Maternal Employment and Child Obesity – A European Perspective[*]

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WENCKE GWOZDZ
Department of Intercultural Communication and Management, Centre for Corporate Social Responsibility, Copenhagen Business School, Denmark

ALFONSO SOUSA-POZA
Institute for Health Care & Public Management, University of Hohenheim, Germany

LUCIA A. REISCH
Department of Intercultural Communication and Management, Centre for Corporate Social Responsibility, Copenhagen Business School, Denmark

STEFAAN DE HENAUW
Department of Public Health, Faculty of Medicine and Health Sciences, University Hospital, Ghent University, Ghent, Belgium

GABRIELE EIBEN
Department of Public Health and Community Medicine, Public Health Epidemiology Unit, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

JUAN FERNANDEZ
Growth, Exercise, Nutrition and Development Research Group, University of Zaragoza, Zaragoza, Spain

CHARALAMPOS HADJIGEORGIOU
Research and Education Institute of Child Health, Strovolos, Cyprus

EVA KOVÁCS
Department of Paediatrics, Medical Faculty, University of Pécs, Pécs, Hungary

FABIO LAURIA
Institute of Food Science & Technology, National Research Council, Italy

TOOMAS VEIDEBAUM
National Institute for Health Development, Tallinn, Estonia

GARRATH WILLIAMS
Department of Politics, Philosophy and Religion, Lancaster University, Lancaster, UK

KARIN BAMMANN
Bremen Institute for Prevention Research and Social Medicine, University of Bremen, Bremen, Germany

WOLFGANG AHRENS
Bremen Institute for Prevention Research and Social Medicine, University of Bremen, Bremen, Germany

On behalf of the IDEFICS Consortium

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[*] Corresponding authors: Wencke Gwozdz (wg.ikl@cbs.dk) and Alfonso Sousa-Poza (alfonso.sousa-poza@uni-hohenheim.de). This study was conducted as part of the IDEFICS study (http://www.idefics.eu). We gratefully acknowledge the financial support of the European Community within the Sixth RTD Framework Programme under Contract No. 016181 (FOOD). Alfonso Sousa-Poza also thanks the Centre for Gender and Nutrition at the University of Hohenheim for financial support. We are thankful for valuable comments made on an earlier version of this paper by Jane Greve and Hendrik Jürges.

Abstract

Female employment rates in Europe and the United States have increased substantially over the past two decades. Political and public rhetoric has often linked this to negative effects on child development, including obesity. Based on objective (including bioelectrical impedance and anthropometric) data on child obesity from the IDEFICS study of over 7,000 children aged 5–9, we analyze the relation between maternal employment and childhood obesity in 16 regions in 8 European countries. Using data from accelerometers and nutritional diaries, we also investigate the effects of maternal employment on obesity's main drivers, namely calorie intake and physical activity. Unlike research in the United States, our analysis provides no evidence for maternal employment having a negative effect on child obesity, diet or physical activity.

JEL-Classification: I12, J13, J22

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1 Introduction

Europe has not been spared the dramatic increase in obesity rates in the past decade: just over half (50.1%) of the EU's adult population is overweight or obese, and in no less than 15 out of 27 EU countries overweight and obesity among adults exceeds 50%. Greece, Malta, Slovakia, the Czech Republic, Austria and the UK are among the hardest hit. According to some experts, over 200 million adults exceed a healthy weight, and a total 15.5% of the adult population is obese (OECD, 2010). Because adult obesity is often preceded by childhood obesity (Procter, 2007; Reisch et al., 2011), the rise in childhood obesity in the EU gives special cause for concern. It is estimated that across most EU countries, one in seven children is overweight or obese, and in virtually all European countries, the share of overweight and obese children has increased substantially in the last ten years (OECD, 2010).

According to the European Commission (EC, 2007) white paper "A strategy for Europe on nutrition, overweight and obesity related health issues", this rise in childhood obesity can be expected to increase future levels of a number of chronic conditions, such as cardiovascular disease, hypertension, type 2 diabetes, stroke, certain cancers, musculo-skeletal disorders and even a range of mental health conditions. In the long term, this could result in a negative impact on life expectancy in the EU. Thus, the EC (2007) has proposed a number of measures to combat childhood obesity, including better consumer information (e.g., by setting standards for advertising of food to children), making healthy food more readily available (e.g., at schools) and promoting higher levels of physical activity (e.g., by supporting public infrastructure projects that encourage walking and cycling).[1] The EC document also acknowledges the central role that schools and childcare facilities play in this context, stressing that these bear a great responsibility in ensuring that children understand the importance of healthy nutrition and exercise. This emphasis on the responsibilities of organisations is particularly relevant in the European context in which ageing populations and low fertility rates are leading to a more proactive encouragement of female employment – and thus an increased demand for childcare facilities. As a result, female employment rates have increased substantially over the past two decades. Nevertheless, in 2009, only 14 of the 27 EU

[1] Several member states have also introduced measures to combat overweight (for an overview, see Reisch and Gwozdz, 2011).

member states had a female employment rate above the Lisbon target of 60% (Eurostat, 2011).

An increase in female (and particularly maternal) employment, however, may have detrimental effects on child health, and in particular child obesity. The reasoning is simple (Scholder, 2008): first, employed mothers spend less time at home and thus possibly also less time in preparing meals and taking care of children, which often results in an increase in unhealthy eating behaviours. Second, because employed mothers spend more time away from home, their children spend more time in the care of others, whose quality of childcare can vary substantially. Third, without parental supervision, children may be more likely to stay indoors (watching TV, playing video games), and spend less time on more active recreation. As suggested by a growing body of literature (e.g., Anderson et al., 2003; Herbst and Tekin, 2011; Liu et al., 2009, Phipps et al., 2006; Ruhm, 2008; Scholder, 2008), all these factors could contribute to higher rates of childhood overweight and obesity.[2] It must be noted, however, that the overwhelming majority of these studies originate from the United States. Given the very different childcare models in the two regions, as well as the oft-claimed lower quality of childcare in the U.S. (e.g., Clawson and Gerstel, 2002; UNICEF, 2008), it would be unwise to draw conclusions from the current literature for Europe.

The aim of this paper, therefore, is to analyze child obesity and maternal employment in a number of European regions. To do so, we draw on the unique dataset of the IDEFICS project, which covers over 16,000 children aged 2 to 9 in eight countries (Belgium, Cyprus, Estonia, Germany, Hungary, Italy, Spain and Sweden). Our contribution is threefold: (i) our study is, to our knowledge, the first European study on this topic to cover several countries; (ii) we have an extremely rich dataset with elaborate information on the determinants and several objective measures of child obesity and health; and (iii) these data enable us to also investigate children's diet and physical activity.

The general conclusion of this paper is that our European sample of school children provides no evidence that maternal employment is related to child obesity, unhealthier diets or lower levels of physical activity. The remainder of the paper proceeds as follows: Section 2 reviews the relevant research on the topic, section 3 describes our data and methodology, section 4 discusses the study results and section 5 concludes.

[2] There is also some research that assesses the impact of maternal employment on other aspects of child development, such as cognitive ability and general health (e.g., Baker and Milligan, 2008; Gennetian et al., 2010; Morrill, 2011; Ruhm, 2008, Waldfogel et al., 2002).

2 Previous research

Since Anderson et al.'s (2003) seminal paper on the effect of maternal employment on child weight, a relatively large body of literature has evolved on this topic,[3] one that has been thoroughly reviewed by Greve (2008) and Scholder (2008), among others. For the purpose of our study, however, three insights from this extant research are worth noting.

First, and with very few exceptions, the literature on maternal employment and childhood obesity is an Anglo Saxon one (with several studies in the United States, Canada, Australia and Great Britain). Very few European studies exist. Two studies from the UK which we are aware of are those of Scholder (2008) and Hawkins et al. (2007). Scholder (2008), drawing on data from the British National Child Development Study (NCDS), shows that full-time maternal employment when the child is aged 7 increases the child's probability of becoming overweight by age 16 by about 5.5 percentage points. Likewise, Hawkins et al. (2007), using data from the UK Millennium Cohort Study (MCS) to examine the relationship between maternal employment and overweight in children aged 3 years, show that maternal employment after the child's birth is associated with early childhood overweight. Similar research for *continental* Europe, however, is scarce: the only paper on maternal employment and child obesity in continental Europe that we are aware of is that of Greve (2011), who uses data from the Danish Longitudinal Survey of Children (DALSC) and the official register to analyze the effect of maternal employment when the child is 3½ years old on overweight at age 7½ years. This paper is, as far as we know, the only one not to find a clear positive effect of maternal employment on child overweight. In fact, according to Greve (2011), increased maternal work hours might have a *reducing* effect on child obesity.[4]

Second, past studies have focused on obesity as the outcome variable and have seldom addressed the two main drivers of obesity, diet and physical activity. Although some studies show that maternal employment positively affects expenditures on purchased meals (Horton and Campbell 1991; McCracken and Brandt 1987) and that such meals tend to contain more calories and fats (Lin et al., 1996, 1999), we are aware of only a few that directly analyze the effect of maternal employment on meal patterns and diet. Among these, Cawley and Liu (2007), who examine mothers' time use based on the American Time Use Survey, find that employed women spend less time cooking and eating with their children. Likewise, Gaina et

[3] Two earlier studies worth mentioning from the medical literature are Takahashi et al. (1999) for Japan and Johnson et al. (1992) for the United States.

[4] Another recent (non-European) study that estimates a negative effect of maternal employment on weight is Bishop (2010) for Australia.

al. (2009), who investigate the effects of maternal employment on nutrition habits such as the regularity of breakfast, snacks, and dinner and the speed at which meals are eaten, show that among a sample of 12- to 13-year-old Japanese schoolchildren, mother's employment status affects children's eating habits in a way that could lead to weight problems. Studies on adolescents' meal patterns and maternal employment are more common. For instance, Neumark-Sztainer et al. (2003) find that in the United States, family meals are less frequent when the mothers of teenagers aged 11 to 18 years are employed full time. Siega-Riz et al. (2003), on the other hand, in their analysis of data from the Continuing Survey of Food Intake by Individuals in the United States, find no associations between meal patterns and maternal employment. There is some research evidence that children with more frequent family meals have healthier diets (Gillman et al., 2000; Haapalahti et al., 2003; Videon and Manning, 2003). However, we are not aware of any research that takes a direct look at the relationship between maternal employment and children's *calorie intake*. With regard to physical activity, Brown et al. (2010), using data from the Longitudinal Study of Australian Children, show that the children of employed mothers generally watch more television than the children of mothers who are not employed. Likewise, using diary data from the Child Development Supplement (CDS) of the Panel Study of Income Dynamics (PSID), Fertig et al. (2009) reveal that maternal employment affects a child's inclination to perform activities like reading and watching TV. A more direct measure for the extent of children's physical activity can be obtained with data from accelerometers. To our knowledge, such data have not been used to assess the relationship between maternal employment and child obesity.

A *third* important aspect of the previous research is that is has exclusively used data on BMI. It should however be stressed that BMI is not a measure of obesity which is defined as excess body fat or adipose tissue; it is this, not weight which is associated with the comorbid conditions (Sweeting, 2007). BMI, in turn, measures overweight which is excess weight in relation to height. There are a number of problems in using BMI as a proxy for obesity (Sweeting, 2007): BMI varies strongly according to gender and age (maturity) and such variations mean that among children and adolescents the significance of any particular BMI is more difficult to determine than within adult populations. BMI also measures total body weight and individuals with the same BMI can have different amounts of body fat. Thus, for example, among children with the same BMI, fat measurements tend to be higher for whites than for blacks. BMI is also determined by height and this varies according to gender and age. A further challenge is the definition of the cut-off points in order to determine overweight among children. In adults, cut-off points are associated with morbidity risks, yet this information is generally lacking for children. This latter point is usually tackled with the use of growth charts which, however, rely strongly on US data (e.g. CDC growth charts) or data from a small selection of international countries (Cole et al., 2000).

Most problematic, however, is that previous research on the effects of maternal employment on child obesity relies heavily on self-reported (as opposed to measured) BMI, i.e. usually children's parents report the height and weight of their children.[5] There is considerable evidence that such self-reporting leads to large biases (e.g. Huybrechts et al., 2006; Shields et al., 2011). In their representative study for Canada, Shields et al. (2011) report that "the use of parent-reported values resulted in significant misclassification errors for children of all ages. A substantial percentage of children who were obese according to their measured height and weight were classified in a lower BMI category. For the most part, these errors resulted from the under-reporting of weight. On the other hand, many children who were classified as obese based on parent-reported height and weight were actually overweight or even normal weight. These errors generally resulted from the under-reporting of height" (Shields et al., 2011, p. 8). In their Belgian study, Huybrechts et al. (2006) show how substantial these biases can be: "Among all children requiring nutritional advice on the basis of being overweight or obese, more than one half of the overweight children and >75% of the obese children would be missed with the use of parentally reported weight and height values" (Huybrechts et al., 2006, p. 2109).

As is apparent from the above discussion, previous research on this topic, virtually all of which finds a positive relationship between maternal employment and obesity, addresses Anglo Saxon countries almost exclusively. Furthermore, barely any research exists for Europe that looks directly at how maternal employment affects meal patterns, diet and physical activity. This latter point is, in our opinion, particularly interesting given that different causes of obesity will need to be addressed by different (public) policies.[6] Finally, obesity is poorly captured by (mostly self-reported) BMI measures. Our paper, therefore, not only investigates the relationship between maternal employment and obesity but contributes to the existing literature by exploring the effects of maternal work on meal patterns, diet and physical

[5] Exceptions, i.e. studies using measured BMI are those of Scholder (2008) and Anderson et al. (2003), although in the latter about 15% have mother-reported weight and 22% have mother-reported height.

[6] Thus, in their comparison of obesity between Whites and Blacks in the United States, Johnston and Lee (2011) argue that policies aimed at reducing Blacks' calorie intake may be more successful in reducing the weight gap than policies aimed at increasing physical activity.

activity from a European perspective. We also circumvent the problems associated with BMI by using an array of measures relating directly to body fat.

3 Data and Methods

The data used in this study are taken from the IDEFICS study ("Identification and prevention of Dietary and lifestyle induced health EFfects In Children and infantS"), which is supported by the Sixth Framework Program of the European Commission and uses standardized data collection methods in all survey countries (see Ahrens et al., 2011). Specifically, the IDEFICS is a multi-centre population-based study on childhood obesity carried out in two selected regions[7] in each of eight European countries – Belgium, Cyprus, Estonia, Germany, Hungary, Italy, Spain and Sweden. It must nevertheless be stressed that the data collected in the individual regions are not representative for their countries as a whole. The unique feature of the IDEFICS study is the large number of objective measurements and the amount of laboratory data it provides in addition to the questionnaire data.

The IDEFICS survey, administered between September 2007 and June 2008, comprised a detailed self-administered questionnaire in which parents described their children's lifestyle, diets, consumer behaviour, parental attitudes and socio-demographic circumstances. The questionnaire was developed in English, translated into the corresponding languages and translated back in order to reduce translation errors. A thorough physical examination was also conducted on all children in the sample to determine their amount of body fat and other health indicators. The overall response rate was 53.5%, resulting in a sample of 16,224 children aged between 2 and 9 years. This present analysis focuses on the 7,469 school-aged children – that is, children between the ages of 5 and 9 years.

Maternal employment and child obesity

The IDEFICS dataset contains several anthropometric measurements related to body composition. A validation study was carried out to compare the different field measurements

[7] The regions are as follows: Belgium: Geraardsbergen and Aalter; Cyprus: Strovolos and Paphos; Estonia: Tartu and Tallinn; Germany: Delmenhorst and Wilhelmshaven; Hungary: Pecs and Zalaegerszeg; Italy: Atripalda/Monteforte I/Volturara I and Avellino/Forino/Pratola Serra; Spain: Zaragoza 1. District and Huesca; Sweden: Partille and Alingsas/Mölndal. For a description of the regions, see Bammann et al. (2012a).

with body fat assessed by employing a four-component model (the “gold standard”[8]) and to derive a composite measure for body fat (see Bammann et al., 2012b). Their study shows that (measured) BMI performs only moderately well for assessing body fat. It showed that especially circumference models (e.g., waist and hip circumference as well as a combination of both) and trunk models (combinations of waist and hip circumference and subscapular skinfold) were much better suited to model body fat in this age group than BMI measures. The composite measure (depicted as “fitted model” below) derived from the validation study included hip circumference, triceps skinfold and the resistance index. Body fat mass was estimated by the following formula:

body fat in kg = -15.061 + (.26594 * hip circumference) + (.15793 * triceps skinfold) + (.35564 * FM_{res})

FM_{res} stands for fat mass and was calculated as weight (kg) minus RI (cm^2/Ohm). The resistance index (RI) was calculated as squared height (cm^2) divided by resistance (Ohm), where resistance is measured by bioelectrical impedance.

Based on this validation study, our analysis of maternal employment and child obesity uses four dependent variables. Despite its relative poor performance, for the sake of comparison with other studies on this topic, we include a measure for BMI. More specifically, we use a continuous variable describing BMI z-scores based on the growth charts of the International Obesity Task Force (IOTF) (Cole et al., 2000), which were formulated based on six nationally representative datasets of body mass indices in childhood (the countries being Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the United States). These growth charts are differentiated by age and sex.[9] A z-score thus reveals the corresponding percentile of the underlying growth chart (e.g. a z-score of 1.92 corresponds to the 97^{th} percentile). We calculate the BMI by dividing measured weight in kilograms by squared (measured) height in meters. The second is a measure that captures a child’s overweight status, a binary variable classified according to Cole et al.’s (2000) two BMI cut-off values, which fall at 85% and

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[8] As a reference, a 4-component model was used (Fuller et al., 1992), where fat mass was derived from the measurements of the other three components, i.e.:

Fat mass = body mass - lean dry mass - bone dry mass - total body water

Decomposing the components’ masses into density*volume and assuming the density of body water as 0.99371 kg/l, the density of fat mass as 0.9007 kg/l, of fat free mass as 1.1 kg/L, and the hydration of fat mass as 0% and of fat free mass as 71.94%, this formula can be rewritten as:

fat mass (kg) = 2.747*body volume (l) - 0.710*total body water (l) + 1.460*bone mineral content (kg) - 2.050*body mass (kg).

[9] We also ran our regressions using growth charts from the US Center for Disease Control (Kuczmarski et al., 2002). The main conclusions of the paper do not change.

95% on the distribution function and are also stratified by age and sex. The 85th to 95th percentile is designated “overweight” and the 95th percentile onward, “obese”. For the dummy variable, we code overweight and obese children as 1 (85th percentile or above) and all others as 0. The underlying weight and height measures are obtained by qualified health personnel.

Our third measure for child obesity is waist circumference. We use the corresponding z-scores based on the growth charts of the International Obesity Task Force (IOTF). The fourth measure is based on the fitted model described above, and which is also the most valid measure of child obesity according to the IDEFICS validation study (Bammann et al., 2012b).

Ideally, the choice of explanatory variables should be driven by a theoretical child health production function where child health (in our case obesity) is a function of parental time and other invested commodities (e.g. Ruhm, 2008). As in most studies, we take a relative eclectic approach and include a wide range of explanatory variables. Our choice is largely based on the specification in Scholder (2008), and it includes three dummy variables for maternal employment: full-time employment, defined as working 30 hours or more a week; part-time employment, less than 30 hours a week; whether the mother is undertaking further education; and a reference category of mothers who are not in paid employment (e.g., homemakers, retired, on temporary leave, maternity leave or unemployed). We also distinguish three sets of control variables – child characteristics, family and parental characteristics and socio-economic characteristics – and include country fixed effects in all regressions.

Our set of *child characteristics* includes child’s age, sex, birth weight, premature birth and breastfeeding, as well as four variables that capture health problems during the first four weeks after birth (respiratory problems, infections, underweight and jaundice), four variables that indicate the number of younger, older or same aged sibling (or no siblings), and one variable indicating birth in a foreign country. Child’s age is a dummy variable, with age 7 serving as the reference group; and birth weight is captured by two variables: the actual birth weight in grams and a dummy variable indicating a high birth weight (≥ 4kg). Breastfeeding, as well as the four health problems, are also dummy variables.

Our set of *family and parental characteristics* includes parents’ age, foreign country of origin, household size, age of mother at birth, weight gained during pregnancy, smoking during pregnancy (dummy), drinking alcohol during pregnancy (dummy), and parental BMI.

The *socio-economic variables* are the parents' educational level (ISCED 1–6) and household income (net income after taxes and deductions), which is classified into nine categories. To derive comparable income categories by country, we have built country-specific categories based on the median equivalent income adjusted for the number of household members. The lowest category is defined by each country's poverty line for a single parent with one child. The middle category is the median country-specific income for a household consisting of two adults and one child. The numbers were obtained from Eurostat (2007), and a detailed description of the categories is presented in Bammann et al. (2012, SES paper).

Formally, our regression model is as follows:

$$\mathrm{W} = \alpha_0 + E\alpha_1 + C\alpha_2 + P\alpha_3 + S\alpha_4 + D\alpha_5 + \varepsilon \qquad (1)$$

where W is a matrix for our measure for overweight and may have either continuous or discrete variables as defined above. E is a matrix of mother's employment status, C is a matrix of observable child determinants of weight, P is a matrix of observable family and parental determinants of weight, S is a matrix of socio-economic determinants of weight, and D is a matrix of country dummy variables (seven countries, with Germany as the reference country). ϵ is a matrix of idiosyncratic error terms, and the α's are the coefficients to be estimated, with α_1 being the coefficient of particular relevance in this study. Depending on the nature of W, (1) is estimated using either ordinary least squares or a probit model.

Establishing a causal relationship between maternal employment and child weight is not easy in our cross-sectional setting, especially given that maternal employment status might be endogenous (i.e., a mother may adjust her labour supply depending on the health of her child). Extant studies use five approaches to tackle this problem (Greve, 2008): (i) including a full range of observed characteristics (Anderson et al. 2003; Herbst and Tekin, 2011; Ruhm, 2008; Scholder, 2008), (ii) using (long difference) fixed effects (Anderson et al., 2003; Ruhm, 2008; Scholder, 2008), (iii) using sibling fixed effects (Anderson et al., 2003; Bishop, 2010), (iv) using average treatment effects (Liu et al., 2009; Ruhm, 2009), and/or (v) employing instrumental variables (Anderson et al., 2005; Bishop, 2009; Greve, 2008, 2011; Zhu, 2007). An elaborate discussion of the pros and cons of these methods can be found in Greve (2008). In our analysis, we try to take this endogeneity into account by using a very rich set of child and family characteristics.[10]

[10] We also extend the model depicted above by including several additional right-hand side variables, namely leisure activities (sports, playing, audiovisual media (AVM) time), family food style and attitudes, relationship between parents and child, description of family life, events encountered by the child (e.g.,

Because it is impossible to test whether or not our set of variables eliminates all unobserved heterogeneity, we also tried to employ an instrumental variable (IV) approach. As in several other papers (e.g. Greve, 2011), we used the local unemployment rate as our instrument. Unfortunately, however, because our sample includes only 16 regions, the instrument's variation was too low. It is nevertheless worth noting that all the papers that we are aware of that use an IV approach show maternal employment status to be clearly exogenous, which does provide some support for the assumption that the endogeneity of maternal employment is not a major problem in such models.

In order to better explore the heterogeneous effects of maternal employment at different points on the children's BMI distribution, we, like Greve (2011), Herbst and Tekin (2011) and Terry et al. (2007), also run quantile regressions whose estimated coefficients show the marginal change in the n^{th} BMI quantile that results from changes in the maternal employment status. Quantile regressions are also applied to the other dependent variables.

Maternal employment, diet and physical activity

According to Scholder (2008), the timing of maternal employment is important; more specifically, in her study, full-time maternal employment during mid-childhood positively affects the probability of the child's being overweight at age 16, although there is no evidence that part-time or full-time employment at earlier or later ages affects this probability. Although very few studies addressed this important point (see also Miller, 2011), most assess the effect of *past* maternal employment on *future* child weight, which they measure using different lag lengths. In our cross-sectional data set, we can control only for maternal employment status on the date that the children were surveyed,[11] even though the mother's current employment status may not be an ideal explanatory variable for current child obesity (although current and past employment are usually strongly correlated). It is, however, the relevant variable when examining the child's current diet and physical activity.

Although obesity is obviously the result of an imbalance between energy intake and energy expenditure, the exact mechanism of this imbalance is hard to pinpoint. Two points are clear, however. There is considerable marketing pressure on children to consume processed foods and the opportunities for them to do so are many. As a result, passive overconsumption is an

divorce of parents, death of parent, death of sibling, job loss of mother/father or serious illness). The conclusions of this paper do not change with such a specification.

[11] Although we include a variable for the mother never having been employed, this does not really capture the mother's employment history.

important determinant of obesity (Livingstone, 2000). We therefore analyze three variables associated with food consumption. The *first* variable is the ratio of meal frequency at home (per week) to the total meal frequency (per week), which captures the number of meals both at home and in school or day care. Meals at home are defined as meals consumed in the child's home or at other people's houses (e.g., grandparents or friends). This variable takes into account Michaud et al.'s (2007) finding that differences in obesity rates between the United States and Europe are partially associated wirh the type or quality of food eaten away from home.

The *second* dependent variable is a continuous variable that describes diet on the Youth Healthy Eating Index (YHEI) (Feskanich et al., 2004), which ranges from 0 to 80, with a higher score indicating a healthier diet. Because there is no corresponding index for European children nor common European guidelines on which to base one, the YHEI, although based on U.S. dietary guidelines, is the best available instrument for generating comparable data among the eight survey countries and drawing conclusions on the relative healthiness of a diet. This index, which measures food consumption and food-related behavioural patterns, is based on food consumption frequencies, which are collected in the IDEFICS survey using the Children's Eating Habits Questionnaire (CEHQ) (Lanfer et al., 2011). Specifically, parents responded to the following question about their children's food consumption of 43 food categories: "*In the last month, how many times did your child eat or drink the following food items? – Please refer to the last four weeks and exclude foods served at school.*" Respondents were asked to exclude foods served at school so that YHEI measures solely the healthiness of the diet under parental control. We also included meal pattern information from the CEHQ – for example, the frequency of fast food consumption, the frequency of breakfast at home or in school or the frequency of family dinners. Based on these data, we were able to replicate 10 of the 13 original YHEI dimensions (which are listed below with nutritional values in brackets):

Food types:

1. 'Whole grains' (source of fibre, vitamins, and minerals),
2. 'Vegetables' (source of vitamins and minerals),
3. 'Fruits' (source of vitamins),
4. 'Dairy' (source of calcium),
5. 'Snack foods' (unnecessary energy),
6. 'Soda and drinks' (unnecessary energy), and

7. ‘Margarine and butter’ (sources of fat).

Food behavioural patterns:

8. ‘Fried foods outside home’ (high energy intake),
9. ‘Eat breakfast’ (indicator of healthy dietary patterns), and
10. ‘Dinner with the family’ (indicator of healthy dietary patterns).

To calculate our amended YHEI, we use the sum of all available scores for the 10 dimensions, the criteria for which are adapted from Feskanich et al. (2004) (see Table 1). The possible minimum for the index is 0 and the maximum is 80.[12]

Table 1 about here

Our third measure captures the calorie intake of children in calories (kcal) per day. The data was collected by a 24-hour self-administered children and infant nutrition assessment tool called SACINA (Ahrens et al., 2011), which is based on the YANA-C questionnaire (Vereecken et al., 2008). Parents filled out this one-day diary for their children, and for school meals there was an additional on-site school meal assessment undertaken by qualified dieticians. With this information, and together with country-specific food composition tables, energy intake (kcal) is calculated for each child on a daily basis.

For energy expenditure, we employ two dependent variables: first, as a proxy for sedentary behaviour, we use the children’s total screen time (AVM time), measured as the average hours children spend on weekdays and weekends watching television, video, DVD, or in front of a computer or a game console.[13] Second, we calculate non-sedentary behaviour on the basis of uniaxial accelerometry (Ojiambo et al., 2011), a practical method of quantifying physical activity in children, whose efficacy has been demonstrated in several studies (Jackson et al., 2003). As pointed out by Johnston and Lee (2011), the benefit of such monitors is that they can capture non-structured activities that are overlooked in self-reports. Such self-reports (although widely used in the economics literature) are generally recognized

[12] The YHEI also includes the dimensions ‘meat ratio’, ‘multivitamin use’ and ‘visible animal fat’, but these factors are not covered in the IDEFICS data.

[13] We also tested physical activity using parental reported physical activity and leisure time (as further proxies for sedentary behaviour). The conclusions of the paper do not change.

as being unreliable (Troiano et al., 2008), especially when parents are reporting on their own children's physical activities. In the IDEFICS study, the monitoring device, secured directly to the skin on the right hip using an elastic belt and removed at night, was worn for an average of 3.7 days (including weekdays and weekends). The resulting activity data were sampled on a minute-by-minute basis and then averaged over a whole week, although the analysis included only days with greater than 600 minutes of registered data. The total volume of physical activity is expressed as total counts divided by number of days registered; the time engaged in moderate and vigorous physical activity is calculated and presented as a proportion of total time.

For this analysis, we include the same set of variables as in the weight regressions; namely, maternal employment, child characteristics, family and parental characteristics, socio-economic characteristics and country dummies. Thus, formally, our regression model is as follows:

$$D = \alpha_0 + E\,\alpha_1 + C\,\alpha_2 + P\,\alpha_3 + S\,\alpha_4 + D\alpha_5 + \varepsilon \qquad (2)$$

where D is our measure for diet and physical activity. The dependent variables for diet are meals at home/out or the YHEI values and those for physical activity are sedentary versus non-sedentary behaviour. E is a matrix of mother's employment status, C is a matrix of child characteristics, P is a matrix of observable family and parental determinants of weight, S is a matrix of socio-economic determinants of weight, and D is a matrix of country dummy variables (seven countries, with Germany as the reference country). ϵ is a matrix of idiosyncratic error terms. The descriptive statistics for all variables are given in appendix table A1.[14]

4 Results

Maternal employment and child weight

The descriptive statistics for (part- and full-time) employed and non-employed mothers on four measures of weight (BMI, overweight and obese, waist circumference, fitted model) are given in table 2. In our full sample, all obesity measures are significantly *higher* among non-employed than employed mothers. These differences are particularly high in our German and Swedish samples (see table 3) – in Germany, the percentage of overweight or obese children

[14] We also ran all regressions with different combinations of explanatory variables, yet our main conclusions never changed.

among working mothers is 19% compared to 26% among non-employed mothers. This could be a result of the relatively low socio-economic status of non-employed mothers (see Will et al., 2005). In no country is there any significant evidence that the children of employed mothers are heavier than those of non-employed mothers.

Table 2 about here

Table 3 about here

In general, the regression results for our four dependent variables on child obesity, summarised in table 4, provide no evidence that maternal employment has a positive effect on child weight. In the case of part-time employment, we note that in most models the estimated coefficients for the part-time employment dummy are negative (although not significant at conventional levels), implying that part-time employment could actually reduce child weight. These results differ greatly from the vast body of evidence obtained for the U.S. but are very similar to those of Greve (2011) for Denmark and Bishop (2010) for Australia. Scholder (2008) too finds no evidence of a positive effect of part-time employment on child weight in the UK.

Table 4 about here

The country effects outlined in table 4 are quite substantial. All else being equal, the Southern European children in our sample are significantly heavier than the reference sample from Germany, whereas the Swedish and Belgian children are significantly lighter. One noteworthy point is that these country differences remain even after the inclusion of a very rich set of covariates. This observation supports Font et al.'s (2010) finding, for a comparative study of adult obesity in Italy and Spain, that cultural and environmental factors (e.g., peer effects and regional BMI values) explain a large share of differences in obesity and override the effect of many individual determinants. The results of the individual country regressions are listed in table 5. Clearly, and despite large variations in obesity among the regions in our sample, maternal employment is seldom significant and thus does not appear to be the driving force in determining child obesity. Only full-time employment in Cyprus (BMI model) and Italy (fitted model) is significant. Part-time employment in Spain (fitted model) reveals a significant negative effect.

Table 5 about here

As indicated by the results for the quantile regressions (see table 6), we observe little effect of maternal employment on child weight at different points on the obesity-measuring distribution. In our fitted model, we note that part-time employment has a significant (albeit small) effect on obesity in the top percentile. This observation mirrors that of Greve (2011) for Denmark, as well as Herbst and Tekin's (2011) finding for the U.S. that the impact of maternal work has no consistent pattern over the BMI distribution and results in very few significant coefficients.

Table 6 about here

To summarize, current maternal employment is not associated with the children's current obesity. As we cannot rule out the possibility that current maternal employment may affect future obesity levels, we proceed by analysing the effect that maternal employment has on the direct drivers of obesity, namely energy intake and expenditure.

Maternal employment, diet and physical activity

Descriptive statistics for (part- and full-time) employed and non-employed mothers on meal patterns and diet and physical activity are given in table 7. Although it is not surprising that meals at home are more common among the children of non-employed mothers, we find slightly higher YHEI scores for the children of employed mothers. Children's energy intake is significantly lower and energy expenditure is significantly higher among employed mothers, although the differences are very small. At the country level (table 8), few differences are significant. Only in Belgium do we note that calorie intake is lower among children of employed mothers, whereas the opposite is true in our Swedish sample. In our Hungarian sample, children of non-employed mothers have a significant higher level of physical activity. Differences are, however, relatively small.

Table 7 about here

Table 8 about here

As shown in table 9, which depicts the regression results for maternal employment on meal patterns and diet, children of employed mothers consume meals at home less frequently. These results support findings reported by Neumark-Sztainer et al. (2003) and Cawley and Liu (2007). Some studies suggest a positive relationship between the frequency of family meals at home and diet healthiness (Gillman et al., 2000; Haapalahti et al., 2003; Videon and Manning, 2003). In our analysis, because there is no evidence of a relation between maternal employment and the healthiness of children's diet under parental control (as measured by the YHEI index), the lower frequency of meals at home seems to play no role on the healthiness of the diet under parental control. There is also no evidence that maternal employment affects the calorie intake of children. This latter result is particularly relevant as it captures both meals taken at home as well as outside the home.

Table 9 about here

According to the estimated effects of maternal employment on physical activity, outlined in table 9, maternal employment status has no effect on the child's sedentary and non-sedentary behaviour.

5 Conclusions

Our analysis of approximately 7,000 European school children provides no evidence that maternal (part- or full-time) employment is related to child obesity, diet or physical activity. If anything, maternal (part-time) employment may actually have a beneficial effect on child obesity. These findings stand at odds with those of a number of studies conducted primarily in the U.S., and raise the question of why maternal employment need not have a negative effect on this aspect of child development in the European context.

In answer, we point first to the importance of institutional differences in public support for parental childcare. In many European countries, provision of maternity and parental leave may allow mothers (and in some countries, fathers also) to spend more time caring for children without withdrawing from the labour market. Cash benefits like child-family allowances, tax relief, and subsidized services may also allow parents to forgo some employment-related earnings in order to spend more time caring for children (Sayer, Bianchi et al., 2004). In the U.S., however, public support for parental childcare is much lower, and it is the only OECD country without federal or central government legislation on paid maternity leave (OECD, 2011). In fact, Sayer, Bianchi et al. (2004) argue that in the US, less-educated parents may spend the majority of their parenting effort on providing for their children. These parents are also more likely to be employed in occupations with rotating shifts or inflexible hours, and may have to take two jobs to make ends meet. Consequently, they may not have as much time or energy to care for children as more highly educated parents.

In addition, as Bianchi (2000) argues, the dramatic rise in maternal employment has not necessarily led to a qualitatively significant reduction in the time mothers spend with their children. Rather, employed mothers maximize such time by working part-time or by having fewer children, a particularly relevant factor in Southern European countries where fertility rates have been extremely low for a number of decades. They may also use their non-market time differently; for example, by using market substitutes for housework or by expending less time on leisure or on volunteering. At the same time, working fathers are spending more time with their children than in the past (Benson and Mokhtari, 2011). Bianchi (2000) thus concludes that, despite large increases in maternal employment, mothers’ time and attention to children has been far more constant over the past few decades than might be expected.

Finally, although these aspects of parental care matter, the provisions of institutional childcare may be just as important to overall diet and physical activity levels. Hence the provision of quality non-parental care may be an effective way of improving child outcomes. The often-claimed poor quality of childcare in the U.S. (UNICEF, 2008), although admittedly difficult to measure, may partly explain the differences between the findings for continental Europe and the U.S.[15] As a number of studies in Nordic countries show that there exists a beneficial effect of high quality out-of-home care on the welfare of especially disadvantaged children, there seems to be fairly strong support for the Nordic model of public provision of formal child care with its educated and regulated caregivers for children in all age-groups (Gupta et al., 2008). Although many concerns have been expressed that maternal employment outside the home may adversely affect children, our study indicates that, with regard to obesity in Europe, such concerns are not warranted.

[15] Of the 10 benchmarks defined by UNICEF, the United States fulfils only 3 and is ranked fourth from last in a group of 25 developed countries. Interestingly, the last four countries in this ranking are Anglo Saxon, namely Ireland, Canada, Australia, and the United States.

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Tables and figures

Table 1: Youth Healthy Eating Index (YHEI) scoring criteria, based on Feskanich et al. (2004)

YHEI dimensions	**YHEI scoring criteria** **Requirements for max. score of 10**	**Requirements for min. score of 0**	**Scores Mean (SD)**
	⟵ Servings per day	⟶	
1. Whole grain	≥ 2	0	3.19 (3.31)
2. Vegetables	≥ 3	0	3.91 (2.52)
3. Fruits	≥ 3	0	3.87 (2.67)
4. Dairy	≥ 3	0	6.42 (2.50)
5. Snack foods	0	≥ 3	6.25 (2.66)
6. Soda & drinks	0	≥ 3	8.50 (2.52)
	Requirements for max. score of 5	**Requirements for min. score of 0**	
7. Margarine & butter	Daily	≥ 2 pats/day	3.16 (1.67)
8. Fried foods outside home	Never	Daily	4.74 (.31)
9. Eat breakfast	≥ 5 times/week	Never	4.76 (.83)
10. Dinner with the family	Daily	Never	4.79 (.83)
YHEI (0-80)			49.67 (8.40)

Table 2: Descriptive statistics: children's weight status by employed vs. non-employed mothers

Variable	**Full-time and part-time employed**	**Non-employed**	**P (t test)**
BMI (z-score, Cole)	.41	.61	.000***
Overweight & obese (Cole, dummy)	.26	.32	.000***
Waist circumference (z-score, Cole)	.57	.65	.021*
Fat (fitted model) (in kg)	5.29	5.84	.000***
Observations	4,772	2,694	

* p < .05, ** p < .01, *** p < .001

Table 3a: Descriptive statistics across countries: BMI and overweight values

		BMI (z-score, Cole)			Overweight/obese (dummy, Cole)		
Country	**Obs.**	**Full-time and part-time employed**	**Non-employed**	**P**	**Full-time and part-time employed**	**Non-employed**	**P**
Belgium	780	-.10	-.14	.740	.12	.13	.707
Cyprus	937	.58	.40	.103	.33	.27	.100
Germany	1,034	.27	.43	.034*	.19	.26	.007**
Hungary	1,268	.32	.30	.856	.25	.24	.830
Estonia	812	.31	.39	.386	.20	.24	.302
Italy	1,290	1.38	1.28	.218	.56	.53	.233
Spain	769	.54	.60	.551	.29	.29	.960
Sweden	578	.01	.17	.312	.13	.22	.038*

* p < .05, ** p < .01, *** p < .001

Table 3b: Descriptive statistics across countries: Waist circumference and fat (fitted model)

		Waist circumference (z-score, Cole)			Fat mass (kg, fitted model)		
Country	**Obs.**	**Full-time and part-time employed**	**Non-employed**	**P**	**Full-time and part-time employed**	**Non-employed**	**P**
Belgium	780	.27	.25	.848	3.83	3.73	.683
Cyprus	937	1.01	.95	.608	5.22	5.32	.740
Germany	1,034	-.04	.13	.034*	4.98	5.55	.008**
Hungry	1,268	.60	.50	.223	5.29	4.95	.135
Estonia	812	.34	.42	.417	4.92	4.84	.757
Italy	1,290	1.35	1.24	.205	8.06	7.58	.068
Spain	769	.56	.64	.447	5.29	5.49	.450
Sweden	578	.28	.52	.064	4.67	5.53	.009**

* p < .05, ** p < .01, *** p < .001

Table 4: OLS/Probit estimates of maternal employment status and country on various obesity measures

Variable	**(1) BMI (z-score, Cole)**	**(2) Overweight/ obese (dummy, Cole)**	**(3) Waist circumference (z-score, Cole)**	**(4) Fat mass (kg, fitted model)**
Full-time employment	.066	.085	.062	.189
	(.05)	(.06)	(.053)	(.15)
Part-time employment	-.044	-.087	-.025	-.108
	(.05)	(.07)	(.06)	(.16)
In school/university	.234	.455*	.270	979
	(.20)	(.21)	(.21)	(.56)
Belgium	-.188*	-.286*	.58***	-.203
	(.08)	(.12)	(.08)	(.19)
Cyprus	.573***	.671***	1.33***	1.36***
	(.09)	(.11)	(.09)	(.24)
Estonia	.085	-134	.444***	-.134
	(.08)	(.11)	(.09)	(.23)
Hungry	.043	.214*	.603***	.013
	(.08)	(.10)	(.08)	(.20)
Italy	1.180***	1.151***	1.480***	3.270***
	(.08)	(.09)	(.08)	(.22)
Spain	.509***	.486***	.894***	1.320***
	(.08)	(.10)	(.09)	(.21)
Sweden	-.216*	-.249*	.377***	-.497*
	(.09)	(.12)	(.09)	(.21)
Observations	4,385	4,386	4,306	4,222
Adj. R^2/Pseudo R^2	.241	.176	.220	.277

Note: OLS/Probit estimates with robust standard errors in parentheses. Dependent variables are four obesity measures (BMI z-score by Cole, overweight/obese dummy by Cole, waist circumference z-score by Cole and fat mass in kg by Bammann et al., 2011) for children in school below the age of 10 years. All presented variables are dummy variables. Reference category for the first three employment status variables is non-employment. Reference country is Germany. We control for child, family and parental as well as socio-economic characteristics.

* p < .05, ** p < .01, *** p < .001

Table 5: OLS/Probit country regressions on various obesity measures

Variable	Belgium	Cyprus	Estonia	Germany	Hungary	Italy	Spain	Sweden
				Dependent: BMI (z-score, Cole)				
Full-time employment	.109	.414*	-.040	.243	-.014	.219	-.015	-.106
	(.17)	(.19)	(.14)	(.21)	(.13)	(.13)	(.15)	(.22)
Part-time employment	.139	.443	-272	-.074	.011	-.030	-.238	-.052
	(.17)	(.24)	(.18)	(.12)	(.21)	(.15)	(.16)	(.27)
Observations	452	510	490	463	815	837	445	373
Adj. R2	.162	.136	.180	.188	.096	.146	.232	.092
				Dependent: Overweight/obese (dummy, Cole)				
Full-time employment	.321	.218	-.224	.129	.072	.154	.055	.173
	(.35)	(.20)	(.19)	(.29)	(.13)	(.12)	(.21)	(.33)
Part-time employment	-.201	.283	-.434	-.125	.015	-.135	-.191	.192
	(.36)	(.25)	(.28)	(.19)	(.22)	(.14)	(.22)	(.39)
Observations	429	509	476	461	812	837	444	364
Adj. R2	.287	.115	.160	.208	.092	.117	.192	.165
				Dependent: Waist circumference (z-score, Cole)				
Full-time employment	.099	.244	-.017	.350	.057	.241	-.083	.075
	(.16)	(.20)	(.15)	(.22)	(.13)	(.13)	(.16)	(.19)
Part-time employment	.144	.385	-.118	-.152	.009	.042	-.265	.297
	(.16)	(.24)	(.17)	(.129)	(.20)	(.15)	(.18)	(.23)
Observations	496	496	475	463	810	823	439	373
Adj. R2	.114	.114	.182	.172	.103	.175	.191	.144
				Dependent: Fat mass (kg, fitted model)				
Full-time employment	.444	.323	-.058	.368	-.064	.780*	-.186	-.032
	(.31)	(.51)	(.40)	(.55)	(.36)	(.41)	(.42)	(.50)
Part-time employment	.126	.853	-.218	-.422	-.547	.034	-.709*	.338
	(.30)	(.60)	(.49)	(.289)	(.52)	(.44)	(.42)	(.61)
Observations	417	463	455	459	809	819	443	357
Adj. R^2	.223	.185	.203	.275	.138	.216	.264	.138

Note: OLS/Probit estimates with robust standard errors in parentheses. Dependent variables are four obesity measures (BMI z-score by Cole, overweight/obese dummy by Cole, waist circumference z-score by Cole and fat mass in kg by Bammann et al., 2011) for children in school below the age of 10 years. All presented variables are dummy variables. Reference category for the first three employment status variables is non-employment. We control for child, family and parental as well as socio-economic characteristics.
* p < .05, ** p < .01, *** p < .001

Table 6: Quantile regression estimates on child's weight; bootstrapped standard errors in parentheses (100 repetitions)

Variable	**(10%)**	**(25%)**	**(50%)**	**(75%)**	**(85%)**	**(90%)**	**(95%)**
Dependent: BMI (z-score, Cole)							
Full-time employment	.109	.414*	-.040	.243	-.014	.219	-.015
	(.17)	(.19)	(.14)	(.21)	(.13)	(.13)	(.15)
Part-time employment	.139	.443	-272	-.074	.011	-.030	-.238
	(.17)	(.24)	(.18)	(.12)	(.21)	(.15)	(.16)
Observations	452	510	490	463	815	837	445
Pseudo R2	.162	.136	.180	.188	.096	.146	.232
Dependent: Waist circumference (z-score, Cole)							
Full-time employment	.099	.244	-.017	.350	.057	.241	-.083
	(.16)	(.20)	(.15)	(.22)	(.13)	(.13)	(.16)
Part-time employment	.144	.385	-.118	-.152	.009	.042	-.265
	(.16)	(.24)	(.17)	(.129)	(.20)	(.15)	(.18)
Observations	496	496	475	463	810	823	439
Pseudo R2	.114	.114	.182	.172	.103	.175	.191
Dependent: Fat mass (kg, fitted model)							
Full-time employment	.444	.323	-.058	.368	-.064	.780*	-.186
	(.31)	(.51)	(.40)	(.55)	(.36)	(.41)	(.42)
Part-time employment	.126	.853	-.218	-.422	-.547	.034	-.709*
	(.30)	(.60)	(.49)	(.289)	(.52)	(.44)	(.42)
Observations	417	463	455	459	809	819	443
Pseudo R^2	.223	.185	.203	.275	.138	.216	.264

Note: Dependent variables are three obesity measures (BMI z-score by Cole, waist circumference z-score by Cole and fat mass in kg by Bammann et al., 2011) for children in school below the age of 10 years. All presented variables are dummy variables. Reference category for the first three employment status variables is non-employment. We control for child, family and parental as well as socio-economic characteristics.
* p < .05, ** p < .01, *** p < .001

Table 7: Descriptive statistics: diet and physical activity by maternal employment

Variable	N	Full-time and part-time employed	Non-employed	P (t test)
Diet: meals home (percent)	5,879	77.92	84.34	.000
Diet: YHEI (0–80)	6,324	49.87	48.78	.000
Diet: Energy intake (kcal/day)	4,792	1,580	1,638	.000
Physical activity: sedentary AVM (hours/week)	7,180	12.88	13.53	.000
Physical activity: moderate/vigorous (%)	3,997	10.31	10.51	.191

* p < .05, ** p < .01, *** p < .001

Table 8: Descriptive statistics across countries: YHEI and sedentary behaviour

	Diet: energy intake (kcal/day)				Physical activity: moderate/vigorous (%)			
Variable	Obs.	Full-time and part-time employed	Non-employed	P	Obs.	Full-time and part-time employed	Non-employed	P
Belgium	150	1,416	1,637	.009**	273	10.59	11.46	.093
Cyprus	492	1,348	1,380	.500	159	7.98	8.09	.859
Estonia	458	1,705	1,753	.417	495	11.11	11.51	.357
Germany	942	1,652	1,608	.248	643	12.66	12.58	.853
Hungry	885	1,308	1,324	.675	930	9.51	10.25	.006**
Italy	1,137	1,835	1,826	.779	588	7.05	7.63	.067
Spain	289	1,731	1,797	.276	621	11.04	11.63	.095
Sweden	439	1,688	1,534	.007**	228	11.73	10.23	.054

* p < .05, ** p < .01, *** p < .001

Table 9: OLS estimates of maternal employment status and country on diet and physical activity

Variable	(1) Diet: % meals home	(2) Diet: YHEI	(3) Diet: Energy intake	(4) PA: moderate & vigorous activity (Pate)	(5) PA: sedentary (AVM time)
Full-time employment	-3.31***	-.565	-24.60	-.121	-.017
	(.51)	(.33)	(.26.30)	(.20)	(.28)
Part-time employment	-1.35*	.440	-52.40	-.218	-.459
	(.58)	(.39)	(.28.80)	(.26)	(.31)
In school/university	-.178	1.77	.-36.0	-.847	-1.02
	(1.65)	(1.37)	(78.20)	(.81)	(.96)
Belgium	-12.80***	-1.36*	-223***	-2.12***	2.17***
	(1.19)	(.64)	(56.6)	(.43)	(.46)
Cyprus	-21.70***	.138	-268***	-4.77***	3.07***
	(1.63)	(.70)	(44.3)	(.47)	(.49)
Estonia	-17.80***	4.21***	22.6	-1.48***	6.01***
	(.95)	(.63)	(45.9)	(.40)	(.50)
Hungry	-26.50***	-.082	-363***	-2.82***	.256
	(.95)	(.58)	(39.5)	(.35)	(.42)
Italy	7.17***	-.794	181***	-5.32***	2.01***
	(.90)	(.57)	(37.9)	(.37)	(.43)
Spain	-6.71***	2.38***	48.9	-1.52***	.756
	(1.00)	(.60)	(49.0)	(.37)	(.43)
Sweden	-21.4***	6.89***	-18.5	-.554	2.92***
	(.96)	(.64)	(43.5)	(.46)	(.47)
Observations	3,560	3,847	2,866	2,374	4,309
Adj. R^2/Pseudo R^2	.568	.141	.149	.208	.149

Note: OLS estimates with robust standard errors in parentheses. All variables are dummy variables. Reference category for the first three employment status variables is non-employment. Reference country is Germany. We control for child, family and parental as well as socio-economic characteristics.
* p < .05, ** p < .01, *** p < .001

Appendix

Table A1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Dependent variables					
BMI (z-score)	7,466	0.49	1.39	-8.73	5.06
Overweight & obese (dummy)	7,469	0.28	0.45	0	1
Waist circumference (z-score)	7,322	0.60	1.40	-3.82	5.18
Fat mass (kg)	7,170	5.49	3.82	0	30.25
Diet: % Meals home	5,879	80.27	17.23	16.67	100.00
Diet: YHEI	6,324	49.49	8.33	17.76	78.81
Diet: Energy intake (kcal)	4,792	1,603.38	568.93	13.37	5,426.35
PA: Sedentary behaviour (AVM)	7,180	13.11	7.45	0.00	56.00
PA: Moderate & vigorous activity	3,937	10.38	4.48	0.71	32.09
Maternal employment					
Full-time employment	7,469	0.46	0.50	0	1
Part-time employment	7,469	0.18	0.38	0	1
In school/university	7,469	0.01	0.10	0	1
Country					
Belgium	7,469	0.10	0.31	0	1
Cyprus	7,469	0.13	0.33	0	1
Estonia	7,469	0.11	0.31	0	1
Germany	7,469	0.14	0.35	0	1
Hungary	7,469	0.17	0.38	0	1
Italy	7,469	0.17	0.38	0	1
Spain	7,469	0.10	0.30	0	1
Sweden	7,469	0.08	0.27	0	1
Child characteristics					
Age: 5 years	7,469	0.01	0.11	0	1
Age: 6 years	7,469	0.23	0.42	0	1
Age: 7 years	7,469	0.44	0.50	0	1
Age: 8 years	7,469	0.29	0.45	0	1
Age: 9 years	7,469	0.02	0.16	0	1
Sex	7,469	0.51	0.50	0	1
Birth: weight (g)	7,242	3,328.41	554.24	1,000	6,100
Birth: premature	7,335	0.27	0.45	0	1
Infancy: breastfed	6,527	0.54	0.50	0	1
Infancy: respiratory problems	7,469	0.03	0.17	0	1
Infancy: infections	7,469	0.03	0.16	0	1
Infancy: jaundice	7,469	0.14	0.35	0	1
No of siblings: older	7,469	0.04	0.19	0	1
No of siblings: same age	7,469	0.66	0.88	0	10

No of siblings: younger	7,469	0.04	0.20	0	4
No of siblings: none	7,469	0.51	0.68	0	10
Country of birth: foreign	7,469	0.17	0.38	0	1
Family & parental characteristics					
Age: mother	7,409	36.41	5.27	18	79
Age: father	6,756	39.47	5.81	22	73
No household members	7,398	3.94	1.24	1	15
Country of birth mother: foreign	7,398	0.12	0.33	0	1
Country of birth father: foreign	7,369	0.12	0.32	0	1
Pregnancy: age mother	7,216	28.88	5.10	15	45
Pregnancy: weight gain mother	7,064	14.18	6.12	0	50
Pregnancy: maternal smoking	7,469	0.15	0.36	0	1
Pregnancy: alcohol consumption	7,469	0.03	0.17	0	1
BMI mother	7,196	23.95	4.31	12.3	63.3
BMI father	6,365	26.57	3.67	14.8	47.3
Socio-economics					
Education mother: ISCED	6,906	3.61	1.14	1	6
Education father: ISCED	6,511	3.53	1.16	1	6
Household net income	6,844	5.11	2.51	1	9