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Regular Article

The double jeopardy of low family income and negative emotionality: The family stress model revisited

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Abstract

The family stress model has, for decades, guided empirical work linking poverty with increased risk of child social-emotional dysfunction. The present study extends this line of work by examining whether child negative emotionality moderates associations between family income, family stress (maternal distress, parental locus of control, and relationship dissatisfaction), and later externalizing and internalizing behavior problems. In a longitudinal population-based sample (n ~ 80,000) of Norwegian children followed from birth through age five (The Norwegian Mother, Father, and Child Cohort Study; MoBa), we examined whether high (vs. moderate or low) negative emotionality families would display: (a) compounding stress (i.e., particularly strong associations between low family income and family stress), (b) diathesis-stress (i.e., particularly strong associations between family stress and behavior problems), or (c) double jeopardy (i.e., both compounding stress and diathesis-stress moderating effects). Negative emotionality significantly moderated the association between family income and behavior problems in a manner most consistent with *double jeopardy*. As a result, compared with children with moderate/low negative emotionality, the family income-behavior problems association was two to three times larger for those with higher negative emotionality. These findings underscore the active role children may play in family processes that link low family income with behavior problems.

Keywords: compounding stress; diathesis-stress; double jeopardy; family stress model; negative emotionality

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Introduction

Children growing up in low-income families are at increased risk for adverse social-behavioral outcomes (Dearing, 2014; Duncan et al., 2015), with considerable evidence these harms are causal and not merely social selection (see Cooper & Stewart, 2021 for a review). For several decades, the Family Stress Model (FSM) has provided a seminal theoretical perspective on how financial difficulties affect children via psychological pressure on parents. According to this model, stress and psychological pressure caused by financial constraints can increase parental distress, which in turn may reduce the consistency and warmth of parenting practices and compromise interpersonal family relationships more generally (Gershoff et al., 2007; Neppl et al., 2016; Newland et al., 2013; Parke et al., 2004; Yeung et al., 2002). The resulting challenges to family climate ultimately puts children at a greater risk for behavioral dysregulation.

However, this chain of spillover effects from income to child outcomes may not always result in the same level of adversity for children and families. Some parents and families may exhibit resiliency or exceptional vulnerability. Indeed, scholars have argued that individual and family characteristics may be influential in mitigating or exacerbating the adverse effects of low family income on children's outcomes, thereby changing the way family processes operate (e.g., Bradley & Corwyn, 2002; Conger et al., 2010; Donnellan et al., 2009; Masarik, & Conger, 2017). Despite calls to address this through theoretically driven research, however, only a few researchers have examined the moderating role of family- and parent-level factors within the FSM framework. Empirical tests of moderators have included individual stress coping mechanisms, family-level risk and protective factors, as well as community-level variables. For instance, caregiver conflict in low-income families (a family-level factor), exacerbates the overall stress experienced by parents, thereby potentially increasing the likelihood of internalizing problems in children (Landers-Potts et al., 2015). Similarly, effective stress-coping strategies, as individual-level factors (Wadsworth et al., 2011), and neighborhood collective support, as community-level factor (Krishnakumar et al., 2014), buffer families from income-related stress, resulting in fewer maladaptive child outcomes.

A few early studies also examined the role of child-level characteristics within the family stress framework. For example, Elder et al. (1985) investigated whether the child's attractiveness moderated the FSM pathways. They found that fathers were less nurturing toward their unattractive daughters than their attractive daughters, especially in cases where families faced higher levels of economic strain. In another study by Lee et al. (2011), higher levels

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of child aggression amplified the negative effects of low family income on parental stress and parenting practices, leading to more challenging behavioral outcomes in children. Consistent with interaction-based theories (e.g., Bronfenbrenner & Morris, 1998; Lytton, 1990; Scarr & McCartney, 1983) and the family systems perspective (Cowan et al., 1998), these empirical findings underscore children's active role in unfolding of FSM processes, evoking and responding to caregiver behaviors, and influencing the parent-child relationship. In the present study, we extend this work to focus on child temperament, specifically negative emotionality, as a potentially powerful factor that may modify the strength of pathways from low income to behavioral dysregulation within the FSM.

Children's levels of negative emotionality can be understood as a result of the interaction between environmental adversities, such as low family income, and biological factors. Scholars have argued that exposure to positive nurturing environment and high-quality positive parenting may increase young children's ability to regulate emotions, and thus influencing their level of negative emotionality. Conversely, exposure to exceptionally stressful family conditions heightens children's emotional reactivity and undermines the regulation thereof (e.g., Gruhn & Compas, 2020; Spinelli et al., 2021). At the same time, biologically-based precursors to temperamental differences in emotional reactivity and regulation are evident within the first few months of infancy, with implications for the ways children influence their caregiving environments (Fox et al., 2005). Temperamental characteristics are consistently found to influence how children respond to, and cope with, environmental stressors (Fox et al., 2021; Rothbart, 2012). Heightened emotional intensity, for example, reduces childrens' ability to regulate and manage emotions under stress (Campos et al., 2004; Eisenberg et al., 2010).

The transactional nature of family context and child temperament notwithstanding, child negative emotionality stands as a manifestation of failure in adapting effective emotion regulation strategies, potentially becoming an added risk factor in challenging conditions. Children higher in negative emotionality, as a result, may exhibit developmental vulnerabilities, which may exacerbate the impact of adversities to which they are exposed (e.g., Eisenberg et al., 2005, 2009; Paulussen-Hoogeboom et al., 2007). Previous studies have linked children's temperamental tendencies to the emergence of two distinct behavior problems: externalizing problems, characterized by impulsivity and aggression, and internalizing problems, marked by anxiety, difficulties in emotion regulation, and behavioral withdrawal (e.g. Keiley et al., 2002; Sanson et al., 2004). However, other studies report only modest associations between child emotionality and behavior problems (De France et al., 2023; Keiley et al., 2003).

One reason for these mixed findings could be that, beyond main effects, temperament may interact with other risks in causing behavior problems. Interactions between temperament and income-related stress exposure in the first years of life may offer one such case. Recent research has found that children with elevated negative emotionality are more likely to exhibit behavioral problems when exposed to parental conflict (Xuan et al., 2018) or when they live in low-income families (Bøe et al., 2016). These findings support the hypothesis that negative emotionality exacerbates the risk of child behavioral dysfunction in the face of family stress. Yet, whether child negative emotionality moderates the FSM is yet to be investigated; does the impact of family income on family stress mechanisms and/or the influence of these family stress mechanisms on behavioral problems differ as a function of child emotionality?

We hypothesize that child negative emotionality may evoke substantial variation in responses when interacting with adverse environmental conditions in the FSM, and empirically test whether three related hypotheses are supported by data from a large, nationwide dataset from Norway. First, we hypothesize *compounding stress* when a child's negative emotionality interacts with low family income in amplifying family- and parental stress. Second, building on the *diathesis-stress* model, we hypothesize that negative emotionality predisposes children to display more problem behaviors when exposed to an adverse family climate, such as poor parenting, high maternal distress, and interparental conflict. Lastly, we hypothesize that children who are higher in negative emotionality potentially experience *double jeopardy;* that is, temperamental reactivity jointly interacts with both adverse financial conditions (compounding stress) *and* negative family mechanisms (diathesis-stress) in developing behavior problems. In the following sections, we provide a general overview of the FSM and subsequently review empirical evidence related to compounding stress, diathesis-stress, and double jeopardy hypotheses.

The family stress model

Initially developed to explain the impact of the Great Depression on family functioning of American families (Elder et al., 1984), the FSM has guided a generation of empirical works examining how economic strains influence children's development via the impact of economic strain on parents' functioning and caregiving practices (e.g., Conger & Conger, 2002; McLoyd et al., 1994). The FSM proposes that economic difficulties within families place emotional, cognitive, and physical demands on parents. These challenges lead to elevated levels of parental stress, anxiety (Newland et al., 2013), and depressive symptoms (Dearing et al., 2004). In turn, parent propensity to engage in harsh and inconsistent parenting practices increases as does risk of maltreatment (Neppl et al., 2016; Warren & Font, 2015). The psychological distress caused by financial difficulties may also harm the quality of interparental relationships (e.g., Neppl et al., 2016). While some interpretations of the FSM suggest that interparental relationship problems may also increase the likelihood of experiencing mental health problems, the majority of existing studies support a process in which economic pressure, resulting from low income and negative financial events, predicts parent-child and interparental relationship dynamics through a negative effect on the mental well-being of parents (e.g., Landers-Potts et al., 2015; Newland et al., 2013). Regardless, this constellation of family dysfuntion undermines children's emotional and behavioral regulation.

Studies have shown that a negative family climate where there are frequent conflicts, communication problems, and adverse parenting increases the risk of externalizing and internalizing behavioral problems in early (Neppl et al., 2016; Zhang, 2014) as well as in middle childhood and adolescence (Bøe et al., 2012). Moreover, studies indicate that adverse influence of economic struggles in the family persists into adulthood and may place children in a disadvantaged position in later outcomes such as low wages and income (e.g., Duncan et al., 2012).

The FSM has gained substantial support from several studies, most notably in the United States (e.g., Jeon & Neppl, 2016; Landers-Potts et al., 2015; Lee et al., 2011; Linver et al., 2002), but also in countries with very different sociopolitical contexts including Britain (e.g., Sosu & Schmidt, 2017), Belgium (e.g., Ponnet et al., 2016), Germany (e.g., Heintz-Martin et al., 2021), and China (e.g., Zhang et al., 2020). Despite most studies on FSM being correlational, the results are consistent with a model where financial strain experienced in a family indirectly causes adversities

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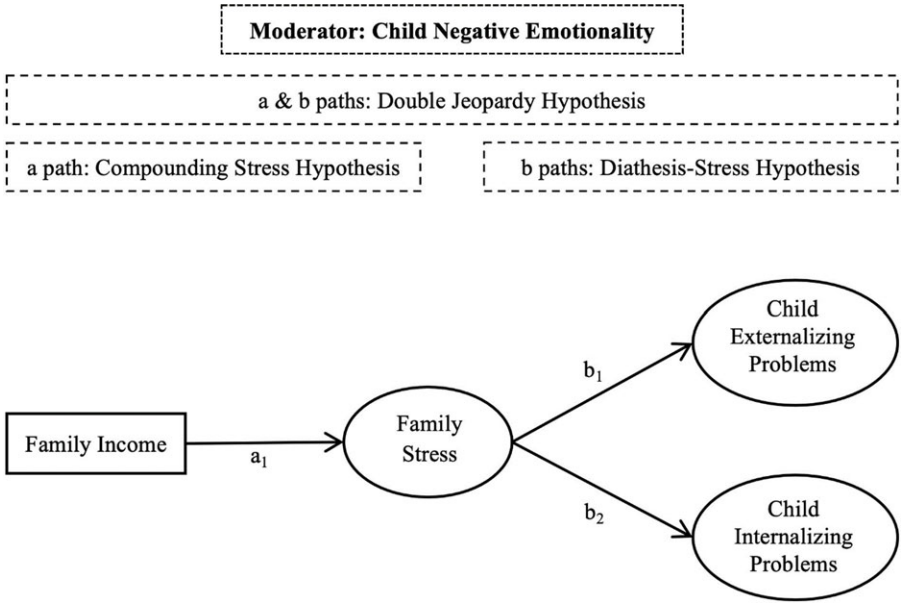

Figure 1. Hypothesized multigroup family stress model outlining the proposed compounding stress, diathesis-stress, and double jeopardy hypothesis. *Note.* if the a path (a_1), *b* paths (b_1 b_2), or both (a_1 & b_1 b_2) are stronger for children with higher negative emotionality, it supports the compounding stress hypothesis, the diathesis-stress hypothesis, and the double jeopardy hypothesis, respectively.

in the child's development through a range of income-related family processes. Thus, family stress processes seems to act as a channel in which economic strains undermine the development of children (Barnett, 2008; Conger & Donnellan, 2007).

The family stress model revisited

Do children respond differentially to financial and parental stress as a function of their reactivity to contextual influences, and do parents respond differentially to financial stress as a function of their child's reactivity? To address these questions, we refer to the vast literature on child temperament, parenting, and child outcomes (see Belsky & Pluess, 2009; Pluess, 2015 for reviews). Prevailing environmental sensitivity theories suggest that individual differences in temperament, which refer to a child's reactions to internal and external stimulations that strongly influence their ability to meet changing environmental demands, may contribute to their vulnerability to stressors (Rothbart, 2012). Negative emotionality is a core aspect of temperament (Shiner, 1998) and refers to a child's emotional and behavioral ability to regulate *reactions to stressors*, and their degree of irritability and discomfort in the face of novelty (Rothbart et al., 1994). Consequently, focus on child negative emotional reactivity becomes particularly important for identifying and managing how children respond or adapt to the effects of environmental stressors on their well-being (Rothbart, 2004; Wachs, 2006).

We hypothesize that individual differences in negative emotionality affect the FSM through different mechanisms along the causal chain of FSM. The objective of the present study is not to challenge the basic premise of the FSM, as it has been established as a valuable framework for understanding how financial stress affects families and children. Instead, we aim to assert that temperamentally reactive children may be more sensitive to environmental conditions while making the parents more distressed about their financial situation. Thus, we test the extent to which children's temperamental characteristics play a role in the FSM framework. As outlined in detail below, we hypothesize that children's negative emotionality moderates family stress, the influence of family stress, or both, which we call the compounding stress, diathesis-stress, and double jeopardy hypotheses, respectively. The proposed risk hypotheses and corresponding pathways are outlined in Figure 1.

Compounding stress hypothesis

The left-hand side of Figure 1 illustrates the first pathway of the FSM; the proposed effects of income on family stress (path a_1). Low family income is hypothesized to put an extra toll on parents, dysregulating their capacity to cope, and disrupting psychological and physiological response processes (Almeida et al., 2005; Kahn & Pearlin, 2006). In addition, the adverse developmental consequences of low income have been frequently associated with cumulative exposure to ongoing stress accompanying poverty (see Evans, 2004 for review). For example, stressful psychosocial and physical environmental conditions such as poor housing (Zilanawala & Pilkauskas, 2012), food insecurity (McLaughlin et al., 2012; Slopen et al., 2010), and family instability (Fowler et al., 2015) are factors correlated with living in poverty, and have serious consequences for child psychopathology.

Stress can also originate from within the family. Child emotionality is a case in point. A child's negative emotionality has been shown to be associated with higher parental stress (Collins et al., 2000; O'Connor, 2002; Mulsow et al., 2002; Östberg & Hagekull, 2000), poorer psychological well-being (Solmeyer & Feinberg, 2011), higher postpartum depression (Hopkins et al., 1987), and lower parent-child closeness (Acar et al., 2018). This may be because temperamentally emotional children are likely to have highly sensitive sensory processing, low thresholds for stimulations, and impulsive reactions when aroused. This, in turn, may pose a challenge to parents in providing appropriate attention, responding to the child's needs in a nurturing and supportive way, managing behavioral challenges, and maintaining optimal psychological and behavioral control (e.g., Gelfand et al., 1992; Laukkanen et al., 2014). As a result, parents of difficult-tempered children may feel overwhelmed and frustrated and, in turn, provide lower-quality care than those with easier-tempered children. Mothers of difficult-tempered children may be less responsive to their child's needs as they demand more attention and responsiveness (Crockenberg, 1986), less likely to display sensitive caregiving (Hyde et al., 2004), and may even resort to harsh and abusive parenting practices such as spanking when they feel a lack of control (Martorell & Bugental, 2006). Negative emotionality may also contribute to problems in children's sleep routines (Thunström, 1999), leading to sleep deficits

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for parents that increase their reactivity and decrease coping capacities in response to challenging child behaviors and demanding environmental conditions.

Building on the literature on child temperament, we hypothesize that child negative emotionality exacerbates the relationship between family income and family stress, which we call the compounding stress hypothesis. This means that having a child with high levels of negative emotionality may pose a challenge for parents to effectively use their psychosocial resources to deal with financial stress (see Bates & McFadyen-Ketchum, 2000 for review; Parker et al., 1988). Regarding this, Chang et al. (2004) provided supporting evidence by demonstrating a positive correlation between difficult child temperament and parental stress among low-income mothers.

In sum, parenting may be more stressful and troublesome when a child's high negative emotionality compounds with the stress associated with low family income. We hypothesize that the relationship between family income and parent-level family stress is stronger in families where children have higher levels of negative emotionality. In our empirical model, this *compounding stress* hypothesis will be supported if levels of child negative emotionality moderate the path *a1* in Figure 1.

Diathesis-stress hypothesis

The right-hand side of Figure 1 depicts the second set of pathways of the FSM; the proposed effects of parent-level family stress on externalizing (path b_1) and internalizing (path b_2) problem behaviors. The diathesis-stress model proposes that some individuals may be more prone to display maladaptive outcomes when exposed to an environmental stressor as compared to other individuals due to a biological vulnerability such as difficult temperament, physiological reactivity, or specific genetic makeup (Ingram & Luxton, 2005; Monroe & Simons, 1991; Zuckerman, 1999). The co-occurrence of vulnerability factors with negative environmental influences leads those individuals to run into more harmful effects of a negative environmental exposure (see Belsky & Pluess, 2009). The diathesis-stress framework has been utilized in research to address the interplay between various biological vulnerabilities and environmental factors, including but not limited to parental depression symptoms (Cummings et al., 2007), parenting stress (Sperati et al., 2024), exposure to stressful life events (Caspi et al., 2003), absence of positive parenting (Yaman et al., 2010), and relational stressors such as emotional abuse (Chango et al., 2012). This interactive nature of the model suggests that the effect on the outcome of one component (diathesis) is a function of the other (stress), such the proposed effect of the diathesis (e.g., negative emotionality) should result in more adverse outcomes (e.g., more behavior problems) in the presence of stressors (e.g., family stress).

A large number of studies have supported the diathesis-stress pattern in predicting child problem behaviors (e.g., Kim & Kochanska, 2012; Morris et al., 2002; Paterson & Sanson, 1999). Among those studies, particular focus has been given to understanding the interaction between parenting and various temperamental characteristics (see Kiff et al., 2011 for review). Yet, negative emotionality has been repeatedly set out as a unique characteristic that renders children vulnerable to adverse environmental influences (see Slagt, Semon Dubas, Deković et al., 2016 for a meta-analysis). For example, in a Dutch sample, harsh parenting led to lower prosocial behavior among children with higher negative emotionality than others (Slagt, Semon Dubas & van Aken, 2016). In another study, the negative association between parenting quality and behavioral problems was more substantial for children with higher negative emotionality as compared to children with lower negative emotionality (Leve et al., 2005; Stoltz et al., 2017). Furthermore, children displaying higher negative emotionality are also more vulnerable to the effects of chronic intrafamily stressors such as parental conflict, parenting hassles, negative life events (Shaw et al., 1997), and mothers' depressive symptoms (Wang & Dix, 2017). In conclusion, child negative emotionality may emerge as a diathesis factor that exacerbates a child's vulnerability to adverse environmental influences, including in the context of family stressors.

Building on the diathesis-stress model, we propose that the association between family stress and behavioral problems is conditional on the child's negative emotionality. We hypothesize that the associations between parent-level family stress and behavior problems are stronger in families where children have higher levels of negative emotionality. Our empirical model will support the *diathesis-stress* hypothesis if levels of child negative emotionality moderate the *b* paths in Figure 1 (b_1 b_2).

Double jeopardy hypothesis

With the *compounding stress* hypothesis, we suggest that the effects of low family income *and* child negative emotionality are compounded in affecting family stressors. With the *diathesis-stress* hypothesis, we suggest that the effects of these parent-level family stressors (hypothesized to be caused by low family income) have varying effects on child behavior problems as a function of negative child emotionality. If both processes operate simultaneously–that is, income affects family-level stress differentially as a function of child negative emotionality *and* behavior problems in children with high levels of negative emotionality are more strongly influenced by the parent and parenting components–then, there is *double jeopardy.*

There is a considerable amount of literature suggesting that the accumulation of risk factors characterizes the path toward atypical developmental consequences. Their cumulative nature predicts child outcomes beyond the simple sum of the individual risk factors (Evans et al., 2013; MacKenzie et al., 2011; Masten & Wright, 1998). This perspective also guides us to recognize Bronfenbrenner's ecological model, in which different factors in context, such as innate child characteristics (e.g., temperament, genetic) and psychosocial quality of setting (e.g., parenting, parent-child interaction, support, parental control), are predictive of child outcomes (Bronfenbrenner & Evans, 2000; Bronfenbrenner & Morris, 1998). Both perspectives underscore the need to consider the cumulative load of risk factors, often measured across domains (e.g., individual and family), that have been associated with adverse developmental outcomes (e.g., Rutter, 1981; Sameroff et al., 2004; Sameroff, 2006).

Past research in the field of developmental psychopathology provides evidence supporting the double jeopardy hypothesis. For instance, Shaw et al. (1997) found that in low-income families, the association between parental conflict and internalizing problems was greater for children with higher negative emotionality, suggesting that children with higher negative emotionality also struggle to regulate emotional difficulties arising from marital conflict. Black et al. (2007) also found that infants in low-income families attain fewer developmental skills when they have high irritability and their mothers show higher depressive symptoms. Similarly, Ackerman et al. (1999) documented that stress reactivity in children moderates the effects of family instability in predicting internalizing behavior in economically disadvantaged families. These findings suggest that individual characteristics on the

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part of the child (e.g., temperamental emotionality), parental factors (e.g., parental stress, parenting styles), and the socioeconomic environment (e.g., low family income) interactively affect child outcomes (Keenan & Shaw, 1994). Recently, Evans and De France (2022) suggested considering the moderating role of child temperament while broadening the understanding of how early cumulative risk exposure influences child internalizing. Accounting for the state of coexistence and interrelatedness of these diverse family and child characteristics in a holistic FSM approach, the present study addresses the double jeopardy hypothesis by furthering the cumulative and ecological risk perspectives.

The role of low income, child temperamental characteristics, and family stressors appear to contribute to the development of maladaptive outcomes conjunctively, thus pointing to the need to examine the developmental pathways in more detail. Yet, it is plausible, but it remains to be determined whether the increased prevalence of behavior problems among temperamentally reactive children is due to either children's vulnerability to adverse environmental influences or the joint impact of low income and a child's higher negative emotionality. The case of double jeopardy in the FSM framework, in that sense, views that low income and having a child with higher negative emotionality have a synergetic effect on the increased prevalence of behavior problems among temperamentally reactive children. Highly emotional children may increase the stress levels of parents who are already overwhelmed by economic deprivation. Concurrently, these children may exhibit more negative consequences in terms of poor developmental outcomes due to their vulnerability to environmental conditions, as compared to children with lower negative emotionality. Therefore, in the present study, we propose that the higher negative emotionality puts added stress into the nexus of these associations and makes parents and children more vulnerable to adverse family contexts, which in turn, influence the occurrence of problem behaviors. In our empirical model, the *double jeopardy* hypothesis will be supported if levels of child negative emotionality moderate both the *a* and *b* (b_1 b_2) paths in Figure 1.

Present study

In the present study, we link a large, population-based pregnancy cohort study (The Norwegian Mother, Father, and Child Cohort Study; MoBa) with tax data on family income to test the FSM across the first five years of life, and to examine whether child negative emotionality moderates the paths proposed by the model. Specifically, we include family income across the first three years of life, family stress at age 3, and child externalizing and internalizing problems at age 5, as well as child temperament measured across the first three years of life. Early childhood is a critical time to investigate behavior problems and their potential associations with negative emotionality; it is a period of rapid brain development in domains critical to behavioral regulation (Noble et al., 2012), with implications for long-term behavioral outcomes (Moffit, 1993). Moreover, a focus on temperament during this developmental phase provides an early window into the impact that children may have on family dynamics and functioning in contexts of economic stress, while acknowledging that transactional processes linking caregiving environment with temperament may begin unfolding from the earliest days of life, if not prenatally (e.g., De France et al., 2023; Perry et al., 2018).

Based on our theoretical arguments above, our first objective is to test whether the general FSM can be replicated in Norway. Specifically, we expect an association between early family income and later behavior problems, which is mediated through family stress. Our second objective is to test our three hypothesized moderating roles of negative emotionality on specific FSM paths: the compounding stress hypothesis (i.e., negative emotionality moderates *a* path in Figure 1), the diathesis-stress hypothesis (i.e., negative emotionality moderates *b* paths in Figure 1), and the double jeopardy hypothesis (i.e., negative emotionality moderates both *a* and *b* paths in Figure 1).

Method

The Norwegian setting

Norway is a wealthy country with a compressed wage structure. Additionally, a fairly comprehensive support system for all families, including paid parental leave (for employed parents), universal health care free of charge, and subsidized universal child care, may temper some of the negative impacts of low income. However, income inequality has been rising sharply during the last decade (Barth et al., 2021), and Norway has a highly skewed wealth distribution (the richest 5% of the households account for 40.3% of Norway's wealth; Pfeffer & Waitkus, 2021). The proportion of children in families below the official threshold for low family income (60% of median household income for three consecutive years, adjusted for family size) has increased from 4.1% in 1997 to 11.7% in 2020 (Statistics Norway, 2022), and is projected to reach 15% within a few years (The Norwegian Directorate for Children, 2017). Moreover, despite the support systems, low family income has considerable consequences for child development in Norway, as in any other country. For example, a population-based study of 8-year-olds showed a prevalence of any psychiatric diagnosis of about 30% among children in families with the lowest incomes, compared to about 5% among children from families with higher incomes (Heiervang et al., 2007). Similarly, children from families with the lowest incomes are four times more likely than those with high incomes to have a registered psychiatric diagnosis in the healthcare system (Kinge et al., 2021), and they display more problem behaviors (Bøe et al., 2012) and mental health problems (e.g., Bøe et al., 2017). Previous studies have also associated family income changes in the lower end of the distribution with cognitive (Black et al., 2014; Løken et al., 2012) and behavioral outcomes (Zachrisson & Dearing, 2015). It is important to note that studies conducted in other countries and on different samples have provided evidence that pattern of associations between family stress and child outcomes may be universal and not limited to specific cultural or socioeconomic contexts (e.g., White et al., 2015). Thus, our findings are likely to have implications beyond Norwegian families, as the mechanisms that underlie the associations regarding income and family stressors are likely to operate in other contexts as well.

Participants

We used data from MoBa, which was conducted by the Norwegian Institute of Public Health (see Magnus et al., 2016 and www.fhi.no/morogbarn). Participants were recruited from all over Norway from 1999 to 2008. The women consented to participation in 41% of the pregnancies. The cohort includes approximately 114.500 children, 95.200 mothers, and 75.200 fathers (Magnus et al., 2016). For the present study, MoBa was linked (via personal identity numbers) to Norwegian population registries to retrieve exact annual income data for the families and medical birth information regarding perinatal health conditions. This linkage was available for the 2002-

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2009 cohorts, leaving the sample of the current study to 102.993. We use version 12 of the quality-assured data files from MoBa released for research in 2018. The establishment of MoBa and initial data collection were based on a license from the Norwegian Data Protection Agency and approval from The Regional Committees for Medical and Health Research Ethics. The MoBa cohort is currently regulated by the Norwegian Health Registry Act.

The MoBa questionnaires were exclusively provided in Norwegian, and consist of various scales regarding children's health, daily diet, lifestyle exposures, and their socioemotional and cognitive development, and questionnaires regarding mothers' physical and emotional health. The present study targets the cohorts that completed the selected measures at 1.5, 3, and 5 years of age. The 5-year questionnaire was distributed from 2004 and onwards; hence we restrict our analyses to the 2004-2008 cohorts ($n = 79.889$ children).

Measures

Behavior problems

Child externalizing and internalizing behavior problems were measured at 5 years of age with the selected items from the Child Behavior Checklist (Achenbach, 1992). The mothers responded to items on a Likert scale ranging from 1 "very true/often true" to 3 "never/rarely" as considering their children's behaviors in the last two months. Externalizing problems were derived from the attention problems and aggressive behavior scales and measured by twelve items (e.g., "Can't concentrate, can't pay attention for long," "Gets in many fights"; Cronbach's $\alpha = .777$, Omega coefficient $\omega = .788$). The internalizing problems were measured by nine items capturing emotional reactivity, anxiety/depression, and withdrawal (e.g., "Clings to adults or too dependent," "Nervous, high strung, or tense"; Cronbach's $\alpha = .682$, Omega coefficient $\omega = .681$). A high correlation ($r = .92$) between the selected externalizing scale items measured at age 3 and the full scale in the NICHD Study of Early Child Care and Youth Development (NICHD Early Child Care Research Network, 1999) indicated representative item selection for externalizing scale, albeit the correlation with the selected internalizing items was not provided (Zachrisson et al., 2013). High scores on both scales represent high levels of externalizing and internalizing behavior problems.

Family income

Data on the annual household income was derived from the national income registry. We used the sum of disposable (after tax) family income from all sources, in Norwegian currency (1 Norwegian kroner = 0.87 US Dollars, May 2023). The family income has been adjusted to 2018–levels using Consumer Price Index and averaged across the first three years of the child's life. We removed the lowest 2% of incomes (approximately < NOK 40,000), as these are unreasonably low and probably reflect tax deductions due to losses in privately-owned companies. Incomes above the 98th percentile were truncated to avoid outliers. As indicated in previous studies (e.g., Dearing & Taylor, 2007), family income has a nonlinear association with child behavior problems. To account for the nonlinear associations, we rescaled (dividing by 100.000) and log-transformed the family income variable.

Family stress

We modeled a latent construct of family stress using three distinct but interconnected indices of income-related stressors: (1) maternal distress, (2) relationship satisfaction, and (3) parental locus of control. (1) Maternal distress was measured when the child was 36 months by a short version of the Hopkins Symptom Checklist (SCL) (Hesbacher et al., 1980), which captures the presence of both anxiety and depression. The mothers were asked to rate how far they were bothered by the situations described in the items during the last two weeks. They responded to items on a Likert-type scale ranging from 1 "not bothered" to 4 "very bothered" (e.g., the symptoms of anxiety: "Feeling fearful"; symptoms of depression: "Feeling hopeless about the future"; Cronbach's $\alpha = .872$, Omega coefficient $\omega = .880$). Higher scores correspond to higher maternal distress. (2) Relationship satisfaction was measured at 36 months by using the five-item Relationship Satisfaction Scale (Røysamb et al., 2014), which was developed based on previously developed relationship quality scales (e.g., Blum & Mehrabian, 1999; Henrick, 1988; Snyder, 1997). Mothers rated each item using a Likert-type scale from 1 "agree completely" to 6 "disagree completely", reflecting how far the items describe their relationship with their partners (e.g., "I am satisfied with my relationship with my partner"; Cronbach's $\alpha = .897$, Omega coefficient $\omega = .910$). Of the sample, 53.123 (95%) women reported being in a relationship at child age three years. Higher scores on this scale indicated lower satisfaction. (3) Parental locus of control was assessed at 36 months of age using selected items from the Parental Locus of Control Scale (Campis et al., 1986). The scale assesses the extent to which parents feel that child behavior is under their own control or other external forces on a Likert-type scale from 1 "totally disagree" to 5 "totally agree" (e.g., "What I do has little effect on my child's behavior"; Cronbach's $\alpha = .489$, Omega coefficient $\omega = .521$). Higher scores reflected external locus of control (i.e., lower parental control).

Negative emotionality – temperament

A child's negative emotionality was measured at 18 and 36 months using selected items from The Emotionality, Activity, and Shyness Temperament Questionnaire (Buss & Plomin, 1984). The mothers rated items on a Likert-type scale ranging from 1 "very typical" to 5 "not at all typical", reflecting on the extent to which the child tends to become intensely and easily aroused. The following three items showed a high correlation with the original scale in the previous Norwegian sample (Mathiesen & Tambs, 1999), thus being selected for both time points to capture the child's negative emotionality in the early years of life: "Your child cries easily", "Your child gets upset or sad easily", and "Your child reacts intensely when upset" (Cronbach's $\alpha = .642$ & $.645$ at 18 and 36 month old measures, respectively). We categorized child negative emotionality scores into three temperamental subgroups: low, moderate, and high, based on the distribution of average values in the composite negative emotionality variable across 18 months ($M = 2.74$, $SD = 0.77$) and 36 months ($M = 2.79$, $SD = 0.77$). The average emotionality scores below the 33rd percentile were classified as "low" ($M = 1.99$, $SD = 0.35$, $n = 23.647$), those between the 33rd and 66th percentiles as "moderate" ($M = 2.67$, $SD = 0.12$, $n = 18.568$) and those above the 66th percentile as "high"($M = 3.40$, $SD = 0.41$, $n = 31.319$). Mean level comparisons suggest that negative emotionality scores significantly increase as the group level increases from low to high. Although we mainly concentrated on children who were rated in the upper and lower thirds of the temperament measure (i.e., those with the highest and lowest levels of negative emotionality), we retained and reported the results with moderate negative emotionality group included.

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Covariates

The Medical Birth Registry supplies information on birth weight ("0 = ≥ 2500 grams", "1 = < 2500 grams"), year of birth, and number of children and adults in the family in the first three years. The national registry data supplies information about Western and non-Western immigrant background ("0 = No", "1 = Yes"), maternal education (years), and mothers' age at birth (years). These family and child-related demographics served as control variables in all stages of the model test because these factors may confound the association between family income and problem behaviors.

Child's gender ("0 = Girl", "1 = Boy") was also included in all stages of the model test as a covariate. The FSM is generally considered to be invariant across child gender. However, some researchers suggest considering child gender differences in response to economic hardship and family stressors (e.g., Conger et al., 1994), with inconsistent results concerning whether child gender actually moderates the impact of economic hardship (e.g., Conger et al., 2002; Wadsworth et al., 2013). Therefore, we tested the moderating role of child gender on the direct and indirect pathways of the FSM. The results showed that the indirect paths from family income via family stress to externalizing problems are stronger for boys than girls, while the opposite is true concerning internalizing problems. We presented the results for gender differences in the supplementary material (see Table 1S).

Table 1. Descriptive statistics

Variables	Missing %	Mean	*SD*	Min	Max
Family characteristics					
Mother's age at birth (years)	0.41	30.61	4.55	20	40
Maternal education (years)	5.63	13.51	2.87	0	23
Number of adults in the family	0.46	1.86	0.26		
Number of kids in the family	0.46	1.79	0.62		
Non-western immigrant background (%)	0.41	4.73			
Western immigrant background (%)	0.41	9.64			
Child characteristics					
Gender – boy (%)	0.0	51.3			
Low birth weight < 2500 gr (%)	0.06	4.45			
Birth cohort (%)					
2004	0.41	13.94			
2005	0.41	15.89			
2006	0.41	17.85			
2007	0.41	16.53			
2008	0.41	13.77			

Statistical analysis

We estimated a latent FSM using structural equation modeling (SEM) in MPlus version 8.8 (Muthén & Muthén, 1998–2012). To account for the incomplete responses on the observed variables, all SEM analyses used full information maximum likelihood estimation with robust standard errors (i.e., maximum likelihood robust; Satorra & Bentler, 2010). Robust maximum likelihood is more resistant to data non-normality compared to conventional estimators (Maydeu-Olivares, 2017) and produces unbiased parameter estimates based on all the data available to study variables under the assumption of missing at random or missing completely at random (Enders & Bandalos, 2001). Regarding the MoBa data, previous studies documented that attrition rate does not cause biased estimates of the associations (e.g., Gustavson et al., 2012; Nilsen et al., 2009). Yet, some found mean differences between the early and follow-up samples, albeit effect size was very small to argue for attrition bias (e.g., Bøe et al., 2016).

Following the suggestions by McDonald and Ho (2002), we employed sequential analysis to test the FSM, examining measurement models (i.e., confirmatory factor analyses) first and then the structural model that combines measurement and path models. First, taking advantage of having item-based data on each measured scale, we estimated latent variables from a set of measured items for each study variable to account for measurement error and ensure unidimensionality. The latent variable of family stress was measured using a second-order measurement model, reflecting the commonalities between three lower-order factors: maternal distress, relationship satisfaction, and parental locus of control. Child problem behaviors were measured using a two-factor measurement model.

Second, we have tested our structural model, which includes direct, indirect, and moderating pathways among study variables. We considered the following fit indices to assess to what extent the proposed models fit the data well: comparative fit index (CFI), Tucker-Lewis Information (TLI), root-mean-square error of approximation (RMSEA), and the standardized root mean squared residual (SRMR). The cutoff value close to 0.90 for CFI and TLI, 0.06 for RMSEA, and 0.08 for SRMR indicates a good model fit (Hu & Bentler, 1999). The χ^2 goodness-of-fit statistics were disregarded since it produces a lack of acceptable fit for models with large sample sizes. However, using a combination of indices provides a more comprehensive assessment of how well the model fits the data (McNeish et al., 2018). The full set of covariates was included in all analyses.

Finally, the follow-up multigroup analysis was conducted on each FSM path to inspect significant differences in path coefficients across emotionality groups. Initially, we compared our structural model, where each path coefficient is constrained to be equal across emotionality groups, with a baseline model without imposing equality constraints. Multigroup analysis with three emotionality groups produced three possible pairwise group comparisons (low vs medium; medium vs. high; low vs. high) for each specified path within our hypothesized model. We have complemented the results obtained from the multigroup analysis through additional sensitivity analyses. These sensitivity analyses included the application of a linear moderated regression using a continuous negative emotionality measure and an extension of the multigroup analysis by increasing the number of emotionality categories (four emotionality groups) to probe more detailed group differences. The results of the sensitivity checks are presented at the end of the Results section.

Results

Descriptive statistics

Descriptive statistics for family and child-related characteristics are presented in Table 1. Additional descriptives, including a correlation table of all study variables and gender differences of all study variables are presented in the supplementary material (see Table 2S and 3S). Of particular relevance for our study is our measure of family income. Initial data screening supported a non-linear

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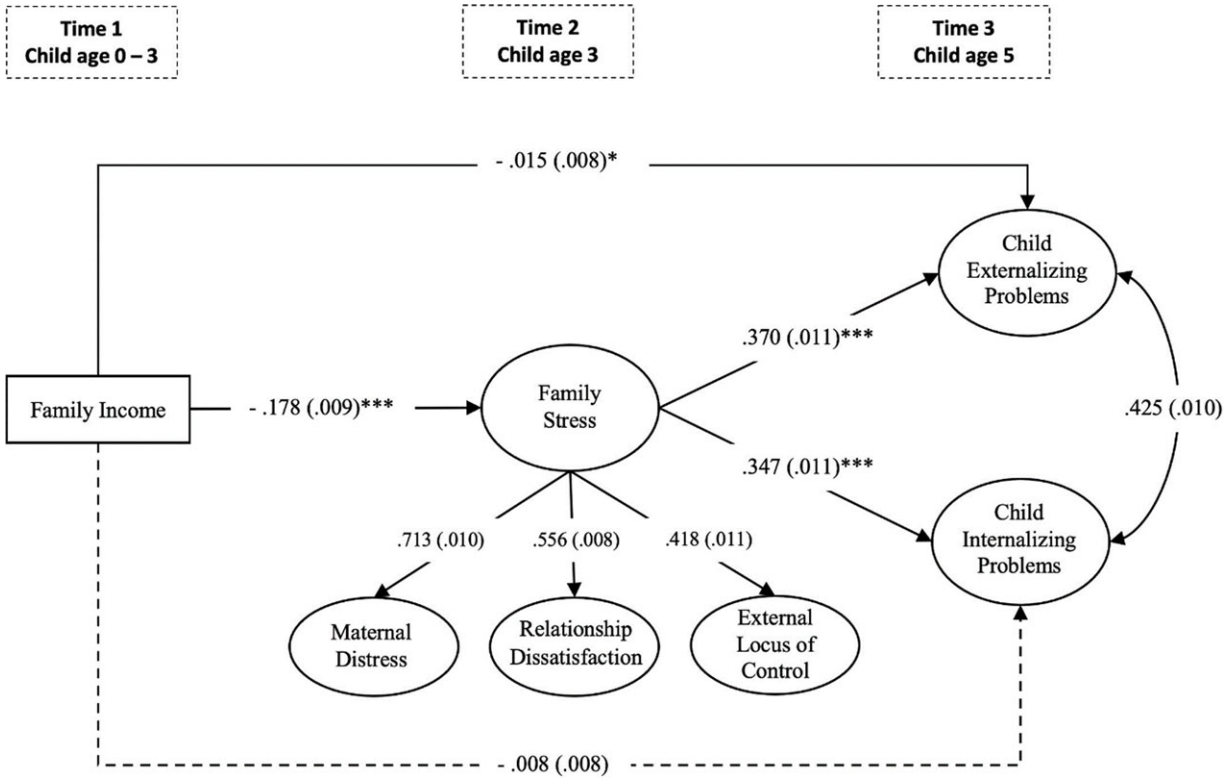

Figure 2. Hypothesized structural SEM model; family income in the first three years of life impacts on child externalizing and internalizing problems at age 5 mediated through family-related processes observed at age 3. *Note*. Adjusted for birth weight, year of birth, number of children and adults in the family, child's gender, western and non-western immigrant background, maternal education, and mothers' age at birth. Measurement models were not included in the model for reasons of brevity. Standardized coefficients (standard errors in parentheses) are presented in the figure. Solid lines indicate statistically significant path coefficients. A dashed line indicates nonsignificant association. * $p = .05$. *** $p < .001$.

association between family income and behavior problems (both externalizing and internalizing). Thus, we used log-transformed family income in our primary models providing semi-log estimates of the association between income and the other variables. On the linear income scale, the 1st percentile was app. NOK 223,000 (app. USD 21,600), the 5th NOK 316,000 (app. USD 30,600), and the 10th app. NOK 384,000 (app. USD 37,000). On the log scale, comparable values were 1.04 (1st percentile), 1.32 (5th percentile), and 1.49 (10th percentile). Our standardized estimates below show the difference in *behavioral outcomes* as a function of one standard deviation difference in the log of income (i.e., 0.33). This difference is equivalent to, for example, the app. difference between the 1st and 5th percentile, the 5th and the 15th percentile, or the 10th and the 30th percentile. Of the sample, the 25th percentile was about NOK 520,000 (app. USD 50,000), while income at the 75th percentile was app. NOK 800,000 (app. USD 77,600).

The measurement models

Multiple indicators were observed for all hypothesized latent constructs: eight for maternal distress, five for relationship satisfaction, five for parental locus of control, twelve for child externalizing, and nine for internalizing problem behaviors. The model fit statistics for both measurement models were all in acceptable ranges: for family stress [χ^2 (129) = 11567.736, $p < .001$, RMSEA = .046, SRMR = .043, CFI/TLI = .945/.935] and for child problem behaviors [χ^2 (185) = 14289.088, $p < .001$, RMSEA = .044, SRMR = .044, CFI/TLI = .867/.849]. All item loadings were significant across latent constructs and there were no cross loadings between latent constructs. The factor loadings and the fit indices for each model are presented in the supplementary material (Figure 1S & 2S). The measurement models are maintained in the analysis of the structural model and multigroup analysis.

The structural model

This section tests our structural model in which we have specified mediational paths between the family income and child's problem behaviors, with a latent variable measuring family stress (mediator), two latent factors serving as child problem behaviors (outcomes), and family income as a manifest construct.

Direct and indirect effects

Our first objective concerned the FSM without moderation by child temperament. In Figure 2, we show a path model with standardized coefficients for model direct effects (e.g., family income to family stress, family stress to child problem behaviors), omitting paths for the measurement models. The structural model yielded acceptable model fit [χ^2 (1194) = 51023.698, $p < .001$, RMSEA = .023, SRMR = .034, CFI/TLI = .876/.870]. Overall, the model was consistent with the FSM. The direct effects of family income on problem behaviors were small and only marginally significant for externalizing problems and nonsignificant for internalizing problems after the influence of family stress was controlled. In total, one standard deviation higher log of family income (e.g., the difference between the 5th and the 15th percentile) was associated with 8.1 and 7% of a standard deviation lower scores on externalizing and internalizing problems, respectively. Of this

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Table 2. Indirect effects from family income to children's behavior problems for low vs. moderate vs. high negative emotionality groups

	Levels of negative emotionality			Group difference		
	Low (*L*)	Moderate (*M*)	High (*H*)	L – M	M – H	L – H
	β (SE)	β (SE)	β (SE)	*p*	*p*	*p*
Direct paths						
$H1_1$: Family income → family stress	−.162 (.016)***	−.158 (.016)***	−.189 (.013)***	.799	.050	.031
$H2_1$: Family stress → externalizing problems	.215 (.015)***	.256 (.018)***	.415 (.019)***	.091	.000	.000
$H2_2$: Family stress → internalizing problems	.170 (.015)***	.235 (.019)***	.472 (.023)***	.014	.000	.000
Family income → externalizing problems	−.001 (.012)	−.018 (.014)	−.035 (.013)***	.372	.270	.034
Family income → internalizing problems	−.009 (.012)	−.019 (.014)*	.003 (.015)	.582	.374	.667
Indirect paths						
$H3_1$: Family income → family stress → externalizing problems	−.035 (.004)***	−.040 (.005)***	−.079 (.006)***	.230	.000	.000
$H3_2$: Family income → family stress → internalizing problems	−.028 (.004)***	−.037 (.005)***	−.089 (.008)***	.067	.000	.000
Total effects (indirect + direct)						
Family income → externalizing problems	−.036 (.012)**	−.058 (.014)***	−.114 (.012)***			
Family income → internalizing problems	−.037 (.012)**	−.056 (.014)***	−.087 (.013)***			

Note. Adjusted for birth weight, year of birth, number of children and adults in the family, child's gender, western and non-western immigrant background, maternal education, and mothers' age at birth. $N_{Low} = 18279$; $N_{Moderate} = 14256$; $N_{High} = 24054$. **$.001 \leq p < .01$. *** $p < .001$.

effect, a substantial proportion, specifically 81% for externalizing problems and 88% for internalizing problems, was attributed to the mediating role of family stress. Family income and family stress together explained approximately 15 and 16% of the variance in externalizing and internalizing problems, respectively.

When we look closer to the direct effects in the first part of the model, we found that one standard deviation higher log of family income was associated with 18% of a standard deviation less family stress. The second part of the model concerns associations between family stress at age three and behavior problems at age 5. Specifically, one standard deviation higher score on family stress was associated with 37 and 35% of a standard deviation higher scores on externalizing and internalizing problems at age 5, respectively.

Moderating effects of negative emotionality: test of risk hypotheses

Our second objective was to examine whether our structural model significantly varied as a function of child emotional reactivity. We performed a multigroup analysis to examine whether the mediation paths varied across groups of children with different levels of negative emotionality. We compared a model in which all parameters are freely estimated to one in which parameters were constrained to be equal across groups. Given the results obtained through the Satorra and Bentler scaled chi-square difference test (Satorra & Bentler, 2010), the constrained model significantly worsened the model fit, indicating that our hypothesized mediational model cannot be treated as equal across temperament groups (TRd = 260.2615; $\Delta df = 10$; $p < .001$). The direct and indirect parameter estimates across three negative emotionality groups are summarized in Table 2.

The results of the multigroup analysis largely align with our expectations for the proposed hypotheses. Family income showed a considerably stronger association with behavior problems among children with higher compared to lower levels of emotional reactivity. One standard deviation higher log of family income (e.g., the difference between the 5th and the 15th percentile) was associated with 3.6% of a standard deviation lower score on externalizing problems among children with lower negative emotionality, compared to 11.4% of a standard deviation among children with higher. For internalizing problems, the difference in association between the lower and higher emotionality groups was slightly smaller, 3.7% of a standard deviation for the group with lower emotional reactivity compared to 8.7% for those with higher levels. To sum up, the total association between family income and externalizing problems was nearly three times larger in children with higher negative emotionality, and almost two times larger for internalizing problems in the same group compared to those with lower negative emotionality.

In the first part of the model, the family stress variable was regressed on family income. The moderated model was consistent with the compounding stress hypothesis, while the differences were small. Specifically, a one standard deviation increase in family income was associated with 19% of a standard deviation lower family stress in the group of children with higher emotional reactivity, compared to about 16% in the group with lower and moderate levels ($H1_2$). The differences were significant at the 5% level when comparing children with lower versus higher levels of emotionality, as well as moderate versus higher levels of emotionality.

In the second part of the model, externalizing and internalizing problems were regressed on income-related family stress. A one standard deviation higher score on family stress was associated with approximately twice as high scores on externalizing ($H2_1$) and internalizing ($H2_2$) problems in the group with higher emotional reactivity compared to those in the lower groups. Overall, this part of the model results were consistent with the diathesis-stress hypothesis.

When we accounted for the indirect effect of family stress, there was no significant direct association between family income and both problem behaviors for children with lower levels of negative emotionality. Consequently, the negative association between family income and problem behaviors was contingent upon the extent to which it contributed to overall family stress. For externalizing problems, the total indirect effects mediated through

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family stress were twice as high for children with higher negative emotionality (products of path coefficient −.079) compared to those with lower (products of path coefficient −.035) and medium levels of emotionality (products of path coefficient −.040) ($H3_1$). Similarly for internalizing problems, the indirect effects were approximately three times higher for children rated as having higher (products of path coefficient −.089) compared to those with lower levels (products of path coefficient −.028), and twice as high for those with medium levels of emotionality (path coefficient −.037) ($H3_2$). The strength of the indirect paths was variant between high and low, as well as high and moderate, levels of emotionality. Overall, the findings supported the double jeopardy hypothesis that the associations between family income and family stress ($H1_1$) and between family stress and behavioral problems ($H2_1$ and $H2_2$) are stronger for children with higher levels of negative emotionality.

A test of alternative model

We have also tested an alternative theoretical model where family income was allowed to directly predict each distinct parent-level mediator (maternal distress, relationship satisfaction, and parental locus of control), and each parent-level mediator was allowed to directly predict child externalizing and internalizing problem behaviors (see Figure 3S). Initial inspection of the model results showed that the pattern of structural associations between the study variables in this re-specified model was consistent with those found in our main model, described above. The details about the alternative path model and the results associated with this model are provided in the supplementary material (see Figure 4S), and are only briefly summarized here.

Overall, the alternative structural model with separate family stressors involved yielded an acceptable model fit, and was partially consistent with the FSM. Compared to our main specification, distinguishing between different mediators reduced the proportion of the total family income effect explained by the mediators. While the latent family stress construct above explained 81% of the association between family income and externalizing problems, the separate parent-level family stressors only explained 30% of the association in the alternative path model. Likewise, the latent family stress construct above explained 88% of the association between family income and internalizing problems, whereas the alternative path model only explained 44% of the association. Nevertheless, the results for the structural model were generally consistent with our primary theoretical model. The multigroup results supported compounding stress, diathesis-stress, and double jeopardy hypotheses. That is, the direct and indirect associations were stronger for children with higher levels of emotionality compared to those with lower levels. Notably, the most substantial group disparities were found when compared the lower and higher bound of the negative emotionality groups (see Table 8S).

Sensitivity analyses

In order to ensure the robustness of our main findings, we run a set of sensitivity analyses. First, due to computational intensity arising from integrating linear interactions with numerous indicators on such a large sample (Sardeshmukh & Vandenberg, 2017), we performed a linear moderated regression analysis to test whether we obtain similar influences when child negative emotionality is treated as a continuous scale. The results showed that child negative emotionality significantly moderated the relationship between lower family income and increased family stress, as well as the association between family stress and problem behaviors, supporting the compounding stress and diathesis-stress hypothesis, respectively (see Table 4S). Thus, our overall conclusion regarding the double jeopardy hypothesis remained unchanged.

The second set of sensitivity analyses examined the moderating role of child negative emotionality on four different levels: low, moderate, high, and very high levels of negative emotionality. The results mirrored those from the original analysis, demonstrating consistent and significant group disparities on the paths connecting family income with family stress, as well as family stress with behavioral problems. Specifically, the strength of the associations reached the strongest in the 'very high' levels of emotionality groups and dropped off at the low and moderate levels, thereby supporting the proposed hypotheses across four emotionality levels (see Table 5S).

The third sensitivity test was performed to test the extent to which family income is associated with child negative emotionality. The results of the regression analysis showed that an increase in family income is associated with a decrease in our emotionality measure ($\beta = -.033$, SE = .016, $p = .036$), as measured by the average of the 18- and 36-month measures (see Table 6S). However, this association is modest and driven by the relationship between family income and negative emotionality at 36 months; while family income is associated with the 36-month measure of negative emotionality ($\beta = -.066$, SE = .018, $p < .001$), it is not related to the 18-month measure ($\beta = -.009$, SE = .016, $p = .575$). These results align with the previous evidence suggesting a limited correlation between income and child negative emotionality (De France et al., 2023; Dougherty et al., 2010).

Nevertheless, since family income is associated with the moderator in our multigroup analyses, the average of emotionality across 18 and 36 months (i.e. Table 6S), we conducted a sensitivity check to confirm that our results remain consistent when measuring negative emotionality at 18 months only. The results demonstrated that using the 18-month emotionality measure as a moderator provides similar results as those obtained with the average emotionality measure (see Table 7S).

Discussion

In the present study, we examined a longitudinal FSM in a large-population-based sample of Norwegian children, from childbirth through age five. We provide a key extension to the current literature by allowing associations between family income, income-related stress experienced by parents, and child well-being to vary as a function of child negative emotionality. Three types of potential moderating effects of child negative emotionality were examined: (1) compounding stress, (2) diathesis-stress, and (3) double jeopardy. On average, associations were consistent with the family stress model whereby low family income predicted worse parent outcomes and, in turn, worse child outcomes. Importantly, however, we also found robust evidence of double jeopardy for children with negative emotionality: child negative emotionality appeared to compound the harm of low family income on family stress *and* compound the harm of family stress on children's behavioral outcomes.

Replication of the family stress model

Our first objective was to test the FSM in Norway. In our sample, the results demonstrated that family stress at the parental level—greater distress, relationship dissatisfaction, and negative parenting styles—mediated the association between income and behavior problems, which aligns with previous research in Nordic samples

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(Bøe et al., 2014, 2018 in Norway; Solantaus et al., 2004 in Finland), as well as in other populations (Conger et al., 1994; Conger & Conger, 2002; Yeung et al., 2002). The growing evidence supporting the FSM in Norway demonstrate that a well-structured welfare system, with various programs and policies such as unemployment, sickness, and family-related benefits, do not fully buffer families from potential economic stress.

However, although our study adds to the growing evidence of the importance of the FSM in a non-US setting, the associations in our Norwegian sample are smaller than the corresponding associations in typical US studies. For example, income explained about 16% and 15% of the variance in externalizing and internalizing behavior problems, respectively, in our analyses, while explaining about 22% of the variance in behavior problems in one US study (Linver et al., 2002). Notably, however, comparing coefficients across studies and contexts is challenging because of differences in measures and modeling choices. For example, our data provides a detailed measure of family income, as we have utilized tax records that capture the exact amount of money within each household, but lacked measures for subjective indicators of family economic status such as perceived material hardship (e.g., Gershoff et al., 2007; Yeung et al., 2002). To the extent that these differences in effect sizes may reflect contextual differences between Norway and the US rather than measurement and modeling differences, two factors seem particularly relevant to consider.

First, the income distribution is much more compressed in Norway than in the US. Hence, the variability in income is smaller. Because the raw differences between family incomes at high and low levels are modest (e.g., incomes at the 75th percentile are 1.5 times higher than the 25th percentile), differences across the income spectrum in both family stress and behavior problems should be expected to be smaller than in countries with a more dispersed income distribution (assuming a similar causal effect of income on these outcomes).

Second, Norwegian families with low income may experience economic stress differently in comparison to their counterparts in the United States. Compared to the US, Norway has a more extensive social safety net. Moreover, Norway has a more favorable family-work balance and offers more equal opportunities for both parents to take part in their children's upbringing. For example, families in Norway receive paid parental leave and benefit from universal subsidized early childcare services, as soon as their children reach one year of age. This wider family-friendly socio-political context may make the families more resilient to combat the potential risks of income-related family stress, thus buffering the income-related adverse effects on families. Yet, even if Norway's extensive social support does contribute to smaller income or family stress effects, our study underscores the remaining meaningful association between income-related family stress processes and child behavioral adjustment. Norwegian families still suffer from increased stress due to low income and material deprivation, which in turn appears to have negative effects on children's well-being. Comparative studies in other countries with different sociopolitical and economic contexts might help further uncover specific cultural and/or socio-economic factors at play.

Most previous FSM studies have primarily focused on either middle childhood (Murry et al., 2002) or adolescence (Conger et al., 1994; Elder et al., 1995). Moreover, previous studies conducted in Nordic countries covered only the samples of adolescents (e.g., Solantaus et al., 2004). The present study fills this research gap by focusing on a sensitive time frame (from birth to age five) to examine the impact of family income on young children during a period in which children are particularly vulnerable to negative environmental influences (McFarland, 2017). We found that family dysfunction resulting from economic stress, including negative parenting styles, greater distress, and marital dissatisfaction, was found to be significantly associated with maladaptive behaviors in young children. Beyond finding additional support for the FSM in a progressive sociopolitical context, our findings therefore indicate that the harmful consequences of economic stress on families and children may be enduring and begin as early as infancy (e.g., Farah et al., 2006; Noble et al., 2012).

Double jeopardy effects of child negative emotionality in low family income contexts

For years, studies have underscored the bidirectional nature of parent-child interactions, with parents influencing not only their children's developmental processes but also children playing an active role in shaping their environment (Davidov et al., 2015; Pettit & Arsiwalla, 2008). In a similar vein, around a decade ago, FSM researchers propounded to bring the *child effect* back into the discussion of linking family income with child development (e.g., Conger et al., 2010; Donnellan et al., 2009). In fact, they suggested that child characteristics may moderate the effects of the key pathways stemming from the FSM, leading to heterogeneity in child developmental outcomes when combined with economic strain. This study contributes to the FSM research by identifying child negative emotionality as a specific moderator that significantly modifies the pathways between family stress and child development, thereby enhancing our understanding of how these factors interrelate. In doing so, our model provides an important theoretical foundation for further research on this association.

The present study reviews the one-size-fits-all approach in testing the FSM, where all pathways are equally important for all parents and children, and suggests that incorporating the role of unique child characteristics may enhance the predictive power of the model. Notably, our multigroup FSM model showed variability across lower and higher emotionality groups in the proposed pathways in terms of both coefficient magnitude and statistical significance, suggesting that differential impacts may exist for children with varying levels of negative emotionality. This highlights that a standardized approach to testing the FSM may fail to capture the nuanced effects of economic adversity on children.

Our results indicate that the FSM is moderated in two ways. First, in support of the *compounding stress* hypothesis, the association between family income and family stress was larger when the child had a higher level of negative emotionality. This finding indicates that due to the compounded stress of having a reactive child, parents in these families are experiencing a range of emotional and psychological challenges that can affect overall family well-being. Thus, it is important to recognize the significant impact of environmental as well as individual factors on family well-being.

Second, our results supported the *diathesis-stress* hypothesis, as children with higher negative emotionality showed more problem behaviors when family stressors were elevated. This finding is consistent with prior research indicating that children who experience higher levels of negative emotions are particularly vulnerable to the harmful effects of negative environmental factors (for an overview, see Bates & Pettit, 2015; Belsky & Pluess, 2009). Highly emotional children may be particularly sensitive to negative emotional cues in their intimate environment, or they may be less able to regulate their emotions and behaviors in the face of

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emotional intensity (Eisenberg et al., 1994). Moreover, we know that parent-child interactions offer children the best fitting context to reflect upon how they can embrace and regulate the physical and emotional demands (Steinberg & Morris, 2001). Family context, in that sense, provides a unique and nurturing setting to support children's emotional and social development. Highly emotional children, like any other children, learn about emotional as well as behavioral regulation through modeling the strategies from their parents (Eisenberg & Spinrad, 2004). When parents are already experiencing income-related psychological strain, their highly emotional child seems to face challenges in engaging in effective regulatory strategies.

Together, the existence of both compounding stress and diathesis-stress supports our *double jeopardy* hypothesis. Consistent with the double jeopardy hypothesis, some studies have found that children with distinct temperaments are at a higher risk of delinquency and antisocial behavior in poor neighborhood contexts (Colder et al., 2006; Lynam et al., 2000), and that the impact of parental income on behavior problems varies by a child's negative emotionality (Bøe et al., 2016). These findings support the notion that multiple difficulties may cumulate across contexts, creating a pile of adversities, which can be overwhelming for an entire family (MacKenzie et al., 2011; Masten & Cicchetti, 2016). In line with this, our analysis revealed that parent-level family stress mediates the relationship between family income and behavioral problems to a greater extent for families with highly emotional children. This finding suggests that children with higher negative emotionality and their parents experience a more stressful family environment compared to their lower emotionality peers. Yet, future work is needed to confirm and validate these findings in diverse samples, with different risk factors, and with a more causal design.

Aligned with considering the children as influential agents in a family context (Scarr & McCartney, 1983), another crucial aspect of our findings is to consider the potential for transactional developmental processes. The transactional model of development is summarized as the role of bidirectional influences between child and environment (Lewis, 2000; Sameroff, 2009), highlighting that child characteristics can shape parenting behaviors and family dynamics, while also being influenced by them. By recognizing the transactional nature of child development, researchers can gain a more nuanced understanding of the intricacies of child-environment transactions. Yet, we acknowledge that our study design does not fully disentangle bidirectionality as it unfolded between parents and children; given the complexity of estimating moderation and limits to the timing of assessments, we focused our modeling primarily on links between parent and child processes at a unidirectional level. Moreover, our data pertain only to static micro processes that occur within parent-child interactions in the context of how low income stress shapes development.

Nevertheless, our models provide an extension to the cumulative knowledge in theoretically informed ways. Some reassurance of this can be seen in our alternative modeling approaches in which we captured cross-lagged associations between parent variables and temperament; the estimated effects of our parent variables on temperament were not strong enough to discount the contribution of temperament as a moderator, even if negative emotionality were partly determined by earlier parenting. Yet, we recommend future studies employing more time-intensive and diverse measures that can better account for moment-to-moment transactions that shape a child's developmental trajectory.

Strengths & limitations

The present study broadens the theoretical scope of FSM by introducing child emotionality as a moderator of economic stress. The empirical SEM analyses draw upon a large-scale health survey linked with high-quality register data. However, there are also some limitations of the analysis. Our study focused on examining the impact of various factors on the family environment, particularly income, relationship dissatisfaction, and maternal distress. These variables align directly with classic family stress studies, as they have been widely recognized as influential factors in understanding the dynamics within families (see Masarik & Conger, 2017; Stack et al., 2015 for an overview). Moreover, we were able to include an important cognitive aspect of child-rearing practices, parental locus of control, which has previously been shown to relate both to parental stress levels and parenting behaviors, including discipline practices and consistency (Kokkinos & Panayiotou, 2007; Moreland et al., 2016).

Related to this, there is a tradeoff of using secondary data, which may penalize the scope of measures that could be relevant. For example, all measures used in the current study, except for family income, relied on maternal reports, which may increase the likelihood of common method variance bias (Fiske, 1982). Future work should embrace methodologically independent techniques to measure study variables, such as using observation for parenting practices and teacher reports for problem behaviors. Notwithstanding this limitation, the utilization of a large-scale data allowed us to create unobserved latent constructs using measured indicators for family stress and child outcomes. This enabled a more precise estimation of key FSM measures and removed potential measurement error (Adjerid & Kelley, 2018), as has been done in previous research on FSM (e.g., Neppl et al., 2016; Simons et al., 2016; Sosu & Schmidt, 2017).

Like nearly all studies on the FSM, we are limited in our ability to account for confounders that may partly explain the association between family income and behavior problems, such as genetics (e.g., Rowe, & Rodgers, 1997). Although we control for some important confounders, such as parental education, our ability to draw conclusions on cause and effect is limited because of unobserved parent- or child-related factors. Future research should employ more rigorous causal designs to further investigate this relationship and minimize any potential confounding effects.

Lastly, differential selection into MoBa may limit our ability to generalize the findings across samples with different characteristics in Norway. The MoBa sample is selective, comprising an underrepresentation of parents with lower education, lower income, and children from immigrant backgrounds. Earlier research has suggested that the under/over-representation of specific child and family characteristics in the MoBa sample may not necessarily invalidate the robustness of the proposed associations for MoBa participants (Nilsen et al., 2009; Zachrisson et al., 2023). However, we cannot rule out the possibility of underestimating the impact of family income and family stressors on child developmental outcomes.

Conclusion

For decades, FSM researchers have called for bringing *the child* back when examining the connection between family income and child development. In line with this, our current study investigates the role of the child's negative emotionality in moderating the impact of family processes on child externalizing and internalizing problems. We explore whether this moderation occurs due to

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compounding stress, diathesis-stress, or a double jeopardy effect. We find that the associations between family income and family processes *and* the subsequent association between family processes and child developmental outcomes were stronger for children with higher negative emotionality than those with lower emotionality. Our results suggest that low family income is a heterogenous risk factor for behavior problems, and that the family processes manifesting this risk are in part due to the child's role in shaping the family environment. The findings of the present study suggest that FSM researchers should consider the unique characteristics of individual children, thus acknowledging potential diversity within the key pathways of the FSM.

Taking into account the cumulative risk of high negative emotionality and family economic difficulties can provide valuable insights into family processes in a larger context, as well as inspire potential interventions to address these factors. As children with higher negative emotionality need additional attention and positive parenting to develop their emotion-regulatory capacities and skills (Albers et al., 2016; Jaffe et al., 2010), family mechanisms may be valuable intervention targets to protect reactive children from being highly influenced by early adversities (see Traub & Boynton-Jarrett, 2017). This may be because the challenges faced by parents disrupt both pieces of the double jeopardy phenomenon. In that sense, interventions directed towards supporting parental psychological distress through education or social support may contribute to improving overall family well-being and fostering positive child development outcomes (see Garbarino et al., 2002 for detailed review).

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S0954579424000373

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Competing interests. The author(s) declare none.

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