare (Lewis et al., 2008). This follows from a gendered form of familialism which assigns family care responsibilities primarily to women and structurally limits their choices to transition from family care to employment (Leitner, 2003). This results in highly specialised, gender-imbalanced roles with greater disadvantages for new mothers' mental health and well-being.

Empirical research finds direct associations between family policy characterisation and parental mental health at the national level. Familising policies are negatively associated with parental mental health, particularly for mothers as it places a much greater caregiving burden on them (Somogyi et al., 2021). Conversely, policies that allow parents to place their children into family-external care tend to enhance parental mental health, particularly mothers who benefit the most from such support. In general, effective family policies help integrate work and family life while mitigating the financial and time-related costs associated with parenthood, facilitating smoother parenthood transitions with beneficial outcomes for parents (Chao & Glass, 2020; Glass et al., 2016; Nomaguchi & Milkie, 2017; Pollmann-Schult, 2018). The effects of parenthood in Australia, Germany, and the UK may therefore be more mixed –particularly for women– due to less extensive family policies compared to other countries.

4.2.2.2 Heterogeneity in parental well-being by socioeconomic status across countries

In addition to analysing how men's and women's mental health evolves across parenthood transitions in Australia, Germany, and the UK, this study also considers the influence of socioeconomic status (SES) in shaping trajectories within these national contexts. Parental well-being may not only depend on SES but also on its interplay with the national normative and policy frameworks surrounding parenthood, which may be a particularly relevant factor for women. SES is shown to have a more substantial impact

on the well-being of women compared to men, as it is shown to influence their decisions after becoming parents more considerably than men (Nomaguchi et al., 2005). Specifically, higher SES women are more likely to remain employed after childbirth while also being more engaged in childrearing (i.e., through 'concerted cultivation' and 'intensive parenting' practices; Gimenez-Nadal & Sevilla, 2016; Hays, 1996; Lareau, 2003). This can result in greater work-life conflict, time constraints, stress, and negative psychosocial processes (e.g., 'mother's guilt' when struggling to balance work and family demands) among higher SES women with adverse implications for their well-being (Floderus et al., 2008; Henderson et al., 2016; Matysiak et al., 2016; Mikucka & Rizzi, 2019; Sperlich et al., 2011). Consequently, despite having more advantages and resources, higher SES women may experience fewer positive effects from motherhood compared to lower SES women.

However, this may not be the case to the same extent across countries. In contexts with extensive and accessible family-friendly support, the impact of SES on maternal well-being may be less pronounced, as such measures would facilitate balancing work and family responsibilities for higher SES mothers, thereby reducing their potential well-being disadvantage (Treas et al., 2011). Conversely, in countries with pronounced gender-normative pressures and penalties for working mothers along with more limited family support, the observed SES-based disparities may be larger. Despite this, variations in parental mental health trajectories by SES across countries remain underexplored. Previous studies find that women from higher socioeconomic backgrounds experience reduced benefits from parenthood compared to less privileged women in the UK, while no SES-based differences in overall happiness are found in Germany (Metzger & Gracia, 2023; Myrskylä & Margolis, 2014). Yet, it is unclear whether similar patterns apply to mental health in other countries, in this case, Australia and Germany. This study addresses this question by examining possible SES-related cross-national heterogeneity in mental health trajectories among men and women.

4.2.2.3 The case of formal childcare

Although family policies encompass a range of measures aimed at supporting parents, certain policies, such as formal childcare provision, have been more clearly linked to improved parental well-being than others. The long-standing lack of affordable public childcare in a number of countries –including Australia, Germany, and the UK– restricted

women to staying at home or majorly reducing their working hours, following typical male breadwinner models. In fact, Australia, Germany, and the UK present some of the highest percentages of 1.0 or 1.5-earner models among OECD countries, linked to late policy implementations and adherence to specialised gender norms (Baxter et al., 2007; van Egmond et al., 2010). Presently, compared to Australia and the UK, Germany offers the most comprehensive and universally accessible childcare, supported by robust public funding that ensures low costs for daycare services (Barber & Immervoll, 2005). The UK also provides formal childcare but with much higher costs (despite existing subsidies) and more limited access due to demand exceeding existing offers (J. Rutter & Stocker, 2015). Australia's system is comparable to the UK's in terms of provision, access, and cost issues (Brennan & Adamson, 2014). As formal childcare provision is a policy primarily aimed at easing family demands for women, allowing them to be more independent from childcare responsibilities, it can prove particularly efficient in familialistic countries such as Australia, Germany, and the UK.

Previous studies by Schmitz (2020), Schober and Stahl (2016), and Schober and Schmitt (2017) for Germany, Luppi and Arpino (2020) and Yamauchi (2010) for Australia, and Brewer et al. (2022) for the UK find that the expansion, increased availability and improved access to affordable formal childcare are associated with positive outcomes for women. Mothers who can make use of extended external childcare are shown to shift freed-up time from childcare to employment (Bauernschuster & Schlotter, 2015) –with positive effects on well-being, likely through the direct benefits of employment (e.g., social interaction, sense of purpose and independence, financial autonomy) and indirect effects (e.g., increased income, improved work-life balance)– and display increased satisfaction with their leisure time. External childcare may therefore (partially) play a role in determining parental mental health.

Consequently, we examine the link between different mental health trajectories and childcare use patterns across countries to assess whether childcare use is associated with differences in trajectories. We focus on formal, external childcare as it reflects policy-constrained choices in terms of availability, access, and affordability compared to informal childcare (i.e., family, neighbours, friends, etc.). Given the complex processes underlying the determinants of childcare choices (such as access, availability, quality, family structure, and gender ideology), we examine whether there are discernible

differences in trajectories between the groups using formal childcare and those who do not, without attributing these differences solely to the difference in childcare use as we do not isolate the effect of childcare use on mental health trajectories. Rather, we compare how patterns between formal childcare users and non-users evolve in each country. Due to better public childcare provision, the group benefitting from daycare use may be more visible in Australia or the UK, as there are greater barriers to formal, high-quality childcare, than in Germany. Generally, effects may be more apparent for the second child than the first, as external childcare may increasingly relieve mothers' caregiving.

4.3 Data and methods

4.3.1 Datasets

We combine three large-scale, long-running household panels from Australia (*Household, Income and Labour Dynamics in Australia*, HILDA), Germany (*German Socioeconomic Panel*, GSOEP), and the United Kingdom (*UK Household Longitudinal Survey*, UKHLS). The surveys are highly comparable in design and collection method, with all household members annually surveyed, providing rich information on family structure, family arrangements, and socioeconomic circumstances. We use the Comparative Panel Files for the initial merging of the datasets (CPF v1.5; Turek et al., 2021) and to obtain cross-country harmonised variables for demographic and socioeconomic indicators. Additionally, we construct specific variables needed for the analyses (i.e., the parenthood timer and childcare use detailed below). We limit data to the survey years that include a multi-dimensional mental health measure: waves 1 to 21 (2001-2022) for Australia; waves 1 to 12 (2009-2021) for the UK; waves 19 to 38 (2002-2021) for Germany[20], which restricts all surveys to comparable periods.

4.3.2 Samples

We define samples based on the same criteria in all three countries. We select two different samples to study first and second births separately. The selection criteria and

[20] The 'Mental Health' module in the GSOEP is only surveyed every other year, we therefore drop the waves that do not include the measure.

process are detailed in Appendix Figure 4.6. The sample compositions are summarised in Appendix Table 4.5.

Table 4.2 Sample description by gender and country, first birth

	Sample 1: First birth		
	AU	**GE**	**UK**
	WOMEN		
MCS			
Overall	46.7 (11.2)	48.5 (9.9)	46.2 (10.8)
Within-individual SD	7.5	6.8	7.2
Age*	23.83 (7.1)	25.60 (7.9)	25.44 (8.2)
Tertiary education	0.52	0.32	0.47
Employment status*			
Full-time	0.40	0.31	0.48
Part-time/irregular	0.34	0.15	0.22
Not employed/other	0.26	0.54	0.30
Household income*	$86,682 (63,573)	€39,976 (31,066)	£40,762 (37,935)
Weekly work hours*	29.12 (15.1)	32.21 (14.6)	33.65 (14.1)
Partnership status*			
Partnered	0.42	0.19	0.35
Single	0.57	0.78	0.64
Separated	0.02	0.03	0.02
Health impairment*	0.09	0.08	0.10
N	5,739	6,903	9,047
	MEN		
Mental health score			
Overall	48.0 (10.2)	50.7 (9.4)	48.6 (10.1)
Within-individual SD	6.7	6.3	6.5
Age*	25.47 (9.0)	28.52 (10.4)	28.60 (11.2)
Tertiary education	0.35	0.29	0.37
Employment status*			
Full-time	0.54	0.45	0.54
Part-time/irregular	0.22	0.08	0.13
Not employed/other	0.24	0.47	0.33
Household income*	$83,733 (59,061)	€38,378 (30,744)	£39,659 (70,405)
Weekly work hours*	34.90 (16.4)	37.67 (14.1)	38.42 (14.0)
Partnership status*			
Partnered	0.38	0.19	0.34
Single	0.61	0.77	0.65
Separated	0.01	0.04	0.02
Health impairment*	0.08	0.07	0.11
N	6,027	8,264	9,404

Notes: * Computed at first observation. MCS = Mental health summary score; SD = Standard deviation. SD in parentheses. Income expressed in national currency. AU = Australia, GE = Germany, UK = United Kingdom.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

For first births, we select respondents who transition into parenthood during the observation frame of the study, as well as include a group of childless respondents who have not (yet) transitioned into parenthood to provide more robust estimations of control variables (Brüderl & Ludwig, 2015; Ludwig & Brüderl, 2021; Perales, 2019).

Table 4.3 Sample description by gender and country, second birth

	Sample 2: Second birth		
	AU	**GE**	**UK**
	WOMEN		
MCS			
Overall	46.6 (10.5)	48.6 (9.8)	46.9 (10.4)
Within-individual SD	7.5	6.8	7.2
Age*	26.7 (7.9)	32.4 (8.0)	30.7 (8.3)
Tertiary education	0.51	0.33	0.43
Employment status*			
Full-time	0.41	0.30	0.49
Part-time/irregular	0.28	0.29	0.23
Not employed/other	0.31	0.41	0.28
Household income*	74,199 (50,357)	36,048 (24,074)	37,518 (134,388)
Weekly work hours*	30.8 (14.7)	30.5 (13.7)	34.0 (12.5)
Partnership status*			
Partnered	0.64	0.50	0.65
Single	0.33	0.38	0.30
Separated	0.03	0.12	0.06
Health impairment*	0.09	0.10	0.11
N	3,120	5,305	5,534
	MEN		
Mental health score			
Overall	48.6 (9.7)	51.0 (9.1)	49.3 (9.3)
Within-individual SD	6.7	6.1	6.3
Age*	29.8 (9.6)	37.00 (9.9)	34.71 (9.9)
Tertiary education	0.40	0.37	0.38
Employment status*			
Full-time	0.72	0.76	0.79
Part-time/irregular	0.13	0.06	0.06
Not employed/other	0.15	0.18	0.15
Household income*	75,112 (46,863)	38,653 (25,821)	38,437 (69,645)
Weekly work hours*	40.3 (14.8)	42.1 (11.8)	43.0 (11.4)
Partnership status*			
Partnered	0.69	0.61	0.79
Single	0.28	0.30	0.17
Separated	0.03	0.09	0.04
Health impairment*	0.08	0.09	0.11
N	2,769	4,971	4,252

Notes: * Computed at first observation. MCS = Mental health summary score; SD = Standard deviation. SD in parentheses. Income expressed in national currency. AU = Australia, GE = Germany, UK = United Kingdom.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

For second births, we select respondents who have their second child during the observation period, along with a control group of respondents who have one child but have not (yet) had their second child for the same reasons. Lastly, respondents are selected based on complete-case criteria for all variables used in model specifications. Sample descriptions by gender and country are presented in Table 4.2 and Table 4.3.

4.3.3 Variables

4.3.3.1 Dependent variable

Mental health is measured with the Mental Component Summary (MCS) score derived from the Short-Form general health questionnaires available in all three surveys. The MCS is classified as a measure of positive mental health and is suitable for measuring population mental health across countries (OECD, 2023d). The measure evaluates various dimensions of mental health across four scales, each based on multiple items: social functioning, role functioning, emotional functioning, and vitality. The overall score is computed from a combination of these items and ranges from 0 to 100 points (higher scores indicate better mental health). The advantage of using the MCS over single-scale measures of well-being is that it reflects both emotional states and daily functioning by considering the frequency of negative and positive affect (e.g., feeling depressive, happy or calm), as well as whether these states impact day-to-day life (e.g., good functioning in daily tasks and social settings). The HILDA survey includes the SF-36 MCS (36 items, with 14 related to mental health), and the UKHLS and GSOEP use the SF-12 MCS (12 questionnaire items, with 6 related to mental health). The SF-12 is a shortened, adapted version of the SF-36 but measures the same dimensions and is shown to be near-identical to the SF-36 (Jenkinson et al., 1997). See Appendix Table 4.6 for more details on item questions by survey.

4.3.3.2 Independent variables

We construct parenthood timers around the birth events for respondents who experience a first and/or second birth during the selected observation period. To model the dynamic, nonlinear nature of the parenthood transitions, we define a discrete-time trend variable for both first and second births ranging from -3 years (the reference period) to +6 years post-birth to obtain the distributed effects of parenthood over time.

For Australia, first and second births are identified by (1) the respondent indicating the birth of a new child in the past year and (2) the total number of children currently in the household being equal to 1 for first births and equal to 2 for second births (we identify twin births by crossing birth information with a lagged variable of the number of children in the household that shows a simultaneous increase by 2 children in the household). The birth event is marked as t_0, with all preceding and subsequent years defined relative to this point.

In Germany, births are identified using the *biobirth* file, which provides the month and year of birth for all children from first to last for each respondent. We define t_0 as the birth year if the birth occurred before the interview date in that year (i.e., the child is already born by the interview date). For respondents with missing birth or interview months but available birth years, we impute a default mid-year value (June).

In the UK, births are identified by (1) the respondent indicating being the parent of a new entrant baby (i.e., a baby born between the latest and current wave) and (2) the (lagged) number of total children in the respondent's household increasing from 0 to 1 for first births (or 2, in case of twin births) and from 1 to 2 for second births (3 in the case of twins). The wave in which the birth occurs is then marked as t_0.

4.3.3.3 Moderating variables

Socioeconomic status. SES groups are defined along a dummy variable indicating whether the respondent holds a tertiary-level degree or not across all observed survey years.

Childcare use. We define childcare use as a binary variable indicating the use of formal childcare arrangements at any point during the first six years following birth. Formal childcare includes crèches, kindergartens, day-care centres, and preschools. Since the observation window ends when children reach age 6, care through primary school is effectively excluded.

We identify formal childcare use in the HILDA data through the *cpu* variables, which indicate the type of childcare each respondent utilises, providing year-by-year information on childcare arrangements. Parents –specifically, mothers– are marked as using external, formal childcare when they report using daycare services, kindergarden,

or preschool for their children. Unlike the GSOEP and UKHLS, the HILDA data does not specify to which child the arrangement refers; therefore, we cannot differentiate the type of care that applies to each child (unless there is only one child in the household).

In the GSOEP data, we identify formal childcare use with the *kidlong* longitudinal file, which tracks every child in the survey and indicates for each year whether they were in formal care. Children are marked as being in formal childcare if they attend 'Kinderkrippe', 'Kindergarten', or 'Kindertageseinrichtung' using the *ks_pre* variables. We then link these children back to a parent (in this case, their mother) by matching the child's parent ID with the parents' respondent ID and the corresponding year. This process is done for the first and second child, resulting in year-by-year information on the childcare type for each child.

For the UKHLS data, we first retrieve each child's mother's ID from the *xhhrel* cross-wave household file. We determine each child's birth order by grouping them by their mother's ID and sorting them by date of birth. By merging all *child* files, we retrieve yearly information on each child's childcare arrangements using the *wrkch2a* variables. Children are marked as attending formal childcare if they attend nursery, crèche, or preschool. This is done for both the first and second child, using birth order information to identify each. Finally, we link this information back to the mother's ID and the corresponding year to obtain the year-by-year information on childcare use for each child.

Table 4.7 and Table 4.8 in the Appendix show the distribution of the model variables across childcare groups for the respondents becoming first- or second-time parents. The tables show that childcare utilisation varies across countries, with the highest use being in Germany, and the lowest in the UK. Groups using childcare also are more likely to have higher education, work full-time, and display slightly better mental health levels (around 1-point differences).

4.3.3.4 Control variables

Using the CPF harmonised variables, we control for the following time-varying factors: age and age squared to capture (nonlinear) age-related effects on mental health, as age is a strong predictor of mental health fluctuations over the life course. We also control for (log) household income (net adjusted disposable income after taxes and transfers) to account for changes in household resources, which could negatively impact mental health

in the case of significant income reductions, as well as employment status (full-time, part-time, or no employment) to control for changes that could impact mental health (e.g., going from full-time work to unemployment). Additionally, we control for relationship status to account for the effects of relationship dissolution on mental health, and health impairment to capture the adverse effects of major physical health deteriorations on mental health.

4.3.4 Analytical strategy

Individual mental health trajectories are estimated using individual fixed effects models to assess within-individual changes in mental health over time, specifically before, during, and after parenthood transition(s). Fixed effects models leverage within-individual variations in time-varying explanatory variables to estimate their impact on changes in the outcome. These models eliminate time-constant individual effects and unobserved heterogeneity, resulting in mostly unbiased estimates –provided there is no confounding by unobserved time-varying variables– and operate within a framework requiring few other assumptions (Allison, 2009). In the context of parenthood transitions, the estimated timer coefficients indicate how the anticipation, the birth, and the progression through subsequent years of having a (first or second) child affect individuals' mental health relative to the reference period (3 years before the birth). Person-year observations are right-censored once a higher parity birth occurs within the observed time frame to prevent the effects of the subsequent child from being aggregated with those of the child of interest in the estimation of the parenthood transitions variable.

The models include control samples of respondents who do not become first- or second-time parents. This includes childless respondents for the first parenthood transition and parents with only one child for the second transition (i.e., the control sample matches the family composition of the ‘treated’ sample in the pre-birth reference period). Respondents in the control samples are assigned a constant default value on the parenthood transition variable and therefore do not contribute to estimating parenthood effects on mental health. However, they contribute to the robust estimation of time-variant control variables. In particular, this allows accurate estimations of age effects (i.e., the impact of ageing) on mental health to remove any age-related effects from the parenthood time trend variable (Brüderl & Ludwig, 2015; Ludwig & Brüderl, 2021; Perales, 2019).

Formally, the fixed effects regression models are specified as follows. Equation 1 specifies the overall effect of parenthood transitions on mental health changes:

$$Y_{it} = \beta_0 + \beta_1 \cdot TP_{it}^k + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \text{ with } k = 1,2 \quad (1)$$

Where TP^1 is the categorical discrete-time variable for the first parenthood transitions (first child) and TP^2 for the second parenthood transition (second child), with values ranging from -3 years before birth (reference category) to +6 after birth (cut-off). $\boldsymbol{X}$ contains all time-dependent individual control variables, and α_i is the individual fixed effect.

Equations 2 and 3 model the moderation analyses of Equation 1 by socioeconomic status and formal childcare use. Both moderating variables are defined as time-invariant. Although this may reduce precision, it is not recommended to moderate a time-varying variable with another time-varying variable in fixed effects models due to the complex interpretation of the resulting estimation (see Giesselmann & Schmidt-Catran, 2020).

$$Y_{it} = \beta_0 + \beta_1 \cdot TP_{it}^k + \beta_2 \cdot TP_{it}^k \cdot SES_i + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \text{ with } k = 1,2 \quad (2)$$

Where SES is the time-invariant moderator that marks educational attainment. β_2 indicates whether and by how much the trajectory coefficient for the higher socioeconomic group ($SES = 1$) at time t significantly differs from the trajectory coefficient β_1 of the lower socioeconomic group ($SES = 0$) at time t.

$$Y_{it} = \beta_0 + \beta_1 \cdot TP_{it}^k + \beta_2 \cdot TP_{it}^k \cdot CC_i^k + \beta_3 \cdot TP_{it}^k \cdot SES_i + \boldsymbol{\gamma}' \cdot \boldsymbol{X}_{it} + \alpha_i + \varepsilon_{it} \text{ with } k = 1,2 \quad (3)$$

Where CC^1 is the time-invariant indicator for formal childcare use for the first child and CC^2 is the indicator for formal childcare use for the second child. Here β_2 indicates whether and by how much the trajectory coefficient for the group using childcare for their first or second child ($CC^k = 1$, $k = 1,2$) at time t significantly differs from the trajectory coefficient β_1 of the group not using formal childcare ($CC^k = 0$, $k = 1,2$) at time t. $TP \cdot SES$ is the interaction term between the transition to parenthood variable and socioeconomic status to control for processes linked to SES and childcare use.

All models are estimated separately for men and women, using clustered (robust) standard errors, for $k = 1$ and $k = 2$ (i.e., by parity) in each country. Countries are

analysed individually rather than pooled to prevent unobserved country-specific, time-varying factors from affecting estimates (e.g., shifts in social norms and parenting strategies that may simultaneously affect parenthood transitions and mental health in certain national contexts; Faircloth, 2014). Results are presented in graphs with statistical significance marked (both for trajectory coefficient and differences between moderated trajectories) and labelled coefficient values. Full model results tables are included in the Appendix.

4.4 Results

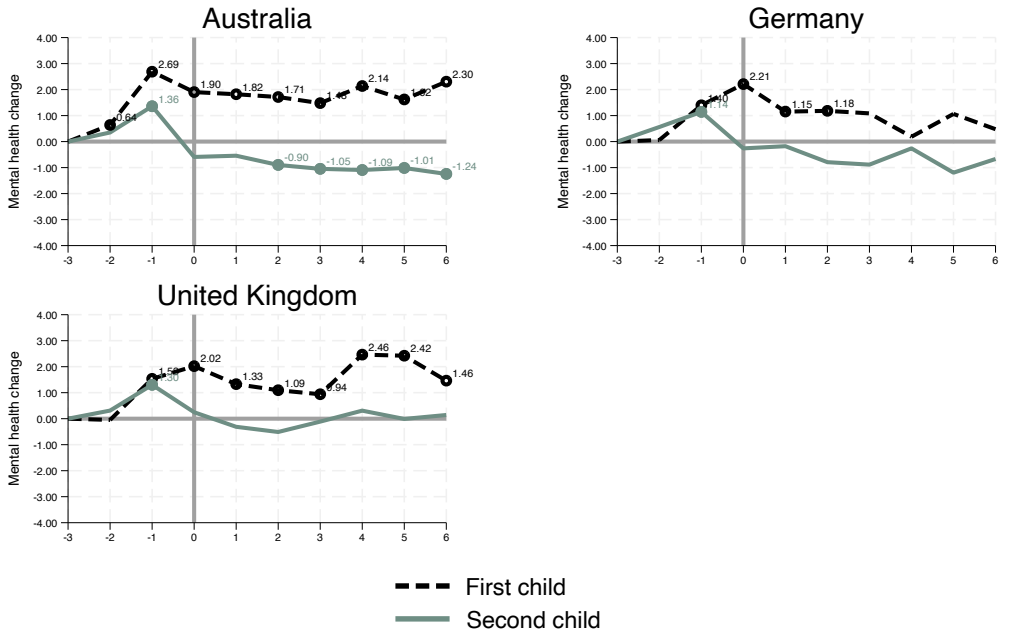
4.4.1 Mental health trajectories across gender and birth parity

We first model the overall mental health trajectories for men and women for the first and second births. Results are presented in Figure 4.1 for women and Figure 4.2 for men. For women, trajectories across the first parenthood transition are generally similar in all three countries. We observe clear anticipation effects in the year before birth (which includes the pregnancy period), followed by positive short-term effects. However, some differences emerge in later years. In Australia, positive trajectories remain stable, while an adaptation effect starting around year 4 post-birth occurs in Germany, whereas mental health in the UK reverts to birth levels from year 4 onwards after a dip in years 1 to 3.

Differences become more apparent when comparing trajectories for the second child[21]. Although we observe similar anticipation effects during the second pregnancy as for the first in all countries, we do not find any lasting positive effects after birth. Australian women even show a negative trend starting from 2 years post-birth, consistent with previous findings on maternal subjective well-being in Australia (Matysiak et al., 2016). This suggests that, despite mothers anticipating their second child similarly to their first, they do not experience the same mental health benefits following birth. Notably, the second child appears to have a more detrimental effect on mental health in Australia.

[21] The reference category is defined at -3 years before the second birth, but respondents' observation points are left-censored if they do not yet have a first child at t=-3. That way, only parents with one child are included in the pre-birth baseline (including both those that transition to a second child during the observation window and those who do not).

Figure 4.1 Predicted changes in mental health around first and second birth in Australia, Germany, and the UK, women



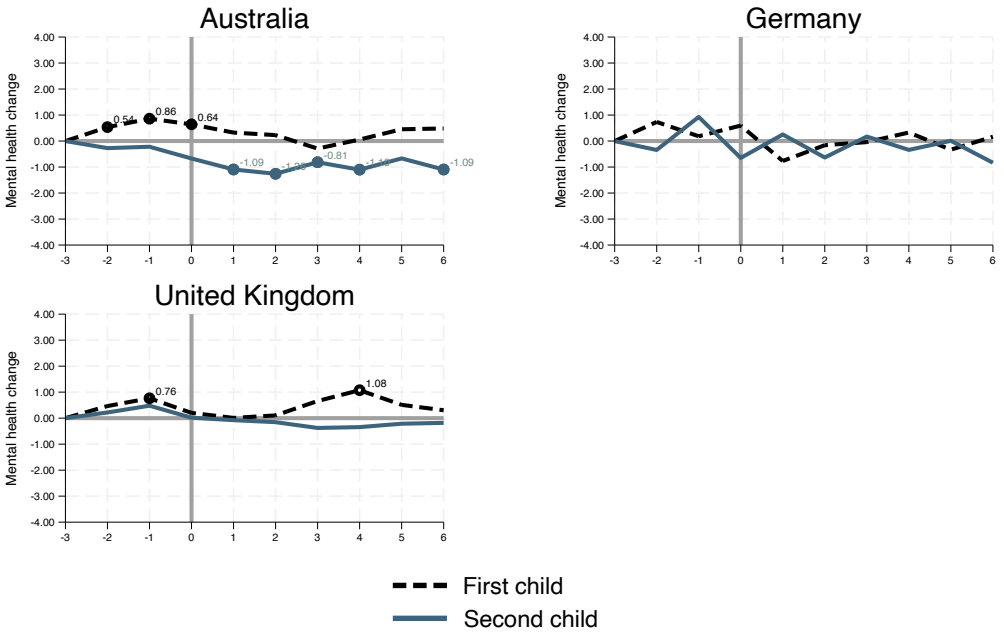
Note: Fixed effects models estimates with reference category at -3 years. Circles indicate coefficients that are statistically significant at the 0.05 level. Controls include age, age squared, household income, employment status, relationship status, and long-term health impairment. Separate models for first and second births.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

For men, trajectories across the first transition to parenthood are comparable across the three countries. There are mild anticipation effects and some positive effects at birth, but unlike for women, no clear trend emerges. The effects are smaller for men, consistent with previous research showing that women generally have stronger emotional responses to parenthood than men (Roeters & Gracia, 2016). However, similar to women, Australian men show a negative trend from the second birth onwards, while German and British men are unaffected.

Overall, results show that first childbirth consistently improves mental health, with more substantial benefits for women than men across all countries. In contrast, beyond the pre-birth anticipation effects, having a second child in Germany and the UK does not have a lasting positive effect on parental mental health. However, raising a second child has a negative impact on both Australian men and women, suggesting that the Australian

context may make navigating family expansion and providing for larger families more challenging than in Germany or the UK.

Figure 4.2 Predicted changes in mental health around first and second birth in Australia, Germany, and the UK, men



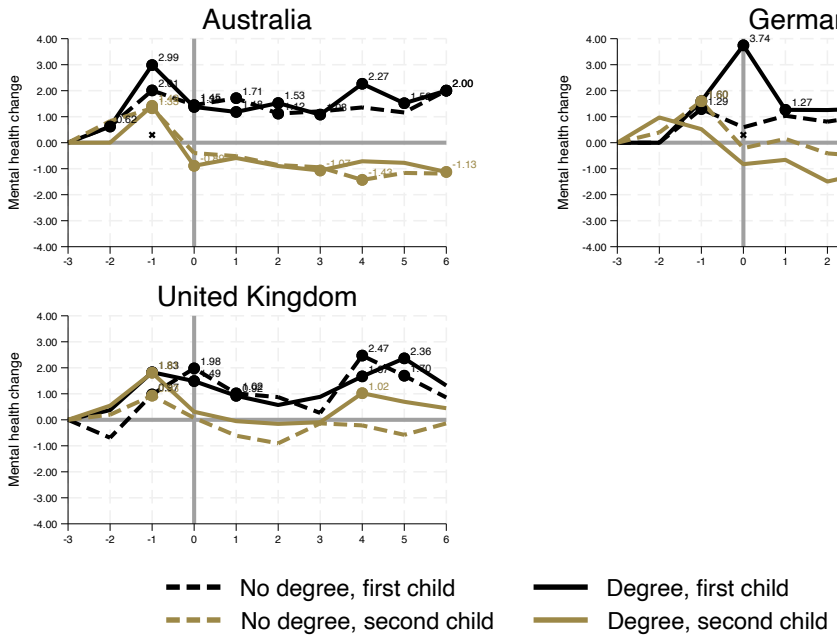
Note: Fixed effects models estimates with reference category at -3 years. Circles indicate coefficients that are statistically significant at the 0.05 level. Controls include age, age squared, household income, employment status, relationship status, and long-term health impairment. Separate models for first and second births.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

4.4.2 Trend heterogeneity by socioeconomic status

Results for mental health trajectories moderated by SES across gender and parity are presented in Figure 4.3 for women and Figure 4.4 for men. Women generally follow similar trajectory shapes across SES groups (i.e., by educational attainment) for both transitions in all three countries. In Australia, SES differences are negligible for both the first and second child with near-identical trajectories, with the only exception of a statistically significant larger positive anticipation effect for the first birth among higher SES women (b=2.99, p<.05). In Germany, the positive birth effect is also much stronger among higher SES women for the first child (b=3.74, p<.001), but the subsequent years follow very similar patterns. For the second child, higher SES women display a lower

(negative) trajectory post-birth than lower SES women, the differences between the trajectories are small, and the coefficients on the trajectories are not statistically significant. Lastly, in the UK, higher and lower SES women follow comparable trajectories for the first child, while for the second child, higher SES women marginally benefit from a positive medium-term effect (*b*=1.02, p<.05).

Figure 4.3 Predicted changes in mental health around first and second birth in Australia, Germany, and the UK by educational attainment, women



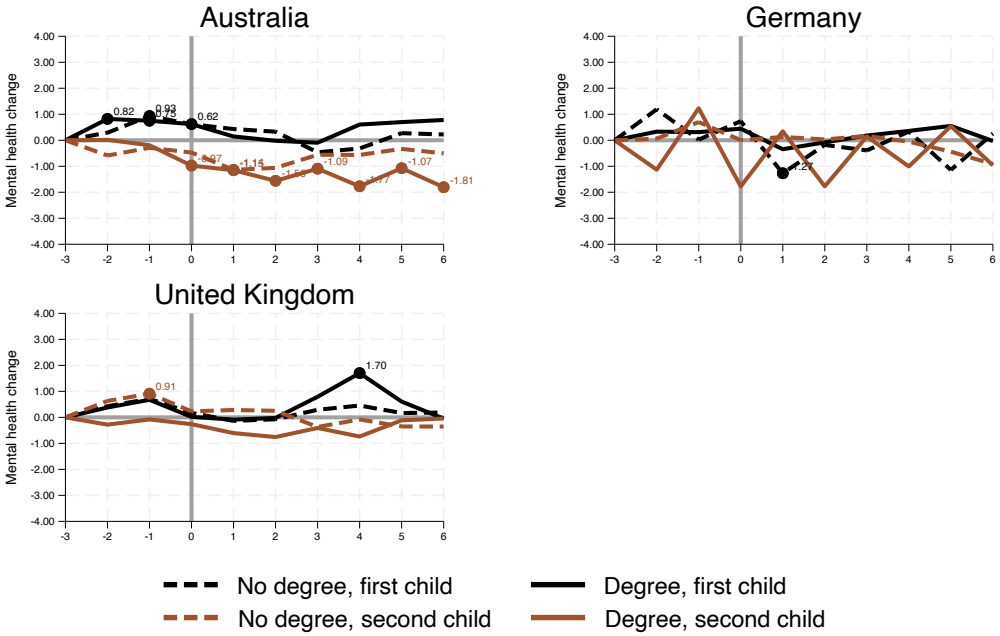
Note: Fixed effects models estimates with reference category at -3 years. Circles indicate coefficients that are statistically significant at the 0.05 level. The labels indicate the value of the estimated coefficient. Diamonds above the x-axis indicate that the difference between the trajectory time points is statistically significant at the 0.05 level. Controls include age, age squared, relationship status, and long-term health impairment. Separate models for first and second births.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

For men, we similarly observe minimal SES-based heterogeneity. Australian men with higher SES show slightly more negative effects up to year 2 after the birth of the second child, but otherwise, trajectories are identical across SES groups. In Germany[22], lower

[22] It should be noted that the uneven trajectory of higher SES German men for the second child in Figure 4.4 is due to less robust estimations linked to the smaller number of available person-year observations.

SES men display a negative effect 1 year after the birth of the first child (b=-1.27, p<.05), but no other distinct patterns emerge. By contrast, in the UK, higher SES men show a positive medium-term effect 4 years post-birth (b=1.70, p<.05).

Figure 4.4 Predicted changes in mental health around first and second birth in Australia, Germany, and the UK by educational attainment, men



Note: Fixed effects models estimates with reference category at -3 years. Circles indicate coefficients that are statistically significant at the 0.05 level. The labels indicate the value of the estimated coefficient. Diamonds above the x-axis indicate that the difference between the trajectory time points is statistically significant at the 0.05 level. Controls include age, age squared, relationship status, and long-term health impairment. Separate models for first and second births.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Overall, we find little SES-related heterogeneity, as measured by education, across parenthood transitions in all three countries among both men and women. This suggests that educational attainment may not be a strong differentiator of parental mental health across countries, despite potential differences in parenting strategies and managing family demands, which tend to vary across parents' educational levels (Lareau, 2003).

Since the GSOEP only reports the MCS every other year, there are fewer data points compared to the other surveys. This is compounded by the sample being split across the two moderation groups in this analysis.

4.4.3 Using external support: Differentiated maternal mental health trajectories by formal childcare use

We compare mental health trajectories between women who use external childcare support at least once during the observed years and those who never use it across countries[23]. This results in two groups that likely differ in several characteristics, including their family arrangements and employment status (e.g., mothers who use formal childcare are often more inclined to remain employed after childbirth). Particularly in Australia and the UK, mothers with financial resources may be able to access more extensive and potentially higher-quality childcare that includes educational activities (Baxter & Hand, 2013; Cattan et al., 2014). These differences should be considered when interpreting the trajectories by childcare usage.

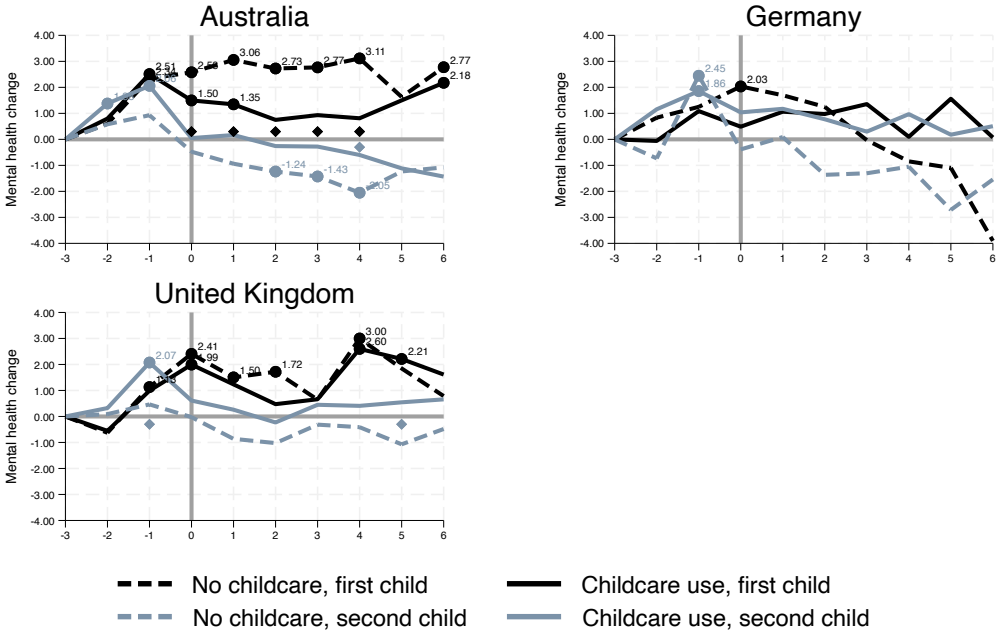
Results for maternal mental health trajectories moderated by formal childcare use are presented in Figure 4.5. Women's mental health trends by formal childcare use show more marked differences between groups and by parity than by SES. For the first birth, Australian women using formal childcare experience a reduced positive trajectory in years 0 to 4, despite similar anticipation effects to the other group. In the UK, the trajectories of both groups are nearly identical following the first birth. In Germany, however, although trajectories show identical birth anticipation effects, trajectory shapes diverge by childcare use following birth: while German mothers making use of formal childcare show a stable positive trend, those who do not use formal childcare display a steep downward trajectory that significantly diverges from the other group by year 6.

For the second child, results are more consistent across countries, although the trends vary. Women who do not use formal childcare for their second child show generally more negative changes in mental health. In the UK, the divergence between groups starts in the year before birth: mothers who will use childcare for their second child have a statistically significant positive anticipation effect, whereas those who will not use childcare do not. The fact that this difference is already visible before birth suggests that

[23] We restrict analyses to women as they predominantly take on the primary caretaker role resulting in much larger adjustments following birth (employment, housework, schedule constraints, etc.) whereas men engage much less in child care and domestic work (Baxter et al., 2008; Killewald & García-Manglano, 2016). As a result, men do not face the same double burden as women, and differences between male childcare users and non-users would be minimal.

the two groups already diverge in the pre-birth period on factors not directly related to using or not using formal childcare. This potentially indicates that mothers who will not use formal childcare for their second child may have already relied less (or not at all) on childcare for their first child, and thus may anticipate the second child as an increased burden, therefore reducing their anticipation. In Australia, a similar pattern occurs but to a lesser extent, as the anticipation effect is also higher among women who will use childcare, but the difference is not statistically significant[24]. In Germany, anticipation effects are identical between both groups.

Figure 4.5 Predicted changes in maternal mental health around first and second birth in Australia, Germany, and the UK by formal childcare use



Note: Fixed effects models estimates with reference category at -3 years. Circles indicate coefficients that are statistically significant at the 0.05 level. The labels indicate the value of the estimated coefficient. Diamonds above the x-axis indicate that the difference between the trajectory time points is statistically significant at the 0.05 level. Controls include age, age squared, household income, employment status, relationship status, and long-term health impairment. Separate models for first and second births.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

[24] It should also be noted that the Australian childcare variables are less precise compared to those for Germany and the UK, as the HILDA survey reports childcare arrangements for all children in the household together, whereas the GSOEP and UKHLS report childcare arrangements for each individual child.

Post-birth, groups not using childcare for their second child show declining mental health trajectories in all countries, with the steepest declines in Germany, followed by Australia. In particular, post-birth trajectories for Australian women not using childcare are significantly negative in years 2-4 compared to baseline levels and compared to the group using childcare (b=-2.05, p<.01). Meanwhile, decreases are much more moderate among women who do not use formal childcare for their second child in the UK. By contrast, those using childcare maintain a stable, neutral trajectory. This may imply that although having a second child does not boost maternal mental health in the formal childcare group, it also does not worsen it in all three countries.

4.5 Discussion

This study is the first to combine a comparative approach with a longitudinal perspective to study gendered mental health trajectories around childbirth across three different countries, taking into account heterogeneity by socioeconomic context and childcare arrangements. We consider three countries that are comparable but present some dissimilarity in welfare characteristics and family policy implementation: Australia, Germany, and the UK. Because of the small number of country-cases in our study (restricted due to data availability and outcome measure comparability), we do not aim to provide macro-level comparisons, but rather evaluate micro-level processes and patterns, and whether they hold across countries using identical outcome measures, sample selections, and modelling across cases for more robust comparisons.

We find that mental health improves in all countries after the first parenthood transition, with greater increases among women than men, consistent with previous single-case longitudinal research findings for subjective well-being and mental health (Mikucka & Rizzi, 2019; Myrskylä & Margolis, 2014; Ruppanner et al., 2019). This stability of patterns around the first transition into parenthood suggests that the initial positive experience of parenthood is generally shared regardless of context, complementing comparative cross-sectional findings that show the positive effects of being a parent across countries (Aassve et al., 2012). However, trajectories following the second transition show notable dissimilarities. Despite nearly identical anticipation effects to those observed for the first birth, there is no subsequent mental health improvement that

follows the second birth. Specifically, we find flat and nonsignificant trajectories in Germany and the UK, and a clear negative trend in Australia for both men and women. This aligns with previous longitudinal and cross-national studies indicating that additional children are associated with lower parental well-being than for the first child (Aassve et al., 2021; Margolis & Myrskylä, 2011; Mikucka & Rizzi, 2019; Ruppanner et al., 2019). Our study contributes to these findings by suggesting greater cross-national variability in mental health trajectories as parity increases. For Australia, Ruppanner et al. (2019) attribute this to increased time pressure among parents, but it remains unclear how this mechanism compares among German and British parents, and should be investigated in future studies.

Further, we do not find significant SES-related disparities in mental health trajectories for either birth among men or women. By contrast, we observe more distinct mental health trajectory heterogeneity between childcare arrangement groups among women. While findings are entirely mixed across countries for the first child, results are more consistent for the second child, with women who never use formal childcare displaying worse mental health trajectories in all countries, particularly in Australia and Germany. This suggests a potentially protective effect of the use of formal childcare arrangements as family size increases and mothers face a duplication in caregiving responsibilities, which may become more critical to mitigate than for the first child (Sayer et al., 2004). This finding suggests that childcare use is a greater differentiator of women's mental health trajectory than SES. Yet, as SES and childcare use are partly related –with higher SES families being more likely to seek out and obtain access to formal childcare (Van Lancker & Ghysels, 2016)– this may indicate that SES-driven choices, such as opting for formal childcare, play a more pivotal role in distinguishing different mental health patterns around parenthood transitions than just SES itself.

Overall, our results show a reasonable similarity in mental health trends across Australia, Germany, and the UK following parenthood transitions, which is coherent with their comparable welfare regimes and family policy contexts (Lewis, 2009). However, some differences emerge with increased parity and childcare arrangements, potentially influenced by national specificities around parenthood, such as Germany's large expansion of formal childcare provision over the past 20 years, setting it apart from the liberal market-led policies of the UK and Australia, and may explain the more consistent

beneficial mental health patterns for German mothers using childcare. In general, results would suggest that adverse mental health consequences may be buffered among the groups that make use of formal childcare.

However, this result cannot be strictly attributed to the use of formal childcare, as the analysis does not capture any causal effects. Instead, we separate women into two groups based on whether they utilise formal childcare for their first and/or second child or rely on informal arrangements (including self-provision) throughout the observation period and then examine the patterns of each group. This means that the two obtained groups differ in other characteristics related to childcare choices (e.g., stay-at-home mothers vs. full-time working mothers, gender attitudes and norms about maternal roles, etc.) that may be linked to mental health (King et al., 2022). Therefore, while observed group trajectories align with the expectation that formal childcare is associated with enhanced maternal well-being (Schmitz, 2020; Schober & Schmitt, 2017), this finding is only an explorative correlation that likely includes other co-occurring developments related to childcare and mothers' characteristics in each group. Consequently, although our study aimed to provide a general overview of group patterns rather than isolate the exact processes behind childcare choices and their effect on mental health in each country, future research should further disentangle these selection mechanisms to better understand how this policy measure relates to mental health trajectories across countries.

Additionally, childcare provision should also be considered as part of a comprehensive, integrated family policy package rather than an isolated measure. Policies are often designed to complement one another and operate across different areas (e.g., employment, care, early education, etc.) throughout different life course phases of both parents and children to optimise their overall benefits (including well-being benefits) for families (Abendroth et al., 2012; Glass et al., 2016). The comparative macro-level life course design developed by Fasang et al. (2024) stresses an approach that considers national policy constellations, rather than relying on broad welfare regime characterisations or single policy measures, to obtain an accurate estimation of policy impacts on individuals' life course trajectories. Their approach could be adapted to research on the interplay between family policy packages (including childcare and other related policy measures) and parental mental health outcomes over the life course in future studies.

Lastly, our study presents some data-related limitations. First, due to group-size considerations for moderation analyses, we separate formal childcare use groups only between 'never using it across the observation period' and 'using it a least once during the observation period'. This reduces the precision of the analysis within the childcare-using group, as effects may differ based on (i) whether formal childcare was used most years or only once, and (ii) whether childcare was used during very early years (e.g., creche), only in later years (e.g., kindergarten) or in both. Second, while previous research shows that the expansion from half-day to full-day childcare provision tends to have the most significant impact on parents (Brewer et al., 2022; Schmitz, 2020), we are unable to differentiate between weekly or daily frequencies of formal childcare use (e.g., full-day, half-day, or a few days per week) due to the lack of available information, potentially overlooking important variations. Third, the HILDA childcare variables do not specify which child benefits from formal childcare arrangements (relevant for households with two children), making exact comparisons more challenging. Similarly, the GSOEP mental health measure is only reported every other wave, which generally does not pose major issues but leads to some volatile estimations in the moderation analyses.

Despite these limitations, our study contributes to comparative research on parenthood consequences and complements previous cross-national studies that emphasise the role of national context in shaping parental well-being by employing a longitudinal micro-level approach, and more broadly to the literature on population mental health (OECD, 2023d, 2023e, 2023c). We hope that future research, with improved longitudinal data resources, will extend these findings to a wider range of countries with more diverse institutional contexts to complement the cases of Australia, Germany, and the UK.

4.6 Appendix

Table 4.4 Literature review: Parenthood and well-being in a cross-national comparison

Author, year	Country	Dataset	Data type	Analytic strategy	Sample	Analyses by gender	Analyses by SES	Outcome measure	Findings
Panel A. Cross-national cross-sectional studies using subjective well-being measures									
Blanchflower & Clark, 2021	31 countries	US GSS (1972-2018), Eurobarometer (2009-19) ISSP (2017)	Repeated cross-sectional	Linear regression	N ≈ 1,500,500	Yes	No	Life satisfaction	Negative effect of children is mediated by financial difficulties and turns positive
Chao & Glass, 2020	10 Asian countries	WVS (2005/09), Asian Barometer Survey (2005/07)	Repeated cross-sectional	Multilevel model	N ≈ 20,000	No	No	Happiness	No significant positive effect of parenthood in any Asian country but work-family policies reduce disparities with nonparents
Ugur, 2020	22 European countries	European Values Survey (1981-2008)	Repeated cross-sectional	IV	N = 65,044	No	No	Life satisfaction; Happiness	Life satisfaction was increased by parenthood for those who had children due to family policies (i.e., for compliers)
Pollmann-Schult, 2018	25 European countries	ESS (2004/10)	Cross-sectional	Multilevel regression	N = 40,664	Yes	No	Life satisfaction	Greater life satisfaction for parents in countries with high policy support due to lower financial strain and work–life conflict
Glass et al., 2016	22 OECD countries	ESS (2006/08), ISSP (2007/08)	Cross-sectional	Multilevel model	N = 78,972	Yes	No	Happiness	Generous family policies are associated with smaller happiness gaps between parents and nonparent
Aassve et al., 2015	28 European countries	ESS (2008)	Cross-sectional	Multilevel regression	N = 26,744	Yes	No	Happiness	Fathers are always happier than nonfathers, mothers are happier only when relevant institutions are adapted to gender equity
Aassve et al., 2012	19 European countries	ESS (2006)	Cross-sectional	Rank ordered probit	N = 14,419	Yes	Yes	Happiness	Overall positive link between parenthood and happiness but variations by partnership, welfare regime, employment, and income
Margolis & Myrskylä, 2011	86 countries	WVS (1981-2005)	Repeated cross-sectional	Linear regression	N = 201,988	Yes	Yes	Happiness	Happiness decreases with number of children but positive age gradient for all countries, genders, and incomes

Panel B. Cross-national cross-sectional studies using mental health scores

Nordenmark, 2021	25 European countries	ESS (2004)	Cross-sectional	Linear regression	N ≈ 19,000	Yes	No	Mental well-being (WHO-5)	Lower mental health with children at home compared to no children among women in liberal and conservative countries
Somogyi et al., 2021	26 European countries	EU-SILC (2014)	Cross-sectional	Multilevel model	N = 141,648	Yes	No	Mental health (MHI-5)	Parents have better mental health, individualising policy had positive effects, whereas familising policy has negative effects, particularly for women

Panel C. Single-country longitudinal studies using subjective well-being measures

Aassve et al., 2021	Australia	HILDA (2001-2013)	Longitudinal	FE + KOB	N ≈ 2,000	Yes	No	Satisfaction domains	Positive short-term effect for 1st and 2nd child, long-term negative effects for 2nd child, effects driven by leisure, health, and partner satisfaction
Radó, 2020	Hungary	GGS (2001-2012)	Longitudinal	Matching + linear regression	N ≈ 400	Yes	No	Life satisfaction	Positive effect of 1st and 2nd birth, long-term effects for women but not for men
Mikucka & Rizzi, 2019	Switzerland	SHP (2000-2018)	Longitudinal	FE	N ≈ 20,000	Yes	Yes	Life satisfaction	Positive effect of 1st child, medium-term negative effect of 2nd child for women, more negative trajectories for educated mothers and mothers working longer hours
Matysiak et al., 2016	Australia	HILDA (2001-2013)	Longitudinal	FE	N ≈ 7,000	Yes	WFC	Life satisfaction	Short-term positive effect for 1st, 2nd, and 3rd child for women but medium-term negative effects for 2nd and 3rd child, moderation effect by WFC
Mikucka, 2016	Russia	RLMS-HSE (1994–2015)	Longitudinal	FE	N ≈ 33,000	Yes	Yes	Life satisfaction	Long-term increase in life satisfaction for 1st and 2nd birth, but reduced effects among younger parents and less wealthy mothers
Rudolf & Kang, 2015	Korea	KLIPS (1998-2008)	Longitudinal	FE	N ≈ 10,000	Yes	No	Happiness	Negative effect for happiness following 1st birth for women, only positive anticipation effects for men
Baranowska & Matysiak, 2011	Poland	Social Diagnosis (2000-2009)	Longitudinal	Condi-tional logit; CRE	N ≈ 12,000	Yes	No	Happiness	Positive effect of 1st child for mothers, temporary effect only for men, no change with parity increases
Clark et al., 2008	Germany	GSOEP (1984–2003)	Longitudinal	FE	N ≈ 3,000	Yes	No	Life satisfaction	Positive short-term effect of 1st birth for women, anticipation only for men, negative effect in years 2-4 for women, 1-4 for men

Panel D. Two-country longitudinal studies using subjective well-being measures

Myrskylä & Margolis, 2014	Germany, UK	BHPS (1991-2008), GSOEP (1984-2009)	Longitudinal	FE	$N_{GE} \approx 5{,}000$ $N_{UK} \approx 3{,}200$	Yes	Only for GE	Happiness	Positive effect of 1st birth for women and men with larger effects for women in both countries, marginal SES differences in GE
Panel E. Single-country longitudinal studies using mental health scores									
Metzger & Gracia, 2023	UK	UKHLS (2009-2020)	Longitudinal	FE	N ≈ 20,000	Yes	Yes	Mental health (SF-12)	Positive effect of 1st birth for women, reduced positive effect for higher SES mothers and mothers working full-time
Ruppanner et al., 2019	Australia	HILDA (2001-2016)	Longitudinal	FE	N = 20,009	Yes	No	Mental health (MHI-5)	Positive effect of 1st child for women but not for men, negative effect of 2nd child for men
Giesselmann et al., 2018	Germany	GSOEP (2002-2016)	Longitudinal	Matching + FE	N ≈ 8,000 (women only)	No	Yes	Mental health (SF-12)	Negative long-term effect of 1st birth, no SES-based difference
Clark & Georgellis, 2013	UK	BHPS (1991-2008)	Longitudinal	FE	N ≈ 20,000	Yes	No	Life satisfaction; Mental health (GHQ-12)	Positive short-term effect on SWB of 1st birth for women, negative effect on mental health for men, no effect outside of anticipation effect for women

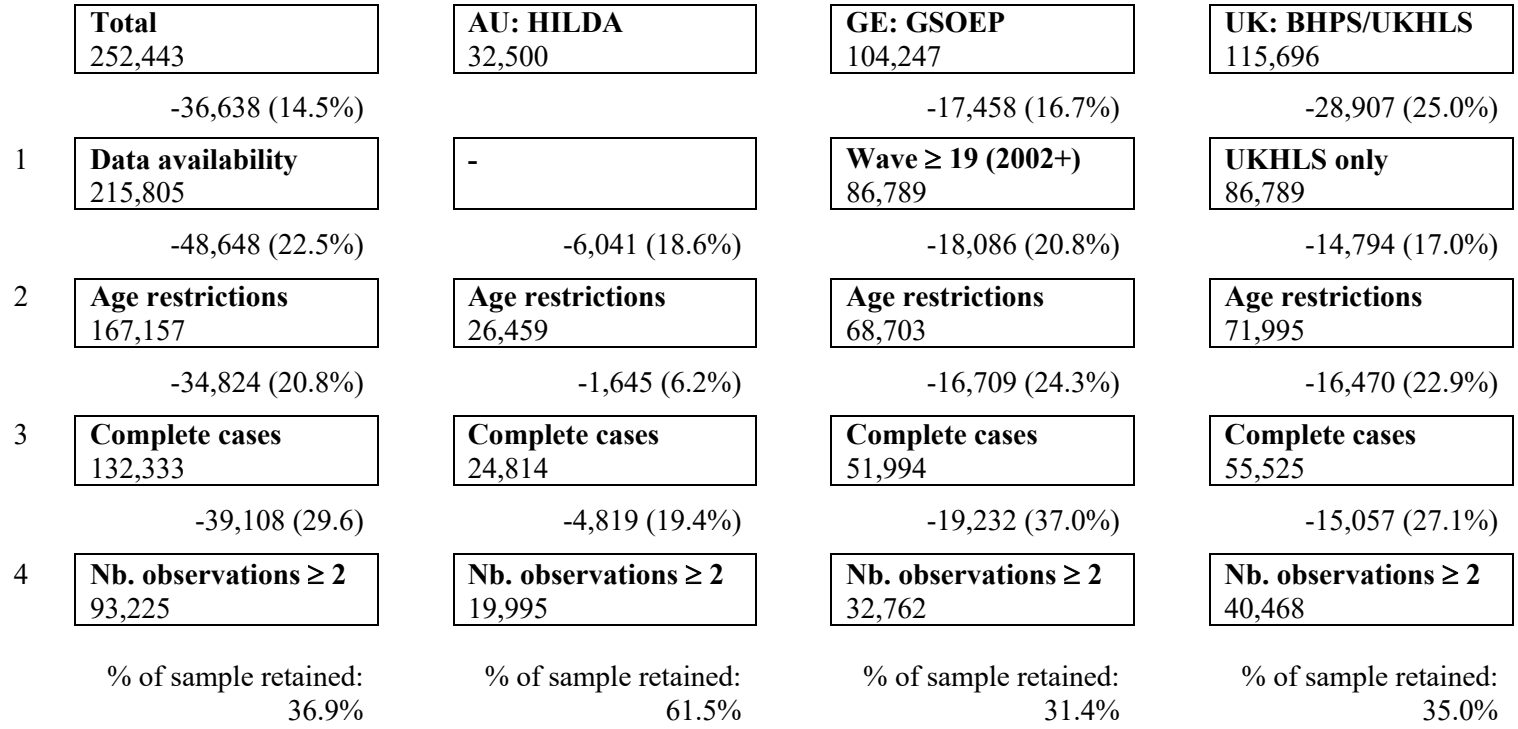
Notes: Articles are selected based on field relevance (i.e., published in Demography, Sociology or closely related interdisciplinary journals). FE = Fixed effects model; WFC = Work-family conflict; CRE = Correlated random effects model; KOB = KOB decomposition method; SF-12, SF-36 = Short-Form health questionnaire (12 item version, 36 item version); GHQ-12 = General health questionnaire (12 item version); MHI-5 = Mental health inventory (5 item version).
Source: Own elaboration.

Table 4.5 Sample composition and size by country, first and second birth

	Sample 1: First birth			Sample 2: Second birth		
	AU	**GE**	**UK**	**AU**	**GE**	**UK**
***N* Treated**	4,120	4,306	4,325	3,438	4,286	4,146
***N* Untreated**	7,646	10,861	14,126	2,451	5,990	5,726
***N* Sample**	11,766	15,167	18,451	5,889	10,276	9,786
***N* Total**		45,384			25,951	

Notes: Treated = Experiencing a parenthood transition (to first child or to second child). Untreated = Not experiencing a parenthood transition (remaining childless or remaining with only one child). AU = Australia, GE = Germany, UK = United Kingdom.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Figure 4.6 Sample selection flowchart



1	**Data availability**	Only survey waves that include the MCS measure are used.
2	**Age restrictions**	Respondents are limited to ages 18–50 for women and 18–60 for men.
3	**Complete cases**	Only respondents with non-missing data on all model variables are included.
4	**Nb. observations ≥ 2**	Only respondents observed at least twice or more are kept.

Notes: AU = Australia, GE = Germany, UK = United Kingdom.

Table 4.6 Mental health questionnaire comparisons across surveys (SF-36 MCS vs. SF-12 MCS)

Subscales	**Australia (SF-36)** **Item question**	***Range***	**Germany (SF-12)** **Item question**	***Range***	**United Kingdom (SF-12)** **Item question**	***Range***
Role functioning	Cut down the amount of time you spent on work or other activities as a result of any emotional problems	*yes/no*				
	Accomplished less than you would like as a result of any emotional problems		How often did you feel that due to mental health or emotional problems you achieved less than you wanted to at work or in everyday activities?	*1-5 (greatly-never)*	How much of the time have you accomplished less than you would like as a result of any emotional problems?	*1-5 (all the time-none of the time)*
	Didn't do work or other activities as carefully as usual as a result of any emotional problems		How often did you feel that due to mental health or emotional problems you carried out your work or everyday tasks less thoroughly than usual?	*1-5 (greatly-never)*	How much of the time did you work or do other regular daily activities less carefully than usual as a result of any emotional problems?	*1-5 (all the time-none of the time)*
Social functioning	To what extent has your physical health or emotional problems interfered with your normal social activities	*1-5 (not at all-extremely)*	How often did you feel that due to physical or mental health problems you were limited socially, that is, in contact with friends, acquaintances, or relatives?	*1-5 (greatly-never)*	How much of the time has your physical health or emotional problems interfered with your social activities?	*1-5 (all the time-none of the time)*
	How much of the time has your physical health or emotional problems interfered with your social activities	*1-5 (all the time-none of the time)*				
Emotional functioning	How much of the time have you been a nervous person?	*1-6 (all the time-none of the time)*				
	How much of the time have you felt so down in the dumps that nothing could cheer you up?					

	How much of the time have you felt calm and peaceful?		How often did you feel calm and relaxed?	*1-5 (greatly-never)*	How much of the time have you felt calm and peaceful?	1-5 (all the time-none of the time)
	How much of the time have you felt down?		How often did you feel down and gloomy?	*1-5 (greatly-never)*	How much of the time have you felt downhearted and depressed?	*1-5 (all the time-none of the time)*
	How much of the time have you been a happy person?					
Vitality	How much of the time did you feel full of life?	*1-6 (all the time-none of the time)*				
	How much of the time did you have a lot of energy?		How often did you feel energetic?	*1-5 (greatly-never)*	How much of the time did you have a lot of energy?	1-5 (all the time-none of the time)
	How much of the time did you feel worn out?					
	How much of the time did you feel tired?					

Note: All questions refer to a 4-week time frame.

Table 4.7 Sample distribution and description by formal childcare use, first birth

	Sample 1: First birth					
	AU		**GE**		**UK**	
	Childcare use	**No childcare**	**Childcare use**	**No childcare**	**Childcare use**	**No childcare**
MCS	47.02 (10.36)	46.66 (10.84)	48.39 (10.06)	48.32 (9.74)	49.29 (9.11)	48.37 (10.52)
Age*	24.20 (5.66)	23.73 (5.59)	27.72 (5.75)	25.34 (5.77)	27.18 (6.08)	25.83 (5.58)
Education*	0.63	0.49	0.37	0.37	0.60	0.48
Employment status*						
Full-time	0.56	0.42	0.35	0.31	0.67	0.59
Part-time/irregular	0.25	0.27	0.18	0.12	0.16	0.16
Not employed/other	0.19	0.31	0.47	0.57	0.17	0.24
Household income*	79,296 (47,501)	77,407 (57,725)	34,705 (22,277)	38,442 (37973)	40,213 (27,080)	37,656 (24,716)
Weekly work hours*	32.67 (14.50)	30.75 (14.70)	32.16 (14.08)	31.99 (14.64)	38.12 (11.81)	36.70 (12.15)
Partnership status*						
Partnered	0.57	0.61	0.41	0.31	0.66	0.62
Single	0.42	0.39	0.55	0.67	0.33	0.37
Separated	0.01	0.00	0.04	0.03	0.01	0.01
Health impairment*	0.07	0.09	0.07	0.10	0.07	0.09
***N** (%)*	933 (45%)	1,135 (55%)	1,443 (71%)	596 (29%)	681 (29%)	1,700 (71%)

Notes: Descriptive table only for treated (i.e., having their first child during the observation window) respondents and restricted to women. AU = Australia, GE = Germany, UK = United Kingdom.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.8 Sample distribution and description by formal childcare use, second birth

	Sample 2: Second birth					
	AU		GE		UK	
	Childcare use	**No childcare**	**Childcare use**	**No childcare**	**Childcare use**	**No childcare**
MCS	47.14 (9.99)	47.21 (10.58)	48.29 (9.61)	49.19 (9.43)	49.62 (8.98)	48.75 (10.33)
Age*	25.33 (5.73)	24.49 (5.68)	30.64 (5.84)	28.17 (5.48)	29.02 (5.29)	27.40 (5.59)
Education*	0.62	0.49	0.36	0.37	0.61	0.48
Employment status*						
Full-time	0.51	0.34	0.23	0.26	0.56	0.42
Part-time/irregular	0.28	0.25	0.28	0.19	0.24	0.23
Not employed/other	0.21	0.41	0.50	0.56	0.21	0.36
Household income*	75,740 (44,611)	70,376 (51,636)	37,355 (20,654)	34,464 (20,539)	39,652 (28,059)	33,479 (21,492)
Weekly work hours*	32.27 (14.33)	29.62 (14.70)	28.27 (14.17)	28.85 (14.85)	34.89 (12.28)	33.01 (12.28)
Partnership status*						
Partnered	0.66	0.67	0.64	0.53	0.80	0.71
Single	0.33	0.32	0.31	0.41	0.18	0.26
Separated	0.01	0.01	0.06	0.06	0.02	0.03
Health impairment*	0.07	0.08	0.08	0.08	0.06	0.10
***N** (%)*	890 (48%)	963 (52%)	1,411 (70%)	596 (30%)	809 (35%)	1508 (65%)

Notes: Descriptive table only for treated (i.e., having their second child during the observation window) respondents and restricted to women. AU = Australia, GE = Germany, UK = United Kingdom.
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.9 Fixed effects linear regression models predicting changes in mental health around birth by country, first birth

	WOMEN					
	(1) AU		(3) GE		(5) UK	
	Coef.	SE	Coef.	SE	Coef.	SE
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.64*	0.25	0.06	0.46	-0.05	0.27
-1	2.69***	0.24	1.40***	0.41	1.53***	0.27
0	1.90***	0.27	2.21***	0.56	2.02***	0.28
1	1.82***	0.30	1.15*	0.46	1.33***	0.31
2	1.71***	0.36	1.18*	0.56	1.09**	0.35
3	1.48***	0.43	1.09+	0.60	0.94*	0.41
4	2.14***	0.51	0.19	0.73	2.46***	0.47
5	1.62**	0.53	1.06	0.73	2.42***	0.56
6	2.30***	0.57	0.48	0.80	1.46*	0.58
Age	-0.71***	0.09	-0.38***	0.10	-1.06***	0.08
Age sq.	0.01***	0.00	0.01***	0.00	0.01***	0.00
Partnership status						
Single	*Ref.*		*Ref.*		*Ref.*	
Partnered	0.60**	0.20	0.64*	0.31	0.52*	0.20
Separated	-0.91	0.63	-0.50	0.69	-0.29	0.54
Employment status						
Full-time	*Ref.*		*Ref.*		*Ref.*	
Part-time	-0.42**	0.14	0.05	0.23	-0.39**	0.15
Not employed	-1.04***	0.20	-0.31	0.23	-1.03***	0.18
Household income	0.05	0.09	0.16	0.11	-0.01	0.06
Health impairment	5.75***	0.26	4.44***	0.31	4.20***	0.21
Observations	38,174		23,761		46,285	
Nb. respondents	5,723		6,783		9,029	
	MEN					
	(1) AU		(3) GE		(5) UK	
	Coef.	SE	Coef.	SE	Coef.	SE
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.54*	0.22	0.73	0.47	0.47+	0.25
-1	0.86***	0.23	0.19	0.38	0.76**	0.26
0	0.64**	0.24	0.60	0.50	0.20	0.26
1	0.33	0.26	-0.77+	0.45	0.01	0.29
2	0.23	0.32	-0.16	0.61	0.11	0.33
3	-0.29	0.41	-0.04	0.60	0.66+	0.39
4	0.06	0.50	0.33	0.70	1.08*	0.47
5	0.45	0.54	-0.33	0.75	0.51	0.54
6	0.48	0.57	0.17	0.82	0.30	0.68
Age	-0.69***	0.06	-0.46***	0.07	-1.20***	0.06
Age sq.	0.01***	0.00	0.01***	0.00	0.01***	0.00
Partnership status						
Single	*Ref.*		*Ref.*		*Ref.*	
Partnered	0.92***	0.19	0.61*	0.30	1.19***	0.20
Separated	-1.09+	0.58	-0.16	0.67	-0.07	0.47
Employment status						

Full-time	*Ref.*		*Ref.*		*Ref.*	
Part-time	-0.14	0.16	-0.27	0.24	-0.64***	0.16
Not employed	-1.08***	0.19	-0.71***	0.19	-1.18***	0.17
Household income	0.15*	0.06	0.22*	0.11	0.00	0.05
Health impairment	5.30***	0.25	3.61***	0.29	3.95***	0.19
Observations	41,429		29,658		49,552	
Nb. respondents	6,018		8,164		9,376	

Notes: AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.10 Fixed effects linear regression models predicting changes in mental health around birth by country, second birth

	WOMEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.35	0.32	0.56	0.59	0.31	0.30
-1	1.36***	0.33	1.14*	0.49	1.30***	0.30
0	-0.59+	0.34	-0.26	0.66	0.25	0.31
1	-0.54	0.35	-0.18	0.54	-0.31	0.33
2	-0.90*	0.37	-0.79	0.69	-0.51	0.35
3	-1.05**	0.40	-0.89	0.59	-0.11	0.37
4	-1.09**	0.42	-0.26	0.74	0.31	0.40
5	-1.01*	0.45	-1.19+	0.64	-0.01	0.43
6	-1.24**	0.47	-0.67	0.77	0.14	0.47
Age	-0.35**	0.12	-0.12	0.14	-0.76***	0.11
Age sq.	0.00**	0.00	0.00	0.00	0.01***	0.00
Partnership status						
Single	*Ref.*		*Ref.*		*Ref.*	
Partnered	1.37***	0.34	0.52	0.39	0.78**	0.28
Separated	-0.37	0.57	-0.85	0.59	-0.83+	0.44
Employment status						
Full-time	*Ref.*		*Ref.*		*Ref.*	
Part-time	-0.08	0.19	0.28	0.24	-0.02	0.15
Not employed	-0.52*	0.23	-0.24	0.26	-0.77***	0.21
Household income	0.29+	0.17	0.42*	0.18	-0.10	0.09
Health impairment	5.61***	0.30	3.86***	0.31	4.13***	0.23
Observations	24,176		19,562		34,205	
Nb. respondents	3,073		5,240		5,523	
	MEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	-0.27	0.34	-0.34	0.66	0.22	0.31
-1	-0.22	0.33	0.93+	0.49	0.48	0.31
0	-0.67+	0.35	-0.65	0.67	0.02	0.32

1	-1.09**	0.36	0.25	0.51	-0.08	0.35
2	-1.26**	0.39	-0.63	0.71	-0.15	0.37
3	-0.81*	0.41	0.17	0.57	-0.38	0.40
4	-1.10*	0.43	-0.34	0.76	-0.34	0.44
5	-0.67	0.43	0.01	0.62	-0.21	0.46
6	-1.09*	0.47	-0.83	0.80	-0.18	0.50
Age	-0.48***	0.10	-0.34**	0.11	-0.96***	0.10
Age sq.	0.01***	0.00	0.00**	0.00	0.01***	0.00
Partnership status						
Single	*Ref.*		*Ref.*		*Ref.*	
Partnered	1.50***	0.36	0.01	0.38	1.02**	0.35
Separated	-0.77	0.68	-1.66**	0.60	-0.62	0.55
Employment status						
Full-time	*Ref.*		*Ref.*		*Ref.*	
Part-time	-0.34	0.25	0.38	0.37	0.07	0.28
Not employed	-1.78***	0.36	-0.78*	0.32	-1.39***	0.29
Household income	0.25+	0.14	0.15	0.23	0.07	0.09
Health impairment	5.20***	0.32	3.12***	0.33	2.92***	0.24
Observations	21,933		18,747		26,571	
Nb. respondents	2,714		4,916		4,241	

Notes: AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors.
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10
Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.11 Fixed effects linear regression models predicting changes in mental health around birth across socioeconomic status, first birth

	WOMEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.63	0.42	0.00	0.62	-0.69	0.44
-1	2.01***	0.40	1.29*	0.55	0.97*	0.42
0	1.45***	0.40	0.59	0.68	1.98***	0.42
1	1.71***	0.45	1.04+	0.58	1.02*	0.45
2	1.12*	0.53	0.81	0.68	0.87+	0.49
3	1.21+	0.62	1.06	0.78	0.26	0.59
4	1.36+	0.76	-0.16	0.89	2.47***	0.61
5	1.16	0.81	1.18	0.98	1.70*	0.82
6	2.00*	0.90	-0.15	0.96	0.86	0.80
Years × SES						
-2 × SES	-0.01	0.51	-0.00	0.89	1.06+	0.54
-1 × SES	0.98*	0.47	0.30	0.78	0.85	0.53
0 × SES	-0.07	0.47	3.15***	0.95	-0.49	0.52
1 × SES	-0.53	0.52	0.23	0.79	-0.09	0.56
2 × SES	0.41	0.64	0.45	0.98	-0.30	0.63
3 × SES	-0.13	0.77	0.26	1.06	0.62	0.74
4 × SES	0.91	0.94	1.00	1.33	-0.80	0.85
5 × SES	0.36	0.99	0.12	1.31	0.67	1.02

6 × SES	-0.00	1.05	1.70	1.57	0.46	1.07
Controls	Yes		Yes		Yes	
Observations	38,163		23,631		46,087	
Nb. respondents	5,722		6,744		8,979	
	MEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.29	0.33	1.19+	0.71	0.43	0.35
-1	0.93**	0.33	0.02	0.56	0.71+	0.38
0	0.62+	0.34	0.73	0.70	0.17	0.37
1	0.43	0.37	-1.27*	0.62	-0.14	0.41
2	0.33	0.44	-0.18	0.85	-0.07	0.45
3	-0.46	0.54	-0.39	0.82	0.29	0.52
4	-0.32	0.70	0.33	0.92	0.46	0.63
5	0.27	0.70	-1.14	1.00	0.17	0.68
6	0.22	0.70	0.26	1.06	0.19	0.88
Years × SES						
-2 × SES	0.53	0.42	-0.86	0.91	-0.05	0.50
-1 × SES	-0.18	0.43	0.29	0.74	-0.04	0.51
0 × SES	0.01	0.43	-0.29	0.94	-0.15	0.50
1 × SES	-0.28	0.48	0.93	0.83	0.05	0.54
2 × SES	-0.35	0.60	0.10	1.13	0.05	0.63
3 × SES	0.37	0.77	0.57	1.14	0.50	0.75
4 × SES	0.92	0.93	0.03	1.34	1.24	0.89
5 × SES	0.43	1.06	1.69	1.46	0.44	1.07
6 × SES	0.56	1.17	-0.29	1.62	-0.23	1.33
Controls	0.15*	0.06	0.22*	0.11	0.00	0.05
Observations	41,422		29,566		49,291	
Nb. respondents	6,017		8,135		9,322	

Notes: Controls include age, age squared, relationship status, and health impairment. AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.12 Fixed effects linear regression models predicting changes in mental health around birth across socioeconomic status, second birth

	WOMEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.83+	0.46	0.39	0.73	0.20	0.43
-1	1.33**	0.49	1.60*	0.63	0.93*	0.43
0	-0.40	0.50	-0.21	0.83	0.07	0.44
1	-0.52	0.51	0.15	0.69	-0.61	0.46
2	-0.86	0.54	-0.41	0.87	-0.90+	0.49
3	-0.95+	0.56	-0.53	0.76	-0.14	0.50

4	-1.43*	0.60	-0.04	0.91	-0.21	0.56
5	-1.16+	0.63	-0.69	0.81	-0.58	0.60
6	-1.19+	0.65	-0.44	0.95	-0.14	0.64
Years × SES						
-2 × SES	-0.83	0.62	0.58	1.21	0.35	0.58
-1 × SES	0.09	0.64	-1.07	0.98	0.88	0.58
0 × SES	-0.49	0.64	-0.62	1.30	0.24	0.58
1 × SES	-0.07	0.64	-0.81	1.05	0.56	0.59
2 × SES	-0.04	0.67	-1.08	1.36	0.75	0.62
3 × SES	-0.12	0.70	-0.59	1.10	0.05	0.65
4 × SES	0.72	0.73	-0.47	1.42	1.24+	0.69
5 × SES	0.39	0.76	-1.00	1.19	1.27+	0.72
6 × SES	0.06	0.78	-0.49	1.43	0.58	0.79
Controls	Yes		Yes		Yes	
Observations	24,173		19,489		34,034	
Nb. respondents	3,072		5,223		5,491	

	MEN					
	(1) AU		**(3) GE**		**(5) UK**	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	-0.58	0.50	0.06	0.79	0.63	0.44
-1	-0.29	0.49	0.70	0.68	0.91*	0.44
0	-0.47	0.50	0.01	0.79	0.23	0.44
1	-1.14*	0.51	0.13	0.71	0.28	0.47
2	-1.06+	0.56	0.03	0.85	0.25	0.50
3	-0.56	0.59	0.17	0.77	-0.37	0.53
4	-0.56	0.59	-0.05	0.91	-0.08	0.57
5	-0.33	0.58	-0.44	0.84	-0.35	0.60
6	-0.50	0.65	-0.91	0.93	-0.35	0.66
Years × SES						
-2 × SES	0.60	0.67	-1.19	1.37	-0.91	0.61
-1 × SES	0.10	0.64	0.53	0.96	-0.99	0.61
0 × SES	-0.50	0.65	-1.78	1.39	-0.49	0.60
1 × SES	-0.01	0.65	0.22	0.97	-0.89	0.63
2 × SES	-0.50	0.70	-1.80	1.42	-1.01	0.66
3 × SES	-0.54	0.72	-0.02	1.05	-0.04	0.70
4 × SES	-1.21	0.74	-0.95	1.50	-0.66	0.76
5 × SES	-0.74	0.72	0.98	1.11	0.24	0.77
6 × SES	-1.30+	0.78	-0.05	1.55	0.31	0.85
Controls	0.15*	0.06	0.22*	0.11	0.00	0.05
Observations	21,931		18,722		26,496	
Nb. respondents	2,713		4,907		4,227	

Notes: Controls include age, age squared, relationship status, and health impairment. AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.13 Fixed effects linear regression models predicting changes in maternal mental health around birth by formal childcare use, first birth

	(1) AU		(3) GE		(5) UK	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.60	0.52	0.83	0.90	-0.63	0.45
-1	2.34***	0.46	1.25	0.84	1.13**	0.44
0	2.58***	0.47	2.03*	0.98	2.41***	0.44
1	3.06***	0.53	1.70+	0.89	1.50**	0.48
2	2.73***	0.67	1.25	1.01	1.72**	0.53
3	2.77***	0.81	-0.03	1.46	0.65	0.66
4	3.11***	0.91	-0.85	1.52	3.00***	0.69
5	1.63	1.03	-1.10	2.16	1.85+	0.97
6	2.77*	1.24	-3.90+	2.01	0.78	0.90
Years × CC						
-2 × CC	0.20	0.49	-0.89	1.00	0.07	0.58
-1 × CC	0.17	0.46	-0.16	0.94	-0.14	0.59
0 × CC	-1.08*	0.46	-1.55	1.03	-0.41	0.58
1 × CC	-1.71***	0.50	-0.63	0.95	-0.27	0.59
2 × CC	-1.98**	0.64	-0.28	1.06	-1.25+	0.66
3 × CC	-1.84*	0.83	1.39	1.49	0.02	0.77
4 × CC	-2.30*	1.04	0.95	1.64	-0.40	0.88
5 × CC	-0.13	1.08	2.66	2.16	0.36	1.04
6 × CC	-0.60	1.19	3.98+	2.03	0.83	1.07
Controls	Yes		Yes		Yes	
Observations	37,498		22,677		45,932	
Nb. respondents	5,605		6,475		8,945	

Notes: Controls include age, age squared, relationship status, employment status, household income, health impairment, and the parenthood transition (in years) × SES interaction term. AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Table 4.14 Fixed effects linear regression models predicting changes in maternal mental health around birth by formal childcare use, second birth

	(1) AU		(3) GE		(5) UK	
	Coef.	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Years						
-3	*Ref.*		*Ref.*		*Ref.*	
-2	0.58	0.54	-0.73	1.11	0.09	0.47
-1	0.93+	0.56	2.45*	1.01	0.46	0.48
0	-0.47	0.56	-0.39	1.25	-0.03	0.48
1	-0.94+	0.55	0.09	1.07	-0.86+	0.50
2	-1.24*	0.59	-1.36	1.26	-1.02+	0.54
3	-1.43*	0.63	-1.30	1.26	-0.31	0.55
4	-2.05**	0.68	-1.05	1.52	-0.41	0.61
5	-1.23+	0.70	-2.71+	1.45	-1.07	0.65
6	-1.08	0.73	-1.54	1.74	-0.48	0.69
Years × CC						
-2 × CC	0.80	0.63	1.89	1.28	0.23	0.61
-1 × CC	1.13+	0.64	-0.59	1.16	1.61**	0.59
0 × CC	0.52	0.63	1.42	1.42	0.64	0.61
1 × CC	1.10+	0.66	1.09	1.19	1.12+	0.62
2 × CC	0.98	0.68	2.14	1.43	0.79	0.63
3 × CC	1.15	0.71	1.60	1.35	0.76	0.66
4 × CC	1.45*	0.73	2.02	1.65	0.82	0.70
5 × CC	0.12	0.76	2.89+	1.53	1.62*	0.73
6 × CC	-0.35	0.78	2.05	1.86	1.14	0.81
Controls	Yes		Yes		Yes	
Observations	37,498		22,677		45,932	
Nb. respondents	5,605		6,475		8,945	

Notes: Controls include age, age squared, relationship status, employment status, household income, health impairment, and the parenthood transition (in years) × SES interaction term. AU = Australia, GE = Germany, UK = United Kingdom. Robust standard errors. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: HILDA release 21; GSOEP v38; UKLHS waves 1-12.

Chapter 5: Study 4 – Exploring the heterogeneity in first-time mothers' and fathers' mental health trajectories

Abstract

The transition into parenthood is a complex life course event with potentially unequal consequences on mental health across different subpopulations. Yet the level of heterogeneity in mental health changes in response to parenthood beyond the immediate perinatal period remains largely unexplored. Using large-scale representative Australian panel data for men and women having a first child (2001-2022; N=3,854), Growth Mixture Modelling with linear splines is used to identify latent subgroups following similar mental health trajectory patterns across the birth event. Results suggest that the majority of individuals maintain a high and stable mental health trajectory across the transition to parenthood, with small positive improvements around birth. However, the remaining parents are distributed across three groups characterised by lower average levels of mental health and dissimilar trajectory patterns showing much greater variations around birth. Results further show that first-time mothers are more likely to be in the groups with lower mental health with steeper declines in the post-birth period. Overall, this study stresses the importance of addressing parents as a heterogeneous group with distinct mental health responses, requiring differentiated policy measures that take into account women's greater mental health vulnerability during this life event.

Keywords: Life course; Parenthood; Mental health; Heterogeneity; Growth mixture model

5.1 Introduction

Mental health has increasingly been at the forefront of policy concerns due to the rise in the prevalence of mental health issues in the general population over recent decades (Collins et al., 2011; Whiteford et al., 2013). Furthermore, mental health issues persistently manifest differently across genders with women facing higher levels of psychological distress and affective disorders than men, irrespective of the examined sociocultural context (Hopcroft & Bradley, 2007; Van de Velde et al., 2010). This disparity is partially linked to the pervasive gender norms and societal pressures that condition men and women and distinctively shape their mental health over time (Bird, 1999; Bird & Fremont, 1991; Cabezas-Rodríguez et al., 2021). Notably, the transition to parenthood is argued to constitute a crucial life event with unequal consequences for men and women as it typically involves gender-based redistributions of responsibilities, often placing disproportionate burdens on women (Baxter et al., 2008). Yet relatively little is known about how gendered mental health develops over the life course –and specifically across key life course stages such as parenthood– and whether there are notable differences in patterns of change of mental health between individuals. This study explores the inter-individual heterogeneity in mental health responses to parenthood and assesses how gender relates to different trajectory patterns during this transformative period, thereby providing a more nuanced understanding of the evolution of mental health over the life course with an emphasis on gendered differences.

Previous research in the Health and Family Demography literature considerably varied in methodological approaches to estimating the impact of parenthood on individuals' mental health and well-being. Cross-sectional studies examine between-individual differences, focusing on the mental health gap between parents and nonparents to approximate the effect of parenthood, whereas longitudinal studies focus exclusively on within-individual variations to estimate the consequences of parenthood on changes in individual mental health. Although both approaches separately acknowledge important aspects of how parenthood affects mental health in the population (i.e., between-person differences in mental health by parenthood status vs. within-individual change following parenthood transitions), they both present limitations. Cross-sectional studies are static assessments which do not reflect the dynamic nature of parenthood such as the anticipation effect during pregnancy, the 'disruption' of birth and the shifts occurring

following birth that contribute to shaping mental health across different parenthood stages (Simon & Caputo, 2019).

On the other hand, longitudinal models examining parenthood effects on mental health typically employ fixed effects regression models that account for both observed and unobserved time-independent factors (e.g., educational attainment, socioeconomic and cultural background, age or family context at birth) as well as control for co-occurring changes (e.g., increased time pressures, financial constraints, changing relationship dynamics) to tease out the underlying effects of parenthood over time (Keizer et al., 2010; Pollmann-Schult, 2014; Ruppanner et al., 2019). However, these models do not show between-individual differences in the level and rate of changes in mental health over time, but only estimate a single trajectory which reflects the average within-individual changes during this transition. Yet, given the complexity of the parenthood experience, there is reason to assume variability in how different subgroups experience parenthood, with varying trajectories that include differences in initial baseline levels, the rate of change, trends and patterns (e.g., stability, recovery or decline following birth) in mental health, and is likely to differ between men and women.

To date, the extent of heterogeneity in mental health trajectories post-parenthood across the population is not well-documented. Perinatal studies in Health and Psychology research find that there is trajectory heterogeneity in mental health following birth but (i) focus exclusively on clinical depression, i.e., on mental ill-health, (ii) concentrate on short-term effects immediately around birth, and (iii) do not systematically examine representative samples that include both men and women (Denckla et al., 2018; Fredriksen et al., 2017).

This study contributes to the existing literature by combining a longitudinal, dynamic approach to the effects of parenthood on mental health with an exploration of the variability between individuals that is not picked up by traditional longitudinal methods. To do so, it employs Growth Mixture Modelling that identifies latent subpopulations exhibiting distinct mental health trajectories by leveraging a large-scale nationally representative sample including both men and women and using a comprehensive, multidimensional measure of (positive) mental health (SF-36 Mental Component Summary score).

5.2 Background

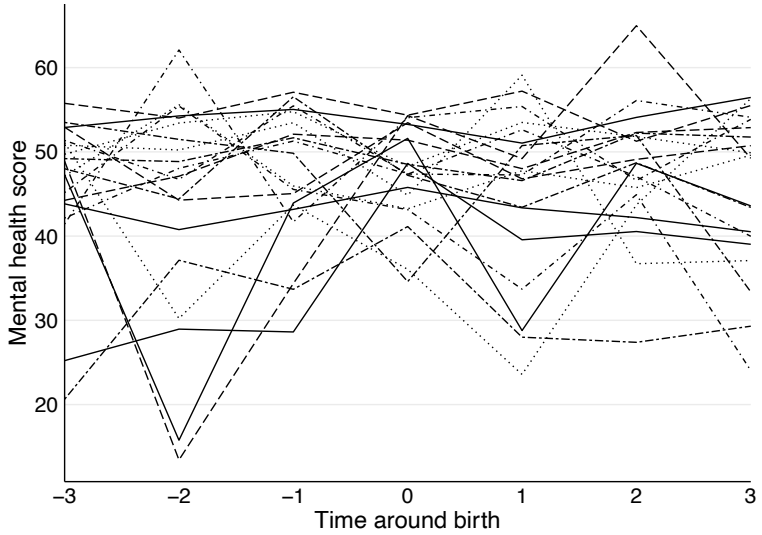
Individuals' mental health is not static but rather develops throughout the life course (WHO, 2022). Piecing together different cohorts and age groups, Bell (2014) examines individual mental health over different life course phases and shows that mental health trends are nonlinear, variable, and age-dependent across the population. Specifically, mental health is shown to decline from early adulthood (18 years and older) up to middle age (late forties), with women consistently reporting lower levels of mental health than men. Previous research has sought to explain this persistent gender gap, suggesting that the different gender roles assigned to men and women may be important determinants. Parenthood in particular has been advanced as a potential factor contributing to sustaining or even exacerbating these gaps, as it reinforces the distinct, specialised roles for men and women, with potentially unequal mental health consequences (Baxter et al., 2008, 2015; Perales et al., 2018). Yet, how parenthood operates on mental health life course variations, and whether it does so differently for men and women, remains to be better understood.

Previous longitudinal studies examining how trends in mental health fluctuate across the transition to parenthood yield varying findings. Some studies find positive but only temporary effects (Clark & Georgellis, 2013; Tosi & Goisis, 2021), others a longer-term negative effect (Giesselmann et al., 2018), and further studies show a long-lasting positive impact (Metzger & Gracia, 2023; Ruppanner et al., 2019). These differences may be due to (1) varying methodologies (i.e., sample restrictions, analytical strategy, etc.) and (2) the complexity of the impact of parenthood on mental health. In particular, parenthood is shown to carry counteracting positive and negative consequences for mental health, which can complicate the estimation of its net total effect on individuals' mental health trajectories.

Further, this research largely focuses on single population average trends for each gender. Although some studies on gendered parental mental health explore effect heterogeneity by socioeconomic background, marital status, age at birth, and conception method, these findings are based on moderation analyses that split the analytical sample into broad, pre-defined groups hypothesised to share common effects (Myrskylä et al., 2017; Nomaguchi & Brown, 2011; Simon, 2002; Tosi & Goisis, 2021). While this approach captures

average trends within specific subgroups, it does not allow identifying the full extent of trajectory heterogeneity present in the population. Figure 5.1 illustrates this variability by displaying the mental health trajectories of 20 randomly selected first-time parents: some start with much lower mental health levels than others, some have very stable trajectories with minimal yearly variations, while others experience substantial declines. Estimating an average trend may therefore prevent gaining a more detailed understanding of the diverse mental health trajectories across this life course transition.

Figure 5.1 Observed mental health trajectories for 20 individuals



Notes: 20 individuals selected at random among those observed at every time point in the survey.
Source: HILDA release 21. Own illustration.

Individuals may present dissimilar responses to the same situation depending on their level of psychosocial resilience: individuals with higher resilience are less affected by stress or adversity and adapt more easily to major life events without experiencing significant changes in their overall mental health, making them more likely to maintain stable trajectories across the transition to parenthood (M. Rutter, 1987; C. Young et al., 2019). In contrast, other individuals may be more vulnerable to an identical circumstance and display poorer outcomes. This is determined by individual characteristics as well as their interaction with the individuals' environment (i.e., family and socioeconomic context, and social support system). Overall, these individual- and context-based

determinants of the level of vulnerability to life course events suggest that mental health variations during the transition to parenthood will differ across the population. This may affect (i) the *levels* of mental health, (ii) the *rates of change* in mental health across the transition to parenthood, and (iii) the overall *pattern* of these changes. However, whether, and to what extent, trajectories vary, and whether men and women are associated to different patterns in the general population remains unclear.

Previous studies find that while women may experience greater benefits from parenthood than men, they tend to also be more negatively affected (Nomaguchi & Milkie, 2003). In particular, women are more likely to experience perinatal depression, a mental disorder specific to parenthood transitions (WHO, 2022). Crucially, studies examining perinatal depression find that the disorder manifests in varied patterns among women: some women show consistently low symptoms throughout, some experience symptoms but subsequently recover, while others display chronic and persistent patterns of high symptoms (Denckla et al., 2018; Fredriksen et al., 2017). Typically, these studies identify between three and five distinct groups sharing similar trajectories of disease progression (Santos et al., 2017; Vanwetswinkel et al., 2022; Waqas et al., 2023).

However, these studies are restricted to short-term clinical diagnoses around birth among women. Yet individual mental health is more than just the presence or absence of a disorder, rather it encompasses daily affect and good social and emotional functioning (WHO, 2022). As such, individuals—both men and women—may experience suboptimal mental health without meeting the criteria for a clinical diagnosis (OECD, 2023d; WHO, 2022). This study therefore examines broader, subclinical mental health heterogeneity across multiple years around the transition to parenthood among first-time mothers and first-time fathers.

5.3 Data and methods

5.3.1 Data and sample

Data for this study are drawn from the Household, Income and Labour Dynamics in Australia (HILDA) survey, covering the period from 2002 to 2022. The HILDA is a large-scale household-based panel survey that annually collects data from over 9,000

Australian households (including a sample top-up in 2011). It includes all household members aged 15 and over, providing detailed mental health information along with comprehensive socioeconomic and demographic variables at both the individual and household levels. To focus on mental health trajectories around the first transition to parenthood, the sample is restricted to respondents whose first birth occurred during the survey period and who are surveyed at least twice without missing mental health measures. This resulted in a final sample size of N = 3,854 (1,824 men and 2,030 women) with n = 20,508 person-year observations. Women are slightly overrepresented in the sample (53%).

5.3.2 Variables

Outcome measure. Mental health is measured using the SF-36 Mental Component Summary (MCS) score (Ware et al., 1994). The SF-36 MCS is a reliable and valid multidimensional indicator for assessing mental health in the Australian population (Jenkinson et al., 1994; McCallum, 1995). It evaluates several dimensions of positive mental health across four subscales: role functioning, social functioning, emotional functioning, and vitality. Each subscale is based on multiple items that capture the frequency or severity of different symptoms, which are then summed, weighted, and averaged to produce a normalised score ranging from 0 to 100 (higher scores indicate better mental health) with a population mean of 50 and standard deviation of 10. The SF-36 MCS is therefore a comprehensive measure that reflects how affect, functioning, and fatigue determine individuals' overall mental health, all crucial aspects to consider, particularly when examining the transition to parenthood (Nelson et al., 2014; Nomaguchi & Milkie, 2003; Umberson & Gove, 1989).

Time measure. The years around the first birth are used as the time reference in the models to model the transition into parenthood. The observation window is defined to be between –3 before and 3 years after birth. This time frame captures pre-birth conditions to assess any pre-existing trajectory heterogeneity and includes both the immediate period surrounding the birth event and the early adaptation years that follow. For the obtained GMM estimates to reflect the average initial mental health levels at the start point (–3 years), the time variable plugged into the models is defined from 0 to 6 but is labelled from –3 to +3.

5.3.3 Empirical strategy

Growth mixture models (GMM) are applied to classify the mental health trajectories of first-time parents selected in the sample. GMMs are longitudinal finite mixture models that can identify different latent classes of outcome development over time. In other words, GMMs are a generalisation of single growth curve models (GCMs) used to classify longitudinal observations into latent subgroups that share a common mean value on the outcome and follow a similar trajectory shape (Herle et al., 2020; van der Nest et al., 2020). Each subgroup is characterised by its own growth curve model that describes the class-specific trajectory, which can be compared across subgroups. As the number of subgroups is unknown *a priori*, GMMs are estimated sequentially with varying numbers of classes. The optimal model offering the best class solution (i.e., which best identifies distinct subgroups) is selected based on goodness-of-fit criteria. Individuals are then assigned to the class they are most likely to belong to based on derived posterior probabilities.

In this study, GMMs are employed for exploratory purposes. Accordingly, there are no theoretical expectations in terms of the number or the characteristics of the subgroups that will be obtained. This includes no prior assumption that latent trajectories develop differently for men and women. Therefore, all models are run for men and women pooled, and the likelihood of men and women being in specific subgroups of the final class solution is subsequently determined.

All subgroups follow the same model specification (that is derived in the first analysis step) but with different parameters (i.e., class-specific intercept and slope coefficients). Additionally, class-specific trajectories are not restricted to being equal for all individuals within the same class; instead, models are set to class-specific variance-covariance matrices of the random effects that allow for variation in trajectories between individuals of the same subgroup. After determining the classes, class membership is predicted using multinomial logistic regression to assess the association between time-invariant characteristics and specific trajectory shapes.

Formally, a GMM model with a linear time specification can be written as follows:

$$y_{it}^{c} = (\beta_0^c + u_{0i}^c) + (\beta_1^c + u_{1i}^c) \cdot t_{it} + \varepsilon_{it}^c$$

$$\text{with } \begin{cases} u_{0i}^{c} \sim \mathcal{N}\left(0, \sigma_{u_o^c}^2\right) \\ u_{1i}^{c} \sim \mathcal{N}\left(0, \sigma_{u_1^c}^2\right) \\ \varepsilon_{it}^{c} \sim \mathcal{N}\left(0, \sigma_{\varepsilon_{ct}}^2\right) \end{cases} \text{ and } cov(u_{0i}^{c}, u_{1i}^{c}) \neq 0$$

Where y_{it}^{c} is the measured outcome for observation i at time t (with $t = 0, \dots, T$, in this application t represents the time before and after the transition into parenthood) within class –or subgroup– c (with $c = 1, \dots, C$). β_0^c and β_1^c are class-specific fixed effects that define the growth curve's intercept and linear trend. u_{0i}^{c} and u_{1i}^{c} are class-specific random effects that allow for between-individual deviations in initial levels (i.e., intercept values) and from the average time trend. Both random effects are assumed to be normally distributed with a class-specific variance-covariance structure. That is, each random effect has its own class-specific variance ($\sigma_{u_o^c}^2$ and $\sigma_{u_1^c}^2$) and may covary (i.e., in each class the intercept and the linear time trend can be correlated). ε_{it}^{c} is the class-specific individual error term that represents random within-individual variability and is also assumed to be normally distributed and may vary over time.

All data analyses are performed in R (version 4.3.3) using the *lcmm*-package following the standard procedure steps described in Ram & Grimm (2009) and Elhakeem et al. (2022).

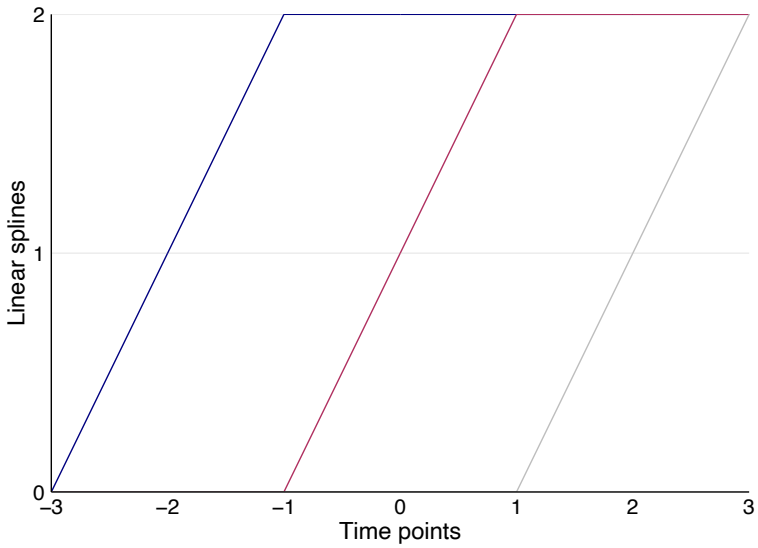
5.4 Results

5.4.1 Model specification and class solution

First, a baseline growth curve model (i.e., a single-class growth mixture model) is defined to determine the overall trend in the data and identify the specification that best describes single-group changes. Several different polynomial time specifications (linear, quadratic, cubic, and 4th-order polynomial) are tested, both with and without random effects in the linear time coefficient (with a non-structured variance-covariance matrix of random effects), as well as linear spline functions with different knot placements. Among those, the best-fitting model is a linear spline function time specification, with knots at t=-1 and t=1 (where t=0 is the year of birth). The three defined basis functions increase linearly from 0 with a slope of 1 until the next knot is reached (or the end of the observation

window), after which it becomes constant. This approach allows including each function as a model covariate and interpreting the three linear coefficients simply as the rate of change within each segment (i.e., [–3,-1]; [-1,1], and [1,3]). The basis functions used are plotted in Figure 5.2.

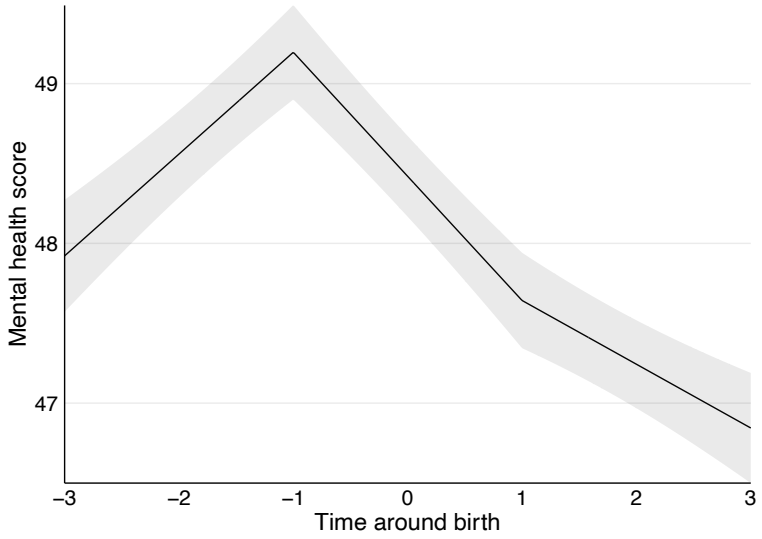
Figure 5.2 Linear spline basis functions



Notes: The blue line represents the function estimated between years -3 to -1, the red line represents the function estimated between years -1 to 1, the grey line represents the function estimated between years 1 and 3.
Source: Own illustration.

This knot placement also naturally corresponds to three distinct phases around the parenthood transition: pre-birth anticipation (up to year -1), the pregnancy and birth period (up to year 1), and the adaptation period to the new family circumstances (up to year 3). This is mostly consistent with previous studies identifying nonlinear trajectory patterns and is similar to the trajectory obtained with the cubic and 4th-order polynomial time specifications (Mikucka, 2016; Myrskylä & Margolis, 2014). The obtained single-group piecewise growth model is presented in Figure 5.3. Results for the single-group model show that (i) there is a positive anticipation effect up to pregnancy which declines following birth and in later years, and (ii) that the rates of change –both positive between years -3 and -1 and negative ones in subsequent years– are relatively small, although statistically significant (+1.3, -1.6, -0.8 points respectively in each segment, $p<.001$), compared to the overall variation of the SF-36 MCS (SD ≈ 10 points).

Figure 5.3 Piecewise growth curve model with knots at -1 and 1 years around birth



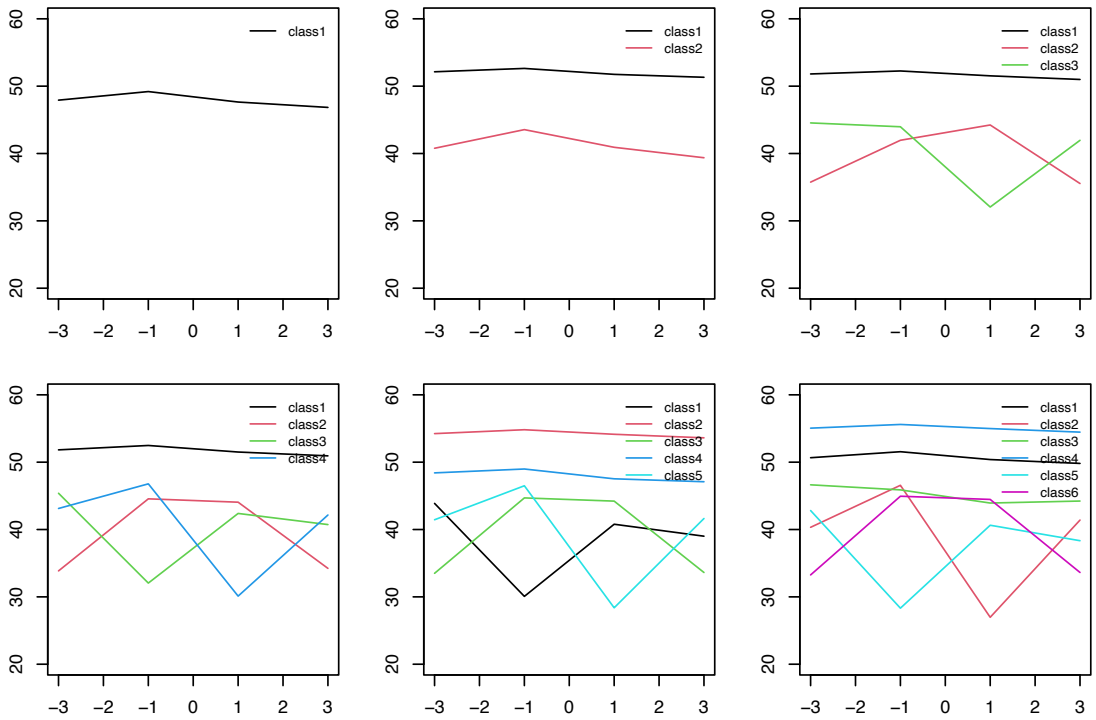
Notes: Unadjusted model pooling men and women. Shaded area shows 95% confidence intervals.
Source: HILDA release 21.

It should also be noted that this model is (i) pooled for men and women, (ii) considering between-individual variation in coefficient estimation, and (iii) unadjusted for any covariate other than time (including age, although age is a strong predictor of mental health declines; Bell, 2014). This explains why the obtained average trajectory pattern differs from previous findings using fixed effects models that robustly control for within-individual age effects and other time-variant predictors (e.g., Metzger & Gracia, 2023).

Second, using the baseline model specification, a series of Growth Mixture Models (GMM) is estimated going from a 1-class (identical to the baseline model) to a 6-class solution. Based on previous studies examining perinatal depression trajectories, the obtained number of classes is expected to be around 4 and no more than 5. Following methodological recommendations, the number of estimated groups should exceed by 1 the maximal number of expected groups, therefore models including up to a 6-class solution are considered. To avoid erroneous solutions (i.e., local maxima vs. global maximum convergence), an automatic search procedure with 100 iterations of random initial values –chosen based on the 1-class baseline model parameters– is applied to ensure the correct convergence of the models (Elhakeem et al., 2022; van de Schoot et

al., 2017). The 6 resulting class solutions are plotted in Figure 5.4 and the fit indices of each solution are summarised in Table 5.1.

Figure 5.4 Plots for growth mixture models with 1 to 6 latent classes



Notes: Unconditional models pooling men and women.
Source: HILDA release 21.

The class separation process can be followed through Figure 5.4. In the 2-class solution, the single high and stable trajectory observed in the 1-class solution is split into higher and lower-level groups. The 3-class solution further divides the lower-level trajectory into two distinct groups: one with increasing and one with decreasing mental health around the time of birth. In the 4-class solution, the decreasing trajectory group is separated into those whose mental health declines before birth and those whose decline occurs after birth. Finally, the 5- and 6-class solutions differentiate the 'high-stable' group into 'mid-stable' and 'lower-stable' classes, separating individuals that follow a similar pattern of change but with different initial levels of mental health.

Aside from this graphical evaluation, the optimal class solution is selected by examining the Integrated Completed Likelihood (ICL, computed in two ways) and the model entropy which assess the quality and the certainty of class separation. The preferred

Bayesian Information Criterion (BIC) cannot be used here due to its mechanical decrease with the increase in the number of classes, a known issue with GMM applications (Erosheva et al., 2014; van der Nest et al., 2020). The 4-class model is chosen as the best solution based on having (1) the lowest ICL values (in both versions), (2) the highest entropy (with a value of 0.74, indicating satisfactory class discrimination), and (3) no small-sized class (i.e., a class with 5% or less of the sample). This solution also holds up well in qualitative comparison with the 5- and 6-class solutions, which would not provide additional substantial information beyond further dividing the 'high-stable' trajectory group.

Table 5.1 Fit statistics for growth mixture models with 1 to 6 latent classes

Classes	npm	BIC	Entropy	ICL1	ICL2	% in each class
1-class	8	144012.2	1.00	144012.2	144012.2	100
2-class	14	142787.0	0.53	144041.9	143964.2	68, 32
3-class	20	142356.8	0.68	143707.9	143556.5	73, 15, 12
4-class	26	142005.0	0.74	143406.2	143245.8	72, 12, 6, 9
5-class	32	141779.7	0.65	143936.2	143921.6	5, 41, 11, 35, 8
6-class	38	141737.1	0.60	144497.4	144631.7	34, 6, 16, 28, 5, 11

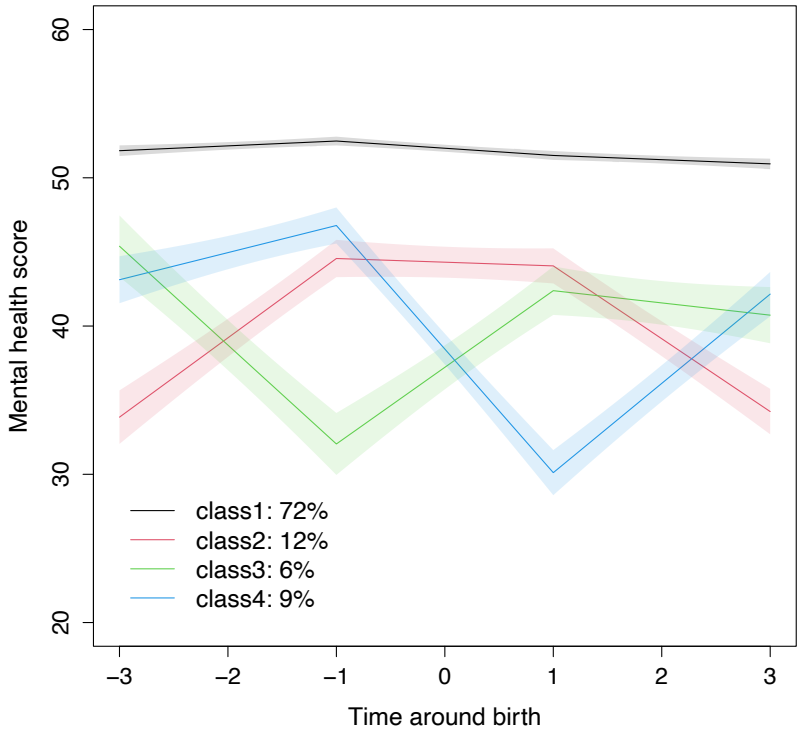
Notes: npm = number of parameters; BIC = Bayesian Information Criterion; ICL = Integrated Completed Likelihood.
Source: HILDA release 21.

Lastly, individuals are assigned to a class based on the posterior probability of class membership, which estimates the likelihood of belonging to each class. Each individual is allocated to the class for which they have the highest probability. In the selected 4-class solution, the average posterior probability of class membership for all individuals in each class exceeds 0.75, indicating a good level of classification.

5.4.2 Characteristics of the final unconditional model

The final model with the 4-class solution is shown in Figure 5.5, and model parameters are presented in Table 5.2.

Figure 5.5 Class-specific predicted mean trajectory of 4-class solution



Notes: Unconditional model pooling men and women. Shaded areas show 95% confidence intervals.
Source: HILDA release 21.

Most individuals (72%) are assigned to the 'high-stable' class, characterised by a higher initial mental health level of approximately 52 points, which corresponds to the Australian population average. This class presents small variations in mental health, with yearly rates of change ranging between 0.33 and– 0.49 across the three observed periods. This group pattern is logically the most consistent with the 1-class single-group trajectory. The remaining individuals are distributed across classes that show more substantial changes in mental health.

The 'low-increasing' class (12%) has the lowest average starting levels of around 34 points on the MCS scale (which represents over 1.5 of a standard deviation below the average score) but also experiences the steepest increase in mental health before birth (5.35 yearly point increase in that period), which stabilises at that level around birth before declining post-birth. The 'pre-birth decline' class is the smallest of the four classes (6%) and is the only group displaying large and significant mental health declines in

mental health in the pre-pregnancy/birth period (-6.70 yearly point decrease amounting to a 13.4 points total decline over that period). However, this group recovers across the birth period and stabilises thereafter. Lastly, the 'post-birth decline' group (9%) initially shows a moderate positive anticipation effect (1.83 yearly rate of change) followed by a very large decline across the birth period (-8.34-point decrease) but similarly shows recovery during the third time interval. Overall, results suggest that classes with lower-than-average initial mental health levels show the most variation in the years around parenthood, while those with standard mental health (i.e., equal to the general population average) are much more stable.

Table 5.2 Characteristics and model parameters of the 4-class solution

Class	Description	Class size	APPA	Intercept	Pre-birth slope	Birth slope	Post-birth slope
1	High-stable	2,799	0.91	51.83	0.33**	-0.49***	-0.28**
2	Low-increasing	468	0.79	33.85	5.35***	-0.25***	-4.91***
3	Pre-birth decline	241	0.75	45.39	-6.70***	5.17†	-0.83
4	Post-birth decline	346	0.77	43.12	1.83***	-8.34***	6.02***

*** p<.001, ** p<.01, * p<.05, †p<.10
Notes: Unconditional model. APPA = Average Posterior Probability of Assignment.
Source: HILDA release 21.

5.4.3 Prediction of class membership and class description

The gender distribution across the final classes show women are particularly overrepresented in the 'low-increasing' and 'post-birth decline' groups: class 1 ('stable') is made up of 50% of women and class 3 of 56% whereas classes 2 and 4 both have 62% of women. Further, only 23% of men are in a class other than 'stable', whereas 31% of women are in a group with more inconsistent mental health patterns. Univariate multinomial regression results (not shown) confirm the descriptive findings: women are statistically significantly more likely to be in classes 2 and 4 (p<.001) than in class 1, but not significantly more likely to be in class 3 over class 1 (p<.10). Overall, this indicates that women are more likely to belong to groups where mental health decreases *post*-birth and displays greater fluctuations. This is supported by the multinomial logistic regression results in Table 5.3, which include sociodemographic indicators to predict class membership. While age at birth does not predict membership in any of the three unstable

classes, having tertiary education (compared to only primary education) is associated with a lower probability of belonging to any of these unstable classes rather than the 'high-stable' group. This suggests a potentially protective effect of education and/or reflects the social gradient in mental health, whereby disadvantaged socioeconomic groups tend to have poorer mental health outcomes.

Table 5.3 Predicted class-membership from multinomial logistic regression models

		High-stable vs.	
	Low-increasing	**Pre-birth decline**	**Post-birth decline**
Female	0.49***	0.25	0.74***
Age	-0.01	-0.01	0.02
Education			
Primary	*Ref.*	*Ref.*	*Ref.*
Secondary	-0.51*	-0.35	-0.45
Post-secondary	-0.25	0.00	-0.34
Tertiary	-0.62**	-0.76*	-0.78**

*** p<.001, ** p<.01, * p<.05, †p<.10
Source: HILDA release 21.

5.5 Discussion

This study uses Growth Mixture Models to examine the latent heterogeneity in mental health trajectories among first-time parents and whether men and women are more likely to be associated with different trajectory patterns. As existing longitudinal studies on parental mental health trajectories focus on population averages that reduce parental mental health trends to a single homogenous pattern, this study contributes to this literature by exploring the extent to which the mental health response to the transition to parenthood varies across the population.

Results show that about ¾ of parents show minimal mental health changes during the transition to parenthood, with uniform patterns that mostly follow the typical population-average shape. However, the remaining parents are distributed across three groups characterised by lower average levels of mental health and dissimilar trajectory patterns showing much greater variations. Two groups show declines in mental health: one in the pre-birth/pregnancy period, the other during the 2-year pregnancy/birth period. The last group shows significant but only temporary mental health improvements in the 2-year pregnancy/birth period.

Women are more likely to be in the two groups with large mental health declines after childbirth. This could suggest that motherhood-related difficulties may play (among other factors) a greater role in these groups, leading to more distinctive patterns in women's trajectories. This may be further compounded by lower initial mental health levels, which would suggest that greater pre-existing mental health vulnerability makes new parents –and mothers in particular– more susceptible to the stressors linked to childrearing. This could potentially also be related to the groups of women experiencing perinatal depression. However, according to the WHO, only an estimated 10-11% of women experience this condition, yet 25% of the women in the sample are assigned to one of these two group, which would exceed the average number of women having this disorder (WHO, 2022). Whether such types of trajectories are driven by women with perinatal depression and/or by women experiencing parenting stress without disorder – as well as whether these relate to other factors– should be explored in subsequent studies. Lastly, the smallest subgroup identified is the only one that displays a large pre-birth mental health decline, resembling those in Tosi & Goisis (2021). This group –which is noticeably gender-balanced– may therefore be capturing individuals with conception difficulties and/or requiring medically assisted reproduction, which has been shown to take a significant toll on both men's and women's mental health (Tosi & Goisis, 2021). As this information is not available in the HILDA survey, this would need to be explored in a subsequent study with replicated groups using a different dataset.

This study adds to previous longitudinal studies on mental health trajectories across the transition to parenthood by describing the underlying heterogeneous patterns behind this life course event. It shows the importance of not considering parents as a homogenous group but as consisting of several subgroups, some of which have mental health needs that may significantly diverge from those of the majority. Further, while the study does not detect long-lasting impacts of the first birth on mental health (consistent with most previous longitudinal studies), it does identify sharp decreases in mental health among certain parental groups within three years of birth. Yet research shows that this time window is the most crucial for child development. Therefore, even if parents' mental health eventually recovers, the short-term declines may still have a significant negative impact on children, as poor parental mental health is consistently associated with poor infant development (Waqas et al., 2023). Consequently, the negative narrative around parenthood may be concentrated among more vulnerable individuals who are at higher

risk of an adverse parenthood experience and may require additional support. This further highlights the need for differentiated policy approaches addressing both parenthood and mental health (Hewlett & Moran, 2014).

Overall, the approach and the resulting findings of the study complement and expand on previous knowledge (including the previous chapters of this thesis) focused on a strictly within-person perspective. Although fixed effects models establish robust estimates of within-individual changes, GMMs further show meaningful variation that informs how specific latent population subgroups experience parenthood. This complementary approach strengthens confidence in the overall findings (the positive and mostly stable mental health trajectories for most parents align with the general trends observed in the fixed effects results) while allowing for a more precise examination of those at risk of adverse mental health outcomes, ultimately contributing to a more nuanced perspective on the interplay between parenthood and well-being.

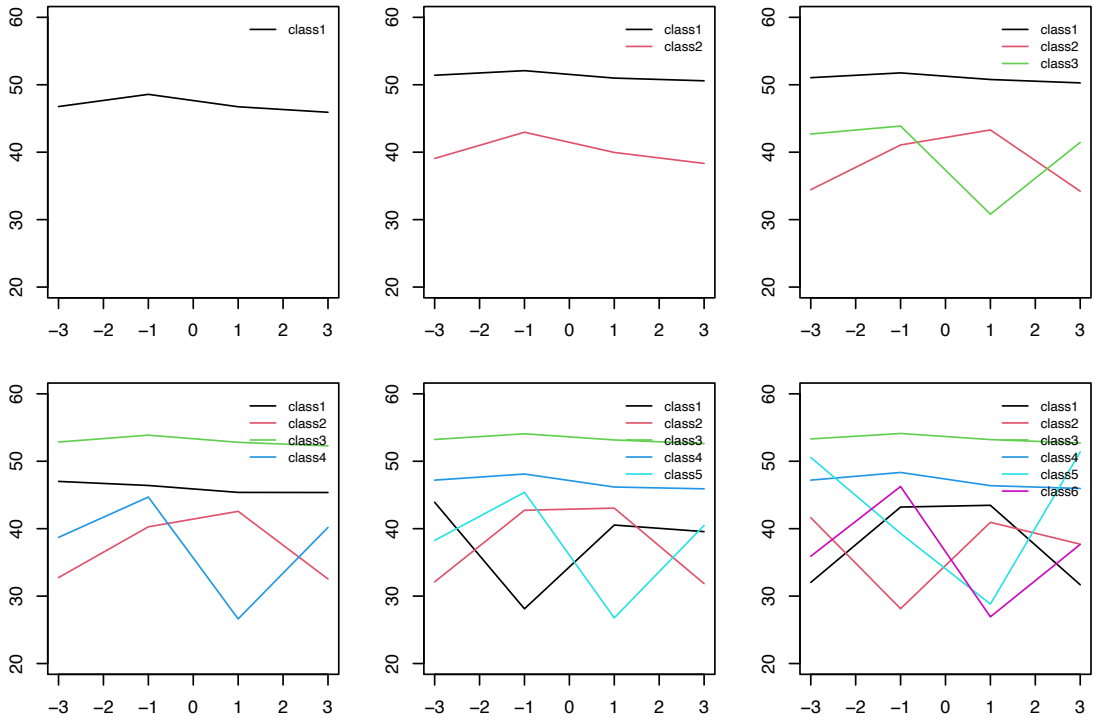
The study also presents the following limitations. First, although GMM is a technique that does not need pre-defined groups like classic moderation analyses to identify effect heterogeneity, it remains a constrained exploratory technique, as it suggests possible groups and trajectory patterns based on a pre-specified number of classes. Even though multiple class options are tested, and the final number of classes is selected based on various fit criteria, this process is still somewhat arbitrary, and the resulting trajectories may not accurately reflect real groups within the population. Additionally, the Bayesian Information Criterion (BIC), the most commonly used and recommended goodness-of-fit measure for these models, could not be evaluated against the other available criteria to ensure greater confidence in the class number selection. Second, the study does not stratify the sample by gender to detect pattern heterogeneity among men and women separately. This decision was made to avoid making any assumptions about the data, allowing the GMM analysis to naturally differentiate trajectories by gender if necessary. However, it could be argued that this approach may have resulted in less precise findings, particularly for women, where greater variation would have been expected than among men. Additional analyses running the 1- to 6-class solutions separately for men and women show that up to the 5-class solution, group-specific patterns emerged similarly for men and women as they did when both genders were pooled together (see Appendix Figure 5.6 and Figure 5.7). Although the 6-class solution showed more differences

between genders, (a) it was not the preferred class solution for either men or women based on the available fit criteria, and (b) it divided an already split sample into very small subgroups, leading to unclear results. Based on this, the study presents the heterogeneity for men and women combined. Lastly, models are defined as unconditional, i.e., no covariates, including age, are included in the base model. As a result, age trends are not accounted for when classifying latent mental health trajectories. This approach allows the GMMs to identify trajectories purely based on the observed mental health data without imposing prior assumptions about latent trends, including those driven by age. Given the relatively short six-year observation window, age-related trends in mental health are unlikely to be a major factor in distinguishing trajectories in this study. However, this modelling choice should be considered when interpreting the results.

To conclude, this study shows that most parents with good mental health navigate the transition to parenthood relatively well, while those who struggle around this life course event tend to already have lower levels of mental health from the start and may face a wider range of difficulties. These study results can also be summarised by the 'Anna Karenina Principle' ("all happy families are alike, each unhappy family is unhappy in its own way"): individuals with higher levels of mental health experience very similar stable trajectories, while those with lower mental health exhibit much more diverse mental health patterns around the transition to parenthood.

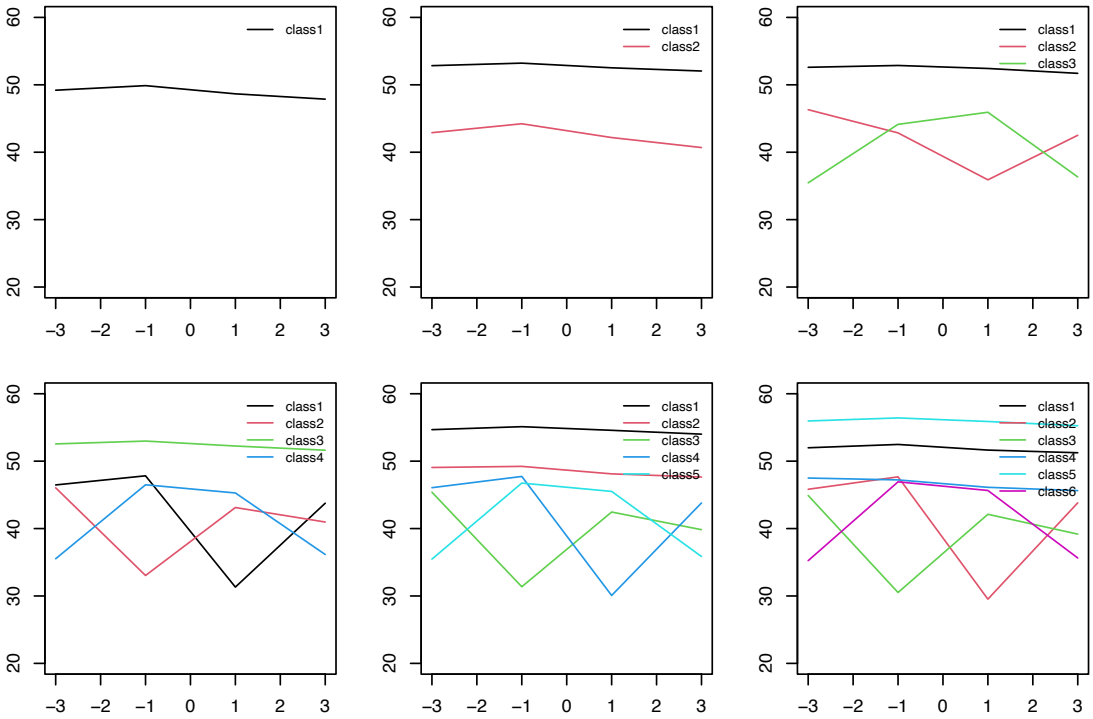
5.6 Appendix

Figure 5.6 Plots for growth mixture models with 1 to 6 latent classes, women



Notes: Unconditional models.
Source: HILDA release 21.

Figure 5.7 Plots for growth mixture models with 1 to 6 latent classes, men



Notes: Unconditional models.
Source: HILDA release 21.

Chapter 6: Conclusion

Mental health differences between men and women are well-documented, but the timing, causes, and mechanisms behind these differences throughout the life course remain unclear. Parenthood is a particularly gendered turning point, marked by significant individual changes that reinforce specialised gender roles. These changes are often unequally distributed between men and women with distinct gendered consequences. Specifically, these inequalities can lead to different mental health responses among men and women after becoming parents, potentially contributing to the existing gender gaps in mental health. However, the evidence on whether and how parenthood contributes to shaping mental health inequalities is mixed, suggesting important complexity in this relationship.

This thesis examined the dynamic association between parenthood transitions and gendered mental health, using long-running, large-scale, and high-quality panel data, a comprehensive mental health outcome measure, robust longitudinal modelling, and systematic side-by-side comparisons between men and women. The primary aim was to provide a cohesive analysis of the different gendered processes surrounding parenthood transitions and to assess the extent to which parenthood serves as a key link between gender and mental health throughout the life course. In doing so, this thesis contributes to the growing body of research on men's and women's health and well-being over the life course that informs and guides policy measures aimed at improving and equalising mental health across genders.

This is achieved through four self-contained but interconnected empirical studies that examine: (1) the complex and conflicting mental health consequences of the transition to parenthood for men and women, (2) the gendered mechanisms shaping mental health across this transition, (3) the role of national context in defining gendered mental health patterns following parenthood, and (4) the heterogeneity in mental health trajectories during the transition to parenthood among men and women.

This final chapter is structured as follows. First, the key findings and contributions of each empirical study are summarised. Second, the methodological and conceptual limitations of the thesis are discussed, along with suggestions for future research. Third,

the main policy implications arising from the research are outlined. Finally, the chapter concludes with a synthesis of the overall conclusion drawn from this research.

6.1 Summary of key findings and contributions

6.1.1 Study 1

Study 1 examined gendered mental health trajectories over the first transition to parenthood in the UK. It further assessed to what extent parenthood affects distinct domains of mental health such as affect, functioning and fatigue. Additionally, it considered mental health trajectory variations in mental health by socioeconomic characteristics among men and women. Findings show that women experience greater mental health improvements than men following birth, which does not support *set-point* theory applied to mental health outcomes. However, results align with the *costs and rewards* approach to parenthood: both positive affect (e.g., happiness) and negative affect (e.g., stress), as well as overall fatigue rise during care-intensive years. Further, results also indirectly support *role enhancement* theory through the substantial and long-lasting improvements in role and social functioning found for mothers. Lastly, results show that higher SES women and women working full-time experience reduced mental health benefits from parenthood. This suggests a motherhood disadvantage for higher SES women, likely due to greater childrearing involvement combined with more demanding work schedules.

Overall, the study shows that first-time parents generally experience improved mental health trajectories after birth. The employed multidimensional approach further captured additional components of individuals' mental well-being, offering novel and nuanced evidence on the complex mental health consequences of the transition to parenthood.

6.1.2 Study 2

Study 2 examined the role of time use changes in paid work and housework in shaping mental health trajectories across the transition to parenthood. Results show that paid work hours are positively associated with mental health for both men and women, whereas individual housework hours negatively impact only women. Following the birth of their

first child, women experience significant reductions in paid work and increases in housework, whereas men's time use is unchanged. Yet despite parenthood markedly reinforcing gendered time use patterns with disadvantageous changes for women, these shifts result only in minor reductions in first-time mothers' mental health, which do not substantially affect their overall improving trajectories following birth. As a result, the findings provide limited support for *role strain* theory and *the time* squeeze perspective as explanations for gender gaps in (parental) mental health. Further, results do not support unequal *partner-relative* contributions having an adverse effect on mental health for either men or women.

Nonetheless, this study is the first to explore the dynamic relationship between time use and mental health during the transition to parenthood by assessing how co-occurring time use changes relate to gendered mental health trajectories. In doing so, this study provides a foundation for future research to explore more nuanced dynamic associations between time use and parental mental health, such as the influence of gender attitudes or the ambivalent role of childcare time.

6.1.3 Study 3

Study 3 examined how gendered mental health trajectories across parenthood transitions compare across different countries. Results show that mental health improves with the first child in all countries, especially for women, but also indicate mental health declines after the second child in Australia for both genders. SES-based heterogeneity in trajectories is minimal across all countries, although findings suggest some lower mental health benefits among higher SES women, particularly in the UK. Clearer trajectory patterns emerge when differentiating by the used childcare arrangements: women who never use formal childcare fare worse as parity increases in all countries than women who make use of it, particularly in Germany.

This study is the first to combine a cross-national approach with a longitudinal perspective to study mental health trajectories around childbirth across multiple countries. Generally, the study shows that mental health trajectories following parenthood transitions are comparable across three similar national contexts but with greater cross-national variations as parity increases. It further suggests that policy-

constrained choices, such as the use of formal childcare, may play a role in explaining differences in mental health trajectories among women.

6.1.4 Study 4

Study 4 explored between-individual heterogeneity in mental health trajectories of first-time parents. It identified several latent heterogeneous patterns of parental mental health trajectories using an explorative data-driven approach. Results show that the majority of first-time parents share a stable mental health trajectory across the transition to parenthood, while the remaining parents are distributed across groups characterised by lower average levels of mental health with dissimilar trajectory patterns and greater fluctuations around birth. First-time mothers are more likely than men to be in the groups with lower mental health, with steeper declines in the post-birth period compared to the group with high and stable mental health.

Overall, this study contributes to existing longitudinal research on parental mental health by moving away from estimating single-group average effects for men and women who treat fathers and mothers as largely homogeneous groups. In doing so, it emphasises the need for greater support for vulnerable first-time parents with lower baseline mental health, as they may be more likely to experience significant mental health fluctuations, potentially leading to a more adverse parenthood experience.

6.2 Limitations and future research

6.2.1 Methodological limitations

Despite the high quality of data and robust longitudinal methods employed, the thesis presents the following methodological limitations.

First, the distributed time effects over the transition to parenthood are grouped by year (i.e., wave by wave) in the statistical analyses due to the annual format of the data. However, this approach may capture respondents at different monthly time points around birth. For instance, some respondents may be interviewed one month after birth, while others may be interviewed ten months post-birth, but both are grouped under the same

"+1 year after birth" variable category. Additionally, the mental health measure used (the MCS score) reflects the respondent's mental health over the “past 4 weeks,” underscoring that mental health is not reported for the same monthly period across all parents. Yet, Hudde and Jacob (2023) show that parental well-being trends can shift monthly, particularly within the six months before and after birth, with more pronounced positive effects than the yearly smoothed-out trajectory would suggest. While this limitation does not alter the overall conclusions of the thesis, the yearly estimates may underestimate the positive impact of parenthood and obscure some heterogeneity. However, this issue primarily affects short-term effects around birth. Given the long observation windows defined in this thesis, the use of year-based estimates would not significantly affect the broader findings.

Second, three out of four studies in this thesis rely on longitudinal fixed effects modelling. Although these models offer key advantages such as eliminating unobserved time-invariant characteristics that may affect both the parenthood decision and individual mental health outcomes, and accounting for self-selection processes (i.e., individuals with higher mental health being more likely to become parents; Cetre et al., 2016), they also have limitations.

In particular, fixed effects models solely rely on within-individual *changes*, which limits the ability to capture the full extent of parenthood’s effects on well-being. Specifically, they do not allow assessing the link between differences in baseline mental health *levels* and the subsequent within-individual changes across the transition to parenthood. Yet, mental health variations may depend on average starting levels. This is suggested by Study 4, which does not however benefit from the strong advantages of fixed effects models. This stresses the importance of using complementary approaches that model different aspects of dynamic associations, such as those explored in this thesis. Furthermore, this issue may particularly limit the results in Study 2, as the level of time use (i.e., the number of hours) may play a significant role separately from the changes in hours, which is the focus of that study.

Additionally, the fixed effects models include a childless control or comparison group, following the recent methodological recommendations in Brüderl and Ludwig (2015) Ludwig and Brüderl (2021), and Perales (2019), as well as following the same strategy used in closely-related empirical life course studies (Anusic et al., 2014; Giesselmann et

al., 2018; Leopold, 2018; Mikucka, 2016; Mikucka & Rizzi, 2019; Ruppanner et al., 2019). This relies on the assumption that the childless and first-time parents groups are comparable on the unobserved time-variant factors. Yet, matching more precisely the comparison group to the treated group (i.e., first-time parents) and assessing whether this affects the estimation results would be an interesting methodological contribution for future life course studies on parental mental health trajectories (e.g., similarly to Winkle and Leopold's (2022) application to widowhood transitions).

Further, although fixed effects models can isolate the effect of the transition to parenthood under certain assumptions, potential endogeneity issues remain in the models employed in this thesis that prevent identifying causal effects of birth and parenthood on mental health variations. Specifically, there may be issues of reverse causality if pre-birth mental health fluctuations influence the likelihood of becoming a parent in the first place, or if individuals adjust their behaviours that improve their mental health in anticipation of becoming parents (e.g., increasing physical activity, reducing stress, improving their material or financial situation). Similar issues may apply to the link between time use and mental health if changes in mental health predict shifts in time use (e.g., a major depressive episode leading to reduced work hours and lower housework engagement). Fixed effects models alone cannot fully address these endogeneity concerns. However, these issues could be mitigated by employing advanced dynamic panel modelling techniques, such as cross-lagged models in future research (see Mund & Nestler, 2019 for up-to-date modelling recommendations). Cross-lagged panel models can, for example, model the potentially reciprocal relationship between time use and mental health across the transition to parenthood. By including lagged variables for both mental health and time use, these models account for prior states of each variable to predict subsequent levels (i.e., lagged 'direct' effects). The temporal sequence can be structured around the transition to parenthood to assess both (i) how time use and mental health evolve across this transition and (ii) whether, how, and in which direction they influence each other from one time point to the next (i.e., *cross*-lagged effects). This approach could help disentangle whether mental health changes drive subsequent shifts in time use, or vice versa, thereby mitigating reverse causality concerns while providing similar advantages to fixed effects models (e.g., controlling for unmeasured time-invariant confounders) to complement the results presented in this thesis.

Fourth, data availability limited the cross-national comparison in this thesis to Australia, Germany, and the UK. However, these countries share similar welfare and family policy support systems, which constrain the conclusions that can be drawn about the role of the national context in shaping parental mental health. Expanding comparative analyses to countries with more diverse welfare systems, family policies, and gender equity levels would have allowed determining more clearly whether the (gendered) effects of parenthood on mental health –and their magnitude– are universal or country-dependent. Specifically, including Nordic countries with extensive welfare provisions (e.g., Denmark) and southern European countries with minimal external family support (e.g., Italy) alongside conservative (Germany) and liberal (Australia, United Kingdom) countries would have better clarified whether the dynamic effects of parenthood on mental health transcend (a) welfare and policy contexts and (b) national family and gender norms, or whether these macro-level factors contribute to shaping diverging mental health responses to parenthood. While this limitation cannot be addressed in the short term due to insufficient data availability, it highlights the need for longitudinal data collected in a wider range of countries to include comparable, high-quality mental health measures to enable more meaningful life course comparisons across divergent welfare regimes and institutional contexts.

Lastly, the decision to use the same outcome measure across all four studies in this thesis is both a strength and a limitation. On the one hand, it enables straightforward comparisons across studies. On the other hand, it limits the focus to the mental health dimensions captured by the SF-36/12 MCS measure. The construction of the MCS score may favour certain dimensions of mental health relevant to overall population health while downplaying others that may be more important for parental mental health. As a result, the measure may emphasise certain aspects and underrepresent other dimensions that are more crucial for understanding mental health in the context of parenthood. It should also be mentioned that –although still currently used in research and included in the recent OECD catalogue of mental health indicators recommended for measuring population mental health– it is an older measure (developed in the late 1990s) and therefore may not detect more nuanced mental health issues that are of interest to researchers and policymakers nowadays.

6.2.2 Conceptual limitations

The thesis also presents the following limitations due to conceptual choices, scope delimitations, and theoretical framing.

First, the focus on the first transition to parenthood, while theoretically motivated by the important gendered shifts it results in, may present a certain limitation. Mechanisms that shape gendered parental mental health, such as *role strain* and *time squeeze*, might become more pronounced with the arrival of a second (or even a third) child, as it intensifies the competing demands and further compresses schedules, especially for mothers. This can lead to increased adverse mental health consequences, even though the experienced shifts may not be as abrupt as with the first child (Matysiak et al., 2016; Ruppanner et al., 2019). Although Study 3 hints at this dynamic, future research should more rigorously explore these effects by examining the impact of subsequent parenthood transitions.

Second, the thesis may be limited by its exclusive focus on positive mental health. Although this is an important aspect, it is not the only indicator of the parenthood experience and its unequal gendered effects. For instance, economic consequences directly resulting from parenthood may be equally significant. Women often face substantial reductions in income and employment stability (e.g., switching to part-time work), leading to greater financial insecurity and lower economic well-being (Kleven, Landais, Posch, et al., 2019; Krämer & Rodgers, 2020; Rohde et al., 2016). Therefore, gendered mental health across the parenthood transition should also be studied in a wider context than general well-being and mental health, to give a complete picture of all gendered consequences.

6.2.3 Directions for future research

Several different possible directions for future research emerge from this thesis. First, "a growing and cumulative body of research has found that the antecedents, consequences, and interpretation of family processes are contingent upon gender ideology" (Greenstein, 2009; p.1040). Consequently, the role of gender ideology and attitudes in the context of parental mental health presents an important avenue for future family research. Specifically, gender ideology may shape (1) the overall experience of parenthood (e.g.,

how central the role of having children should be), (2) the gendered behaviours and mechanisms that operate on parental mental health (e.g., mothers adhering to traditional gender attitudes may not perceive the reduction in employment and the increase in housework as negative, therefore experiencing less negative impact than women ideologically attached to an equal distribution of tasks), and (3) the levels of mental health (e.g., poorer general mental health among individuals with egalitarian attitude; King et al., 2022). There is evidence of protective effects of traditional gender attitudes, as they do not encourage women to 'do it all' but rather to specialise in the household and childcare area which may reduce pressures, strain, stress, and work-life conflict (Balbo & Arpino, 2016; Leupp, 2019). Future studies should address whether the associations between parenthood and mental health explored in this thesis hold across different gender ideology typologies.

Second, future research could use more time-intensive longitudinal measures that trace post-birth mental health at finer intervals (e.g., month- or week-specific measures from birth). This would help distinguish between immediate or acute effects (e.g., postpartum depression) and prolonged consequences (e.g., chronic stress). Such data would also enable path-dependent analyses to assess whether short-term mental health changes in the first few months after birth predict long-term patterns, and better integrate research on perinatal mental disorders with broader life course mental health studies. These data can already be derived from the GSOEP survey by combining birth month and year with interview timing to determine the exact interval between birth and mental health data collection for each respondent having a child (see Hudde & Jacob, 2023 for an application to parental well-being trajectories). In other datasets, such as the UKHLS, accessing detailed birth variables (e.g., month or day of birth) will require a special licence for secured data access to construct such weekly or month-specific measures.

Third, longitudinal family research on parental well-being should make greater use of the advantages offered by Growth Mixture Models (GMM). A specific application relevant to the research questions in this thesis would be to explore in more detail the links between time use changes and mental health trajectories before and after parenthood using GMM. This could be achieved by: (1) classifying latent time use trajectories to identify diverging patterns across the transition to parenthood and examining their association with mental health as a distal outcome, or (2) identifying similar joint

trajectory patterns of time use and mental health and examining the obtained double-patterns. This could be further linked to gender ideology as described above by assessing whether gender ideology typologies predict group membership in different time use trajectories or joint time use–mental health trajectories.

Lastly, future studies could combine the research approach of this thesis with life course research focused on the later-life consequences of key life events, such as parenthood. Bridging these two research areas would provide a comprehensive life course assessment of parenthood, highlighting the complex, cumulative, and far-reaching consequences it has on individuals' lifelong mental health outcomes (Bauer et al., 2022; Comolli et al., 2021; Engels et al., 2021b, 2021b). This may additionally inform the evolution of gendered mental health trajectories over the life course, as studies suggest that family life courses are more influential in shaping women's later-life well-being than men's (Comolli et al., 2021; Fasang, Andrade, et al., 2024).

6.3 Research implications

This thesis has several practical implications for sociological family and health research. First, the research on parental mental health and well-being should follow standard recommendations to precisely categorise the type of outcome that is examined to range results and conclusions into a specific domain of mental health and well-being following WHO and OECD typologies (OECD, 2023d; WHO, 2022). Clarifying which aspect of mental health is being measured would ensure that findings are appropriately situated, reducing apparent contradictions across studies and facilitating a more coherent understanding of how different research complements one another.

More broadly, this thesis encourages more nuanced and balanced reporting of the mental health consequences of parenthood. This approach avoids overemphasising negative implications at the expense of recognising potentially positive effects, ensuring a more comprehensive perspective on how parenthood shapes well-being than in previous literature. At the same time, the thesis stresses the importance of distinguishing between individuals and socioeconomic subgroups that may be more or less vulnerable to changes related to parenthood. The studies included in this thesis suggest that specific

subpopulations (e.g., working mothers, men and women with pre-existing mental health vulnerabilities) encounter distinct challenges –including more adverse experiences– that need to be carefully addressed in future research.

This thesis also has methodological implications for research on parental mental health and well-being. It underscores the importance of using methods that account for both within- and between-individual dimensions and can capture the dynamic interdependencies of different life domains. It highlights the value of Growth Mixture Models or cross-lagged panel models as relevant methodological extensions to study research questions addressing parental mental health to further expand our understanding of the processes and mechanisms underlying this key life course transition.

6.4 Policy implications

The main policy implications of this research are summarised as follows. First, the thesis highlights the importance of considering both the mental health rewards and costs of parenthood, with the costs being the most policy-relevant area to address. Reducing time-related, employment-related, domestic, financial, and material burdens associated with children would contribute to shifting the costs-rewards balance towards favourable outcomes for parents, leading to greater positive impacts. In particular, extensive institutional support for parents, especially through the provision of affordable and high-quality external childcare whose effectiveness has been demonstrated by multiple studies, should be prioritised as a key policy tool (Bauernschuster & Schlotter, 2015; Schmitz, 2020). Yet, many countries, including Australia and the UK examined in this thesis, still provide insufficient support in this respect (Van Lancker & Ghysels, 2016).

Second, the negative narrative surrounding parenthood may be concentrated among a subset of more vulnerable individuals. This highlights the need for careful screening during the transition to parenthood to identify those at higher risk of having an adverse experience, with policy measures tailored to the specific needs and difficulties across subgroups. This is also critical to ensure infant and child well-being, especially in the formative first few years where poor parental mental health may be detrimental to children's development (McDaid et al., 2017)

Lastly, the thesis advocates for policymakers to shift from evaluating policies solely through economic or labour market indicators, and instead, incorporate well-being indicators as key measures of societal growth and policy effectiveness. In the context of parenthood, this means not only assessing family policies –such as parental leave, flexible work, and childcare provision– through metrics like female labour market participation, employment hours or earnings but also considering parents' mental health and well-being across the different parenting stages as indictors of (un)successful policies (Clark et al., 2019; Frijters et al., 2020; OECD, 2011).

6.5 Final remarks

Men's and women's mental health systematically differ and manifest unequally across all life course stages. Understanding the factors and processes contributing to these persistent differences is essential for achieving gender equality at all levels of society. Parenthood, as a highly gendered life course transition, represents a key event that may help explain some of these processes. Therefore, this thesis aimed to address the following question: Does parenthood contribute to shaping distinct mental health responses for men and women?

Generally, the findings support that individuals look forward to becoming parents and mostly benefit from the experience of parenthood. The findings also support a gendered impact of parenthood on mental health, though not in the often-conveyed negative sense. Rather, women benefit more than men from parenthood, showing increased mental health, greater happiness and improved functioning. At the average population level, there is no compelling evidence pointing to parenthood as substantially exacerbating the gender gap in mental health. However, results show that despite these greater advantages, women are also more likely to experience greater mental health disadvantages than men following parenthood, with increased stress and fatigue as well as unfavourable shifts in employment and domestic responsibilities.

Therefore, although findings suggest that the overall net impact of parenthood on mental health remains positive despite some adverse counteracting effects, these negative effects still have important implications that need to be addressed. This is especially important

for women, who are more vulnerable to disadvantageous mental health changes due to their generally lower baseline mental health compared to men. Further, beyond affecting mothers themselves, these negative consequences of parenthood may indirectly manifest in other areas, such as parenting difficulties, that can affect healthy family functioning and child well-being.

Overall, this research calls for adapted and differentiated policy responses around parenthood to ensure an equitable experience not only between men and women but also among women with different mental health profiles, so that all individuals can fully benefit from parenthood.

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