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**Stockholm  
Research Reports  
in Demography  
2016: 11**

**Double Disadvantage in a Nordic Welfare State:  
A Demographic Analysis of the Single Mother Employment Gap in Finland,  
1987–2011**

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**Abstract:** In this study, we demonstrate how an evolving educational gradient of single motherhood can interact with changing labor market conditions to shape labor market inequalities between partnered and single mothers. We analyze trends in the employment rates of partnered and single mothers in Finland from 1987 to 2011. In the late 1980s, Finnish single mothers' employment rate was at an internationally high level and on par with that of partnered mothers. Ever since the 1990s' economic crisis, single mothers have had a 8–10 percentage points lower employment rate than partnered mothers. During the same period, the prevalence of single motherhood increased particularly among the least educated, which meant that single mothers' relative educational profiles have become increasingly disadvantageous. We use Chevan's and Sutherland's decomposition method to estimate how much of the increased gap between partnered and single mothers' employment rates can be explained by compositional change and how much was due to employment rate differences net of compositional differences. Our findings point to an increasing double disadvantage: the gradually evolving disadvantage in educational backgrounds together with large employment rate differences among mothers with low educational attainment levels are an important explanation. These findings show how socio-demographic changes in interaction with a changing employment regime can produce inequalities by family structure also in a Nordic society known for its extensive support for mothers' employment.

**Keywords:** single mothers, employment, demographic decomposition, education, Finland

## **Introduction**

A large body of literature has associated single motherhood with poverty and other economic disadvantages across a wide range of countries (e.g., Brady and Burroway 2012; Maldonado and Nieuwenhuis 2015; McLanahan and Percheski 2008; McLanahan and Sandefur 1994; OECD 2011). Lack of employment and low labor market incomes are key contributors to single mothers' economic disadvantage (Maldonado and Nieuwenhuis 2015; Misra et al. 2012; OECD 2011).

Single mothers' employment rates show large cross-national variation, but in many OECD countries they have increased since the 1980s and are today often on par or exceed those of partnered mothers (OECD 2011; 2015). Finland, Denmark and Sweden are among the countries where single mothers' employment rates have decreased since the 1980s and are currently below those of partnered mothers (Burström et al. 1999; Hakovirta 2006; Kjeldstad and Rønsen 2004; Nordenmark 2000; OECD 2011; 2015). This development has occurred despite the Nordic countries' extensive policies to promote all mothers' labor market participation (e.g., Esping-Andersen 1999). Nordic policies such as extensive, affordable and high-quality child care should foster employment among single mothers who as sole breadwinners of their household generally have higher incentives for paid work than partnered mothers, but without public support can face child-care related and other obstacles to employment (Gonzalez 2004; Kollmeyer 2013). Indeed, Nordic countries' high single mother employment rates in the 1980s, both in international comparison and relative to partnered mothers, supported the view of Nordic countries as supporters of single mothers' employment (Esping-Andersen 1999; Hobson 1994; OECD 2011; Rubery et al. 1999). The Nordic countries have retained their position as societies which actively promote mothers' employment (Thévenon 2011), but in Finland, Sweden and Denmark these policies have not delivered similarly high single mother employment rates as they used to.

This study focuses on Finland, and presents a decomposition analysis of the trends in single mothers' employment rates between 1987 and 2011. Finland went through a serious economic recession in the early 1990s, which triggered a major unemployment crisis and a significant restructuring of the economy from industrial jobs to jobs in the service and high-skilled manufacturing sectors (Asplund and Maliranta 2006; Kiander and Vartia 1996). The severity of the 1990s' crisis becomes clear from Figure 1, which shows a strong decline in all

mothers' employment rates from 1990 to 1993, and a slow increase thereafter. Yet, it is evident that single mothers' employment took a particularly severe hit and never recovered to previous levels, unlike partnered mothers' employment rates.

— *Figure 1* —

Changes in the labor market were accompanied by more gradual socio-demographic change, which has shaped the profile of single motherhood. Finland is among the countries in which single motherhood has increased particularly among low educated women (Härkönen 2016). This means that single mothers' educational attainment levels have become lower relative to partnered mothers. Such trends in the strengthening association between education and family structure have attracted much attention (McLanahan 2004; 2014; Putnam 2015), particularly because of concerns about how they contribute to the reproduction of inequalities by education and gender and across generations (McLanahan and Percheski 2008). The change in single and partnered mothers' educational profiles, as well as potential changes in the age structures of single mothers and their children (OECD 2011) can have contributed to the increasing employment gap between Finnish partnered and single mothers. The effects of these compositional changes can be amplified by a changing labor market which increasingly values education.

The objective of our analysis was to estimate how much of the change in Finland's single mother employment gap—the difference between partnered and single mothers' employment rates—from 1987 to 2011 has been due to changes in socio-demographic profiles by age, educational attainment, and age of the youngest child, and how much has been due to changes in labor supply or demand related factors. We used Chevan and Sutherland's (2009) extension to Das Gupta's (1993) multifactor decomposition method on large and reliable Finnish population register data. An advantage of this method over Das Gupta's decomposition method is that it enables decomposition by variable category and thus, an assessment of the contributions of composition and rate effects within sub-groups of single and partnered mothers. The Chevan-Sutherland method reveals more details about the sources of the change by identifying where in distribution of the background variables the differences matter the most.

Our results point to a double disadvantage behind the decline in Finnish single mothers' employment rates. Finnish single mothers have an increasingly disadvantageous educational profile compared to Finnish partnered mothers. Particularly, the growing gap in higher tertiary educational attainment has contributed to the single mother employment gap. In addition to this compositional change, single mothers have persistently lower employment rates in the lower educational groups. Beyond contributing to understanding why single mothers' employment has declined in a Nordic welfare state, our study adds to the understanding of how uneven family demographic change interacts with labor market trends in shaping social inequality. Our analysis also provides an example of the usefulness of Chevan's and Sutherland's previously underused decomposition technique.

## **Background**

We provide a brief overview of theoretical perspectives to single and partnered mothers' employment as well as of the demography of single parenthood and relevant labor market and policy developments in Finland.

### *Single Mothers and Employment*

In a simplified form, the standard economic model of labor supply predicts that higher wages increase the labor supply, whereas higher non-work incomes as well as other non-work related sources of utility (such as child-care) decrease it (e.g., Cahuc et al. 2014). Because having children increases the value of women's time outside paid work, mothers supply less labor than childless women and women's labor supply is more elastic than men's labor supply (ibid.; Bargain et al. 2014). In addition, mothers' employment and earnings are negatively affected by employer discrimination (Correll et al. 2007).

In general, single and partnered mothers' employment is affected by similar factors: both are more likely to be employed if they are highly educated, have fewer and older children, have higher (potential) earnings and in-work benefits, have good access to quality child day care, and have lower incomes from other sources than work (such as social benefits) (e.g., Ahn 2012; González 2004; Gornick 2004; Misra et al. 2012; OECD 2011; Rafferty and Wiggan 2011;

Steiber and Haas 2012; Wu and Eamon 2011). Differences by these factors partly explain the differences between single mothers' and partnered mothers' employment rates (González 2004; OECD 2011; Wong et al. 1993; Wu and Eamon 2011).

The importance of these factors can nevertheless vary between single and partnered mothers. Single mothers are the sole family breadwinners and should thus have higher labor supply incentives (González 2004). Yet single mothers' labor supply is generally more elastic than the labor supply of partnered mothers (Bargain et al. 2014). It is also more dependent on access to public childcare (Connelly and Kimmel 2003; Misra et al. 2012). Single mothers' childcare responsibilities can also reduce their opportunities in accepting job offers with unusual working hours or reduce employers' willingness to hire them. Finally, social benefits can create stronger labor supply disincentives for single than partnered mothers, either because of benefits or their supplements that are targeted to single mothers or because of single mothers' higher labor supply elasticity.

Consequently, educational attainment, age of the mother, and age of the children can have different effects on single compared to partnered mothers' employment. In particular, single and partnered mothers' employment can differ in groups which are the least attached to the labor market to begin with, such as the young, low educated, and those with young children. Social benefits and public childcare can be of particular importance for these mothers' employment. They can also have lower bargaining power with respect to working times and work conditions.

### *The Socio-Demographic Profile of Single Mothers in Finland*

Mostly owing to increases in separation and divorce, single parent families have become more common across developed societies during the past decades (Fokkema and Liefbroer 2008). In Finland, the share of single mother families of all families with children under 18 year of age increased from 12 % in 1990 to 17 % in 2000, and was 18 % in 2015 (Statistics Finland 2016a).

In many countries, such as the U.S. and the U.K., single mothers' young age, scant work experience (Stewart 2009; Wu and Eamon 2011) and young children (Ahn 2012; Michalopoulos and Robins 2002; Rafferty and Wiggan 2011; Shannon 2009) have been pointed out as factors contributing to their labor market disadvantages. Similar to many other European countries, the

large majority of Finnish single motherhood<sup>1</sup> results from separations rather than childbearing outside unions (Heuveline et al. 2013). Consequently, Finnish single mothers are less likely than partnered mothers to have very young children, which should favor their employment. Typical of the Nordic countries, the adolescent birth rate in Finland is low (United Nations 2013) and the age distributions of single and partnered mothers are generally similar. In 2014, single mothers were slightly overrepresented both among mothers 26 years or younger and among mothers 43 years or older (Statistics Finland 2016b).

Single motherhood is more common at lower than higher educational levels in many countries, including Finland (Härkönen 2016; McLanahan 2004; McLanahan and Jacobsen 2015). In Finland, this is mainly due to the strongly negative gradient between education and union dissolution (Jalovaara 2013), but also because childbearing outside unions is much more common among the lowest educated women (Jalovaara and Fasang 2015). The educational gradient of single motherhood has, furthermore, increased during the last decades. At the end of the 1980s, the prevalence of single motherhood (as a share of all mothers) was similar (approximately 10%) in all educational groups, but by the 2000s, it had doubled among mothers with low education, while remaining stable among mothers with high education (Härkönen 2016). These factors translate into a weakening of single mothers' educational profiles compared to partnered mothers, which can be expected to increasingly contribute to single mothers' lower employment rates.

### *Labor Market and Policy*

The 1990s' economic recession caused a major shock to the Finnish labor market. Employment rates fell sharply and never fully recovered to previous levels (Statistics Finland 2016c). During and in the aftermath of the recession, many industrial jobs disappeared, whereas the demand of labor in research, development and the ICT-sectors increased (Asplund and Maliranta 2006;

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<sup>1</sup> A significant minority – 17 % in 2014 – of single parents are men (Statistics Finland 2016a). Compared to single mothers, single fathers are more homogenous in terms of age and the fathers and their children tend to be older. Because the method used in this paper relies on the cross-tabulation of populations into small sub-categories, single fathers could not be included in the analyses.

Hannikainen and Heikkinen 2006). This led to a relative increase in the demand for skill and unemployment levels among workers with low levels of education have been particularly dire. The 1990s also witnessed an increase in temporary work contracts, the prevalence of which rose above the OECD average and became particularly common among women (Nätti et al. 2005; Polavieja 2006). The economic recession after 2008 further weakened the labor market, which still carried the scars of the 1990s' recession.

Social and family policies can have modified the employment effects of economic restructuring and demographic change. In general, Finnish family policies are characteristic of the Nordic welfare regime, which aims to promote all mothers' employment and gender equality through generous parental leave schemes, strongly subsidized high-quality child care, and individualized taxation (Esping-Andersen 1999). Finland has a comparatively long history of a two-earner model, where women rarely stay voluntarily as homemakers beyond their children's first years and where mothers are typically employed full-time (Statistics Finland 2014). However, one feature that differentiates Finland from the other Nordic countries is the popularity of the child home care leave policy, which is a subsidy paid to parents whose under-three-year-old child is not in municipal day care and consists of a flat-rate amount (currently € 340) as well as municipal and other supplements (Sipilä et al. 2010). This policy was in the 1990s extended to cover all families with children under the age of three (Hiilamo 2006) and is often regarded as a key explanation to the low employment rates of Finnish mothers with young children and argued to weaken women's labor market position in general (OECD 2005; Sipilä et al. 2010). Other changes to Finnish family policies in the 1990s include the elimination of tax breaks for families and cuts to earnings-related parental allowances (Hiilamo 2006).

Nordic welfare states are also known for their progressive taxation and rather generous, often earning-related, social transfers, which are one reason behind relatively low inequality and poverty rates in these countries (Esping-Andersen 1999; Brady and Burroway 2012). The potential downside of such policies is their negative effects on the labor supply, especially at the lower end of the wage distribution. Because of various—often means-tested—supplements, single mothers are generally estimated to face stronger employment disincentives (e.g., Thévenon 2011). In Finland, employment disincentives have weakened since the late-1990s (e.g., Laitila and Viitamäki 2009). Nevertheless, they are estimated to be stronger among single



than partnered mothers (unless her partner is also jobless) and can extend to single mothers whose potential earnings are close to the women's median (Kärkkäinen 2011; Viitamäki 2015).

Summing up, single motherhood has increased particularly among mothers with low levels of education. This means that single mothers' educational profile has become gradually weaker relative to partnered mothers. We expect this compositional change to explain part of the single mother employment gap, and more so toward the end of the follow-up period.

All mothers faced a difficult labor market in the early-1990s. Thereafter, employment rates increased slowly, only to face another recession from 2008 onward. The declines in employment rates were probably particularly severe among some groups of single mothers. The extension of the child home care leave can be expected to have decreased the labor supply of mothers with children under the age of three, and the employment disincentives created by a combination of progressive taxation and generous and means-tested benefits can have decreased the labor supply of mothers with low to average levels of education. If single mothers' labor supply is more elastic than the labor supply of partnered mothers, we would expect the single mother employment rate gap to be larger among mothers with low education and young children. This difference can be strengthened by (means-tested) benefit supplements paid to single mothers as well as the high prevalence of temporary jobs and potentially, family-unfriendly working hours. Single mothers' employment can additionally suffer from employer discrimination, if they are considered to be the least flexible in terms of child-care responsibilities and working hours (Kjeldstad and Rønsen 2004). Overall, Finnish single mothers have an increasingly weak educational profile compared to partnered mothers and the single mother employment rate gap is probably the largest in the groups in which single mothers are increasingly over-represented.

## **Data and Methods**

### *Data*

We used data formed at Statistics Finland, through the linking of a longitudinal population register and registers of employment, educational degrees and vital events, as well as other register sources. The extract is a 10 percent random sample of persons born between 1940 and

1995 who were in the population of Finland between 1970 and 2011. The data include full histories of unions and childbearing, annual measurements of individual economic activity, and monthly data on educational degrees for the sample persons and their partners. The extract used in the final analyses (1,302,680 person years) was limited to women aged 18 to 49 on any year between 1987 and 2011 who had at least one child from 1–17 years of age living in the same household. Data on persons born outside of Finland were dropped because information on their educational histories is often deficient.

In this study, a partnered mother is defined as a mother who lives with an under 18-year-old child or children and who has a married or cohabiting male partner living in the same household. A single mother is defined as a mother who lives (i.e., is registered as domiciled in the same dwelling) with an under 18-year-old child or children, and is neither married nor co-resides with a male partner. Data on cohabitating unions are inferred from registers (see e.g. Jalovaara and Fasang 2015).

Mothers with under 1-year-old children were excluded from the analysis. Finnish family policies allow paid maternity and parental leave until the child is 9 months old, and the great majority of mothers use all of this leave. This makes it difficult to determine the mother's employment situation during the child's first year, because in most cases (but not all) the mother's situation is recorded as her labor market status before the leave. Focus on mothers whose youngest child is at least a year old thus leads to a more accurate picture of employment differences between different groups of mothers.

Employment was measured as a binary variable using information on economic activity, and indicated whether the person was employed (1) or non-employed (0) during the last week of year. The non-employed consist of unemployed job seekers, students, pensioners (persons on disability pension in this age group), homemakers, and other persons outside the labor force.

We used age, age of the youngest child, and educational attainment as compositional variables. Age of the mother was collapsed into three categories: 18–29, 30–39, and 40–49. The age of the youngest child in the household was collapsed into three categories (1–2, 3–6, and 7–17) reflecting family policies in Finland and its school system: parents of under three-year-old children are entitled to home care leave, and children start school the year they turn seven. Most children from age three to six attend day-care centers, especially if they do not have younger siblings. We used age of the youngest child as the compositional variable, because it has a

stronger independent effect on Finnish mothers' employment than the number of children (Statistics Finland 2014).

The measure of educational attainment indicates the highest level of education at the end of the year and was broken down into the following four categories: compulsory schooling (9 years, ISCED 0–2), secondary level (vocational education or academic high school, obtained in two-three years, ISCED 3–4), lower tertiary (e.g. vocational education following academic high school, or bachelor's degree, ISCED 5–6), and higher tertiary (master's degree or higher, ISCED 7–8).

We compared seven time periods between 1987 and 2011: 1987–1990, 1991–1993, 1994–1996, 1997–2000, 2001–2004, 2005–2008, and 2009–2011. The time periods are formed based on macroeconomic conditions and labor market trends, so that the study covers periods of economic upswings and increasing employment (1987–1990, 1997–2000, 2005–2008), recessions and decreasing employment (1991–1993 and 2009–2011), and periods of stable employment (1994–1996 and 2001–2004).

Table 1 in the results section presents the distributions of the background (compositional) variables in each period for single and partnered mothers, respectively.

### *Method*

We analyzed our data, first, by describing partnered and single mothers' socio-demographic profiles as well as their employment rates by each background variable category in each period. Second, we used Chevan and Sutherland's (2009; hereafter, CS) extension to Das Gupta's (1993) multi-factor decomposition. Decomposition is a demographic method that explains how much of the differences between rates in two or more populations are due to the populations' different background compositions, known as the composition effect (Kitagawa 1955; Preston et al. 2001). We were interested in how much of the employment rate difference between partnered and single mothers was due to their socio-demographic compositional differences. Our compositional variables are educational attainment, age, and age of the youngest child. The rate effect is the employment rate difference that is left after adjusting for these compositional differences. It can be interpreted as differences between the two groups of mothers with regard to labor supply and demand, or as due to unmeasured compositional factors.

We performed two sets of decompositions. In the first ones, we decomposed the single mother employment gap in each period to present how much compositional and rate effects, respectively, contributed to the single mother employment gap in these periods. Second, as an extension to these decompositions, we decomposed the change in the single mother employment gap from 1987–1990 into changes in the composition and the rate effects. Because positive differences are easier to interpret than negative ones, we measure the single mother employment gap as the difference between partnered and single mothers’ employment rates, rather than the reverse.

We start with the decompositions for each period. Following Das Gupta’s notation, our task is a three-factor decomposition of the difference in the crude employment rates  $t$  and  $T$  of partnered mothers and single mothers, respectively, into the  $I$ -effect of the age composition,  $J$ -effect of the educational composition,  $K$ -effect of the age-of-the-youngest-child composition, and the rate effect  $R$ , which applies equally to all variables. This can be written as

$$t_{...} - T_{...} = [R(\bar{t}) - R(\bar{T})] + [I(\bar{a}) - I(\bar{A})] + [J(\bar{b}) - J(\bar{B})] + [K(\bar{c}) - K(\bar{C})] \quad (1)$$

The crude difference is the sum of these effects, three compositional variable effects and the rate effect. Each effect is the difference in the standardized (for the other three terms) rates between the two groups; for example,  $I(\bar{A})$  is the ( $J$ ,  $K$ ,  $R$ )-standardized rate among single mothers and  $I(\bar{a})$  is its equivalent for partnered mothers. In practice, for each period, we analyzed  $3 \times 4 \times 3$  tables of cross-classified distributions and employment rates for single and partnered mothers. The equations for calculating each of the terms in the three-factor case are given in Das Gupta (p. 63–66).

The CS extension creates a further decomposition of these effects into effects of each category of each variable. Das Gupta’s method estimates a single composition effect for each variable, telling how much of crude difference is due to group differences in the entire distribution of the compositional variable in question. The CS method further partitions this composition effect into the contributions of each category of the compositional variable. This is done by estimating the group difference in the standardized rates for each category of the variable. For each group, the standardized rate for each variable is the sum of the standardized rates for each category. The  $I$ ,  $J$ , and  $K$ –effects are thus

$$I(\bar{a}) - I(\bar{A}) = \sum_{i..} I(\bar{a})_{i..} - \sum_{i..} I(\bar{A})_{i..} \quad (2),$$

$$J(\bar{b}) - J(\bar{B}) = \sum_{.j.} I(\bar{b})_{.j.} - \sum_{.j.} I(\bar{B})_{.j.} \quad (3),$$

$$K(\bar{c}) - K(\bar{C}) = \sum_{..k} K(\bar{c})_{..k} - \sum_{..k} K(\bar{C})_{..k} \quad (4).$$

As an example, the  $J$ -effect of the educational composition tells how much of the crude single mother employment gap is due to differences in the groups' educational distributions. The CS decomposition further tells how much of this gap is due to differences in, say, in the share of mothers who had completed higher tertiary education. Because a group difference in the size of one category must be offset by a difference of the opposite sign in at least one other category, there are generally both positive and negative category composition effects (CS, p. 435). Positive effects tell that partnered mothers are overrepresented in this category—and this category thus weights more on partnered than single mothers' employment rates—and negative effects tell the opposite. The larger the categories of a variable in which partnered mothers are overrepresented and the higher the employment rates in that category, the bigger its positive composition effect. Overall, the CS method adds detail to the decomposition by locating where in the distribution differences matter the most.

In Das Gupta's method, the rate effect applies equally to all background variables, reflecting the (average) difference in behaviors or unmeasured factors once the compositional differences have been accounted for. The CS method further attributes the rate effect between the categories of each variable. In the three-factor case, single mothers' standardized rates of categories for the variables  $I$ ,  $J$ , and  $K$  are

$$R(\bar{T})_{i..} = \sum_{jk} \frac{\frac{n_{ijk} + N_{ijk}}{n_{...} + N_{...}}}{2} T_{ijk} \frac{1}{NV} \quad (5),$$

$$R(\bar{T})_{.j.} = \sum_{ik} \frac{\frac{n_{ijk} + N_{ijk}}{n_{...} + N_{...}}}{2} T_{ijk} \frac{1}{NV} \quad (6),$$

$$R(\bar{T})_{..k} = \sum_{ij} \frac{\frac{n_{ijk} + N_{ijk}}{n_{...} + N_{...}}}{2} T_{ijk} \frac{1}{NV} \quad (7),$$

and similarly for partnered mothers when  $T$  is replaced by  $t$ . Because the rate effect applies equally to each background variable, the contribution of each category to the overall rate is

obtained by scaling it by the reciprocal of the number of background variables ( $NV$ ). For the same reason, the sums of the standardized category rates are equal for each variable (CS, p. 432). In the case of single mothers:

$$\sum_i R(\bar{T})_{i..} = \sum_j R(\bar{T})_{.j.} = \sum_k R(\bar{T})_{..k} \quad (8),$$

and similarly for partnered mothers when  $T$  is replaced by  $t$ . The category rate effects tell how much the standardized employment rate difference within one category of a background variable contributes to the crude difference relative to the other categories of that variable. For example, the difference between partnered and single mothers' employment rates among the least educated can contribute to the overall difference more than the employment rate difference among the higher tertiary educated. The larger the difference in employment rates within the category and the larger the category, the bigger the category rate effect will be.

The category composition and rate effects are additive, and their sum equals the crude single mother employment gap:

$$t_{...} - T_{...} = \left( \sum_{i..} I(\bar{a})_{i..} + \sum_{i..} R(\bar{t})_{i..} + \sum_{.j.} I(\bar{a})_{.j.} + \sum_{.j.} R(\bar{t})_{.j.} + \sum_{..k} I(\bar{a})_{..k} + \sum_{..k} R(\bar{t})_{..k} \right) - \left( \sum_{i..} I(\bar{A})_{i..} + \sum_{i..} R(\bar{T})_{i..} + \sum_{.j.} I(\bar{A})_{.j.} + \sum_{.j.} R(\bar{T})_{.j.} + \sum_{..k} I(\bar{A})_{..k} + \sum_{..k} R(\bar{T})_{..k} \right) \quad (9).$$

Based on this equation, one can additionally estimate how much composition and rate effects of one category of a variable or combinations of the effects of different categories of one or several variables contribute to the crude single mother employment gap.

These equations give the decomposition of the employment rate difference between partnered and single mothers within each of our seven periods. Because our underlying interest was in understanding the change in this employment gap, we also decomposed the change in the employment gap into its constituent parts. Because the effects are additive and sum up to the crude employment gap, as shown by equations (1) and (9), we can also express the change in this gap in additive terms.

Adding subscripts for period, we can rewrite equation (1) to express the change in the crude employment gap between period  $t$  (the reference, which in our analysis is the earliest period 1987–90) and period  $t + n$  as

$$\Delta_{t,t+n}(t_{...} - T_{...}) = \Delta_{t,t+n}[R(\bar{t}) - R(\bar{T})] + \Delta_{t,t+n}[I(\bar{a}) - I(\bar{A})] + \Delta_{t,t+n}[J(\bar{b}) - J(\bar{B})] + \Delta_{t,t+n}[K(\bar{c}) - K(\bar{C})] \quad (10).$$

In words, the change in the crude employment gap is the sum of the changes in the rate effect ( $R$ -effect), and the composition effects of age, education, and age of the youngest child (the  $I$ ,  $J$ , and  $K$  effects), respectively. In the same way, we could rewrite equation (9) to express the change in the crude employment gap as a function of the changes in the category composition and rate effects to obtain their changing contributions over time.

## Results

### *Changes in Partnered and Single Mothers' Socio-Demographic Profiles*

Table 1 shows the age group, education, and age-of-the-youngest child distributions among partnered and single mothers in each period. Mothers' average age increased from 1987–1990 to 2009–2011; in the latter period, a smaller share of mothers is found in the youngest (18–29 years) and middle (30–39 years), and a larger share is in the oldest (40–49 years) age group. Single mothers have been overrepresented in the youngest and increasingly also in the oldest age groups.

Single mothers had somewhat weaker educational backgrounds than partnered mothers already in the late 1980s. Educational expansion has meant an overall upgrade in educational attainment levels, but the increase in education was faster among partnered mothers, thus widening the educational background gap. By the last period, more than one third of single mothers and more than half of partnered mothers had a post-secondary degree and twice as many partnered mothers as single mothers had a higher tertiary degree. The share of single mothers with no education beyond the basic level was over twice as large as among partnered mothers.

--Table 1--

Single mothers' children were older than the children of partnered mothers throughout the follow-up period. In particular, single mothers were half as likely as partnered mothers to have a child belonging to the youngest age group.

### *Trends in Employment Rates*

Table 2 shows partnered and single mothers' employment rates by the compositional variables in each period. In the late 1980s, 84 % of partnered and single mothers were employed. Almost all sub-categories had employment rates of at least 80 %, with the exceptions of mothers in the under 30-year-old age group and mothers with under three-year-old children. The differences in employment rates between partnered and single mothers were small in most categories, and single mothers' employment was 1–2 % points higher than that of partnered mothers in all educational groups but the lowest (compulsory) educated.

--Table 2 here--

Employment rates declined in all subcategories in 1991–1993 and 1994–1996. The decline was the most remarkable among single mothers with the least education, with a young child, and who were younger than 30 years. In these groups, employment rates collapsed from 81 % to 55 %, from 63 % to 33 %, and from 71 % to 55 %, respectively. Partnered mothers' employment decline in the same sub-groups was much less remarkable. The decrease was the smallest among mothers (single and partnered) with higher tertiary degrees, who had employment rates above 80 % during the entire follow-up period. The single mother employment gap grew particularly among the groups, which generally have the lowest employment rates.

Partnered mothers' employment began a slow recovery in all groups after bottoming out in 1994–1996. A similar turn-around in employment was evident also among single mothers, with one major exception, namely single mothers with the lowest level of education; their employment remained just above 50 % and declined below that in 2009–2011. Although single



mothers' employment increased from 1997–2000 onwards in most subgroups, their employment lagged behind that of partnered mothers with the exception of mothers with higher tertiary degrees.

To summarize, single mothers' employment rates have been below those of partnered mothers since the early 1990s in almost all groups. This employment gap has been the widest among young mothers with low education and with a young child. At the same time, single mothers' educational profiles have become less favorable. Next, we present the results from the decomposition analysis of the extent to which these different developments have contributed to the overall single mother employment gap.

### *Decomposition Analysis*

Table 3 presents the results from the CS decompositions of the single mother employment gap for each period. Table 4 presents the CS decomposition of the change in the single mother employment gap from 1987–1990. The first rows show the crude difference in partnered and single mothers' employment in each period (Table 3) and its change from 1987–1990 (Table 4). The first rows of the composition and rate effects sections show, respectively, how much composition and rate effects in total contributed to the employment gap between partnered and single mothers (Table 3), and how changes in these effects contributed to the change in the single mother employment gap (Table 4). The rows for each variable and their categories show their composition and rate effects in each period (Table 3) and the change therein (Table 4), respectively.

--Tables 3 & 4--

The overall composition effect shifted gradually from positive to negative; single mothers had a more favorable socio-demographic profile than partnered mothers until 1994–1996 but an unfavorable profile since. Had these groups' socio-demographic profiles been the same all along, single mothers' employment rate would have been 1.2 percentage points lower than observed in 1987–90, but 2.0 percentage points higher than observed in 2009–2011 (Table 3). Compositional

change explained one third ( $100 \% \times (3.3 / 10.2) = 33 \%$ ) of the increase in the single mother employment gap from 1987–1990 to 2009–2011 (Table 4).

The rate effects were positive in all periods: single mothers had lower employment rates than partnered mothers when compositional differences were accounted for. The rate effect increased rapidly from a modest 1.3 in 1987–1990 to 9.4 in 1994–1996 and decreased somewhat thereafter, ending up to a still substantial rate effect of 8 percentage points in the two latest periods. In 1987–1990, the negative composition effect and the positive rate effect cancelled each other out. Thereafter, the rate effect dominated over the composition effect and explained most of the single mother employment gap. However, since 1994–1996, the slightly decreasing rate effect and the steadily increasing composition effect meant that the rate effect explained a decreasing share of the crude gap. Taken together, the steadily increasing composition effect and the positive rate effect implied that single mothers, as a group, increasingly faced a double employment disadvantage: an unfavorable socio-demographic profile and lower employment rates net of their compositional disadvantage.

A more precise picture of these disadvantages can be gained by considering composition and rate effects separately by each background variable and their categories. Single mothers' slowly emerging compositional disadvantage hides counteracting trends. Single mothers have a more advantaged profile in terms of the age of the youngest child, a disadvantaged age profile, and a gradually increasing educational disadvantage. This is summarized in Figure A1 of the Appendix.

We focus on the changing effects of education. Because the rate effects are divided equally between the variables, the increasing educational composition effect also means that education had the largest total effect of the background variables on the change in the single mother employment gap.

In 1987–1990, single mothers' employment rate would have been 0.5 percentage points higher than it was without differences in educational profiles. By 2009–2011, this effect had grown to 4.0 percentage points and accounted for 40 % ( $100 \% \times (4.0 / 10.3)$ ) of the single mother employment gap (Table 3), or over a third ( $100 \% \times (3.5 / 10.2)$ ) of the change in this gap from 1987–1990 (Table 4).

The category composition effect of higher tertiary education became particularly important. Mothers with higher tertiary education have the highest employment rates, and thus

the growing composition gap in this educational group became increasingly important for the overall single mother employment gap. The category composition effect of post-secondary education remained slightly stronger even in the last periods (Table 3), but it changed more slowly than the category composition effect of higher tertiary education (Table 4). At the same time, the category composition effects of the two lowest levels of education became increasingly negative. This is because the share of employed partnered mothers in these educational groups declined faster than the corresponding share of single mothers; mothers in these educational groups contributed less to partnered than single mothers' employment rates. Overall, partnered mothers' educational profiles shifted faster than those of single mothers toward the educational groups with high employment rates, while single mothers remained increasingly overrepresented in educational groups with low and declining employment rates. The category composition effects of education are plotted in Figure A2 in the Appendix.

The category rate effects of education are plotted in Figure A3 in the Appendix. Table 2 showed that the single mother employment gap was the largest among mothers with only compulsory schooling. However, from the early 1990s onwards, secondary education has had the biggest category rate effect on the overall single mother employment gap because of its much larger size. On the other hand, the single mother employment gap was small among lower tertiary educated mothers—another large educational category—which translated into a smaller category rate effect. The almost non-existing employment gap among the higher tertiary educated meant that the category rate contribution of this group was miniscule. Summing up, the faster increase in higher tertiary education among partnered mothers and the large employment rate gap among the secondary educated were the two most important contributors to the change in the crude employment gap, together accounting for two-thirds ( $100\% \times ((5.8 + 1.2) / 10.2) = 68.6\%$ ) of the increase in the gap from 1987–1990 to 2009–2011.

Turning to the other background variables, partnered mothers' age profile advantage first became stronger but later decreased and changes in the age profiles did not explain changes in the single mother employment gap from 1987–1990 to the early 2000s and beyond (Table 4). Yet these changes were more complex than mere shifts in average ages. Partnered mothers were continuously underrepresented in the youngest age group (18–29 years), and towards the end of the follow-up, also in the oldest (40–49 years) age group. This is reflected in the negative category composition effects in the youngest, and in the two latest periods, in the oldest age

groups (Table 3). Although partnered mothers' underrepresentation in both of these age groups was 4 percentage points in 2009–2011, the lower employment rate in the youngest group translated into a larger negative effect. The age category rate effects were the largest in the two oldest age groups. The employment gap was of similar size in these groups throughout the period (Table 2), but the growing size of the oldest age group meant that this group became increasingly important in accounting for the crude gap.

The composition effect of age of the youngest child was negative and relatively stable in all periods; single mothers had older children than partnered mothers, which boosted the formers' employment by 2–3 % points. Partnered mothers were more likely than single mothers to have a toddler (age 1–2 years), but less likely to have a school-aged child (7–17 years), which shows in the positive and negative category composition effects, respectively, in Table 3. Because the distributions of the age of the youngest child remained similar throughout the follow-up period, the changes in the composition effects mirror the changing employment rates in these categories. The largest category rate effect is in the school-aged children category, which is also the biggest group. Importantly, even though the single mother employment gap was the largest among mothers with children under the age of three, this group had consistently the smallest category rate effect. The small size of this group meant its large employment gap did not weigh equally much on the crude difference.

## **Discussion**

This paper used large-N population register data to analyze the differences in single and partnered mothers' employment rates in Finland from 1987 to 2011. In 1987–1990, single mothers' employment rate was high (84 %) and on par with that of partnered mothers. Both groups saw a large decline in their employment rates during the 1990s. Single mothers were particularly affected and by 1994–1996, their employment rate had fallen to 64 % as compared to 73 % for partnered mothers. This single mother employment gap has persisted since. Partnered mothers' employment rates later recovered to the late-1980s levels, but those of single mothers did not. In 2009–2011, 85 % of partnered mothers and 75 % of single mothers were employed. The single mother employment gap was particularly large among mothers with the weakest

attachment to the labor market to begin with, that is, young mothers, mothers with the lowest level of education, and those with a toddler.

We used Chevan's and Sutherland's (2009) decomposition method to understand how much of the growth and persistence of the single mother employment gap could be attributed to changes in partnered and single mothers' socio-demographic compositions and how much to labor supply or demand differences net of these compositional effects. Compared to more familiar decomposition techniques (e.g., Das Gupta 1993), this method allowed a detailed analysis of the sources of the single mother employment gap by partitioning the composition and rate effects to the separate categories of each background variable.

Our results pointed to single mothers' increasingly disadvantageous educational profiles and their weaker employment net of compositional differences as the two most important explanations. Finland is among the countries in which single motherhood has increased particularly among women with low education (Härkönen 2016). As a consequence, partnered mothers have higher educational attainment levels than single mothers and this difference has grown over time. Of particular importance has been the growing gap in the shares of partnered and single mothers who hold higher tertiary degrees. Although the 1990s economic crisis hit all groups' employment rates, higher tertiary degree holders weathered the crisis better than other educational groups and had consistently high employment rates. Single mothers' growing underrepresentation in this group thus became an increasingly important factor in explaining their lower employment rates.

Single mothers have since the early 1990s had clearly lower employment rates even when compositional differences are accounted for. In the decompositions, this was captured by the rate effect, which increased sharply during the early-to-mid 1990s and despite decreasing somewhat since, remained large until 2009–2011. Our decompositions also showed that the largest contributions to the changing crude single mother employment gap came from large groups, such as those with secondary education, who were 30 years or older, and who had school-aged children. These were not the groups where the employment rates between partnered and single mothers differed the most, but their large sizes made them important for the crude employment gap.

The Chevan-Sutherland method's possibility to decompose the rate effect between the categories of each variable gives more detailed cues about the potential reasons behind the rate

effect. First, the large single mother employment gap among mothers with children under the age of three suggests that child home care leave policies suppress more the labor supply of single than partnered mothers, as discussed earlier. However, because this group of mothers is relatively small, its employment gap explains only a limited share of the crude employment gap between partnered and single mothers. Therefore, the child home care leave system is likely only of limited importance for the employment difference between partnered and single mothers, even though it has otherwise been singled out as a contributor to gender inequalities in the labor market (OECD 2005; Sipilä et al. 2011). Second, the single mother employment gap varied strongly between the educational groups and was the largest among those with low to middle education. These mothers (and also young mothers) are the most likely to face employment disincentives due to a combination of low wage offers, temporary work contracts (Nätti et al. 2005; Polavieja 2006) and various means-tested social policies. These disincentives are larger among single than partnered mothers and can extend to women's average wage levels (Kärkkäinen 2011; Viitamäki 2015). Our finding of large rate effects of secondary education suggests that these effects extend widely enough to pull down the average employment rates of single mothers. Our analysis does not allow drawing strong conclusions about which specific social policies (or combinations thereof), labor market structures and their changes matter the most. However, the evidence from our results and previous research together suggests that the Finnish social policy regime—which as part of the Nordic welfare model is often heralded to support single mother employment (Esping-Andersen 1999; Misra et al. 2012)—does not deliver sufficiently high single mother employment rates in current labor markets.

The growing educational gradient of single motherhood means that single mothers are increasingly located in educational groups with lower employment rates. This compositional trend puts single mothers as a group at a higher risk of labor market and other economic disadvantage and makes them more sensitive to economic fluctuations (Kjeldstad and Rønsen 2004), especially if they also face other obstacles to employment. The trend towards “diverging destinies” of educational differentiation in family demography (McLanahan 2004) can be difficult to combat. Policy makers should rather tackle the effects of these new demographic realities on single mothers' employment, but without risking their economic living standards. One example is policy reforms in the United Kingdom, which have improved single mothers' employment and well-being (e.g., Gregg et al. 2009), although from a different starting point

than in the Nordic countries. Although Finland and other Nordic countries remain successful in keeping single mother families' poverty rates low (Brady and Burroway 2012), Finland, Sweden and Denmark have not to the same extent lived up to their reputation as promoters of single mothers' employment and have gone against the trend of increasing single mother employment as seen in many other OECD countries (OECD 2011). To the extent that employment promotes non-economic dimensions of single mothers' (and their children's) well-being, the single mother employment gap can shape family structure inequalities not captured by measures such as poverty rates alone. Furthermore, lack of employment can have long-term labor market consequences through lost work experience. Our results do not directly generalize to Sweden and Denmark, but we hypothesize that the growing educational gradient of single motherhood (Härkönen 2016) together with the similar social policy regimes can account for the decrease in single mothers' employment in these countries as well. Our analysis suggests that that these countries' generous parental leave and childcare policies cannot alone guarantee high single mother employment rates.

More generally, our findings contribute to the discussion on the implications of changing educational differences in family demography. Although the debate has mainly been American, similar trends can be found in other countries as well (e.g., Härkönen and Dronkers 2006). These trends can shape socioeconomic inequalities and affect which groups are likely to be more vulnerable in the face of macro-economic trends. To what extent such vulnerabilities translate into employment or other economic disadvantages depend on the economic and policy context in which they are found (cf. Cohen 2005). Policy makers need to acknowledge these demographic trends in developing appropriate responses to reduce their impacts on inequality. Future research should further consider the interplay between demographic change and economic and policy context in shaping inequality outcomes.

## **Acknowledgements**

We wish to thank Heikki Hiilamo and Johanna Kallio and conference and workshop participants in Vilnius, Philadelphia, and Stockholm for their comments. Data for this study was provided by Statistics Finland (permission number TK53-663-11). The research was funded by European Union's Seventh Framework Programme under grant agreement no. 320116, the Strategic Research Council of the Academy of Finland (decision number: 293103), the Academy of Finland (decision number: 275030), and the Swedish Research Council for Health, Working Life, and Welfare (decision number: 2010-0831).



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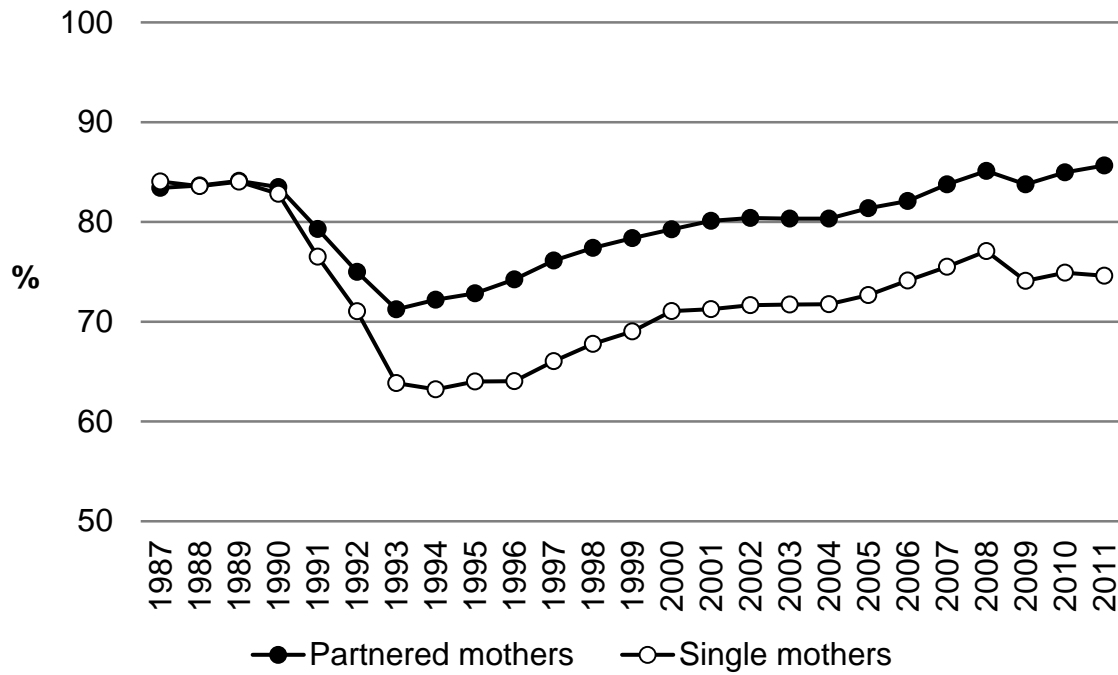
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## Figures and Tables

**Figure 1.** Employment rates (%) of single and partnered mothers with 1–17-year-old children in Finland, 1987–2011.



**Table 1.** Distributions of partnered and single mothers by the compositional variables and time period, %.

	1987–1990	1991–1993	1994–1996	1997–2000	2001–2004	2005–2008	2009–2011
<b>Partnered mothers</b>							
Age							
18–29	15	13	12	10	10	11	11
30–39	51	48	46	46	44	41	41
40–49	33	40	42	43	46	48	48
Total	100	100	100	100	100	100	100
Education							
Compulsory	26	21	17	12	9	8	7
Secondary	42	43	44	43	42	41	39
Lower tertiary	25	28	30	33	35	36	36
Higher tertiary	6	8	9	11	14	16	18
Total	100	100	100	100	100	100	100
Age of youngest child							
1–2	20	21	21	21	21	22	24
3–6	28	26	27	28	27	26	27
7–17	51	53	52	51	52	51	49
Total	100	100	100	100	100	100	100
<i>N</i>	<i>205.104</i>	<i>150.427</i>	<i>142.652</i>	<i>177.715</i>	<i>164.798</i>	<i>157.062</i>	<i>113.169</i>
<b>Single mothers</b>							
Age							
18–29	18	17	15	14	14	14	15
30–39	48	45	44	43	39	34	33
40–49	34	39	41	43	48	53	52
Total	100	100	100	100	100	100	100
Education							
Compulsory	31	27	24	20	17	16	17
Secondary	45	46	46	48	48	48	47
Lower tertiary	20	22	24	25	27	28	27
Higher tertiary	5	6	6	7	8	8	9
Total	100	100	100	100	100	100	100
Age of youngest child							
1–2	10	11	11	11	10	10	12
3–6	25	24	25	26	25	23	24
7–17	66	65	63	63	65	67	65
Total	100	100	100	100	100	100	100
<i>N</i>	<i>25.161</i>	<i>21.639</i>	<i>24.187</i>	<i>33.520</i>	<i>32.985</i>	<i>31.456</i>	<i>22.805</i>

**Table 2.** Employment rates (%) of partnered and single mothers by compositional variable and time period.

	1987– 1990	1991– 1993	1994– 1996	1997– 2000	2001– 2004	2005– 2008	2009– 2011
<b>Partnered mothers</b>							
All	84	75	73	78	80	83	85
<b>Age</b>							
18-29	71	54	47	52	56	62	65
30-39	85	75	73	77	79	82	84
40-49	88	83	81	85	87	89	90
<b>Education</b>							
Compulsory	83	73	68	70	68	68	64
Secondary	82	73	70	74	77	79	81
Lower tert.	87	78	77	82	85	88	90
Higher tert.	87	84	83	87	88	89	92
<b>Age of youngest child</b>							
1–2	69	56	53	58	59	65	71
3–6	84	75	73	79	82	85	86
7–17	90	83	81	85	88	90	91
<i>N</i>	<i>205,104</i>	<i>150,427</i>	<i>142,652</i>	<i>177,715</i>	<i>164,798</i>	<i>157,062</i>	<i>113,169</i>
<b>Single mothers</b>							
All	84	70	64	68	72	75	75
<b>Age</b>							
18–29	71	47	35	40	44	49	48
30–39	85	72	64	69	71	74	75
40–49	88	79	74	77	80	82	82
<b>Education</b>							
Compulsory	81	65	55	56	55	53	47
Secondary	83	69	62	66	69	73	74
Lower tert.	89	77	72	78	82	86	88
Higher tert.	88	84	82	86	89	90	90
<b>Age of youngest child</b>							
1–2	63	43	33	38	39	44	47
3–6	81	64	57	64	66	69	70
7–17	88	78	72	76	79	81	81
<i>N</i>	<i>25,161</i>	<i>21,639</i>	<i>24,187</i>	<i>33,520</i>	<i>32,985</i>	<i>31,456</i>	<i>22,805</i>



**Table 3.** Chevan-Sutherland decomposition of the difference in employment rates between partnered and single mothers in 1987–1990 to 2009–2011, percentage points.

Effect	1987– 1990	1991– 1993	1994– 1996	1997– 2000	2001– 2004	2005– 2008	2009– 2011
Crude difference in rates	0.1	4.8	9.3	9.3	8.7	8.3	10.3
<b>Composition effects</b>							
Total for composition	-1.2	-0.6	-0.1	0.2	0.2	0.3	2.0
Age	0.6	1.2	1.4	1.1	0.8	0.5	0.7
18–29	-4.3	-3.1	-2.3	-2.3	-2.5	-2.5	-2.6
30–39	2.9	1.2	0.3	0.8	2.3	4.1	4.1
40–49	2.0	3.1	3.4	2.7	1.0	-1.0	-0.8
Education	0.5	1.0	1.5	2.1	2.6	3.0	4.0
Compulsory	-2.9	-3.2	-3.7	-4.2	-4.6	-4.8	-4.8
Secondary	-2.3	-1.8	-1.4	-3.0	-4.0	-4.9	-5.5
Lower tert.	4.4	4.3	4.2	5.7	6.6	6.8	7.2
Higher tert.	1.3	1.6	2.4	3.5	4.6	5.9	7.1
Age of youngest child	-2.3	-2.8	-3.0	-2.9	-3.3	-3.2	-2.7
1–2	7.3	5.2	4.6	5.2	5.6	6.8	7.7
3–6	3.2	1.7	1.3	1.5	1.8	2.2	2.1
7–17	-12.9	-9.7	-8.8	-9.7	-10.7	-12.3	-12.5
<b>Rate effects</b>							
Total for rate	1.3	5.4	9.4	9.1	8.5	7.9	8.2
Age	0.4	1.8	3.1	3.0	2.8	2.6	2.7
18–29	0.2	0.5	0.6	0.6	0.6	0.6	0.5
30–39	0.2	0.8	1.6	1.4	1.3	1.0	1.1
40–49	0.0	0.5	0.9	1.0	1.0	1.1	1.2
Education	0.4	1.8	3.1	3.0	2.8	2.6	2.7
Compulsory	0.2	0.6	0.8	0.7	0.6	0.6	0.6
Secondary	0.2	0.9	1.5	1.5	1.5	1.3	1.4
Lower tert.	0.0	0.3	0.7	0.7	0.7	0.5	0.5
Higher tert.	0.0	0.1	0.2	0.1	0.1	0.1	0.2
Age of youngest child	0.4	1.8	3.1	3.0	2.8	2.6	2.7
1-2	0.1	0.4	0.8	0.6	0.5	0.5	0.6
3-6	0.1	0.6	0.9	0.9	0.9	0.8	0.8
7-17	0.3	0.9	1.5	1.5	1.4	1.4	1.4

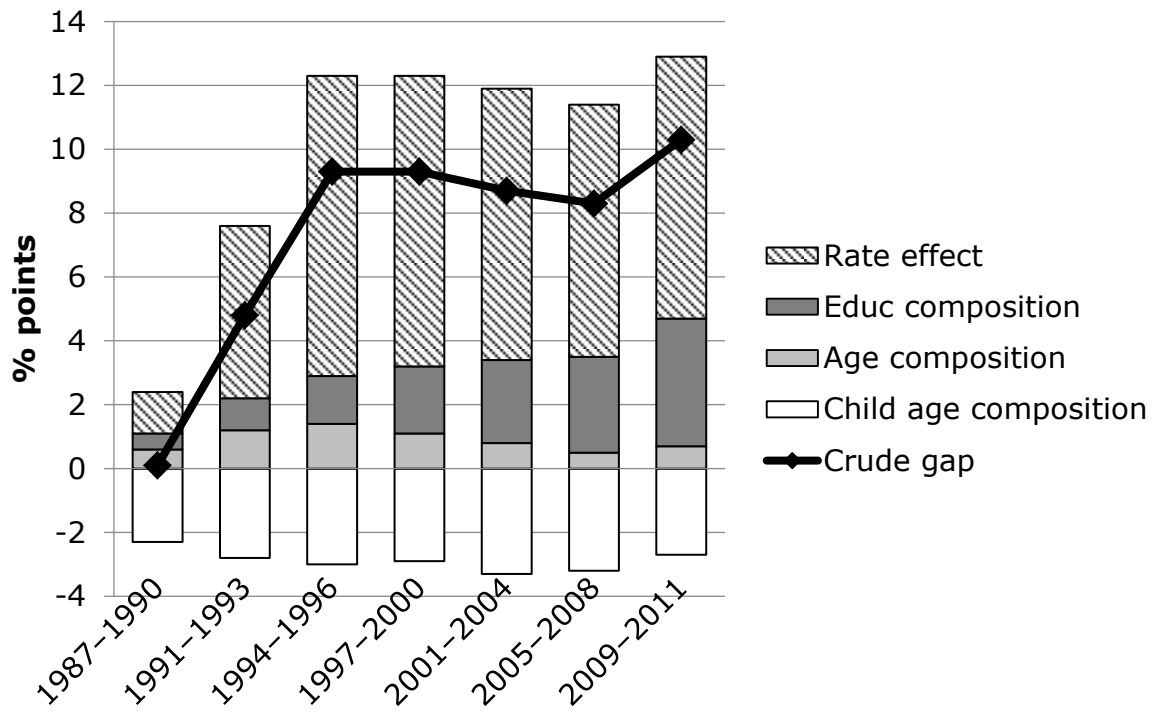
**Table 4.** Chevan-Sutherland decomposition of the changes in the single motherhood employment gap from 1987–1990 (Ref.), to 2009–2011, percentage points.

Effect	1987– 1990	1991– 1993	1994– 1996	1997– 2000	2001– 2004	2005– 2008	2009– 2011
Crude difference in rates	0	4.8	9.2	9.2	8.6	8.2	10.2
<b>Composition effects</b>							
Total for composition	0	0.6	1.1	1.4	1.4	1.5	3.3
Age	0	0.6	0.8	0.5	0.2	-0.1	0.1
18–29	0	1.2	2.0	2.0	1.8	1.8	1.7
30–39	0	-1.7	-2.7	-2.2	-0.6	1.1	1.2
40–49	0	1.1	1.4	0.7	-1.0	-3.0	-2.8
Education	0	0.5	1.0	1.6	2.1	2.5	3.5
Compulsory	0	-0.4	-0.8	-1.4	-1.7	-1.9	-2.0
Secondary	0	0.5	0.9	-0.7	-1.7	-2.6	-3.2
Lower tertiary	0	-0.1	-0.2	1.3	2.2	2.4	2.8
Higher tertiary	0	0.4	1.1	2.3	3.3	4.6	5.8
Age of youngest child	0	-0.4	-0.6	-0.6	-0.9	-0.9	-0.4
1–2	0	-2.1	-2.7	-2.1	-1.7	-0.5	0.4
3–6	0	-1.5	-1.9	-1.7	-1.4	-1.0	-1.1
7–17	0	3.2	4.0	3.1	2.2	0.5	0.3
<b>Rate effects</b>							
Total for rate	0	4.1	8.1	7.8	7.2	6.6	6.9
Age	0	1.4	2.7	2.6	2.4	2.2	2.3
18–29	0	0.3	0.4	0.3	0.3	0.3	0.3
30–39	0	0.7	1.4	1.2	1.1	0.9	0.9
40–49	0	0.5	0.9	1.0	1.0	1.0	1.1
Education	0	1.4	2.7	2.6	2.4	2.2	2.3
Compulsory	0	0.3	0.6	0.5	0.4	0.4	0.4
Secondary	0	0.7	1.3	1.2	1.3	1.1	1.2
Lower tertiary	0	0.4	0.7	0.7	0.7	0.6	0.6
Higher tertiary	0	-0.0	0.1	0.1	0.1	0.1	0.1
Age of youngest child	0	1.4	1.2	1.1	2.4	2.2	2.3
1-2	0	0.3	0.7	0.5	0.4	0.4	0.5
3-6	0	0.5	0.8	0.8	0.8	0.7	0.7
7-17	0	0.6	1.2	1.2	1.1	1.1	1.1

*Note:* Some numbers do not exactly match the differences between the numbers reported in Table 2 due to rounding errors.

## Appendix

**Figure A1.** Composition effects by variable and the rate effect.



**Figure A2.** Composition effects of educational attainment, by educational category.

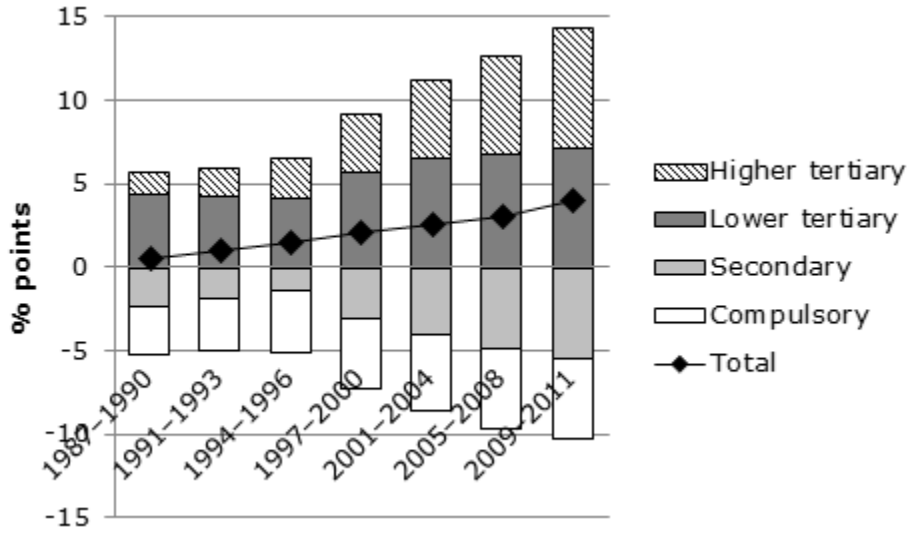


Figure A3. Category rate effects by educational attainment.

