PRELIMINARY

NEIGHBORHOOD CONTEXT AND TRANSITION TO PARENTHOOD: A LONGITUDINAL STUDY

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Introduction

To what extent are individual-level outcomes shaped by influences from the social environment to which they belong? This question has been a central concern in quantitative social science research but despite considerable research efforts the level of scholarly agreement in this area is still relatively low. One reason for this could be that the standard approach to contextual measurement has been to use statistical aggregates for fixed geographical subdivisions such as census tracts although it is well known that such measures are far from ideal. Thanks to increased availability of detailed, geo-coded individual level data and improved tools for geo-statistical analysis it has, however, become possible to overcome these difficulties by constructing improved measures of geographical contexts that are based on individualized, scalable neighborhoods (Bolster et al. 2007; Chaix et al. 2005; Macallister et al. 2001; Östh, Malmberg and Andersson 2014b). In this paper, we will take advantage of such measures to estimate neighborhood effects on childbearing in young adulthood.

Contexts relevant for childbearing range from the immediate family to the nation state. In between are a variety of contexts that vary in size, composition, and the nature of interactions – sub-national administrative units, schools, workplaces and neighborhoods. In this paper, we consider features of neighborhood contexts as potential influences on the timing of first births. Neighborhoods are an immediate physical feature of daily life. They offer varying degrees of economic opportunity. They comprise a collection of individuals or households that may exhibit common patterns of behavior or organization, providing models of what is appropriate or what works best.

Using Swedish register data for a cohort born in 1980 we will estimate the effects of residential context in 1995 on first birth risks from age 15 to age 32 (1995-2012). The same cohort has been analyzed in two other studies, one focusing on educational outcome at age 30 (Andersson and Malmberg (2014), the other on poverty risks and early career success (Malmberg and Andersson 2014).

In addition to applying a new approach to contextual measurement, this paper provides two additional extensions to previous research. First, most studies of neighborhood and first birth timing in economically advanced societies focus on teenage childbearing; our study considers the influence of adolescent neighborhood experiences on childbearing throughout the early adult years. Second, we analyze neighborhood influences on childbearing patterns in a country where the level of social inequality is much lower than in the United States, so that neighborhoods as well as individuals experience relatively more similar structural

opportunities and, possibly, childbearing norms, than is true in the U.S. Furthermore, Swedish sex education and fertility control policies, as well as sexual norms, remove much of the variation in the pathways to early childbearing that can be observed in the U.S.

Social Contexts and Fertility Behavior

Social contexts can be viewed as opportunity structures and arenas of social interaction. As opportunity structures, they provide economic and social conditions that make parenthood more or less costly – e.g., access to employment, affordable housing, services for children and parents. As arenas of social interaction, they generate social norms for fertility and family behavior and offer varying types of social capital, including knowledge and ideas. Each of these elements is hypothesized to influence individual behavior, net of the individual characteristics of persons exposed to a particular social context (Billy and Moore 1992).

Almost 25 years ago, Watkins (1990) argued that fertility theory and research had neglected the social contexts within which individual reproductive choices are made. Exceptions were noted in studies of societies where extended families and local communities exerted considerable control over fertility and family behavior (Axinn and Yabiku 2001; Entwisle, Casterline and Sayed 1989; Entwisle and Mason 1985), and studies of diffusion processes underlying patterns of fertility decline in the first demographic transition (Coale and Watkins 1986). (For a more recent analysis of this question, see Goldstein and Klüsener (2014)). In Watkins' analysis, the relevant elements of context for fertility included both opportunity structures (prices, markets) and arenas of social interaction (knowledge, ideas, norms). Her definition of relevant social contexts ("others") included "members of the community with whom individuals interact on a day-to-day basis, as well as … 'imagined communities'" (p 242). She amassed considerable empirical support for the hypothesis that the nation state had during the first half of the 20th century become the frame of reference for "others" while the influence of local communities or regions had waned.

Later analyses show, however, that regions continue to exhibit considerable variation in ways that suggest contextual effects on individual behavior. Klüsener and colleagues (2013) found persisting variation in non-marital childbearing across national borders, but an increasing significance of regional variation after 1990. They attribute the shift to an increasing importance of local economic, institutional and cultural conditions that may be particularly salient for the union context of childbearing, if not for number or timing of births. Vitalia and colleagues (2013) demonstrated that municipality-level conditions,

including indicators of the local economy and gender equality norms could explain the diffusion of non-marital childbearing in Norway.

More direct evidence for contextual effects is provided by analyses that link contextual characteristics to individual behavior. For example, Hank (2002; 2003) linked time-varying as well as constant regional (72) or district (328) characteristics to reproductive histories from the German Socio-economic Panel Study. During the 1980s and 1990s, he found virtually no contextual effects on marriage or on first and second births. The considerable regional and district variation in the behaviors appeared to arise in large part from differences in the individual characteristics of populations living in different regions or districts. Hank suggests that one of the impediments to identification of contextual effects is that childbearing is the outcome of a long sequence of behaviors, not all of which may be influenced by the particular opportunity structures or arenas for social interaction that could be observed.

A large body of research on the responsiveness of fertility to social policies can also be viewed as effects of the structural opportunities that contexts provide. Much of this research considers only policies that vary at the level of the nation state (Gauthier 2007; Neyer and Andersson 2008), but several studies have examined variations across regions or municipalities, particularly with respect to the availability of childcare (Andersson, Duvander and Hank 2004; Baizán 2009; Del Boca 2002; Fiori 2011; Hank and Kreyenfeld 2003; Kravdal 1996; Rindfuss et al. 2007; Rindfuss et al. 2010). The results are mixed and may depend on the extent to which variations in childcare reach a threshold that is meaningful for childbearing decisions and/or is complemented by other financial supports for dual-earner families (Andersson et al. 2004; Hank and Kreyenfeld 2003). Rindfuss and colleagues (2010) demonstrate further that positive associations may depend on controls for selection into or effects of fertility on child care contexts.

Several authors of studies finding small or no contextual effects suggest that the contexts that could be measured were too large to represent the opportunity structures and arenas of social interaction that would be most salient to prospective parents (Fiori 2011; Hank 2002). Instead such effects should be sought at the level of the neighborhood (or workplace or school). Research on social context and fertility from poorer countries includes several studies at the local neighborhood level. Entwisle and colleagues (1985) found that nonagricultural activity, modernization of agriculture, school participation and family planning services at the village level were associated with contraceptive use and lower fertility intentions. The Chitwan Valley Family Study constructs neighborhoods of 5 to 15 households, i.e., relatively intimate neighbors. Contraceptive use was higher and first births later for women who lived in neighborhoods in childhood or during their reproductive years with more structural opportunities for economic development and arenas of interaction for

the spread of information and ideas about fertility and family planning (Axinn and Yabiku 2001; Ghimire and Axinn 2010). Yabiku (2006) demonstrated the importance of social interaction by showing that, net of the structural opportunities, neighbors' views about marriage influenced marriage rates.

A few studies in economically developed countries also used contextual data at a lower level than region. Meggiolaro (2011) investigated effects of Milanese neighborhoods (10 municipal districts) on women's intentions to have another child. While considerable variation was found across districts, only two characteristics were associated with fertility intentions. Women living in districts with high proportions of children in care or dependent on social benefits were less likely to intend a child, net of their own socioeconomic and family status; those living in "vital" districts (clubs, newspapers, playgrounds) were more likely to intend a child. Berrington and Stone (2014) found that unemployment in local authority districts in the U.K. delayed first births among men 25-44, but not among younger men or women of any age.

Specification of social contexts at the neighborhood level characterizes much of the research in the United States arising from concerns about effects on children and youth of residential segregation and neighborhood disadvantage. Theoretically, this body of research specifies structural opportunities and arenas of social interaction (social capital, norms) as key mechanisms but sees aspirations and perceptions of opportunity as mediators of child and youth outcomes (Wilson 1987). While the bulk of this research focuses on socioeconomic attainments, several studies have investigated early childbearing and its antecedents, early sexual intercourse and (low) contraceptive use.

Several studies find that nonmarital childbearing – most of which occurs at young ages -- is positively associated with neighborhood disadvantage (Billy and Moore 1992; South and Crowder 2010; South and Crowder 1999) while others find no association (Galster et al. 2007; Ginther, Haveman and Wolfe 2000; Thornberry, Smith and Howard 1997). Butler (2002) found a positive association but only for low-income women. Sucoff and Upchurch (1998) reported that neighborhood economic characteristics were not associated with nonmarital childbearing when individual economic background and circumstances, along with the racial composition of the neighborhood, were controlled. The association of neighborhood disadvantage with early or nonmarital childbearing appears to be stronger, the longer children and adolescents are exposed to such environments (South and Crowder 2010; Wodtke 2013), especially during adolescence (Wodtke 2013).

The chain of behaviors and events that produce adolescent pregnancies have also been studied in relation to neighborhood context. Every study finds that the risk of adolescent pregnancy is higher in poorer neighborhoods (Crowder and Teachman 2004; Diamond et

al. 1999; Harding 2002; Ku, Sonenstein and Pleck 1993; McCulloch 2001; South and Baumer 2001). South and Baumer (2001) showed that abortion was lower in such neighborhoods, adding to the differential in births to young mothers. Of course, sexual activity is the starting point for childbearing, and poor neighborhoods are associated with earlier and more frequent adolescent sexual activity (Baumer and South 2001; Brewster 1994a, 1994b). Teitler and Weiss (2000) were able to show, however, that neighborhood effects on sexual activity were in fact due to school effects in a context where those in disadvantaged neighborhoods also attend relatively disadvantaged schools.

A few studies have directly or indirectly investigated mechanisms through which neighborhoods influence adolescent sexual activity. Adolescents in poor neighborhoods more often express attitudes that encourage sexual activity (Browning and Burrington 2006), low ideal ages at first birth (Nettle and Cockerill 2010), and acceptance of teenage pregnancy (Harding 2007; Mollborn 2010). Even though such attitudes are associated with sexual activity or pregnancy, they do not appear to substantially account for neighborhood effects on either outcome (Baumer and South 2001; Mollborn 2010). Harding (2007) showed that poorer neighborhoods were characterized by greater heterogeneity in such attitudes, and that heterogeneity in turn weakened the association between the individual's own attitude and behavior.

Specifying Social Contexts

As noted in the above review, structural opportunities and/or arenas of social interaction have been specified at all levels from neighboring households to the nation state. When it comes to such structural or normative elements as social policy or culture, the nation state may be the appropriate context for study. But as noted above, regional or local variation may be observed in the extent to which policies are implemented and to which individuals subscribe to dominant national beliefs. To the extent that labor is less mobile than capital and behavior can be more easily observed and sanctioned with face-to-face contact, relatively small neighborhoods are likely more salient for childbearing than larger social contexts.

The definition of neighborhood remains, however, data-dependent and therefore often problematic. Most data are available only for administrative units, such as a U.S. census tract. Census tracts are defined so as to capture equal numbers (about 4000) individuals, but relevant neighborhoods may be much smaller or much larger for different types of influence. Based on an in-depth study of children in low-income neighborhoods of a small U.S. City, Caughy and colleagues (2013) found that effects of the physical environment on

child outcomes were strongest for areas from 400 and 800 meters surrounding a child's home. Effects of the average level of behavioral problems in the neighborhood were most noticeable, however, for peers living within 255 meters. The authors suggest that during adolescence, relatively small neighborhoods may be important features of the economic and social and environment, but that as young people move on to higher education or work, the relevant neighborhood may grow.

South and Crowder (2010) found that high poverty in the immediate neighborhood increased the risk of becoming an unmarried parent, but high poverty in surrounding neighborhoods reduced the risk. The effect of local neighborhood poverty was especially pronounced when surrounding neighborhoods were economically advantaged. They argue that as young adults are not confined to their immediate neighborhoods, the relative advantage of persons in adjacent neighborhoods may operate to further dampen their aspirations for economic attainment and conventional childbearing in marriage. (See also Butler 2002)

Administrative boundaries also have the disadvantage of placing everyone in the same neighborhood even if they live some distance apart and closer to areas with different characteristics. Thus, estimates of neighborhood effects may be attenuated by measurement error in the social context to which an individual is exposed.

Fertility Timing in Sweden

The fact that most of the research on neighborhoods and fertility timing (including timing relative to marriage) has been conducted in economically developing contexts or among U.S. adolescents arises from early childbearing being more common and defined as a social problem in these contexts. Darroch and colleagues (2001) conducted an extensive comparative study of early childbearing in the U.S., the U.K., Canada, France and Sweden. In most respects, Swedish reproductive behavior at early ages differed considerably from that in the United States.

In Sweden as well as in the U.S., age at first birth has been increasing over the past several decades. Mean age at first birth in 2000 was 28.2 for Swedish women (Statistics Sweden 2014), 24.9 for U.S. women, with men about two years later in both countries (Census Bureau 2009, Table 78). The U.S. remains an outlier, however, in birth rates among very young mothers; in 2000, the U.S. rate was almost 50 births per 1000 women age 15-44, in Sweden only 10. This dramatic difference is found despite the fact that Swedish and American young people experience first sex at approximately the same age (Darroch et al. 2001).

Sweden provides a much different social context for adolescent and young adult sexual behavior than is available to young Americans. Sex education has been mandatory in Sweden since 1956 and in 1977 a national curriculum was introduced that included teaching about the nature and development of intimate relationships, as well as the physiological dimensions of sexuality (Brown 1983). No such curriculum is generally available in the United States. In Sweden, abortion has been freely available and accessible since 1974; all reproductive services are covered by the national health system and the more expensive contraceptive methods are heavily subsidized. In the U.S., to the contrary, young people, especially those who are under 18, may have considerable difficulty in obtaining the reproductive services they need (Darroch et al. 2001).

As a result, 95% of Swedish 18-19 year olds reported use of contraception at last intercourse, with much lower levels in the U.S. (Darroch et al. 2001). The pregnancy rate for Swedish teenagers in the 1990s was only 25, that in the U.S. 84 (per 1000 women age 15-19). On top of their lower pregnancy rates, Swedish young people are much more likely to have an abortion than their U.S. counterparts; the abortion ratio (abortions/births) among teenagers was 69 in Sweden in the mid-1990s, 35 in the U.S., with similar but smaller differences for those in their early 20s (Darroch et al. 2001). In addition, Swedish parental leave policy creates strong incentives for delaying parenthood until one has been steadily employed. Benefits are income-related and the fixed benefit that is available to those without a sufficient employment history is quite low in comparison.

Still, birth timing remains a significant issue for adult and child well-being, and therefore for social policy, even in Sweden. Otterblad Olausson and colleagues (2001) showed that younger mothers were less likely to be employed, had lower socioeconomic status and educational attainment, were more likely to become single parents and to be dependent on social welfare benefits than were women whose first child was born at a later age. The differentials were larger for births under 20 but remained between those 20-24 and 25-29 at first birth. Coyne and colleagues (2013) used the offspring of twins and siblings to show a causal negative effect of older age at birth on offspring's later criminal behavior, and again these effects were found beyond the teenage years.

Only one study that we know of has investigated neighborhood effects on fertility timing in Sweden. Hedman (2014) investigated effects of the concentration of teenage parents in Stockholm neighborhoods on the likelihood of having a child between 16 and 20. A large variety of individual and parental characteristics were controlled in the analysis, but no other contextual characteristics were considered. In her baseline model where potential selection into the neighborhood was not controlled, she reported a small positive association between neighborhood teenage childbearing and the likelihood for the individual. The effect was reduced by more than half in a hybrid model that mimics fixed

effects but allows for estimation of the effects of fixed characteristics. She concluded that effects estimated from the latter model were so small that they could be ignored. The question remains whether other characteristics of neighborhoods such as those used in U.S. studies might not influence teenage births, and also whether the opportunity structures and social interactions of Swedish neighborhoods may not influence the timing of first birth at older ages.

We note that research on educational or occupational outcomes suggests that neighborhoods can be as central to Swedish young adults as in the United States (Andersson and Malmberg 2014; Bygren and Szulkin 2010). Neighborhoods may influence timing of transition into parenthood through their effects on economic opportunities for young people. In a context where young people's sexual behavior is not viewed as a social problem and contraception is readily available regardless of age, mechanisms of socialization and social control are unlikely to occur through sexual and contraceptive behavior, more likely through modeling and opportunities for higher educational and occupational attainment.

Empirical design, data and methods

Our outcome is the hazard (risk) of first birth, observed at monthly intervals from age 18 to 32. We observe all persons born in 1980 living in Sweden at age 15 and follow them from age 18 until the first birth or age 32, the last age at which we have data. Individuals who leave Sweden are censored at the end of the year before emigration. We excluded individuals with missing data on parental background. Of 124,494 individuals born in 1980, 98,754 are included in our final sample. We model the risk of first birth with Cox proportional hazard models on a monthly basis. All analyses were conducted with Statistics Sweden's secure on-line access system.

To account for individual level influence on first birth, we include five indicators of parental and individual background: if there was one parent on social allowance or not, if the family had at least one parent with tertiary education, one or more parent in the family was non-employed, and the family's disposable income in deciles. In addition, we include an indicator for living in a single mother family. All indicators were obtained for 1995, the year in which the adolescent turned 15.

As shown in Table 1, more than half of the 1980 cohort observed had their first child by age 32 in 2012 (56 %). The cohort is about evenly divided between males and females, as expected. About one in nine lived in a family receiving social allowance and almost a fifth

lived in a single-mother family. A quarter of the cohort had a non-employed parent in the household, and 38 % had at least one parent with tertiary education living in the household.

TABLE 1. DESCRIPTIVE STATISTICS, INDIVIDUAL BACKGROUND VARIABLES 1995.

With respect to the use of individual background variables the empirical design of this study is conventional. This is not the case, though, with our approach to context measurement. Here, instead, our study introduces two important novelties: First, and most important, we introduce contextual measures that are based on individually defined and scalable neighborhoods. Second, we introduce a factor-analysis based representation of the spatial variation in a socio-demographic context as a means to manage the wealth of information resulting from scalability.

Individually Defined and Scalable Neighborhood

We measure neighborhood population composition using individually centered neighborhoods of fixed population size. We used register data containing information on each person's residential location to generate characteristics of the residential location as the aggregation of characteristics of the nearest *k* neighbors. As shown in Table 2, we observe the proportion of neighbors with university education, who are single mothers, who have disposable income in the 90^{th} percentile for Sweden, and who are not employed, among those 25 years old or older. We also observe the proportion of all neighbors, regardless of age, who receive social allowance, are foreign born, or live in a single-family home (versus multiple units as in an apartment building). Each indicator is measured in 1995, when the cohort of interest reached age 15.

To construct neighborhoods, we use the Equipop software developed by John Östh in order to address the modifiable areal unit problem (MAUP) in segregation measurement (Östh et al. 2014b). Traditional measures of segregation such as the isolation index are strongly dependent on the size of the statistical units for which the segregation index has been computed (Östh et al. 2014b). In the Equipop software, the individualized neighborhoods are obtained by expanding a circular buffer around each residential location until the population encircled by the buffer corresponds to the population threshold chosen. When this threshold is reached, the program computes aggregate statistics on a selected socio-economic variable for the encircled population. Recently, Equipop has also been used to analyze residential segregation in the Los Angeles Metropolitan Area (Östh, Clark and Malmberg 2014a).

Equipop requires that the input data is geocoded on a detailed level. We used data from the PLACE database of Uppsala University. The data include geocodes of each person's residential location by 100 square meters, covering the population in Sweden from 1990 to 2010. Each of the indicators in Table 2 is observed for the nearest 12, 25, 50, 100, 200, 400, 800, 1600, 3200, 6400, 12800 and 25600 neighbors.

TABLE 2. CONTEXT INDICATORS FOR K NEAREST NEIGHBORS IN 1995 (AGE 15).

Factor-Analysis, Contextual Variation and Individualized Neighborhoods

With seven different characteristics and 12 different levels of neighborhood scale we obtain a total of 84 contextual indicators. These indicators should be seen characteristics of a detailed location rather than as characteristics of a larger geographical subdivision. Associations among the indicators arise from two sources. First and foremost, indicators based on the same aggregated variable (e.g., percentage born abroad) will be correlated because an aggregation based on a larger number of nearest neighbors will include all aggregations based on smaller numbers of neighbors. If the area defined by the largest number of neighbors (25,600) is relatively homogeneous on a given indicator, the correlations across neighborhood scales will be stronger; if not, they may depend on the relative sizes of the "neighborhoods". The second source of correlations is the association at the individual and aggregate level of different dimensions of socio-economic and family status. For example, education and income may be strongly positively associated and negatively associated with non-employment and social assistance, at any given neighborhood size.

We subjected the 84 contextual indicators to a principal components factor analysis, varimax rotation. The best fitting model, as evidenced by proportional declines in eigenvalues and factor loadings above .40 (Costello and Osborne 2005) was a seven-factor solution, capturing 67 % of the original covariation. The seven factors demonstrate that both scale (number of neighbors) and substantive characteristics combine to describe the dimensions of an individual's neighborhood.

Based on the factor loadings (Appendix), we can characterize the 7 dimensions as follows:

Elite (factor 1): High proportions of people with tertiary education and disposable income above the 90th percentile. Factor loadings range from .61 to .93 for education, .44 to .63 for income across neighborhood sizes.

Foreign born (factor 2): High proportions of foreign born at all neighborhood sizes (loadings range from .45 to .93); high proportions of unmarried mothers and social assistance recipients load marginally (.4 to .5) at the larger neighborhood sizes.

Small-scale non-employment (factor 3): High proportions of non-employed, low proportions at incomes above the 90th percentile for smaller-size neighborhoods.

Large-scale non-employment (factor 4): High proportions of non-employed, low proportions at incomes above the 90th percentile for larger neighborhoods.

Social allowance nearby (factor 5): High proportions of individuals receiving social assistance and high proportions of unmarried mothers in smaller neighborhoods.

Single family housing (factor 6): High proportions of persons living in single-family houses, across all neighborhood sizes (loadings range from .41 to .79).

Medium-scale non-employment (factor 7). High proportions of non-employed persons in neighborhoods of the medium range (400-1600). If this factor is excluded, factors 3 and 4 do not as clearly differentiate the small- and large-scale neighborhoods in terms of non-employment and income.

These results tell us something about the distribution of neighborhood characteristics by neighborhood scale. Concentrations of high education and income, foreign-born, and single-family housing, are spread across relatively large-scale neighborhoods (and therefore also the smaller-scale neighborhoods within them). Concentrations of high non-employment, lower income (below 90th percentile), social assistance and unmarried mothers depend on the scale, i.e., are not homogeneous among the nearest 25,000 neighbors (see Appendix). Thus, there is the potential for differences in influence on first birth timing depending on the size of the neighborhood (Coughy et al. 2013; South and Crowder 2010; Malmberg and Andersson 2014).

We hypothesize that living at age 15 in elite areas will delay childbearing, especially for women. Two previous studies have shown positive effects of elite areas on attainment of tertiary education (Andersson and Malmberg 2014) and early income trajectories (Malmberg and Andersson 2014), both of which increase the opportunity costs of childbearing for women (Becker 1991). Men's childbearing is also likely to be delayed to some extent by time required to complete tertiary education and to generate an early upward income trajectory.

Factors 3, 4 and 7 distinguish non-employment (and to some extent income) at three different neighborhood scales. Andersson and Malmberg (2014) found that concentration at

a smaller scale was associated with lower education; at a larger scale, the association with education was positive, but with income was negative (Malmberg and Andersson 2014). Thus, we would expect those who live in small-scale non-employment neighborhoods to have children earlier (low opportunity costs, less delay by enrollment). But if the neighborhood is within a larger-scale neighborhood of the same type, we expect delayed childbearing due to higher educational attainment (Andersson and Malmberg 2014). The latter delays would be most pronounced for women whose childbearing is more strongly negatively related to enrollment than men's (Dribe and Stanfors 2009).

If growing up in neighborhoods with high proportions of foreign born exposes individuals to traditional family norms, one would expect this factor to be associated with earlier childbearing. Because this factor is constructed to be independent of contexts with high education and income, or high unemployment, any such effect should be independent of the socioeconomic characteristics of the foreign-born. On the other hand, Andersson (2004) has demonstrated that foreign-born women in Sweden quickly adapt their fertility patterns to those of Swedish-born women, consistent with the very strong contextual influence of Swedish parental leave opportunities and gender equality norms.

Concentrations of social allowance in small-scale neighborhoods (factor 5) should also be associated with earlier childbearing, given its association with poverty risks (Andersson and Malmberg 2014) and lower income trajectories (Malmberg and Andersson 2014). Factor 5 neighborhoods are also characterized by high proportions of single mothers. In other national contexts this would suggest normative influence on early childbearing. In the Swedish context this is, however, not necessarily the case since the link between early childbearing and being a single mother is weaker.

Neighborhoods of 25,000 or less characterized by high proportions living in single-family housing (factor 6) are – similar to elite areas – associated with higher educational attainment (Andersson and Malmberg 2014) and higher early income trajectories (Malmberg and Andersson 2014). Based on the same arguments as above, we might expect growing up in such neighborhoods to be associated with delayed childbearing. The availability of housing most suitable for childrearing may, however, enable even those with moderate education and income to form families at an earlier age.

FIG. 1. SPATIAL DISTRIBUTION OF ELITE FACTOR 1. SWEDEN AND THE THREE METROPOLITAN REGIONS.

Figure 1 illustrates the spatial variation in values for the Elite factor in Sweden and close-ups for the three major metropolitan areas. For the country as a whole, the highest values are found in the metropolitan areas of Stockholm, Malmö and Gothenburg. Other large cities in Sweden and especially cities with universities have high values for elite context. It is predominantly rural areas that have low values. The populated areas of the northern inland have low values, and this is also true for more peripheral areas in the South. In the three Metropolitan areas, Stockholm has clusters with low values of the Elite factor to the south and east. In Gothenburg there is a clear division between the north (lower) and the south (higher) side of the river. In Malmö low values are found south-east of the central city.

Together, the seven factors summarize much of the variation in socio-economic context across Swedish neighborhoods and, thus, they can be used to assess how much neighborhood context during adolescence influences the fertility behavior of young adults in Sweden. Although Equipop generates the contextual values for each individual, data restrictions do not currently allow us to link at the individual level. We have therefore aggregated the individual-level data up to the level of the standard small-area statistical units (SAMS) used in Sweden. This is not, however, the same as calculating the indicators at the level of SAMS because the individuals within a given statistical unit will have neighbors who live in an adjacent unit. Nevertheless, the required aggregation introduces a measurement error that is smaller for factors with high loadings for high k (Elite, Foreign born, Large-scale non-employment, and Single family housing) and larger for factors with high loadings for small k (Small- and medium-scale unemployment, Social allowance nearby).

Results

Estimation results for the transition to parenthood are presented in Table 3. The model has been estimated separately for men and women and we include models with only individual level variables and models with both individual level and contextual level variables.

Effects of Individual Level Variables

Model 1 shows the results for men with only individual level variables and Model 2 is the same model but for women, see Table 3. For men, all of the individual-level coefficients are statistically significant; for women, all except living in a single-mother family are statistically significant. High disposable income and tertiary education both have negative

effects on the transition to parenthood for women and men but the effect of education is stronger (the difference in effect between coming from a household with a disposable income at the 25th percentile and the 75th percentile is less than half of the difference in effect of having or not having parents with a tertiary education). Being on social assistance promotes early childbearing more strongly for women than for men, while household unemployment delays parenthood more strongly for men than for women. For men only, living in a single-mother household in adolescence is also associated with delayed childbearing.

TABLE 3. PARAMETER ESTIMATES FOR ENTRY INTO PARENTHOOD.

The Effects of Contextual Level Variables

Model 3 and Model 4 add contextual variables to Models 1 and 2, respectively (Table 3). A comparison of log likelihood values shows that including contextual variables significantly increases the explanatory power of the models (Model 1 vs. Model 3: Chi-square=247, df=7, prob<0.000; Model 2 vs. Model 4: Chi-square=335, df=7, prob<0.000). Including the contextual variables slightly alters some estimates of effects for the individual level variables, but all that were statistically significant in Models 1 and 2 are also statistically significant in Models 3 and 4, respectively. The results discussed above, thus, are robust to the inclusion of contextual level variables.

Table 3 also shows that for both men and women, coefficients for four of the seven contextual factors are statistically significant: Elite and foreign-born neighborhoods are associated with a slower transition to parenthood. Large-scale marginal neighborhoods and those with high proportions of single-family housing are associated with a faster transition to parenthood.

The strongest effect is found for Elite context. For both men and women, growing up in an area where a high proportion of both your distant and your closest neighbors have a tertiary education and many also have an income in the top decile is likely to slow down the transition to parenthood. And, conversely, transition to parenthood will be faster in areas with low values on the elite context factor. Given its effect size, it is the value of the elite factor that will dominate the effect of geographical context on fertility behavior. The map in figure 1 that shows geographical variation in factor 1 values, thus, gives a good picture of how the fertility behavior of individuals in our study cohort has been influenced by where they lived around age 15. That is, young adults with a background in areas with high

values on the Elite factor (in the metropolitan regions and in the bigger cities) will tend to delay childbearing, whereas young adults from more peripheral areas and from non-elite parts of the metropolitan regions tend to experience an earlier entry into parenthood. This pattern corresponds well with the spatial variation in early childbearing identified by Haandrikman et al (2014). Their analysis show that a high share of mothers among the 800 nearest women in ages 15-24 tend to be found in areas which in this study has been found to have low values on Elite context.

For both men and women, having a background in areas with high proportion of foreign born also leads to postponement of parenthood, but the effect is about three times smaller than the effect of factor 1. This finding could be interpreted in the light of Andersson's (2004) finding that foreign-born women in Sweden quickly adapt fertility patterns similar to those of Swedish-born women. Thus, a high share of foreign-born is not necessarily associated with family-oriented norms of a type that might induce early childbearing. To the contrary, one could speculate that individuals that select Sweden as a destination country have a career-orientation that could be even stronger than that of Swedish-born individuals.

Table 3 also shows that for both women and men, Large scale non-employment neighborhoods increase the risk of first birth, i.e., produce earlier childrearing. Keep in mind that this effect is net of the effect of elite areas characterized by high levels of income and education at high as well as low neighborhood sizes (Appendix). The non-employment effect does not operate at the level of smaller neighborhoods.

Finally, Table 3 also shows that living in areas with high proportions of single family housing has a positive effect on early transition to parenthood. This finding is consistent with studies showing a positive association between housing availability and fertility (Enström-Öst 2012). It is not, however, consistent with the higher levels of education attained by adolescents who grow up in such neighborhoods (Andersson and Malmberg 2014) as those with higher education postpone childbearing. A possible explanation is the positive effect of single-family housing on the income careers of young men (Malmberg and Andersson 2014), making a child-friendly home easily attainable. A faster transition to parenthood for individuals with a background in single family housing areas could also be the result of a better availability of housing suitable for childrearing.

In order to evaluate the strength of these effects, Table 4 presents predicted values for share of women from different geographical background that will have had their first child at age 30. The table compares predicted values for women that have a background in neighborhoods with low (10^{th} percentile) and high (90 percentile) values on the elite factor,

foreign-born factor, and large-scale non-employment factor. The table shows clearly that the strongest effects are found for the elite factor.

TABLE 4: PREDICTED SHARE OF WOMEN THAT HAVE HAD THEIR FIRST BIRTH AT AGE 30 FOR DIFFERENT VALUES ON FACTOR 1, FACTOR 2, FACTOR 3 , FACTOR 4 AND FACTOR 6.

Discussion

We showed that growing up in an elite neighborhood characterized by a high proportion of high-income households and of people with tertiary education delays childbearing. Early childbearing, on the other hand, was associated with unemployment in large-scale but not low- or medium-scale neighborhoods. High proportions of single-family housing were also associated with early childbearing. Contrary to our hypothesis, young people growing up with many foreign-born neighbors had later rather than earlier first births.

Our results provide some evidence for the mechanisms of structural opportunities and social interactions associated with neighborhoods. Effects of growing up in elite areas likely arise from both dimensions – better economic opportunities and social interactions that support education and early career success and thereby delay childbearing. Employment opportunities *per se* seem to support a structural explanation. Social interactions and resulting social norms or modeling effects should be greater in nearby neighborhoods; but unemployment in the larger neighborhood was the factor that increased early childbearing. Single-family housing also suggests a structural opportunity mechanism; at a given level of education or income, the more housing suitable for raising children, the easier it is for a young couple to have their first child.

We had expected earlier childbearing among those who lived in neighborhoods with high proportions of foreign-born and single-mother households. The primary mechanism for both hypotheses was social interaction operating through cultural norms (acquired from high-fertility countries of origin) or behavioral models (as early childbearing occurs much more often among those without partners or who are cohabiting). To the contrary, we found that, net of the neighborhood's socioeconomic characteristics; foreign-born neighbors were associated with *later* childbearing. What may underlie this association is differentiation among immigrant groups. Neighborhoods with high proportions of foreign born but that are not socioeconomically disadvantaged may include more persons who immigrated from lower-fertility countries. Or, as noted above, net of the socioeconomic disadvantages of

their neighborhoods, immigrants may be drawn from populations with strong motives to invest in higher education and thus delay childbearing.

It should also be noted that the contextual factors for which we have not found significant effects on first birth timing are those for which the aggregation to SAMS-areas produced larger measurement errors. When measurement errors increase, estimates of structural effects are attenuated and, even though real, may not be detectable in significance testing. If and when data can be linked at the individual level, this problem will disappear. We also note that we have focused on neighborhood characteristics experienced in the adolescent years. It may be that early childhood experiences are also important in the long-term as even younger children may acquire information about economic opportunities and behavioral norms by observing those in their immediate neighborhoods.

We find that contextual effects on transition to parenthood are to a large extent similar to those for educational attainment. Although previous research with these data made use of slightly different contextual factors, the rough pattern is that factors having a positive effect on educational attainment also lead to postponement of first births. The stronger effects for women than men of elite areas are consistent with the greater negative effect of educational enrolment on women's than on men's transition to parenthood.

The demonstration of neighborhood effects on first birth timing is consistent with many studies of other fertility behaviors in both economically developing and developed contexts. The fact that studies in the U.S. and U.K. find mixed results for teenage childbearing does not mean that fertility timing is immune to contextual influence. If one broadens the focus to encompass transitions to parenthood throughout the young adult years, different results might emerge. It is particularly telling that neighborhood economic advantage does influence childbearing even in a context like Sweden where young adults from across the socioeconomic spectrum are supported to pursue higher education.

We also argue that estimation of neighborhood effects can be enhanced by the more nuanced definition of neighborhood context that is afforded by individually-defined neighborhoods rather than by geographical sub-divisions formed for purposes unrelated to individuals and their neighborhood contexts.

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TABLE 1. DESCRIPTIVE STATISTICS, INDIVIDUAL BACKGROUND VARIABLES 1995.

	Percentage
First birth	56 %
Female	49 %
Parent on social allowance	11 %
Single mother household[1]	19 %
Parent with university education	38 %
Parent non-employed[2]	24 %
Family disposable income, percentiles[3]	-

Notes: 1) Single mothers may be living with a cohabiting partner who is not the person's father. 2) Non-employed can be on parental leave or retired.3) Values are between 0 and 100.

TABLE 2. CONTEXT INDICATORS FOR K NEAREST NEIGHBORS IN 1995 (AGE 15).

Variable	Description	Population
Education	1 = university/college, 0 = not university/college	>25 years
Social allowance	1 = social allowance, 0 = not social allowance	All
Family type	1 = single mother, 0 = not single mother	>25 years
Disposable income	1 = Disp income above 90th percentile, 0 = Disp income below 90th percentile	>25 years
Foreign born	1 = foreign born, 0 = born in Sweden	All
Non-employed	1 = non-employed, 0 = employed	>25 years
Housing (1996)	1 = Single family housing, 0 = other types of housing	All

TABLE 3. PARAMETER ESTIMATES FOR ENTRY INTO PARENTHOOD.

	Model 1. Men			Model 2. Women			Model 3. Men			Model 4. Women		
Term	**Estimate**	**Std Error**	**Sig.**	**Estimate**	**Std Error**	**Sig.**	**Estimate**	**Std Error**	**Sig.**	**Estimate**	**Std Error**	**Sig.**
Parent on social allowance	0.130	0.023	.000	0.203	0.020	.000	0.149	.023	.000	.222	.020	.000
Single mother household	-0.097	0.018	.000	-0.021	0.015	.169	-0.061	.018	.001	.010	.015	.530
Family disposable income, percentiles	-0.002	0.000	.000	-0.002	0.000	.000	-0.001	.000	.000	-.001	.000	.000
Parent with tertiary edu.	-0.274	0.014	.000	-0.296	0.013	.000	-0.232	.015	.000	-.250	.013	.000
Parent non-employed	-0.096	0.017	.000	-0.050	0.015	.001	-0.078	.017	.000	-.036	.015	.019
Factor1 Elite							-0.0751	.006	.000	-0.0802	.005	.000
Factor2 Foreign born							-0.0228	.004	.000	-0.0239	.004	.000
Factor3 Small-scale non-employment							-0.0040	.008	.597	0.0035	.007	.606
Factor4 Large-scale non-employment							0.0161	.007	.013	0.0164	.006	.005
Factor5 Social allowance nearby							0.0010	.006	.860	0.0025	.005	.615
Factor6 Single family dwellings							0.0194	.006	.002	0.0174	.005	.001
Factor7 Medium-scale non-employment							-0.0172	.009	.044	0.0103	.008	.175
	-2 Log Likelihood	Chi-square	df	sig	-2 Log Likelihood	Chi-square	df	sig	-2 Log Likelihood	Chi-square	df	sig	-2 Log Likelihood	Chi-square	df	sig
Omnibus Tests of Model Coefficient	504861.3	626	5	0.000	622174	1009.617	5	0.000	504615	844	12	0.000	621839	1317	12	0.000

Note: Chi-square for model 3 and 4 is for the contextual level variables

TABLE 4: PREDICTED SHARE OF WOMEN THAT HAVE HAD THEIR FIRST BIRTH AT AGE 30 FOR DIFFERENT VALUES ON FACTOR 1, FACTOR 2, FACTOR 3, FACTOR 4 AND FACTOR 6.

	Percentile 10 value	Predicted share of women having had their first birth at age 30	Percentile 90 value	Predicted share of women having had their first birth at age 30
Factor 1 Elite	-0.79	53.3%	2.13	45.2%
Factor 2 Foreign born	-0.69	51.6%	2.61	48.9%
Factor 3 Small-scale non-employment	-1.34	50.9%	2.18	51.2%
Factor 4 Large-scale non-employment	-1.43	50.2%	1.32	51.8%
Factor 6 Single family dwellings	-0.68	49.7%	2.18	51.8%

Note: Baseline hazard evaluated at the mean of the covariates

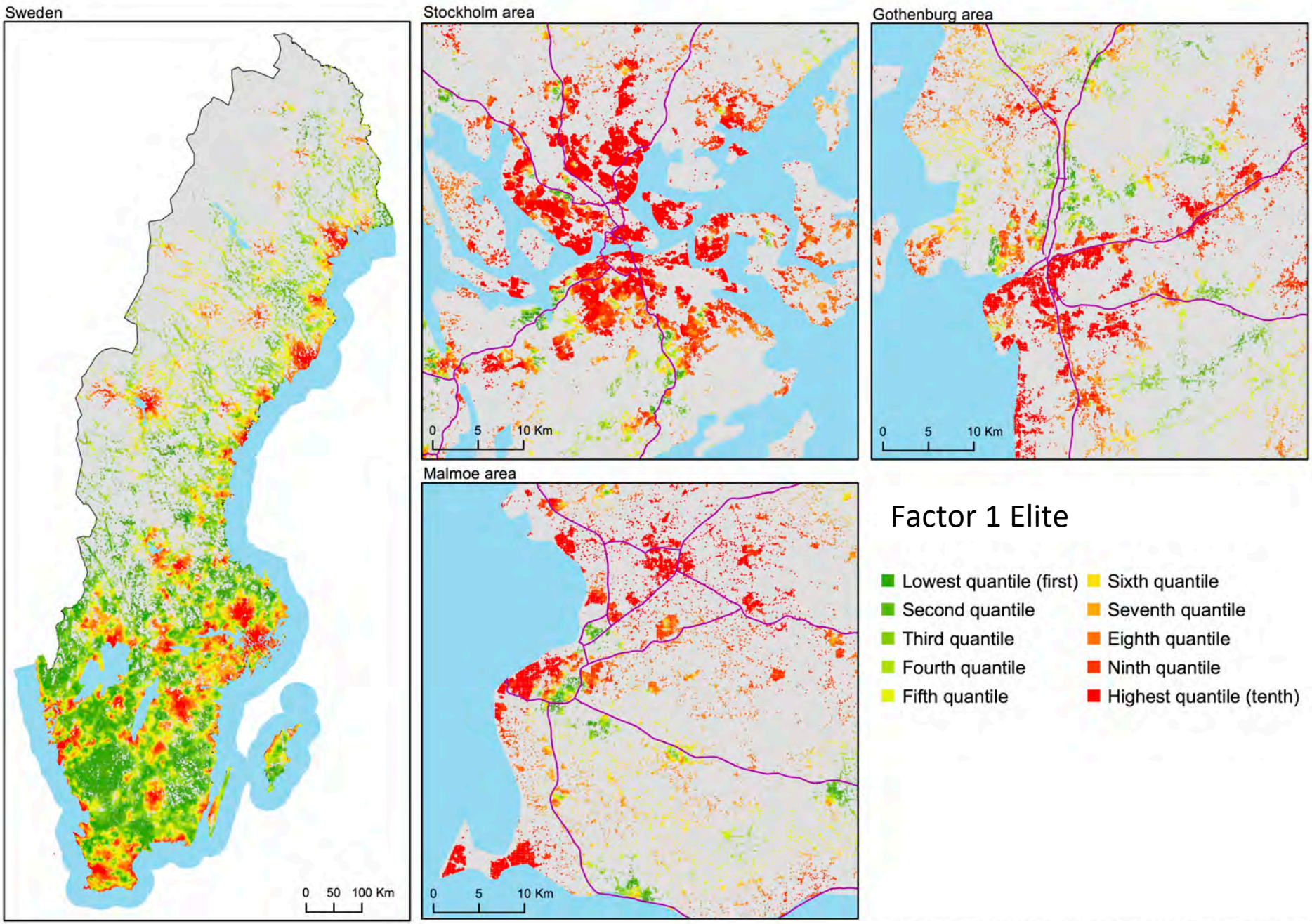

Figure 1 SPATIAL DISTRIBUTION OF ELITE FACTOR 1. SWEDEN AND THE THREE METROPOLITAN REGIONS.

Appendix: Factor loadings

		Elite	Foreign born	Small-scale unem-ployment	Large-scale unem-ployment	Single mother	Single family housing	Medium-scale unem-ployment
Indicator year 1995		**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Factor 6**	**Factor 7**
90th Disp income	12	0.438	0.110	-0.493	-0.126	0.047	0.261	0.189
90th Disp income	25	0.501	0.126	-0.564	-0.146	0.045	0.302	0.194
90th Disp income	50	0.548	0.143	-0.601	-0.169	0.034	0.329	0.161
90th Disp income	100	0.582	0.159	-0.603	-0.201	0.016	0.344	0.088
90th Disp income	200	0.604	0.174	-0.568	-0.245	-0.001	0.338	-0.025
90th Disp income	400	0.621	0.185	-0.500	-0.311	-0.012	0.310	-0.151
90th Disp income	800	0.632	0.186	-0.409	-0.400	-0.015	0.267	-0.248
90th Disp income	1600	0.633	0.175	-0.309	-0.514	-0.010	0.216	-0.252
90th Disp income	3200	0.618	0.161	-0.236	-0.632	-0.009	0.165	-0.151
90th Disp income	6400	0.594	0.154	-0.194	-0.717	-0.010	0.121	-0.010
90th Disp income	12800	0.569	0.146	-0.177	-0.740	-0.009	0.077	0.091
90th Disp income	25600	0.542	0.151	-0.175	-0.705	-0.007	0.027	0.128
Foreign born	12	0.041	0.453	0.108	-0.044	0.166	0.018	0.001
Foreign born	25	0.046	0.541	0.132	-0.053	0.213	0.019	0.001
Foreign born	50	0.050	0.616	0.150	-0.058	0.261	0.018	0.007
Foreign born	100	0.052	0.687	0.157	-0.059	0.312	0.017	0.028
Foreign born	200	0.053	0.746	0.149	-0.052	0.350	0.016	0.066
Foreign born	400	0.053	0.797	0.116	-0.035	0.351	0.014	0.120
Foreign born	800	0.056	0.846	0.053	-0.004	0.305	0.006	0.170
Foreign born	1600	0.064	0.891	-0.021	0.037	0.215	-0.011	0.177
Foreign born	3200	0.078	0.925	-0.086	0.079	0.106	-0.030	0.106
Foreign born	6400	0.108	0.931	-0.130	0.090	0.001	-0.045	-0.017
Foreign born	12800	0.156	0.882	-0.152	0.035	-0.066	-0.056	-0.107
Foreign born	25600	0.201	0.791	-0.164	-0.080	-0.085	-0.048	-0.125
University education	12	0.608	0.051	-0.214	0.034	-0.002	0.088	0.107
University education	25	0.709	0.060	-0.250	0.038	-0.008	0.106	0.107
University education	50	0.789	0.071	-0.270	0.031	-0.017	0.118	0.083
University education	100	0.851	0.083	-0.269	0.014	-0.027	0.124	0.029
University education	200	0.894	0.095	-0.243	-0.016	-0.034	0.118	-0.050
University education	400	0.920	0.105	-0.194	-0.061	-0.035	0.100	-0.137
University education	800	0.933	0.105	-0.130	-0.125	-0.024	0.072	-0.203
University education	1600	0.930	0.098	-0.066	-0.207	-0.006	0.036	-0.203
University education	3200	0.909	0.091	-0.029	-0.294	0.009	-0.001	-0.130
University education	6400	0.877	0.086	-0.020	-0.361	0.019	-0.036	-0.037
University education	12800	0.836	0.075	-0.027	-0.384	0.025	-0.071	0.024
University education	25600	0.778	0.072	-0.040	-0.382	0.032	-0.103	0.042
Single mother	12	0.014	0.022	-0.039	-0.008	0.254	-0.040	-0.003
Single mother	25	0.020	0.033	-0.053	-0.014	0.335	-0.056	-0.006
Single mother	50	0.026	0.051	-0.067	-0.023	0.420	-0.074	-0.005
Single mother	100	0.037	0.081	-0.086	-0.032	0.507	-0.093	0.004
Single mother	200	0.050	0.125	-0.115	-0.036	0.570	-0.105	0.033
Single mother	400	0.073	0.186	-0.165	-0.033	0.583	-0.113	0.078
Single mother	800	0.114	0.267	-0.235	-0.017	0.534	-0.118	0.112
Single mother	1600	0.172	0.359	-0.296	0.003	0.436	-0.126	0.079
Single mother	3200	0.230	0.447	-0.314	0.010	0.310	-0.136	-0.017
Single mother	6400	0.290	0.471	-0.314	-0.051	0.201	-0.145	-0.098
Single mother	12800	0.326	0.419	-0.294	-0.168	0.146	-0.134	-0.105
Single mother	25600	0.351	0.377	-0.248	-0.240	0.119	-0.124	-0.063
Single family housing	12	0.149	0.038	-0.220	-0.002	-0.074	0.565	0.119
Single family housing	25	0.161	0.031	-0.252	0.003	-0.103	0.636	0.125
Single family housing	50	0.167	0.019	-0.278	0.006	-0.140	0.693	0.115
Single family housing	100	0.164	0.000	-0.294	0.006	-0.186	0.740	0.072
Single family housing	200	0.153	-0.028	-0.287	-0.009	-0.230	0.775	-0.017
Single family housing	400	0.132	-0.066	-0.251	-0.046	-0.257	0.787	-0.161
Single family housing	800	0.102	-0.116	-0.171	-0.120	-0.257	0.770	-0.332
Single family housing	1600	0.050	-0.191	-0.055	-0.233	-0.221	0.720	-0.444
Single family housing	3200	-0.026	-0.280	0.064	-0.372	-0.170	0.642	-0.390
Single family housing	6400	-0.127	-0.345	0.140	-0.473	-0.112	0.562	-0.193
Single family housing	12800	-0.232	-0.352	0.173	-0.456	-0.072	0.487	-0.003
Single family housing	25600	-0.334	-0.329	0.168	-0.300	-0.058	0.411	0.073
Social allowance	12	-0.038	0.075	0.120	0.032	0.407	-0.027	-0.063
Social allowance	25	-0.050	0.098	0.156	0.037	0.520	-0.036	-0.076
Social allowance	50	-0.063	0.128	0.192	0.041	0.632	-0.047	-0.074
Social allowance	100	-0.077	0.168	0.217	0.048	0.737	-0.059	-0.049
Social allowance	200	-0.088	0.221	0.220	0.064	0.808	-0.068	0.014
Social allowance	400	-0.095	0.278	0.182	0.094	0.813	-0.074	0.115
Social allowance	800	-0.094	0.348	0.098	0.151	0.742	-0.077	0.222
Social allowance	1600	-0.081	0.427	-0.006	0.229	0.614	-0.086	0.261
Social allowance	3200	-0.059	0.502	-0.095	0.320	0.462	-0.098	0.174
Social allowance	6400	-0.016	0.549	-0.147	0.381	0.325	-0.117	0.003
Social allowance	12800	0.050	0.521	-0.164	0.357	0.233	-0.128	-0.141
Social allowance	25600	0.097	0.469	-0.157	0.232	0.179	-0.107	-0.184
Non-employed	12	-0.195	0.026	0.565	0.101	0.000	-0.167	-0.019
Non-employed	25	-0.234	0.030	0.671	0.120	0.010	-0.205	-0.002
Non-employed	50	-0.267	0.029	0.740	0.143	0.031	-0.235	0.047
Non-employed	100	-0.294	0.025	0.765	0.178	0.057	-0.253	0.139
Non-employed	200	-0.312	0.020	0.736	0.229	0.081	-0.249	0.275
Non-employed	400	-0.328	0.019	0.656	0.306	0.095	-0.222	0.431
Non-employed	800	-0.335	0.030	0.536	0.414	0.092	-0.184	0.548
Non-employed	1600	-0.330	0.062	0.399	0.554	0.074	-0.148	0.536
Non-employed	3200	-0.306	0.094	0.290	0.702	0.051	-0.115	0.373
Non-employed	6400	-0.274	0.102	0.228	0.798	0.028	-0.092	0.157
Non-employed	12800	-0.234	0.092	0.209	0.797	0.015	-0.059	0.011
Non-employed	25600	-0.204	0.070	0.220	0.717	0.010	-0.005	-0.035