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The Subjective Cost of Young Children: A European Comparison

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Abstract
Understanding child-related costs is crucial given their impact on fertility and labour supply decisions. We explore the subjective cost of young children in Europe by analysing the effect of child births on parents' self-reported ability to make ends meet, and link it to changes in objective economic well-being such as income, benefits, and employment. The study is based on EU-SILC longitudinal data for 30 European countries from 2004 to 2019, enabling comparisons between country groups of different welfare regimes. Results show that newborns decrease subjective economic well-being in all regions, yet with economies of scale for the number of children. Mediation analyses reveal that the substantial labour income losses of mothers (indirect costs) explain only a small part of subjective child costs. In the first year after birth, these losses are mostly compensated for via public transfers or increased labour income of fathers, except in regions where women take extensive parental leave. This suggests that the initial drop in subjective economic well-being after childbirth is caused by increased expenses due to the birth of a child (direct costs) and other drivers such as stress that are reflected in the self-reported indicator.

Keywords Cost of children · Subjective economic well-being · European welfare states · Mediation analysis · EU-SILC

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1 Introduction

The cost of raising children affects fertility and labour supply decisions, which is why understanding child-related costs is crucial for both policy-makers and potential parents. Most European governments spend a substantial share of their resources on reducing the cost of children for families. On average, public expenditure on families in the EU was equivalent to 2.3 per cent of GDP in 2017 (Eurostat, 2020). But are these policies effectively compensating the cost of raising children? How strong is the impact of children on household finances, and how do parents perceive their economic well-being before and after having a child? These are important questions that governments are confronted with when configuring family policies.

This paper analyses child-related costs based on parents' self-reported ability to make ends meet, which is referred to as subjective economic well-being (SEW). We interpret changes in SEW due to the arrival of a child as the total subjective cost of children that a household must bear. To better interpret and evaluate our results, we further explore how changes in SEW are linked to changes in objective economic well-being (OEW) involving income, benefits, and employment.

The total cost of children consists of direct and indirect costs that are—partly—compensated by benefits. Direct costs reflect the higher household expenses due to a newborn child. Parents have to spend more on goods such as clothing, food, or housing once their baby is born. In addition, indirect costs occur, for example, when parents endure income losses associated with the birth. These costs vary by country and are larger in regions where mothers take longer parental leave. Hence, the structure of child costs is expected to vary across welfare regimes due to different foci on family policies and benefits, but also due to differences in norms, institutions and macroeconomic conditions.

Child-related costs have received continuous attention over the last decades, but little research has been based on self-reported information. To estimate the costs of (additional) children, the economic literature often mobilises equivalence scales, in order to adjust the income of households of different sizes and compositions (see, for example, Muellbauer (1977); Pollak & Wales (1979); Bourguignon (1999)). However, economists disagree about the empirical methods for estimating these equivalence scales, and so far there has been no consensus on which equivalence scale should be applied (see, for example, Dudel et al. (2021), for an overview). In addition, equivalence scales focus on OEW only. This leaves several factors unaccounted for, which may affect the decision to have a child. Besides purely monetary costs incurred around childbirth, one might think of time costs and the anticipation of eventual direct and indirect costs incurred over the long-term, which contribute to the perceived costs of children. The arrival of a child might, for example, come along with an increased feeling of financial insecurity or vulnerability, which can have a direct impact on consumer behaviour—even in cases where the immediate monetary child costs are rather small. It is therefore worthwhile to go beyond monetary costs and to apply a more holistic approach, which considers a broader spectrum of subjectively perceived costs. Such analyses are rare, yet one exception is by Buddelmeyer et al. (2018) who analyse the cost of children based on self-reported financial stress of parents in Australia and Germany. To the best of our knowledge, however, no one has conducted a similar analysis for all of Europe, linking differences in child-related direct and indirect costs to differences

in family-related policies and state support. Bishop et al. (2014) have estimated the marginal cost of a child in the Eurozone based on subjective data, but did not discuss direct or indirect costs.

We analyse the subjective costs of newborns for 30 European countries separated into six welfare regime groups and link it to objectively measurable indicators of economic well-being. This allows us to: (1) analyse the impact of children on economic well-being; (2) disentangle direct and indirect costs of children; (3) evaluate how governments and households compensate for these costs; and (4) explore the potential of self-reported economic well-being as a complement or even substitute to monetary child cost indicators. In addition to addressing family policies, our analysis thus contributes to the recently growing literature on general satisfaction, of which economic well-being is an important domain (Sirgy, 2017; Stanca, 2012; Van Praag et al., 2003). Longitudinal data from the European Union Statistics on Income and Living Conditions (EU-SILC) survey for almost 128,000 households from 30 countries are used. This extensive dataset is ex-ante harmonised and consequently provides ideal conditions for a comparative study covering the large majority of European countries. We combine panel regression-based mediation analyses with objective and subjective information on economic well-being, thereby providing a novel perspective to the analysis of child-related costs and a critical assessment of SEW. A range of robustness tests is conducted to yield reliable results.

2 Background and Theoretical Framework

2.1 Drivers of Economic Well-Being Related to Childbirth

We interpret the effect of children on SEW as the subjective cost of children borne by households.[1] The total cost of children is composed of direct costs and indirect costs, minus any family-related benefits that a household receives. Due to the subjective nature of this measure, other dimensions of well-being such as stress could also impact the subjective cost of children. The various dimensions are explained in more detail below.

2.1.1 Direct Cost

Direct costs of children reflect increased needs occasioned by the arrival of a child. These can be actual expenses as well as changes in parents' consumption behaviour after their babies are born. Examples for expenses are non-durable consumer goods such as diapers as well as durables like a bigger car or a larger apartment. If couples start buying expensive take-away food instead of cooking on a budget due to time constraints, this can also be considered an increase in direct costs (Letablier et al., 2009).[2]

[1] Public costs of children can also be separated into direct costs such as schooling, and indirect costs such as unused human capital. This article, however, only discusses costs borne by households and individuals.

[2] Furthermore, time costs, if valued in monetary terms, contribute to the direct costs of children. Yet they are not included in this analysis due to data restrictions.

2.1.2 Indirect Cost

Indirect costs of children are defined as opportunity costs, i.e. forgone labour income due to the birth of a child (Joshi, 1990; Kravdal, 1992). They can be separated into short-term indirect costs and long-term indirect costs. Short-term indirect costs are the immediate labour income loss around the birth of a child due to a reduction in working hours, usually during a period of maternity/paternity leave and/or parental leave. Long-term indirect costs include, for example, lower pension entitlements as well as the child-induced loss of professional networks and human capital caused by career breaks and reduced working hours (Letablier et al., 2009). Indirect costs of children are not gender-neutral and child penalties in earnings are generally higher for mothers than for fathers (Kleven et al., 2019), resulting in asymmetries such as the gender wage gap (Weichselbaumer & Winter-Ebmer, 2005) or the female pension gap (Bettio et al., 2013; Hammer et al., 2020). Overall, mothers earn less than comparable childless women (Cukrowska-Torzewska & Matysiak, 2018).

2.1.3 Benefits

Benefits compensate for the direct and indirect costs of children. They consist of in-kind and in-cash transfers, including tax deductions that target families. In the short-term, maternity/paternity/parental leave benefits or other wage loss compensations are particularly relevant. Most European countries follow a common set of goals when implementing family policies, namely the reduction of family poverty and inequality, the reconciliation of family and work, gender equality and the support of children's well-being. Along with these policy objectives it is hoped to provide favourable conditions which allow individuals to have their desired number of children, so fertility objectives can be seen as an additional or overarching goal (Gauthier, 2007; Kalwij, 2010; Thévenon, 2008; Thévenon & Luci, 2012). However, European governments vary in how they approach these objectives, depending on prevalent norms, institutions and the macroeconomic context of the respective countries. Consequently, the magnitude and structure of child-related costs vary depending on the region. Moreover, policies might differ in their effectiveness, depending on the region, time and their configuration. For example, evidence on the effect of family-related policies on fertility varies by the country observed and research methods applied (Björklund, 2006; Kalwij, 2010; Riphahn & Wiynck, 2017).

2.1.4 Other Dimensions of Well-Being

Finally, SEW might also be driven by other aspects of well-being, as children affect their parents' general well-being, which in turn might reflect on their SEW. However, evidence on the direction of this effect is inconclusive (Riederer, 2018). Most findings indicate that parenthood decreases life satisfaction (see, for example, Moglie et al. (2018); Stanca (2012)), yet not all (see, for example, Baranowska & Matysiak (2011). While satisfied people are more likely to have children in the first place (Cetre et al., 2016), the birth-related drop in parents' life satisfaction is associated with a decrease in fertility expectations (Luppi & Mencarini, 2018). Since SEW is an important domain of general well-being, these patterns are presumably intertwined. Lower financial satisfaction of parents seems to be an important explanation for their lower life satisfaction as compared

Table 1 Country groups based on family-related policies, norms, institutions, and macroeconomic indicators

Region	Countries
Nordic	Denmark, Finland, Iceland, Norway, Sweden
Western	Belgium, France, Netherlands
German-speaking	Austria, Switzerland
Liberal	Ireland, UK
Southern	Cyprus, Greece, Spain, Italy, Malta, Portugal
CEE	Bulgaria, Czechia, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Serbia, Slovenia, Slovakia

to non-parents (Stanca, 2012). Moreover, births do increase parents' time and financial stress (Buddelmeyer et al., 2018). While we acknowledge that general well-being might be an important driver of SEW, analysing these interdependencies directly is beyond the scope of this paper. We do, however, discuss the implications of potential additional factors that affect SEW along with the results.

2.2 European Welfare Regimes: Relevant Aspects for Child-Related Costs

European countries can be grouped based on how they approach family-related policies and on their macroeconomic conditions. In this paper, countries are grouped based on dimensions that are relevant for child-related costs. In particular, the following aspects were considered: the magnitude and configuration of public spendings on families (especially policies related to child care provision and maternity/paternity/parental leave); the employment patterns of parents, work–family reconciliation, fertility patterns, attitudes towards the division of labour and relevant macroeconomic dimensions such as unemployment rates. Based on these criteria, six country groups can be differentiated. These groups are: (i) Nordic countries, (ii) Western European countries, (iii) German-speaking countries, (iv) Liberal countries, (v) Southern European countries, (vi) and Central and Eastern European (CEE) countries (see Table 1 for the specific grouping). In the fertility-related literature, European countries are often separated into four welfare regimes only, combining Western, German-speaking, and Liberal countries into one group (see, for example, D'Albis et al. (2017)). However, these three regions are treated separately in the present analysis, given their substantial differences in the magnitude and configuration of public spendings on families, their patterns in parental employment, as well as their fertility patterns (Matysiak & Węziak-Białowolska, 2016; OECD, 2018; Thévenon, 2011). Grouping countries will always result in a simplification, in particular since some countries might be equal in one dimension but different in others. Yet combining similar countries has two main advantages. First, an assessable set of regions allows for straightforward conclusions to be drawn, while analysing 30 countries separately would soon become incomprehensible. Second, insufficient sample sizes of small countries can be overcome by combining them with other, similar countries.

The following paragraphs outline relevant configurations of the six welfare regimes that are considered in this analysis. The Nordic countries form a relatively homogeneous group. Spendings on maternity and parental leave per child in per cent of GDP per capita are the highest in Europe. Along with this they have long parental leaves, also specifically for fathers (Thévenon, 2008). Nevertheless, after taking parental leave, the

large majority of women in our sample re-enter the labour market full time. This is possible due to the wide coverage of public childcare, resulting in the highest share of children under 2 benefiting from formal care (OECD, 2018; Thévenon, 2008). Furthermore, women do not spend as much time on unpaid work as in other European regions (OECD, 2018) and the overall opinion on the division of labour seems less traditional (Matysiak & Węziak-Białowolska, 2016). For example, the Nordic countries have a high share of individuals agreeing with the statement that "paid leave should be shared equally between mothers and fathers". Fertility rates in 2015 were among the highest in the EU and OECD countries (OECD, 2018).

The group of Western countries consists of France, Belgium and the Netherlands. In contrast to the Nordic countries, weeks of paid parental leave granted are below European average there. On average, Western mothers re-enter the labour market rather quickly after giving birth and are also the most active in the labour market in our sample. However, while France and Belgium have high rates of mothers in full-time employment, the Netherlands have one of the highest shares of women in part-time employment in Europe. The quick return to the labour market is facilitated by the substantial provision of childcare and pre-school services for children under 2 (OECD, 2018). Overall, public spendings on families in per cent of GDP are above OECD average (Thévenon & Luci, 2012).

German-speaking countries included in EU-SILC are Austria and Switzerland. Germany did not provide EU-SILC longitudinal data. Compared to the Nordic and Western countries, these countries promote a strong division of labour with little support for combining family and work (Matysiak & Węziak-Białowolska, 2016). Parental leaves are long and generously paid in Austria, but are not so much compensated in Switzerland (OECD, 2018). Most of the women from German-speaking countries in our sample did not re-enter the labour market in the first two years after giving birth. Also, coverage of child care for children under 3 is low, in particular in the countryside. Public spendings on families in per cent of GDP are still above OECD average (Thévenon & Luci, 2012), but the focus is very much on high non-means tested cash benefits. Fertility rates are well below OECD and EU averages (OECD, 2018).

Liberal countries, consisting of Ireland and the UK, are at the very bottom of the list when it comes to policies supporting the reconciliation of work and family (Matysiak & Węziak-Białowolska, 2016). Mothers are encouraged to work, but childcare for children under 3 is mostly private and expensive (Thévenon, 2008). Nevertheless, the share of children under 2 in formal care is above European average (OECD, 2018) and once children grow older, more public childcare is provided for them (Thévenon, 2008). The limited benefits available target low-income families and consist of benefits and tax deductions rather than in-kind support (Thévenon, 2008; Thévenon & Luci, 2012).

Southern Europe was characterised by the lowest total fertility rates in 2015 in our sample (OECD, 2018). Parental leaves can be long, but income replacement rates during leave are extremely low (Thévenon, 2008). In general, public spendings on families in per cent of GDP are below OECD average (Thévenon & Luci, 2012). Along with rigid working hours and a strong employment protection legislation, this makes it hard to combine work and family (Matysiak & Węziak-Białowolska, 2016). Child care facilities are scarce, which in the case of Italy might be linked to the low maternal labour market participation (Del Boca & Vuri, 2007). In addition, the South is by far the region with the highest unemployment in Europe (Eurostat, 2018b). Yet not all population groups are equally affected by the high unemployment. Women between the ages of 16 to 40 who are in a relationship—the sample analysed in this paper—have relatively high employment rates in Southern Europe.

CEE countries are the most heterogeneous group in our sample (Javornik, 2014; Szelewa & Polakowski, 2008), yet creating subcategories is not all that straightforward since some countries are similar in one dimension, but differ by others. One commonality is the large share of mothers not actively participating in the labour market. Also, the rate of young children in formal care is below European average in most CEE countries. Women spend relatively more time on unpaid work than in other regions (OECD, 2018) and gender norms are rather conservative (Matysiak & Węziak-Białowolska, 2016).

3 Data

3.1 Sample Construction

The empirical analysis relies on EU-SILC longitudinal data which was collected yearly from 2004 to 2019 by Eurostat in cooperation with European National Statistical Institutes[3] (Eurostat, 2018c). In total, 31 European countries participated in the survey, 30 of which are considered in this study.[4] An important advantage of EU-SILC data is that it is harmonised across all countries and covers a wide range of economic and demographic information about individuals European Commission (2017). The survey is designed as a rotating panel, with most countries following the participants for a maximum of four years. Exceptionally, France provides a nine-year rotating panel and Norway provides an eight-year one. For comparability reasons and due to panel attrition, only the first four years are considered in these two countries.

We restrict our sample to married and unmarried heterosexual couples living together since the first wave, with women aged 16 to 40 and men aged 16 and older. The age boundaries for women are based on the reproduction behaviour observed in the sample. Additionally, dropping older mothers reduces the risk of wrongly attributed birth orders. The older a woman, the higher the likelihood of a child no longer living in the same household. EU-SILC only captures children who live in their parents' household, which can result in a bias in the number of children, especially for older mothers (Greulich and Dasré 2017). In order to clearly identify OEW and SEW related to the birth of a child, only couples living without additional adults are considered. This way, income from adult children or grand-parents does not distort the income variables. Thus, we do not analyse households with more than two generations or those with children over 16. Once the oldest child turns 16, the household is dropped. After the age of 16, individuals are considered as adults and only included in the sample if they have their own household with a partner, but without additional adults.

[3] The countries fully participating since 2004 are Austria, Belgium, Denmark, Estonia, Greece, Spain, Finland, France, Ireland, Iceland, Italy, Norway, Portugal and Sweden. One year later, Cyprus, Czechia, Hungary, Lithuania, Latvia, the Netherlands, Slovenia, Slovakia and the UK joined. Bulgaria and Malta have been participating since 2006. Romania joined in 2007 but has very few observations for the years 2009 to 2012. Croatia joined in 2010 and Switzerland in 2011. Serbia joined most recently and has provided data since 2013. Denmark, Greece and Norway provided some data for 2003 already, however, we start our analysis in 2004.

[4] Luxembourg is the only participating country not considered in this analysis. Most data files provided by Eurostat had household identification numbers that were attributed to more than one household. These duplicates could be identified by the authors for all countries but Luxembourg.

As the main effect examined here concerns the impact of a newborn child on SEW, the sample is arranged accordingly. Only children who live at least with their mother or their father are considered, i.e. children who live with their grand-parents are excluded. Also, households that have an increase in the number of children due to an older child joining the family are dropped, so that changes in the number of children only occur due to births. Hence, if one partner has a child outside the relationship and that child moves into the couple's household, or if a couple adopts an older child, the household is not considered. Furthermore, couples that lost a child before the age of 16 are dropped. This loss could either be because the child died, or because it moved somewhere else. Also, couples that had more than one child from one wave to the other are dropped, so that changes in SEW can be attributed unambiguously to one child only. These multiple births can either be due to the birth of actual multiples, or because a couple had two children shortly after one another between two waves. Households in which the household respondent changed over time are also dropped to facilitate the application of individual fixed effects, which is explained in more detail in Sect. 4. Finally, only households with consecutive observations are included in the sample. If a household has missing observations within the panel duration period, it is dropped. This leaves a restricted sample of 127,916 households of which 17 per cent participated in all four waves, 15 per cent participated in three consecutive waves, 26 per cent in two consecutive waves, and 42 per cent in one wave only.[5] The latter are not considered in the panel regressions. In total, the sample includes 262,565 observations. The panel structure and its limitations are explained in detail in supplementary material Section A.1.

For the main regression results, we present estimations based on all birth orders. Some of the descriptive results are, however, based on a sub-sample that had their first child, but no additional child, during the observed period. That way the differences in OEW and SEW with and without a child become clearly evident, as previous children have no effect on the trajectories in economic well-being. Yet the sub-sampling results in small numbers of observations for some of the cells, especially in German-speaking and Liberal countries. Moreover, the sub-sample is a very particular group as it only includes couples that will soon have their first child or just had their first child. Thus, for the regression and mediation analyses, a much larger sample is used that also includes couples with no children or more than one child. Moreover, we provide additional analyses by country and income group.

With the dataset presented, only the short-term costs of children can be captured. Couples are followed for a maximum of four years. Even if a child is born at the earliest possible time during the panel duration period, namely between the first and second wave, only a maximum of three values of SEW after that birth can be observed. When including income in the analysis, we have information for a maximum of only three years, since the income of a specific period is always only surveyed in the next wave (more details on this shift is again provided in the supplementary material Section A.1). Consequently, long-term indirect costs such as lower pension entitlements are beyond the scope of this paper and indirect costs might appear much lower than is actually the case. Furthermore, potential adaptations to the costs of children cannot be observed. So called set-point theories state that changes in well-being only occur temporarily. In the long run, individuals adapt to new circumstances and return to their baseline level of well-being (Clark et al., 2004,

[5] Observations that reported negative labour income from employment or negative family-related financial support are also dropped. One Spanish household is excluded because it reported close to €100,000 of family-related benefits per year.

2008). For example, Myrskylä and Margolis (2014) show that in Germany and the UK, happiness of parents increases around the birth of their first child, but returns to before-birth levels afterwards. These findings are likely to be relevant for SEW too, but cannot be captured with EU-SILC data.

3.2 Main Measures

3.2.1 Subjective Economic Well-Being

SEW is captured via a single survey question. Each household respondent in EU-SILC is asked to evaluate the ability to make ends meet of his or her household. Due to the longitudinal design of the survey, it is possible to analyse SEW of couples before and after the birth of a baby. This way, the impact of children on SEW can be clearly identified. In particular, SEW is operationalised based on the following survey question: "*A household may have different sources of income and more than one household member may contribute to it. Thinking of your household's total income, is your household able to make ends meet, namely, to pay for its usual necessary expenses?*" The question is answered by the household respondent[6] based on a Likert scale with categories: (1) "*with great difficulty*", (2) "*with difficulty*", (3) "*with some difficulty*", (4) "*fairly easily*", (5) "*easily*", and (6) "*very easily*."[7] For most of the analyses, the Likert scale is treated as an interval scale. In robustness analyses, however, we address the ordered nature of the variable. The survey question targets current economic well-being rather than explicitly asking about a particular income period. In general, subjective assessments of financial circumstances seem primarily to reflect day-to-day conditions rather than more distant concerns, such as having enough savings for retirement (Sass et al., 2015). Time-constant between-household differences in reporting of SEW are taken care of in the regression analyses via fixed effects.

3.2.2 Objective Economic Well-Being

OEW is frequently measured via income, wealth, expenses, or employment. In this paper, we focus on dimensions that are relevant for young families and captured in the survey. In particular, we analyse OEW based on household income, the labour income of women and men, family-related benefits, and women's full-time and part-time employment. All

[6] We argue that the evaluation by the household respondent is representative for the SEW of the entire household. The EU-SILC ad hoc module 2013 provides information on subjective economic well-being by individuals, however, based on a slightly different question. Every household member was asked to evaluate their satisfaction with their financial situation on a Likert scale ranging from (0) "*not at all satisfied*" to (10) "*completely satisfied*" (Eurostat 2018a). When comparing the distribution of answers by household respondents with that of other household members, no systematic deviation can be found.

[7] Other studies based on this particular question from the EU-SILC include Cracolici et al. (2012, 2014), Guagnano et al. (2016), Palomäki (2017, 2018) and Buttler (2013). However, none of them focuses on the relationship between SEW and children.

income variables are taken from the subsequent survey wave (lead variables), as EU-SILC asks about income in the previous calendar year (for more details on the income reference period, see supplementary material Section A.1). The variables are provided per annum and adjusted for inflation and differences in purchasing power to make them comparable across countries and time.[8] Since income levels vary, even after controlling for differences in purchasing power, relative changes are also presented in the descriptive analyses. For this purpose, mean regional income is indexed and set to 100 at time -3, which is the earliest information we have before a child is born.

Disposable household income of couples in our sample consists mainly of net labour income and net benefits, but could also include other income components such as net asset income. Any social insurance contributions or taxes on income and wealth are subtracted. Consequently, tax deductions linked to the birth of a child are considered, for example, family tax splitting. If disposable income were to be considered separately for each partner, tax deductions could not be observed. We also provide analyses by income group, for which we create income quartiles for each region depending on the household income in the first wave in which a couple is included.

Labour income of men and women is computed as the respective employee cash or near-cash income with neither taxes nor social contributions being subtracted.[9] It includes income in-cash and in-kind as well as any social insurance contributions paid by the employer. Income from self-employment is added if not missing.[10] For the descriptive analyses, we also investigate the share of women in full-time and part-time employment. It is based on women's self-defined current economic status, where work is defined as any work for pay or profit. Women in maternity leave are considered as employed, while women in parental leave are not.

Theoretically, benefits consist of in-kind and in-cash transfers. With the data provided by EU-SILC, only in-cash transfers can be observed, however. In particular, the benefits considered in this analysis include benefits for bringing up children such as birth grants, parental-leave benefits or child allowances received during the respective income reference period.[11] Furthermore, they include housing allowances and financial assistance to individuals who take care of relatives other than children.[12]

[8] Data on inflation and purchasing power parities are taken from the Eurostat database. Inflation indices are based on "*prc hicp aind*" (Eurostat, 2018d), and purchasing power parities on "*prc ppp ind*" (Eurostat, 2018e). As suggested by Mack and Lange (2015), actual individual consumption is used as a base for purchasing power. For all countries, inflation indices and purchasing power parities from the previous year are used, given that income in the dataset refers to the income reference period, which is the previous year (see supplementary material Section A.1 for details on the panel structure). Since the income reference period of Ireland does not refer to an actual calendar year, taking yearly data on inflation and purchasing power parity is somewhat imprecise for Ireland.

[9] Gross income instead of net income was used because net income is missing for one-third of the observations in EU-SILC.

[10] Observations were dropped if they reported labour income from employment below zero. Labour income from self-employment, however, is allowed to be negative, resulting in below-zero values of labour income.

[11] Maternity and parental-leave benefits are included in financial support, unless payments cannot be separately identified from labour income. This can be the case if: (i) payments made by the employer are in lieu of salaries and wages through a social insurance scheme, or if (ii) payments are made by the employer as a supplement to payments from a social insurance scheme (European Commission, 2017).

[12] Financial assistance to individuals who support relatives other than children cannot be identified separately in the dataset.

3.3 Control Variables

For the estimation analyses described in the next sections, we further use a set of control variables. Health might change with childbirth and in turn may alter needs, which is why the health status of both partners is included in all models. Health status is operationalised based on the following survey question: "*How is your health in general? Is it...*" which is answered by each household member separately. The potential answers are (1) "*shape very good*", (2) "*good*", (3) "*shape fair*", (4) "*shape bad*", and (5) "*very bad*". The question is supposed to target different dimensions of health such as physical health or emotional health (European Commission, 2017). The five answers are dichotomised into a category "bad health" if the answers were (4) or (5) and "no bad health" for all other answers. A third category is created indicating if values are missing, because 14 per cent of all women and 17 per cent of all men have missing values for this variable. We also conduct robustness analyses without the health variable (supplementary section A.4). The age of both partners is also included as a control variable. It is operationalised as a categorical variable, consisting of five-year age groups with an open-ended category 60 plus for men.

4 Empirical Strategy

Based on the rich data described above, we aim at answering the following research questions:

1. How does the birth of a child affect parents' SEW and OEW in the first years after childbirth?
2. Do changes in OEW drive changes in SEW related to childbirth?
3. Does childbirth affect SEW and OEW of parents differently across European welfare regimes?

We start answering the first research questions using descriptive analyses, in particular by investigating changes in households' OEW and SEW around the birth of a child. The effect of a newborn child on SEW, i.e. subjective cost, is further estimated using panel regressions. We then proceed to answering the second research question and—with the help of mediation analyses—investigate if and how changes in OEW mediate changes in SEW. This enables us to explore drivers of SEW and allows us to transform the subjective cost of children into an economic cost. Throughout the analyses, we focus on differences between the six welfare regimes outlined above, thereby answering our third research question. In addition, we provide estimates by country and income group to explore further the relationship between SEW and OEW.

4.1 Modelling the Effect of Children on SEW

We analyse the effect of young children on SEW in each of the six regions, also considering changes in household and labour income as mediators. We begin by modelling the total effect of children on SEW, and then continue to the mediation analysis in Sect. 4.2. Or main model can be written as follows:

$$\mathrm{SEW}_{jt} = \beta_0 + \beta_{1.1}\mathrm{CHILDREN}_{jt} + \beta_2 X_{jt} + \gamma Z_i + \mu_t + \alpha_j + \varepsilon_{jt} \quad (1)$$

where CHILDREN_{jt} indicates the number of children in household j at time t. Term X_{jt} stands for other time-varying variables that affect SEW, in particular age and health. Z_i denotes observable time-constant characteristics, i.e. variables such as gender and nationality that do not usually change during the panel duration period and consequently drop out of a panel analysis. α_j and ε_{jt} are both error terms. ε_{jt} is allowed to vary over households and time, whereas α_j is a time-constant for each household observed. Thus, α_j is a household fixed effect that captures unobservable time-invariant characteristics. We assume that the attitude towards money and household needs does not change over time, so answers to the question about the difficulty of making ends meet are comparable. A time fixed effect μ_t is also included in the model, i.e. an intercept that varies with time. It accounts for time trends and shocks such as economic crises. Terms β_1, β_2, and γ are coefficients, and β_0 denotes the constant. Summary statistics for all variables used in the analysis are reported in supplementary material Section A.2.

The main independent variable of interests is CHILDREN_{jt}, which is the number of children below the age of 16 in household j at time t. It is a categorical variable ranging from 0 to 4, where the maximum category of 4 includes any observation with four or more children. Since we are applying a panel approach, it is not necessary to operationalise the birth of a child directly in order to estimate the effect of an additional child on SEW. It is sufficient to have a variable quantifying the number of children in each household in each panel wave. Any increase in this variable then indicates the birth of a child. Coefficient $\beta_{1.1}$ quantifies the total subjective cost of children. More specifically, $\beta_{1.1}$ represents the average reduction in SEW due to the arrival of an additional child.

4.2 Exploring the Drivers of SEW with Mediation Analysis

The total subjective cost of children T consists of direct costs D and indirect costs I, minus benefits B. As discussed in Sect. 2.1, other dimensions of well-being might also affect T—these other dimensions are captured in residual R. Hence, the relationship can be formalised as $T = D + I - B + R$. The primary aim of the regression analysis is to quantify the effect of young children on SEW, hereby capturing T. In addition, we aim to explore if and how OEW mediates changes in SEW to explore drivers of SEW around childbirth. To this end, we conduct a classic regression-based mediation analysis that goes back to Baron and Kenny (1986) and was adapted for longitudinal data by Krug and Prechsl (2019) (for an introduction in mediation analysis see, for example, Van der Weele (2015)). In particular, we investigate how changes in income mediate the effect of child birth on SEW to disentangle direct and indirect effects of children on SEW. For illustrative reasons, we apply a difference method rather than a product method; thus, our method deviates from that of Krug and Prechsl (2019). Sensitivity analyses reveal, however, that our results do not change depending on the method applied. The difference method is applied by fitting two different models, one excluding and one including the mediator of interest (income). Assuming that all relevant confounders are accounted for via fixed effects and control variables, i.e. residual $R = 0$, the model excluding the mediator gives the total effect while the model including the mediator gives the direct effect D. The indirect effect can then be calculated by subtracting the direct effect from the total effect. In particular, $T = D + I - B$ and thus $I = T - (D - B)$.

In the above subsection, we have already estimated the model excluding the mediator and thus estimated the total subjective cost of children (Model 1). Since income is not controlled for in that model, the estimated value of $\beta_{1.1}$ captures the total average reduction

in SEW caused by the arrival of an additional child in the respective country group. This effect can be interpreted as the total subjective cost of children T, combining the impact of increased needs D and income losses I after benefits B. If $R \neq 0$, R is also included in the total cost.

For the mediation analysis, we now need a second model to estimate the direct effect. In the first mediation analysis, family-related benefits are assigned to reduce indirect costs. For this purpose, total disposable household income in household j at time t is added to the model, which includes labour income and family-related benefits. Importantly, disposable household income also includes tax deductions, such as family splitting, which constitute a relevant family policy instrument in some regions and are calculated based on the total household income of families. Income is given in thousands of euros to avoid having coefficients that are too small to interpret; robustness analyses regarding the variable's skewedness are described in supplementary material Section A.4.

The mediation analysis with household income is specified as follows:

$$\begin{aligned} \text{SEW}_{jt} = \beta_0 + \beta_{1.2}\text{CHILDREN}_{jt} + \beta_2 X_{jt} + \beta_3 \text{HOUSEHOLD INCOME}_{jt} + \gamma Z_i + \mu_t \\ + \alpha_j + \varepsilon_{jt} \end{aligned} \tag{2}$$

If the assumption holds that all relevant confounders are accounted for, coefficient $\beta_{1.2}$ in Model (2) can directly be interpreted as the direct costs of children in the respective region, if family-related benefits are not considered. More specifically, $\beta_{1.2}$ indicates the costs of children if household income were to remain constant after the birth of a child. Any changes in labour income as well as family-related benefits are controlled for. Consequently, $\beta_{1.2}$ solely reflects the increase in needs induced by children.

By assuming $R = 0$, rearranging $T = D + I - B$, and inserting the estimation coefficients $\beta_{1.1}$ and $\beta_{1.2}$, we can also calculate the indirect costs of children that is not compensated for via family-related benefits

$$\begin{aligned} T &= D + I - B \\ I - B &= T - D \\ I - B &= \beta_{1.1} - \beta_{1.2} \end{aligned}$$

To compute the total indirect costs of children, i.e. without considering family-related benefits, a second mediation analysis is conducted. For this second mediation analysis, benefits are assigned to reduce direct costs instead of indirect costs. To this end, only labour income is included as a mediator in Model 3, thus, not controlling for any additional family-related benefits.

$$\begin{aligned} \text{SEW}_{jt} = \beta_0 + \beta_{1.3}\text{CHILDREN}_{jt} + \beta_2 X_{jt} + \beta_3 \text{LABOUR INCOME}_{jt} + \gamma Z_i + \mu_t \\ + \alpha_j + \varepsilon_{jt} \end{aligned} \tag{3}$$

By controlling for changes in labour income, we control for the indirect costs of children. Hence, the I in $T = D + I - B$ is controlled for, which leaves us with the direct cost after benefits ($D - B$) only. It follows that $\beta_{1.3} = D - B$. The total indirect costs of children (i.e. family-related benefits are assigned to reduce direct costs) can now be calculated as follows

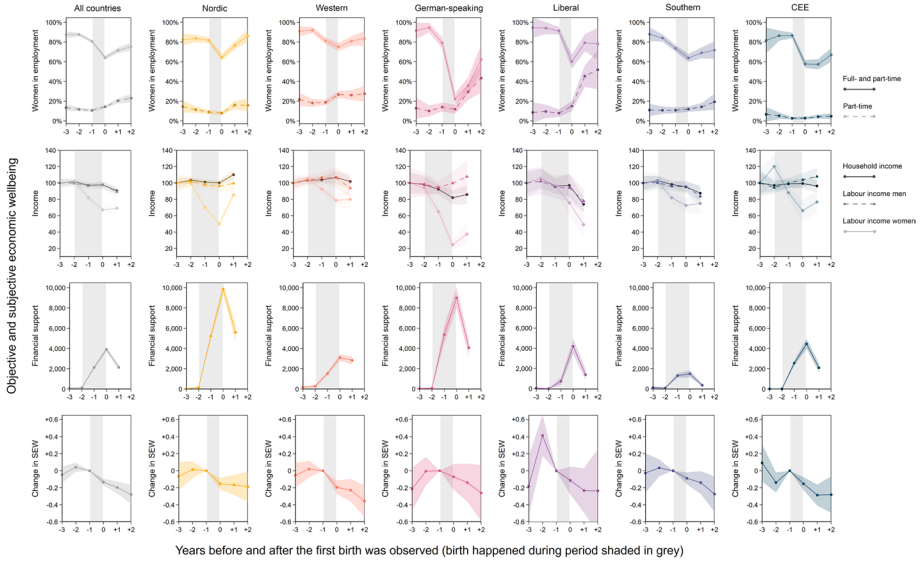

Fig. 1 Subjective and objective economic well-being before and after the birth of the first child. Source: EU-SILC longitudinal data 2004–2019. The weighted means and 95% confidence intervals presented in this graph are based on the 6,396 couples in the sample that had their first child but no additional child during the panel duration period. In total, they provide 19,022 observations for "Women in employment" and "Change in subjective economic well-being (SEW)". Less observations are available for "Income" and "Benefits", as income in the dataset refers to the income reference period, which is the calendar year prior to the survey (see supplementary material Section A.1 for details on the panel structure). Hence, income and benefits can only be observed one year after the birth was observed, rather than two years after the birth was observed. The x-axis shows the years before and after the child was first observed in the dataset; zero refers to the first survey wave in which a newborn was recorded. The grey area gives the period during which the birth happened—it is wider for income and benefits, again due to the shift in the income reference period. The share of employment is based on women's self-defined current economic status, where work is defined as any work for pay or profit. Women in maternity leave are considered as employed, while women in parental leave are not. The solid lines show the share in full-time or part-time employment, while the dashed line only shows the latter. For better comparability across regions, income is set to 100 at the beginning of the observation period, i.e. three years before the birth was observed. The underlying values are provided per annum and are adjusted for inflation and differences in purchasing power. Household income is a net value, labour income a gross value. Benefits are given in euros, provided per annum, and adjusted for inflation and differences in purchasing power. They include family-related financial support only. SEW of all households is set to 0 in the year before the birth was observed, which is why there are no confidence intervals at time −1

$$T = D + I - B$$
$$I = T - (D - B)$$
$$I = \beta_{1.1} - \beta_{1.3}$$

Models 1, 2 and 3 describe a linear relation, their coefficients are estimated using linear fixed effects (LFE) models. In the supplementary material Section A.4, we further apply an ordered logit approach to analyse whether the results vary by estimation method. In order to make the coefficients from each of the three models comparable, only observations that have no missing values in the labour income of both partners as well as household income are considered in the estimations. Consequently, the coefficients from Models 1, 2 and 3

are estimated based on the exact same sub-sample. Each of the three models is estimated separately for each region. That way, region-specific peculiarities due to different family-related policies, norms, institutions and macroeconomic conditions can be analysed. In addition, we provide estimations per country and income groups. The results are presented in the next section, and robustness analyses in the supplementary material Section A.4.

5 Results

5.1 Descriptive Findings on Subjective and Objective Economic Well-Being Around Childbirth

This subsection with initial results explores how childbirth affects the SEW and OEW of parents, using descriptive evidence. Both OEW and SEW drop when a child joins the household, yet the magnitude of this drop and the recovery afterwards vary considerably across regions. Figure 1 shows how the share of women in employment, household income, labour income, benefits for families, and SEW change after the birth of the first child for all countries, as well as by region. The corresponding values are provided in Table A.3 of the supplementary material. We focus on the first child in the descriptive evidence, as patterns for additional children might be influenced by labour market decisions during the first birth. Mean values are based on pooled panels for the respective years before and after the birth was first observed in the survey, i.e. 0 marks the first time the newborn is recorded in the data. The shaded grey in the figure gives the period during which the birth happened.

The first row of Fig. 1 shows the share of employed mothers before and after they gave birth to their first child. All regions have similar employment levels of soon-to-be mothers to start with. However, the share drops drastically after the child arrives, especially in German-speaking, Liberal, and CEE countries, but also in the other regions. While the share of employed women in the Nordic and Western countries returns to its initial level after two years, it remains at low levels in German-speaking and CEE countries. Moreover, there is a strong shift from full-time to part-time employment after birth in German-speaking and Liberal countries. The drop in employment after childbirth is smallest in Western countries. As discussed in Sect. 2.2, women in France, Belgium and the Netherlands have greater incentives to re-enter the labour market quickly after having children. This pattern is confirmed by Western women's employment status in our sample. The drop is also not as pronounced in Southern European countries. Moreover, employment of Southern European women that will soon have their first child is much higher than that of Southern European women as a whole. A possible explanation for the high employment is the fact that the observed group is very selective, as it only includes women aged 16 to 40 that are in relationships and will soon have their first child, i.e. employment might be a precondition for having children.

The drop in employment of new mothers results in substantial labour income losses after the birth of their first child (second row in Fig. 1 and Table A.3). These losses contribute to the indirect cost of children. On average over all countries, labour income of women in the first year that the birth was observed in the survey (time 0) is only 67.1 per cent of the average labour income at the beginning of the observation period (time −3). Labour income losses are largest in German-speaking countries, where the average labour income of women in the first year that the birth was observed (time 0) is only 24.5 per cent of the average labour income at the beginning of the observation period (time −3). Labour

income of mothers in the Nordic countries drops to 49.7 per cent, and to 66.2 per cent in CEE countries. The drop in income is lowest in the West, where the labour income of mothers remains at 78.8 per cent, followed by 72.5 per cent in the South. Figure 1 and Table A.3 also show that average labour income of women starts dropping already at time -2. This is due to the shift between the income reference period and the interview waves described in more detail in supplementary material Section A.1. Some of the children observed in the survey at time 0 were already born two income reference periods previously.

Contrary to women, men's average labour income only slightly decreases after the birth of their first child, and even increases in German-speaking and CEE countries (dashed line, second row in Fig. 1 and Table A.3). There are no indications of an increase in average weekly working hours by fathers in our sample. Hence, the increase in labour income of men is likely due to an increase in age and experience, or due to the so-called fatherhood wage premium (Killewald, 2012).

Female labour income losses are largest in regions where women remain at home for a longer time after giving birth. This is caused by regional differences in the institutional setting providing benefits around childbirth (Sect. 2.2). While there is not much difference between European regions in terms of maternity leave (around 16 weeks of leave, often remunerated at 100% of earnings paid by social security), European regions differ largely in their institutional support for working mothers after maternity leave. In the Nordic countries, remaining at home for a longer time after giving birth is enabled by wage-remunerated parental leave after maternity leave, which is paid for more than one year. In Sweden, for example, parents benefit from 480 days of parental leave, remunerated at 77.6% of earnings. The fact that in Fig. 1 and Table A.3, we see no drop in fathers' labour income, but a significant drop in mothers' labour income suggests that it is mostly mothers who benefit from parental leave in the Nordic countries. In general, mothers' take-up rates for parental leave are larger in countries with more generous leave payments (OECD, 2018). This contributes to the drop in female labour market income being larger in the Nordic than in Southern European and CEE countries. However, we also observe large female labour income losses in the German-speaking countries of Austria and Switzerland. These countries provide relatively generous lump-sum allowances for families, but institutional support for working mothers is relatively weak. As in Germany, access to formal childcare for young children aged 0 to 2 is restricted in Austria and Switzerland (and was even more so during the period covered here - 2004 to 2019). At the same time, conservative gender and family norms stigmatising working mothers of young children are still relatively dominant (Fagnani, 2007).

Remarkably, the average disposable household income remains rather constant in most of the regions (second row in Fig. 1 and Table A.3).[13] Only average values are evaluated, hence, we do not analyse if this finding holds throughout the income distribution. Also, constant disposable income after birth does not signal an unchanged standard of living, because the newborn child increases needs. Still, the stabilisation of disposable household income is surprising given the extensive drop in women's labour market income.

Household income remains rather constant for two reasons. First, as discussed above, men's average labour income increases in some of the regions observed. Second, and more importantly, financial support for families increases drastically in the year after childbirth and compensates for the women's labour income losses in most regions (third row in Fig. 1

[13] If the birth of a child causes a drop in saving or even triggers dissaving, it would not be observed with EU-SILC data since the data do not provide any information on savings.

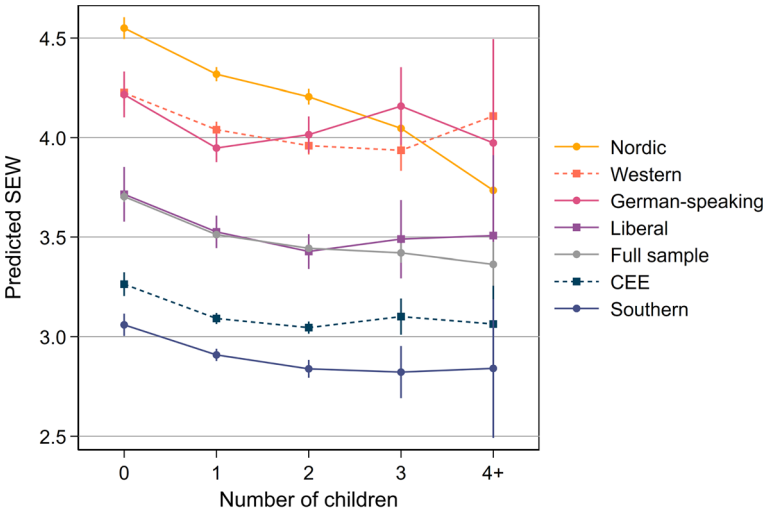

Fig. 2 Predicted subjective economic well-being by region and birth order. Note: Predicted SEW by birth order based on region-specific linear fixed effects estimations of Model (1), with explanatory variables being: the number of children, the age and health of both partners, and year fixed effects. Standard errors are clustered at the household level

and Table A.3). At time 0, family-related benefits in relation to the total household income is largest in the Nordic countries (23.8 per cent) (Table A.3). In German-speaking countries, benefits are also high and make up 19.5 per cent of the total household income. Even though family-related financial support in German-speaking countries is generous, household income drops after the birth of the first child due to the extensive reduction in the labour market income of first-time mothers. In CEE countries, benefits at time 0 makes up 16.1 per cent of the total household income. Given that the CEE region is a very heterogeneous group, this number has to be interpreted carefully. For example, family-related financial support is high in Slovenia, Estonia and Hungary. Yet support is low in Serbia and Romania. In the remaining regions (Western, Liberal and Southern Europe), family-related benefits make up less than 10 per cent of the total disposable household income. In relation to household income, benefits are lowest in Southern Europe (4.2 per cent).

We have now summarised changes in OEW and compared them across regions. In short, the income and employment pattern observed around the birth of the first child seem very interlinked. Naturally, female labour income losses are largest in regions where women remain at home for a long time after giving birth. Moreover, household income remains rather constant where either labour income does not drop too strongly, or where benefits for families is generous and thus counterbalances labour income losses.

The final row of Fig. 1 shows, how the SEW of couples changes with the birth of their first child. Although mean values of ordered categorical variables need to be treated with caution, they can still be quite informative. On average over all regions, SEW appears to drop immediately after the birth and keeps decreasing thereafter. The trend varies, however, between regions. In some regions, especially German-speaking and Liberal countries, a clear trend is difficult to detect due to small numbers of observations and subsequent large confidence intervals. Moreover, the magnitude of the drop in SEW appears not to be directly linked to the average changes in OEW, i.e. we do not find a larger drop in countries

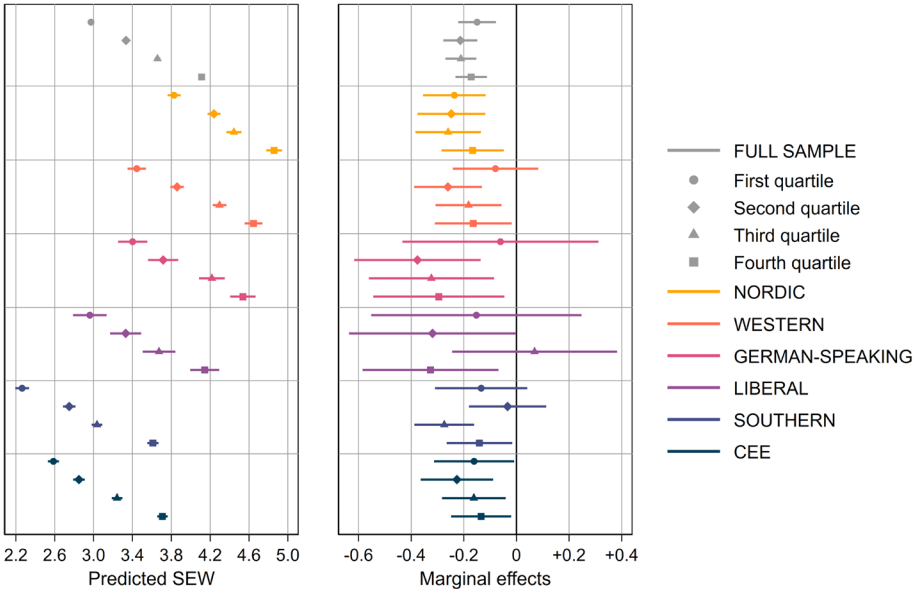

Fig. 3 The effect of children on subjective economic well-being by region and household income quartile. Note: Predicted SEW and the marginal effects of the first childbirth on SEW by region and region-specific household income quartile based on linear fixed effects estimations of Model (1), with explanatory variables being: the number of children, the age and health of both partners, and year fixed effects. Standard errors are clustered at the household level

where employment, income, or benefits in particular follow childbirth. A first reason for the missing correlation between drops in OEW and drops in SEW could be that SEW is driven by direct costs rather than indirect costs, i.e. that parents focus more on expenses related to their child rather than drops in income and employment. Second, SEW could be driven by other dimensions of subjective well-being, such as stress related to children, which is captured in *R*. Third, like all subjective information, SEW might be affected by reporting heterogeneities between countries, genders, age-groups and other relevant dimensions (Spitzer & Weber, 2019), or by different levels of SEW across countries. In the following sections, we will explore in more detail how the birth of a child affects its parents SEW, and explore if and how changes in OEW and SEW around childbirth are related.

5.2 The Effect of Children on Subjective Economic Well-Being

The following results are based on panel regression analysis, in particular Model (1), and thus investigate the effect of childbirth on parents' SEW in more detail, controlling for health status and age of both partners. Overall, children cause a strong significant drop in their parents' SEW in the first years after they are born. On average over all countries, the birth of the first child decreases a couple's SEW by 0.19 (Table A.4). This decrease is interpreted as the subjective cost of young children. Figure 2 provides predicted SEW by birth order and region based on the main Model (1). The predictions suggest that the first child is the most costly one, i.e. the drop in SEW from zero

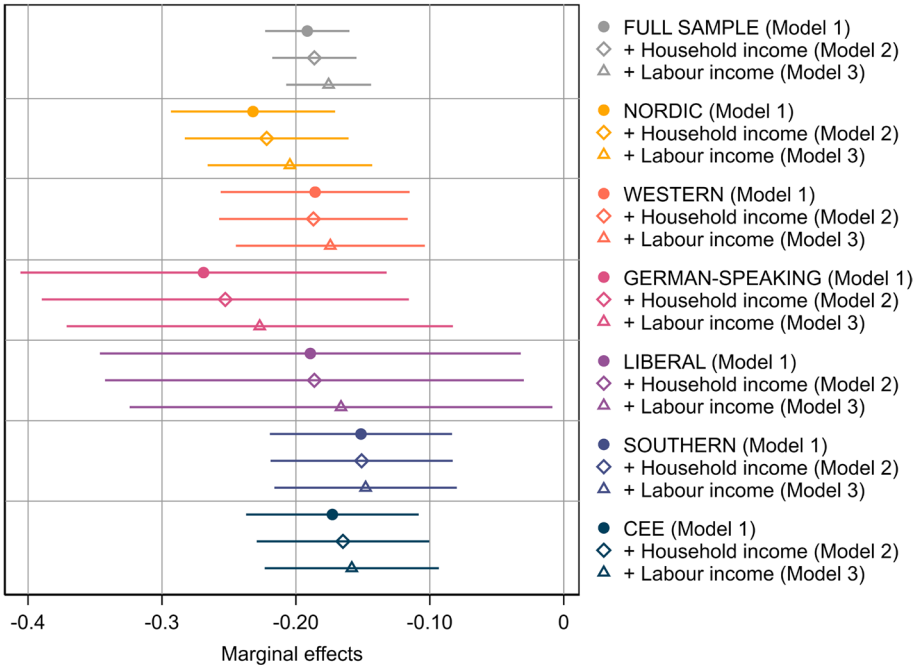

Fig. 4 Objective economic well-being as a mediator between childbirth and subjective economic well-being. Note: Marginal effects of the birth of the first child on SEW based region-specific linear fixed effects estimations of Models (1), (2) (+ Household income), and (3) (+ Labour income), with explanatory variables being: the number of children, the age and health of both partners, and year fixed effects. Standard errors are clustered at the household level

to one child is the largest, each additional child reduces SEW to a lesser extent. This pattern indicates economies of scale in children, which is in line with earlier findings elsewhere (Bishop et al., 2014).

Figure 2 also provides predicted SEW by region (the corresponding regression outputs are provided in Tables A.5 to A.10). First of all, the figure shows the strong difference in the level of SEW across regions. Nordic countries have, on average, the highest SEW, and Southern European countries the lowest SEW. Point estimates of the effect of childbirth on SEW suggest that the drop is largest in regions with high SEW levels, namely Western European, Nordic, Liberal and German-speaking countries (Tables A.5 to A.10). Although the subjective cost of children is largest in these regions, the drop in SEW does not alter the ranking—SEW after the first child is still highest in Nordic and lowest in Southern European countries. Due to large confidence intervals, however, comparisons of the drops in SEW between regions have to be taken with a grain of salt. We also run analyses separately by country, but large confidence intervals of the estimates prevent a meaningful interpretation of the results (Table A.2). To summarise, we do not find a clear link between the country-level drop in OEW seen in Fig. 1, and the drop in SEW.

Figure 3 shows how children affect SEW across the household income distribution. The predicted values in the left panel show a clear gradient in SEW, i.e. SEW is lowest for the first quartile and highest for the fourth quartile in all regions, suggesting that

SEW does capture some variation of OEW, at least within regions. Marginal effects of childbirth on SEW in the right panel are difficult to interpret due to large confidence intervals, but the point estimates suggest a U-shape in the effects: the decrease in SEW is lowest for the lowest quartile (the poorest group), followed by the highest quartile (the richest group). High-income households might have more resources to account for the arrival of a child and thus experience a smaller drop in SEW. At the other end of the distribution, low-income households might have lower opportunity costs, e.g. women had little labour income already before having a child. Furthermore, financial support might cover indirect costs of low-income households. Finally, there might be level effects, i.e. the very low SEW of the lower quartiles might simply not drop any further due to a child, which could also explain the smaller effects of children on SEW in low-income households.

In summary, it appears that SEW does drop with the birth of each child, the strongest drop being with the first child. Differences in the magnitude of this drop across regions and income groups appear, however, not to be directly related to OEW.

5.3 Linking Subjective and Objective Economic Well-Being

The previous sections did not establish a clear link between OEW and SEW at the regional level. In this section, we present results from mediation analyses that show if and how changes in OEW mediate changes in SEW, thereby addressing the second research question of this paper. The estimates provided in Fig. 4 and Tables A.5 to A.10 suggest that drops in household income and labour income, i.e. indirect costs of children, explain little of the drop in SEW after the birth of a child. The estimated effect of children on SEW remains almost identical in the model without controlling for income (Model 1), in the model including household income (Model 2), and in the model controlling for labour income (Model 3). This suggests that the drop in SEW is not driven by indirect costs, but rather by direct costs or other well-being components captured in R, such as stress related to children.

Figure 4 graphically displays the mediation analysis. As described in Sect. 4.2, the difference between $\beta_{1.1}$ from Model 1 and $\beta_{1.2}$ from Model 2 can be interpreted as the indirect costs of children that is not compensated for via family-related benefits—that difference is hardly visible, i.e. the point estimates in Fig. 4 are almost identical. The difference between $\beta_{1.1}$ and $\beta_{1.3}$ from Model 3 can be interpreted as the total indirect costs of children without considering family-related benefits. This difference is a little larger, but still very small.

Though small, the size of indirect costs still reveals differences between regions that are in line with regional variations in OEW. The difference between $\beta_{1.1}$ and $\beta_{1.3}$ is largest in countries where women take extensive parental leave, namely German-speaking and Nordic countries, followed by Liberal and CEE countries. These are the regions in which the share of employed women drops drastically after the birth. The indirect costs are smallest in the South and in the West, where women re-enter the labour market quicker after giving birth.

The relatively low indirect costs of children could, amongst others, be due to self-selection in entering parenthood. Potentially, only couples that do not expect a strong increase in indirect costs, or even total cost, have children. For example, Southern Europe has the highest unemployment rate of all regions (see Sect. 2.2), nevertheless, the mothers observed in this analysis have employment rates as high as the mothers in the other regions (see Fig. 1). This might be an indicator for the self-selection of well-off parents in becoming parents, as

we might only observe couples who knew that they would not experience a large drop in their SEW.

The mediation analysis also allows us to transform the subjective cost of children into economic cost, i.e. we can compute how much extra income could compensate parents for the presence of an extra child.[14] This is done by dividing the effect of the birth of a child by the income coefficient and multiplying it by 1000, since income is given in thousands of euros. In the case of the estimates for the full model (Table A.4), this would result in $\frac{0.186}{0.003} \times 1,000 = 62,000$. Hence, €62,000 would economically compensate a couple for their drop in SEW after having their first child. Given that this amount exceeds annual household income even in the richest region covered in this analysis, this exercise further suggests that the subjective cost of children is driven by much more than actual direct and indirect costs of children, i.e. the assumption $R = 0$ might be violated.

6 Discussion

Newborns decrease their parents' objective economic well-being (OEW) in terms of income and employment, yet the magnitude of that drop varies considerably across countries and income groups. Changes in OEW around childbirth appear closely linked to a region's institutional settings. For example, female labour income losses are largest in regions where parental leave is long and generously compensated for, in particular in the German-speaking and Nordic countries. While both employment and labour income of women approach pre-birth levels after two years in Nordic and Western countries, they remain low in German-speaking, Liberal, and CEE countries, where policies provide little support for the reconciliation of work and family. Remarkably, household income remains rather constant around the birth of a child, despite the substantial decreases in female labour income. We find two possible explanations for this pattern, namely generous benefits, along with increased labour income of men. In regions like the German-speaking countries, however, not even the high financial support can compensate for the large drops in female labour income. By contrast, benefits in Liberal and Southern countries are simply too low to compensate for the drop in labour income.

The birth of a child also reduces parents' subjective economic well-being (SEW)—we interpret this drop as the subjective cost of children. The first child appears to be the costliest, with each additional child reducing SEW less, which signals economies of scale in the number of children. Contrary to OEW, regional differences in the subjective cost of children appear not to be directly related to regional differences in norms, institutions, and macroeconomic conditions. Although mediation analyses suggest that the size of the subjective indirect costs are highest in regions where female employment drops the most, these indirect costs explain only little of the overall drop in SEW. Instead, our results suggest that the subjective cost of children is mostly driven by direct costs along with other well-being components such as stress related to children.

Although SEW appears to reflect differences in the level of OEW across regions, income groups, and birth order, it seems that comparisons in the changes of SEW across heterogeneous groups have to be interpreted with caution. Translating the subjective costs of children into economic costs reveals that parents would require monetary compensation

[14] We thank an anonymous referee for this point.

to make up for SEW loss that exceeds annual household income - even in the richest region analysed. This finding, along with the results discussed above, suggest that SEW might not be a reliable substitute for conventional child cost estimates such as expenditure-based approaches or equivalence scales. While the subjective nature of this indicator is limiting in some aspects, this is precisely what might make SEW a valuable complement for the analysis of economic well-being, as parents' perceived economic well-being is likely to affect their labour supply and fertility decisions.

Yet even the relationship between the childbirth-induced drop in SEW and fertility levels reveals no straight-forward pattern, potentially due to the heterogeneity in the institutional determinants of the child-related female wage losses. Fertility rates are highest in the Nordic countries, with a group average Total Fertility Rate (TFR) of 1.97 in 2010 (calculations based on data from the World Bank World Development Indicators). Despite a remarkable decline of TFRs since 2015 that occured in particular in the Nordic and Western countries, these regions still report fertility levels above the EU average in 2019, the latest year covered by our data. While short-term wage losses are substantial for women in the Northern region, they are mostly compensated for with wage-remunerated parental leave. In addition, mothers generally succeed in re-integrating the labour market after parental leave, as shown in Fig. 1. In contrast, in the German-speaking countries, where fertility is much lower (group average TFR 1.46), women tend to drop out of the labour market around childbirth and often fail to re-enter it after maternity or parental leave. In Southern European and CEE countries, female wage losses and birth-related drops in SEW are smaller (Figs. 1 and 4). However, in these countries, fertility levels are as low as they are in the German-speaking countries (group average TFR 1.41 in Southern European countries and 1.48 in CEE countries) and the benefits for families are rather limited. Our results suggest that in these countries, only women who benefit from stable employment conditions (before and after childbirth) are likely to choose parenthood. It seems that in Southern Europe and CEE countries in particular, female employment is considered as a necessary condition for starting a family, and women are challenged to continue their employment trajectories once childbearing begins. In the context of highly unstable labour markets in these regions, it is therefore plausible that we find relatively low birth-related drops in SEW and in female income, despite the low-fertility environment. The Western and Liberal countries, which have relatively high fertility levels (regional average 1.89 for the Western and 1.99 for the Liberal countries), present intermediate scenarios in terms of birth-related drops in female income and SEW. Overall, our results show that fertility rates are not necessarily higher in those regions with lower birth-induced drops in SEW.

In summary, the short-term birth-related losses in SEW that we reveal in this article cannot be considered as direct indicators of the efficiency of family policies and other institutional settings in each of the six European regions. Rather, our results point towards a complex interplay between the imminent wage losses of new mothers, changes in SEW around childbirth, institutions compensating for direct and indirect costs of childbirth, and fertility outcomes. Against the background of our region-specific results and their interconnection with fertility levels, it seems that allowing parents to stay at home after maternity/paternity leave by offering a wage-related remuneration as well as facilitating their return to the labour market after some months of parental leave emerge as favourable institutional conditions for the reconciliation of employment and family.

The limitations of this analysis are mostly related to the data. First, due to the short duration of the panel, long-term effects of children on SEW cannot be analysed. Consequently, long-term indirect costs of children cannot be observed, and neither can adaptations to the costs of children

in the long run. Second, the shift between the income reference period, the birth of a child, and the reporting of SEW leads—at times—to imprecise estimates. Third, changes in saving behaviour due to childbirth cannot be considered with the data. Finally, the sample is highly selective and thus the results presented above are only representative for small children of unbroken European heterosexual couples with mothers aged 16 to 40 that do not live with any other adults. Results might, for example, be very different for lone parents and couples that break up or drop out of the survey during the panel duration period. Also, as discussed above, self-selection into parenthood cannot be accounted for. If some couples decide not to become parents because they expect a drop in SEW due to children, then the costs of children are underestimated. We find indications for such self-selection, in particular, in Southern European countries.

Future studies could fruitfully explore the long-term subjective costs of children by analysing longer panels that exist at national levels. The analysis at hand only allows conclusions to be drawn regarding the first years after the birth of a child. Long-term direct and, more importantly, long-term indirect costs cannot be observed. The fact that flatter income curves or lower pension entitlements of mothers do not become apparent immediately after childbirth warrants future investigation.

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Code availability The code will be provided upon request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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