

FAMILY SIZE PREFERNCES IN EARLY ADULTHOOD:
MEASUREMENT ERROR AND DIMENSIONALITY

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ABSTRACT

Anna Rybińska: Family size preferences in early adulthood: measurement error and dimensionality
(Under the direction of Yong Cai)

The intended and the desired number of children are widely used measures in family studies yet, despite their popularity, some key questions about these measures remain unanswered. First, little is known about their statistical reliability. Measurement error in either, or both, constructs can cause biased estimation, blurring the relation between these concepts and observed childbearing behavior. Secondly, while extant analyses provide evidence for a distinction between childbearing intentions and desires, these studies do not consider their reliability. Given their wide use, it is necessary to confirm the dimensionality of these concepts and to do so while accounting for measurement error.

In this study, the link between childbearing desires, intentions, and behavior is revisited using a structural equation modeling (SEM) approach in which I test if childbearing desires and intentions are distinct constructs while accounting for measurement error. Using data from the 1979 National Longitudinal Survey of Youth I estimate latent intentions and desires and then use the results to estimate the odds of having a(nother) child within the next three years. The results indicate that measurement error causes major bias in the relationship between childbearing intentions, desires and behavior. In models that account for measurement error, the effects of childbearing intentions and desires on childbearing behavior are twice as large as in models that assume perfect measurement. In addition, I find that while childbearing intentions and desires are distinct constructs, when used independently they might predict childbearing behavior with similar precision. Combined these results suggest that researchers interested in childbearing behaviors need to account for both measurement error and the distinction between childbearing intentions and desires in their models or risk severe bias in their results.

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CHAPTER 1: INTRODUCTION

This paper revisits the concept widely used in fertility studies – fertility preferences and their link with subsequent childbearing. Fertility preferences can be described as individual's preferences for family size (i.e. the number of children one wants to have), timing of the childbearing or family structure (i.e. the preference for having a specific gender composition – for instance least one boy). Although they cannot be treated as exact and reliable predictions of individual or aggregate fertility (Morgan, 2001), they are strongly linked with fertility behaviors. Several decades ago fertility preferences provided information for population projections (Freedman, Whelpton, and Campbell, 1959; U.S. Bureau of the Census, 1975). Currently, they inform policy makers about the demand for family planning and contraception in high fertility regions (Sennott and Yeatman, 2012; Westoff, 1978) and the need for family policies in low fertility regions (Chesnais, 1996; Philipov, 2009). Recently, they have been also used to study the spread of low fertility preferences in developed countries (Goldstein, Lutz, and Testa, 2003; Merli and Morgan, 2012; Merli and Smith, 2002). Although the concept of fertility preferences is frequently present in fertility research, several questions still linger.

One of them is how precisely do the observed values in the surveys describe the fertility preferences? There has been no verification of the statistical accuracy of the measurement of fertility preferences. A measurement error can cause over or underestimation of fertility preferences, blurring the relation between fertility preferences and actual fertility behavior such as the number of children ever born or the timing of child birth. Measurement error has been shown to exist even in seemingly simple, fact questions such as those designed to collect age, race or education level (Asher, 1974) and for more complex measures, it can account for a much higher bias. Duncan and Hill, in their study of economic survey data, show that the measurement error in the reports of earnings and the level of job tenure resulted in a bias of roughly 30% in the estimated payoff to job tenure (Duncan and Hill, 1985). In more

recent studies, findings from various fields suggest that measurement error results in marked bias in the variable of interest (Glewwe 2012 for economic mobility, Freckleton 2011 for behavioral ecology, Kobayashi and Boase 2012 for mobile communication use). These findings show that measurement error can have a significant influence on the estimates used in research of causal relationships. Given the importance of fertility preferences for fertility studies, population projections or policy decisions, there exists a need for verifying the precision of fertility preferences measurement and for a discussion of the consequences of measurement error on the relationship between fertility preferences and fertility behavior.

This study aims at filling this gap in research. I focus on two widely used fertility preferences measures – the desired and the intended number of children and build measurement models to assess their statistical reliability. I then estimate the effect of these measures on childbearing behavior, i.e. having a(nother) child within the next three years. This approach verifies if the statistical relationship between desires, intentions and behavior might have been biased by the measurement error. In addition, I analyze the relationship between the desired and intentioned number of children. As contemporary data sets predominantly contain only one of these measures, they tend to be used interchangeably to study the impact of childbearing preferences on childbearing behavior. If the respondents do not distinguish these measures, the results of such studies could be compared however, if the two concepts of desired and intended number of children should be distinguished, excluding one of them from the analysis could lead to losing important predictive information. In this study I benefit from a study that includes both the desired and intended number of children. I fit the same equation to predict childbearing behavior using first only the desires, then only intentions and at last – both measures. This study verifies what is the effect on behavior of the desires and intentions separately as well as what is the effect when both measures are in the model.

To achieve these goals, I utilize the structural equation approach framework (Bollen, 1989). This approach enables me to account for measurement error and simultaneously estimate the measurement model and the regression equation for the childbearing behavior. It also provides more detailed statistical

fit information to assess the fit of different specifications, allowing for more rigorous comparison between the models. My sample consists of American women followed in the 1979 National Longitudinal Survey of Youth.

The structure of the paper is designed as follows. I first define the concepts of the desired and intended number of children and discuss their importance for fertility research. A brief description of the theoretical model follows. I then discuss the consequences of the measurement error on the relationship between the desires, intentions and behavior. I continue with data and methodology description. In the results section, I present the measurement models and the prediction models. I conclude with a discussion of the consequences of measurement error and model misspecification on fertility behavior predictions.

CHAPTER 2: BACKGROUND

Desires and intentions – definitions and dimensionality

This study focuses on two measures of family size preferences – the desired and intended number of children. I begin with a brief discussion of these concepts and the relationship between them. Desires can be defined as “psychological states that represent what someone wishes for or wants” (Miller, 1994, p. 225). In literature, this term desired number of children is used interchangeably with “wanted” number of children. This measure is considered as the best known and widely available indicator of fertility preferences. Intended number of children can be also referred to as expected number of children¹. It is one’s report about how many children he/she intends to have (Hagewen and Morgan, 2005). As desires, intentions are widely used in studies of childbearing motivations, especially among demographers.

The desired and intended number of children are often used interchangeably in family studies – there are two explanations why this appears. First, numerous studies simply do not include both measures and researcher cannot account for both of them. Secondly, they might be considered as indistinguishable by the respondents. Theoretically, these concepts should be different – one’s desires might be irrespective of one’s situation while intentions might take into account the feasibility of obtaining the desired goal. For instance, a woman might desire to have three children however she might be aware of various constraints such as limited financial resources, limited access to child care, reproductive challenges encountered by her sister or mother. She therefore desires three children but might intend having fewer.

In practice, to my knowledge there is only one study that analyzed the relationship between various measures of family size preferences. Westoff and Ryder analyze four concepts – the ideal, expected, wanted and intended number of children and show that intended and expected number of

¹ Westoff and Ryder provide evidence that expectations and intentions are virtually indistinguishable for respondents (Westoff and Ryder, 1977, p.35).

children are virtually indistinguishable (Westoff and Ryder, 1977 p.35). However ideals, intentions and desires express different orientations to the family size (Westoff and Ryder, 1997, p.35). Their analysis did not account for the measurement error therefore it is possible that the relationship between these concepts might be alternated when the measurement error is being accounted for. However, these results prompted me to assess the dimensionality of these two measures in this analysis. Results presented in Appendix 1 provide evidence that respondents see the desired and intended number of children as two separate concepts with or without the measurement error. For this reason, I have decided to include both measures in the analysis. This approach allows me not only to estimate the measurement error in both measures of the intended and desired number of children separately but also enables me to study the difference between the models that use only one of these measures and the models that use both of them.

Theoretical framework

This analysis is guided by two main theories employed in the research of childbearing preferences: Miller's Traits-Desires-Intentions-Behavior Model (Miller, 1994) and Ajzen's Theory of Planned Behavior (Ajzen, 1991). Miller's approach assumes that childbearing desires are formed by psychological traits. The effects of background factors are mediated through desires and intentions to behavior. In Ajzen's theory, background characteristics such as gender, age, educational level and marital status influence intentions through a set of mediators: attitudes toward the behavior, subjective norms and perceived behavioral control (Ajzen, 1991)². I combine the two approaches and assume the effects of the personal characteristics, background factors and situational covariates on behavior are mediated through desires and intentions. This specification allows for testing the model with or without one of the mediators. As mentioned, some studies include only the measure of desires and some only the measure of intentions – this model can be estimated under both of these circumstances but also allows to compare the partial models with the full model that includes both measures. In addition, recently Mencarini and

² Initially, Ajzen argued that intentions are a sole predictor of fertility behavior. This assumption was later revised with an addition of actual enablers and constrainers that might interfere with the impact of intentions on behavior (Ajzen and Klobas, 2013). In this research, I am not able to control for this type of mediators due to data limitation – the variables that measure attitudes, norms and behavioral control were not included in the survey I utilized.

colleagues (2015) used graphical models to prove that background characteristics influence intentions and fertility behavior not only through the set of mediators but also directly. For this reason, in this analysis I will assume that background characteristics might influence desires, intentions and childbearing behavior indirectly but also directly. The models are further described in the methodology section.

Childbearing preferences in empirical research

Measures of the desired and intended number of children have been present in surveys in various forms for over half a century (Westoff, 1990). However, being frequently employed in fertility studies, “the measurement of reproductive motivation has long been one of the more controversial areas in demography” (Lightbourne Jr 1987, p. 21). First analyses of the relation between fertility intentions and fertility behavior conducted in US in the 1950’s provided evidence that there is an approximate correspondence between these measures (Freedman, Whelpton, and Campbell, 1959) which led to including the information about fertility expectations into population projections (U.S. Bureau of the Census, 1975).

Subsequent analyses provide mixed evidence in favor or against the validity of reproductive preferences. On one hand, researchers expressed their skepticism towards such measures. Among many criticisms, the lack of strong opinion about the ideal family size among respondents (Hauser, 1967) and questionable consistency of reported data (Demeny, 1988) have been discussed. Westoff and Ryder showed that the intentions tend to overestimate the aggregate fertility in case of short term analyses (Westoff and Ryder, 1977). On the other hand, there exists evidence that at least some aspects of the fertility preferences measures are valid predictors of fertility. In the same study, Westoff and Ryder (1977) show that the validity of childbearing intentions at the individual level can be compared to the validity of other demographic and social indicators. Using 134 surveys drawing on results from 84 countries, Westoff shows that the reproductive intentions are strongly correlated with fertility outcomes when respondents verbalize their desire for terminating childbearing, i.e. having no more children (Westoff, 1990). Recently, at a macro level, fertility intentions have been shown to correspond to final family size however, the results on the micro-level provide evidence for a weaker interdependency

(Hagewen and Morgan, 2005; Morgan and Rackin, 2010; Quesnel-Vallée and Morgan, 2003). To summarize, researchers are still not in agreement whether childbearing preferences can predict childbearing behavior.

At the same time as the debate about the predictive power carries on throughout the decades, measures of family size preferences are often used in family studies. Demographers treat intentions and desires to some extent as predictors of future fertility (Philipov, 2009). Studies of fertility preferences can be divided into those that focus on regions characterized by high fertility and low fertility. In high fertility settings, reproductive intentions wanted and intended number of children, are used to study the unmet need for family planning and the demand for contraception (Westoff, 1978; Sennott and Yeatman, 2012). In low fertility settings, researchers use childbearing intentions and desires to inform family policy plans, providing evidence of the existence of economic and institutional constraints that result in below replacement level fertility (Philipov, 2009). For instance, European Commission surveys consistently inform that the desired family size surpasses the replacement level of 2.1 in many European countries but the total fertility rates are much lower (Eurobarometer, 1991; 2003). This is explained by family researchers as a “window” of opportunity for family policies that could eliminate constraints Europeans face when making decisions about childbearing (Chesnais, 1996).

In extremely low fertility regions, family size preferences are studied to observe the spread and acceptance of sub-replacement family size ideals. Goldstein and colleagues (2003), building on the newest data on family size preferences for German speaking countries show that in the German speaking parts of Europe, the average ideal family size given by younger population has decreased to levels as low as 1.7 children. Another stream of research focuses on the interdependencies between family planning policies and family size preferences. A strict one-child policy in China resulted in a spread acceptance of the imposed family size among younger Chinese population, especially in urban areas (Merli and Smith, 2002).

There is no doubt that measures of fertility preferences are employed to study childbearing behavior however little is known about the statistical reliability of these measures. It is possible that the

relationship between the childbearing preferences and the behavior is attenuated by the measurement error present in the measures of preferences. The link between intentions or desires and the behavior might be stronger (or weaker) than previous reported results. Additionally, one of the measures can be more statistically reliable and this might account for the difference in the results of the studies that utilize either the intended or the desired number of children. Assessing the statistical reliability would provide new evidence for empirical research and theoretical debates.

Consequences of measurement error in fertility preferences research

Let us consider the consequences of measurement error as described by Bollen (1989) and Rigdon (1994) on the predictive power the intentions and desires have on the childbearing behavior. In a single equation model, where one or more independent constructs influence one dependent construct, the measurement error in the dependent variable does not bias the coefficients. However, even in the single-equation model, if the independent variable is biased by the measurement error, the relationship between that variable and the dependent construct is going to be biased. It means that if there is a measurement error in the measures of the intended and desired number of children and this measure is being used to predict childbearing behavior, the impact of these preferences on the behavior will be biased. In addition, if other independent constructs are correlated with the measure of desires or intentions, their variance matrix may also be biased and the direction of bias might vary.

The problem becomes more complex when multiple equations are estimated at the same time. Let us consider a system of equations where the desires influence the intentions and intentions then influence behavior. The bias caused by the measurement error in the measure of desires can influence the relationship between the intentions and behavior. To summarize, measurement error in desired number of children might lead to a bias in the effects of desires on intentions, desires on behavior and on the effects of intentions on behavior. If other independent covariates are correlated with desires or intentions, their coefficients can also be biased. Measurement error in the intended number of children will bias the relationship between intentions and behavior.

To problem of the measurement error can be solved using measurement models which assume that observed variables are indicator of latent concepts. Structural equation framework enables a simultaneous estimation of the measurement models together with the explanatory regressions for the intentions, desires and childbearing behavior. This approach provides a detailed assessment of the fit of each estimated equation but also for the general model fit. This approach will allow me to compare the models with different specifications (models with and without measurement error) and to compare models that utilize different measures - only desired number of children, only intended number of children or both measures.

Determinants of childbearing intentions and childbearing behavior

Numerous empirical studies that focus on the determinants of fertility intentions and behavior suggest that they depend on several demographic, socio-economic and gender related factors (Berrington and Pattaro, 2014; Cavalli and Klobas, 2013; Mills et al., 2008; Morgan and Rackin, 2010; Neyer, Lappegaard, and Vignoli, 2013; Quesnel-Vallée and Morgan, 2003; Schoen et al., 1999; Thomson, 1997). This research focuses on the family size intentions and the likelihood of having a child within the next three years and in this section I will shortly discuss factors usually linked with both these measures. It is worth to mention that it is a short-term analysis that focuses on the timing of the next childbirth not on achieving the intended family size. For this reason, the discussion will be tightly linked to the determinants of childbearing postponement rather than final fertility. For simplicity of the analysis I restricted the set of explanatory variables to key background and situational factors previously documented in the literature: family background and situational factors.

Children might adopt their parents values and preferences by observing their parent's childbearing behaviors, family formation and family structure (Murphy and Wang, 2001; Axinn, Clarkberg, and Thornton, 1994; Barber, 2000). Hence *children raised in larger families, i.e. children who had more siblings could form a preference for larger families while children from smaller families could develop a preference for having fewer children of their own*. Larger families might also exhibit other traditional values such as early childbearing. Additionally, children with more siblings are more prone to

have brothers or sisters who already had children of their own. This peer effect could encourage them to have their children sooner as they would have support from their families. For this reason, *children from larger families might be more likely to have a(nother) child sooner rather than postponing parenthood.*

Children might also develop different educational abilities and aspirations during their upbringing based on resources provided to them by their parents (Rindfuss, Bumpass, and St. John, 1980). Firstly, children growing up in families that showed stronger attachment to traditional values and traditional division of roles between men and women (breadwinner – homemaker structure) could internalize these values as their own. As traditional values are positively linked with higher fertility and early childbearing, *being raised in a breadwinner- homemaker households might be positively linked with fertility intentions* and subsequent fertility behavior. Secondly, parent's educational expectations tend to act as strong predictors of the timing of entry to parenthood (Kiernan, 1997). It is possible that they have the same effect on family size preferences. As parents tend to expect their children will obtain at least the same level of education as they did, higher educated parents could support prolonged education and transmit less traditional values and professional career aspirations to their children. *I expect the level of parent's education can be positively linked with childbearing postponement and negatively linked with children's family size preferences.*

Previous research shows that religious involvement can affect family size preferences. Individuals who are more involved - irrespective of denomination - can be more often exposed to teachings and religious doctrine (e.g. by frequently attending mass). Various denominations encourage followers to enter parenthood early and develop preference for large families through pronatalist teachings. Research shows that more religious individuals tend to have higher fertility and fertility preferences (Adsera, 2006; Hayford and Morgan, 2008). *I expect that individuals with higher religious involvement will have higher family size intentions and will be more likely to have another child sooner.*

There is a strong correlation between prolonging education by women and postponing childbearing (Kravdal and Rindfuss, 2008; Mills et al., 2011; Rindfuss et al., 1980; Sobotka, 2004). On one hand, researchers focus on the impact of remaining in education on the timing of childbearing. One of

the arguments might be that since both education and childbearing are time consuming, women who decide to pursue higher education might decide to delay their maternal plans. Some studies, in fact, show that postponing motherhood during education can be just a result of the time taken to complete schooling (Hoem, 1986; Blossfeld and Huinink, 1991; Kravdal, 1994). *I expect that educational enrollment will be negatively linked with the likelihood of having a child within the next three years.* Remaining in education for a longer period of time can also be an indicator of personal preferences for professional career or encourage interests or lifestyles that compete with parenthood (Kohler et al., 2002). *As a result, being in education might be negatively linked with family size intentions.* Additionally, educational enrollment for a longer period of time usually results in obtaining higher level degrees. It has been proven that highly educated women are often driving the trend of having children later in their lives (Kohler et al., 2002; Sobotka, 2004). Higher education is related with further professional career developments because it might enable women to pursue better occupations and focus on their careers.

The main conclusion of economic analyses of the birth timing is that the birth of a child impacts the mother's earnings in two ways. Primarily, child birth reduces woman's labor market participations - a woman has to withdraw from work to take care of the baby. Secondly, it impacts her career development and "slows down the growth of her marketable human capital" (Cigno, 1991). These explanations have several implications. One may be that when resources are scarce (and they usually are for young couples who have only started their experience on the labor market), individuals might delay childbearing until they can afford it. Another implication would be that if woman's wage raises with work experience, she faces a conflict between the decision to continue working and earn more or to pause work and give birth. In the latter case she risks delaying the increase of her wages. Many income studies of mothers indeed show that motherhood postponement provides considerable earnings returns, especially for higher educated women or those in professional occupations (Begall and Mills, 2013; Miller, 2011; Van Bavel, 2010). Moreover, economic theories also imply that when women think about childbearing, they consider not only specifically the amount of their wages. They also account for other work-related aspects such as accumulating work experience (Kravdal, 1994) or attaining more stable positions in the workplace

(Happel et al., 1984). In several empirical studies, women mention that conscious career planning was their main motivation for motherhood postponement, as they anticipated that they will have better chances of career advancement if they delay childbirth (thorough review in e.g. Gustafsson, 2003). For this reason *I expect that employed women will be less likely to have a child within the next three years*. On the other hand, employment provides the family with additional financial resources that might be spent on the baby which might accelerate child birth. It is also then plausible that *employed women will be more likely to have a(nother) child within the next three years*.

Having a supportive partner is crucial for childbearing decisions (Philipov et al., 2006; Testa, 2007). A lack of a partner, a lack of financial and emotional support that a stable partner provides strongly impacts women's childbearing choices. Delaying entering a stable union has a direct influence on the timing of childbearing (Corijn and Klijzing, 2001) and experiencing a union dissolution can force the postponement of childbearing plans until finding another partner. I therefore expect that *married women will be the most likely to have a(nother) child within the next three years as compared to single or separated women*. Remaining single might also be an indicator of non-traditional life style preferences such as lower fertility intentions therefore *single individuals will have lower family size intentions*.

CHAPTER 3: DATA AND METHODS

Data

For the analysis I use the 1979 National Longitudinal Survey of Youth³. It is an panel survey of a national representative sample of Americans, aged 14 to 21 in 1978 (Zagorsky and White, 1999). This survey started in 1979 and respondents were interviewed annually from 1979 to 1986 and then biannually from 1988 to 2010. During each interview, rich information about the household, family formation processes, demographic and socio-economic characteristics were collected. The initial sample consisted of 12,686 individuals. I mainly utilized information from Wave II conducted in 1982, supplemental information were extracted from Wave I in 1979 and from Wave V in 1985. In this paper I focus on the sub-sample of women as their fertility intentions and behaviors have been mostly studied in the past. An analysis of the data for men should be the next step.

Independent measures and outcome

Two measures of family size intentions found in the survey are: “*How many (more) children do you expect to have?*”⁴ and “*Altogether, how many (more) children do you want to have*”. Measures were present in the data set in 1979 and 1982. Both variables are included in the data set as continuous. However the mean values of the intended and desired number of children are close in 1979, one can observe an increasing divergence between the intended and desired number of children in 1982. In addition, the means of desired number of children in 1979 and 1982 are in proximity (2.54 and 2.37) but the intended number of children in 1982 is much lower than in 1979 (1.86 compared to 2.31). The

³ <https://www.nlsinfo.org/content/cohorts/nlsy79>

⁴ Westoff and Ryder (1977) consider these virtually indistinguishable, I follow their assumption.

childbearing behavior is measured as a dummy for having a(nother) child within the next three years, until 1985; 28% of women had a(nother) child until the interview in 1985.

Table 1 Descriptive characteristics of the independent variable and the outcome.

Measures of family size preferences	Mean	Std. Dev.
Desired number of children 1979	2.54	1.49
Desired number of children 1982	2.37	1.29
Intended number of children 1979	2.31	1.45
Intended number of children 1982	1.86	1.29
Childbearing behavior		
Had a(nother) child within the next 3 years	0.28	0.45

Covariates

I use number of siblings as an indicator of family size and parental education is measured by years of education of both parents. The indicator of being raised in a male-breadwinner family is a dummy that equals 1 if the mother worked when respondent was 15 years old. Religiosity is measured by church attendance coded as a dummy equal to 1 when the respondent attends church once per week or more⁵. Enrollment status is divided into four categories: enrolled in college, enrolled in high school, not enrolled, finished high school and not enrolled, less than 12 grades of education. Marital status dummies include: single, married and separated (separated, divorced and widowed) individuals. Three types of employment status are recognized: employed, unemployed and out of labor force. I excluded those active in the military as there were very few women in this category. I include the number of children and age. I additionally include a set of controls including: racial and ethnic origin – as they might reflect subgroup variations in fertility-related norms (Reiss 1967, Staples 1978, St. John and Rowe 1990), a dummy for being raised in an urban area and a control for regional difference indicating residing in the South of the United States. Descriptive statistics of the measures are included in Table 2. The final sample consists of 4,149 women who were interviewed in three consecutive waves.

⁵ The initial indicator is a categorical measure that ranges from 1 – not at all to 6 – more than once per week. Preliminary analysis showed that the church attendance only predicts expectations and behavior if the respondents attend church very frequently – at least once a week. For this reason I changed the coding.

The NLSY-79 sample consist of young adolescent, the mean age in 1982 when the second wave was conducted was 21 years and many respondents have not yet transitioned to parenthood. However, 30% of women already had at least one child. Some respondents are enrolled in college or high school which is specific to this young sample but the majority have already finished their education and started employment. About one third of women have already entered a marital union and 29% are married in 1982. While the majority of women remain employed, about one third is out of labor force which might coincide with attending school or raising young children. What is noteworthy is that the sample is predominantly White and living in urban areas.

Methods

In this study I employ structural equation models framework (Bollen, 1989) which allows me to simultaneously estimate the equation for the intended number of children and the equation predicting the likelihood of having a(nother) child. It also allows me to account the measurement error in the measures of family size preferences and compare the fit of specific equations but also of the entire model by using detailed fit statistics. Since only one indicator of each factor (desires and intentions) is available for each year, the estimation of the models might be problematic due to very limited amount of information the model can use to identify the missing parameters. For this reason I used measures for two years – 1979 and 1982 and included minor constraints in the models. I use maximum likelihood estimator to compute coefficients in the equations and the weighted least squares estimator⁶ to obtain the fit statistics. The analysis was done using MPlus developed by Muthén & Muthén⁷ because this software enables including categorical variables in the SEM framework and provides the richest set of the model fit statistics.

The analysis was conducted in three steps. The first set of models includes only measures of the intended number of children to estimate the results as if no measure of the desired number of children was

⁶ Weighted least squares estimator is used to estimate probit models instead of logit models. However, the fit of these two models should be comparable therefore I decided to use the fit statistics of the probit model to assess the logit. No fit statistics are provided in MPlus when the logit model is employed.

⁷ <http://www.statmodel.com/index.shtml>

available. In the second set of models, only measures of the desired number of children are included – as if no measures of the intended number of children were available. These models aim at estimating the separate impact of these two measures on the behavior. Both sets of model are estimated following the same procedure: I first estimate a model with one measure in 1982 and then extend the model to two measures – 1982 and 1979 to identify the models with latent concepts. Graphs presenting each model estimated in this sequence are available below (Figures 1- 6 for intentions and 7-12 for desires). This approach is guided by the assumption that there is a causal relationship between one's intentions in time 1 (1979) and their intentions in time 2 (1982)⁸. Including measures of 1979 is necessary to identify the models however it might introduce concerns about the relationship between the measures of intentions and desires in 1979 and situational factors in 1982. It is plausible that one's desires might influence their life decisions such as employment or educational choices. These concerns will be addressed in the results section. In addition, models 1-4 and 7-10 do not have any constraints but models 5-6 and 11-12 have the variances of the errors of the observed measures of intended number of children in 1979 and 1982 (or desired number of children in 1979 and 1982) set to equal.

In the third step, I include both measures of the intended and the desired number of children. In this model, background and situational factors have direct influence on the desired number of children, intended number of children and behavior but all the influence of the desired number of children on the odds of having a(nother) child within the next three years is mediated through the intended number of children. I tested the model which allowed also for the direct effects and the model had a significantly worse fit (see Appendix 2). For brevity, I present only the basic model with all measures introduced as observed – Figure 13 and the last model with all measures introduced as latent – Figure 14. In model 14, the variances of the errors of the observed measures of intended number of children in 1979 and 1982 are set to equal and the variances of the errors of the desired number of children in 1979 and 1982 are set to equal.

⁸ Another specification would assume that both measures from 1979 and 1982 are indicators of the same time – invariant latent concept. However this specification had a much worse fit (see Appendix 3).

Table 2 Descriptive statistics of the sample.

Individual characteristics	Mean	Std. Dev.
Age in 1982	20.69	2.27
Has no children	0.70	0.46
Has one child	0.19	0.39
Has two or more children	0.11	0.31
Race: White	0.62	0.48
Race: Hispanic	0.16	0.36
Race: Black	0.22	0.41
Family background		
Mother was employed when respondent was 15 y.o.	0.54	0.50
Mothers education in years	10.92	3.13
Fathers education in years	10.89	3.94
No siblings	0.03	0.16
One sibling	0.13	0.34
Two siblings	0.20	0.40
Three or more siblings	0.63	0.48
Religiosity		
Attends church once per week or more	0.38	0.49
Education enrollment		
Not enrolled, less than 12 grades of education	0.16	0.37
Enrolled in high school	0.12	0.32
Enrolled in college	0.20	0.40
Not enrolled, high school graduate	0.52	0.50
Marital status		
Single	0.66	0.47
Married	0.29	0.45
Separated	0.06	0.23
Employment status		
Employed	0.56	0.50
Unemployed	0.12	0.33
Out of the labor force	0.31	0.46
Controls		
Residing in an urban area	0.78	0.41
Residing in the South	0.37	0.48
N	4,149	

Figure 1 Intentions: Model 1. Observed measure of intentions in 1982.

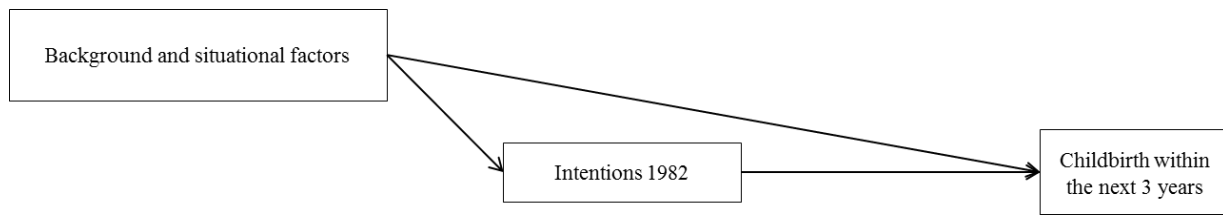


Figure 2 Intentions: Model 2. Latent measure of intentions in 1982.

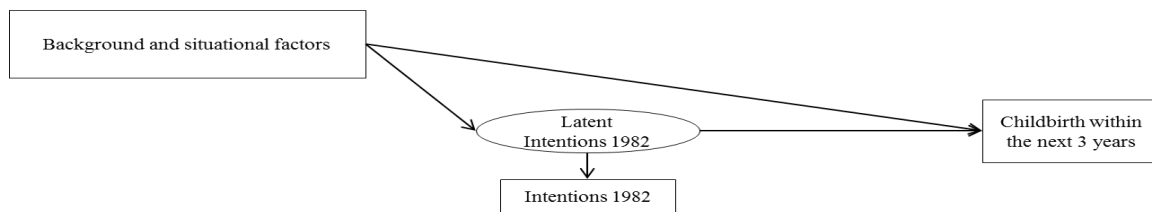


Figure 3 Intentions: Model 3. Observed measures of intentions in 1979 and 1982.

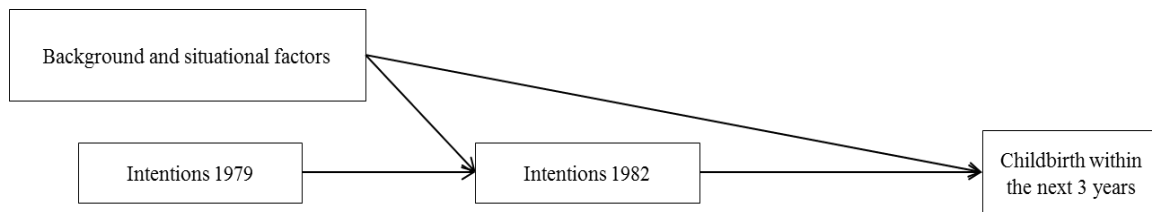


Figure 4 Intentions: Model 4. Observed measure of intentions in 1979 and latent measure of intentions in 1982.

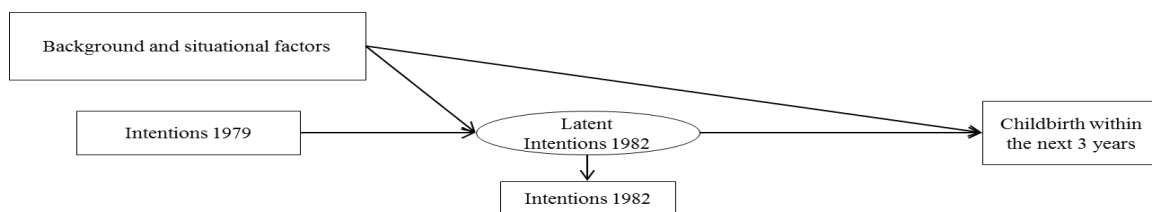


Figure 5 Intentions: Model 5. Latent measures of intentions in 1979 and 1982.

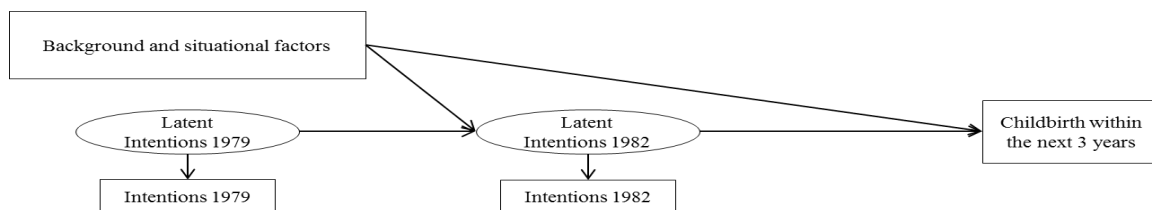


Figure 6 Intentions: Model 6. Latent measures of intentions in 1979 and 1982 - changed temporal relationship.

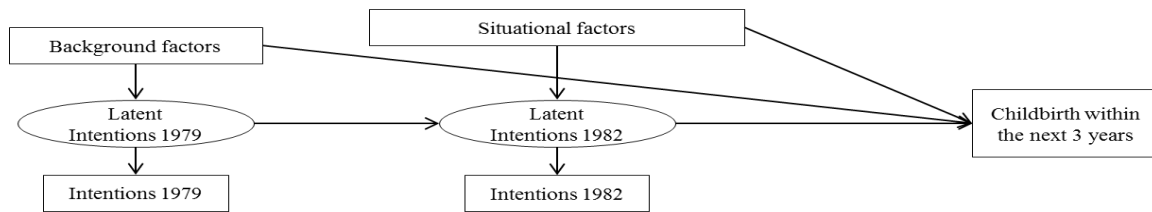


Figure 7 Desires: Model 7. Observed measure of desires in 1982.

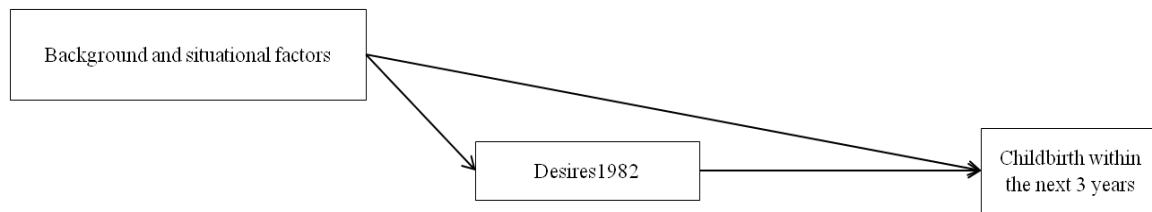


Figure 8 Desires: Model 8. Latent measure of desires in 1982.

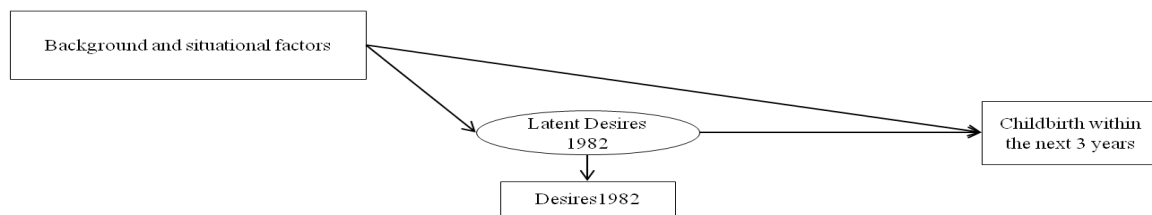


Figure 9 Desires: Model 9. Observed measures of desires in 1979 and 1982.

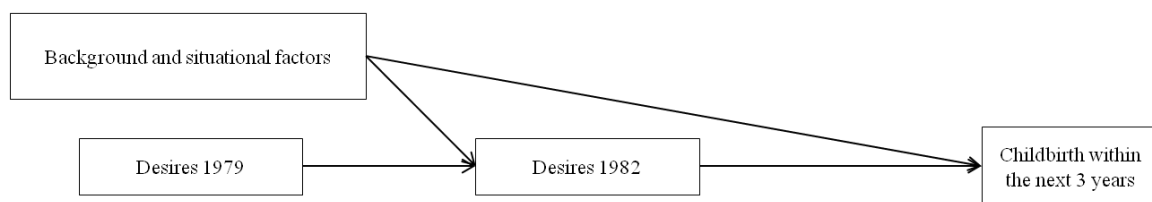


Figure 10 Desires: Model 10. Observed measures of desires in 1979 and latent measure of desires in 1982.

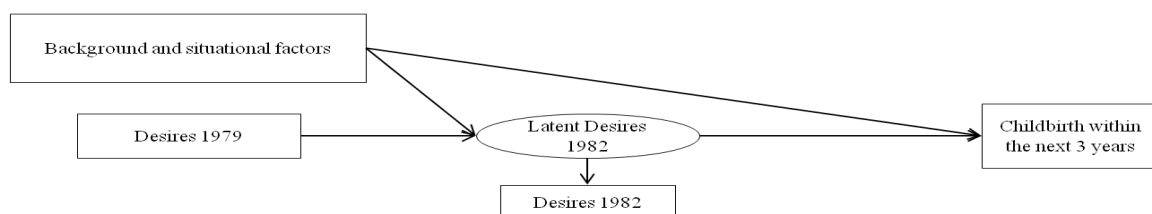


Figure 11 Desires: Model 11. Latent measures of desires in 1979 and 1982.

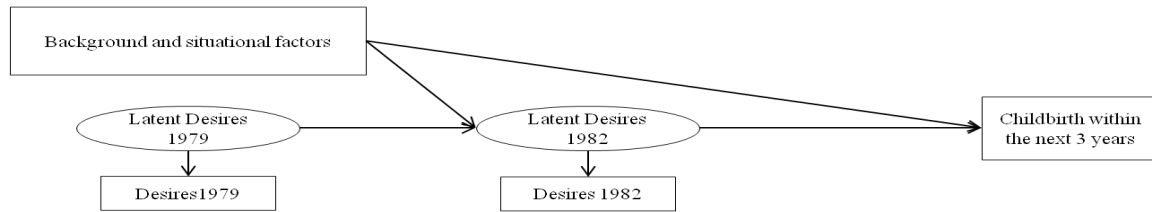


Figure 12 Desires: Model 12. Latent measures of desires in 1979 and 1982 - changed temporal relationship.

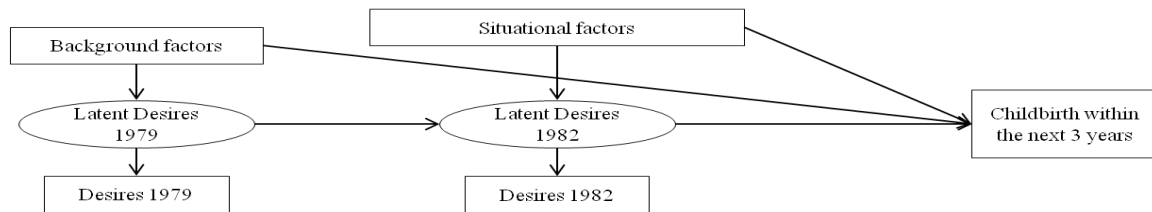


Figure 13 Desires and intentions: Model 13. Observed measures of desires and intentions in 1979 and 1982.

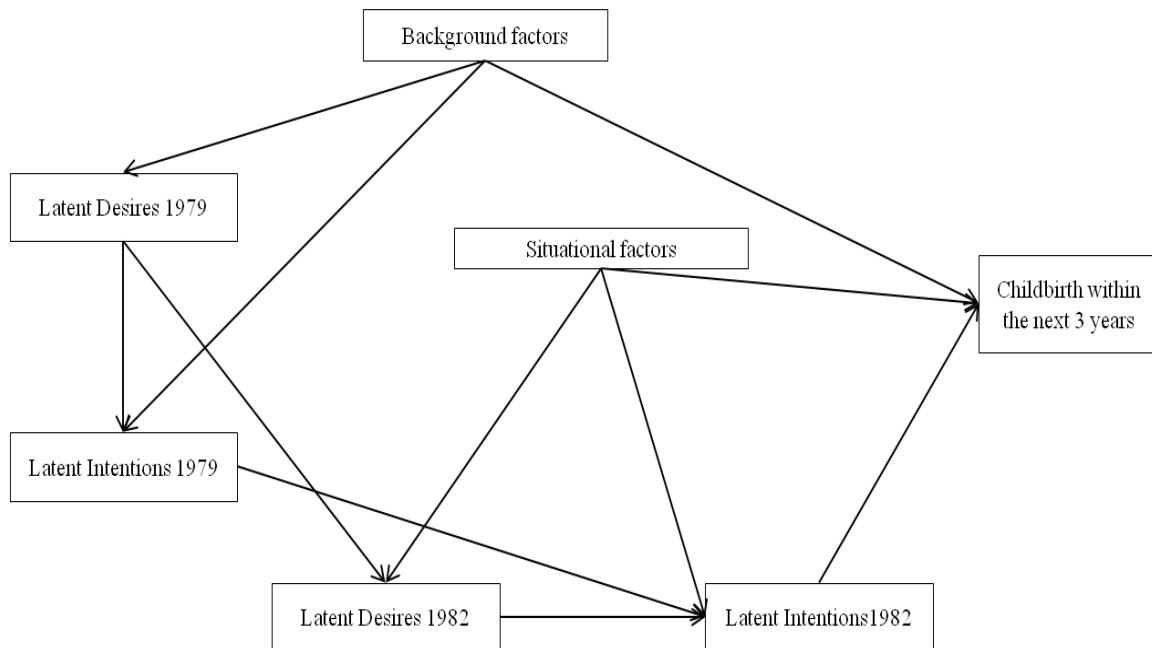
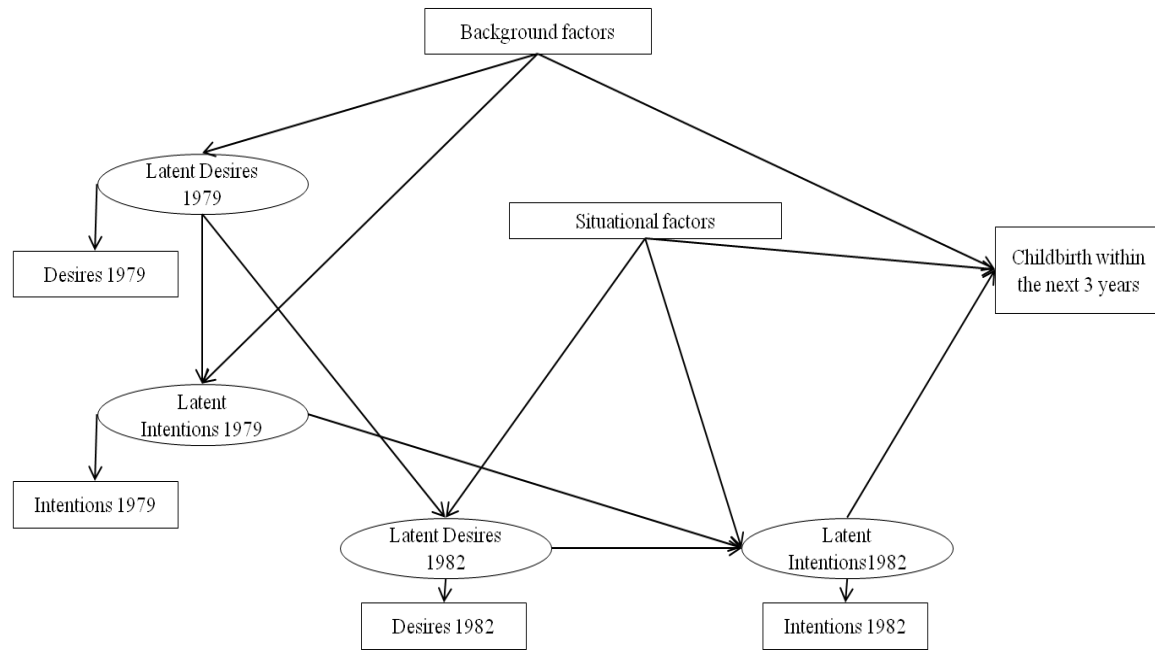


Figure 14 Desires and intentions: Model 14. Latent measures of desires and intentions in 1979 and 1982.



CHAPTER 4: RESULTS

I firstly discuss the results of the models with measures of the intended number of children. In this specification I assume that there is no measure of desires available in the dataset. Results of this estimation are included in Table 3 and 6. First, I estimate the Model 1 with only one observed measure of intentions in 1982 to provide a baseline for the comparison with the measurement models. The odds of having a child within the next three years increase by 20% by a one unit change in the intended number of children. Model 2 includes a latent measure of the intended number of children in 1982 is not identified. I then fit a model with two measures of the intended number of children – as observed and latent concepts. Results from Model 3 are similar to the results of Model 1 – there is no difference in the regression for the odds of having a(nother) child within the next three years but some of the effects of background factors on the intended number of children in 1982 disappear when the intended number of children in 1979 is introduced to the model. There is a strong positive relationship between the intended number of children in 1979 and 1982. In Model 4, after accounting for the measurement error in 1982, the effect of the intentions on the childbearing behavior in the next three years increases, from 20% to 29% increase in the odds. In Model 5, after accounting for the measurement error in 1979 we do not see a change in the coefficient by the intended number of children 1982 but the effect of intentions in 1979 on the intentions in 1982 increases from 0.36 to 0.40. This model does not fit the data – however the CFI and RMSEA values are within acceptable range (above 0.9 for CFI and below 0.05 for RMSEA), the TLI is below acceptable 0.9 and the BIC is positive (should be negative).

To improve the model fit, I fitted Model 6 that has all the background factors effects on the intended number of children in 1982 mediated through the intentions in 1979. The relationship between situational factors in 1982 and the intentions in 1979 is omitted however model has a significantly better,

satisfactory fit. Only TLI value is below acceptable 0.9 which might be due to omitting the mentioned paths between situational factors and intended number of children in 1979. In this specification, the impact of the intentions in 1979 on the intentions in 1982 increases to 0.65 and the impact of the intended number of children in 1982 on the childbearing behavior increases to 40% increase in the odds. In the final specification, the measurement error accounts for 35% of the variance in the intended number of children in 1979 and for 57% of the variance in the intended number of children 1982. The change in the measurement error between Models 5 and 6 is surprising.

In regards to the other effects of other covariates, they remain virtually the same across different specification. Background factors have no or a small effect on the intended number of children in 1982 and 1979. Only the fact of residing in the South and the father's educational attainment did not influence the intended number of children in 1982 but have a positive influence on the intended number of children in 1979. The effects of background and situational factors on the childbearing behavior increase slightly when the measurement model is estimated suggesting a small attenuation bias that might have been caused by the measurement error in the intended number of children. However, all these changes are very small, usually within a standard error difference across the models. Although the intended number of children has a positive impact on the odds of having a child within the next three years, situational factors such as educational enrollment, employment or marital status are much stronger predictors of childbearing behavior.

Table 3 Intentions: Results for Models 1 - 6.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Coefficients						
Intended number of children 1979 – observed			0.36			
Intended number of children 1982 – observed ^a	1.20		1.20			
Intended number of children 1979 – latent				0.40	0.46	0.64
Intended number of children 1982 – latent ^a				1.29	1.29	1.42
R-squared^b						
Intended number of children 1979					0.83	0.65
Intended number of children 1982				0.79	0.77	0.53

Fit statistics					
Chi-square	0	0.74	0	187.27	121.91
dF	0	1	0	20	20
p-value	0	0.39	0	0	0
CFI	1	1	1	0.94	0.96
TLI	1	1.00	1	0.79	0.88
RMSEA	0	0	0	0.05	0.04
BIC	0	-7.59	0	20.66	-44.70
N	4,149	4,149	4,149	4,149	4,149

*All coefficients are statistically significant on the level of 0.001. ^a - odds for logistic regression. ^b - R-square reported only for models with latent concept. It should be interpreted as the amount of the variance of the observed indicator that is explained by the latent measure.

The estimation of the models that include the desired number of children is similar to the procedure for the intended number of children. In this specification, I assume that no measure of the intended number of children is available and predict the childbearing behavior only with the measure of the desired number of children. Table 4 and 7 include results for models 7 - 12. Model 7 provides a baseline of the effect of the desired number of children in 1982 on the odds of having a child within the next three years when it is assumed that the observed variable does not contain measurement error. Under this specification, desires increase the odds of having a(nother) child by 19%. Under the specification that assumes measurement error (model 10), the odds are slightly higher – 23%. In addition, under the specifications that allow for measurement error in the desired number of children in 1979, the influence of the desires in 1979 on desires in 1982 increase from 0.49 to 0.52. The coefficient in the Model 12 includes the effects of background factors mediated through the desires in 1979 therefore is larger. Model 11 has a better fit than Model 5 estimated for the measures of intentions and is close to being an acceptable solution only with TLI slightly below the accepted level of 0.9. Model 6 that includes a change in the specification of the equations for the desired number of children in 1979 and 1982 is a visible improvement with all fit statistics close to their ideal values – CFI and TLI close to 1 and RMSEA close to 0, BIC large and negative. In the final model, measurement error accounts for 31% of the variance in the desired number of children in 1979 and for 42% of the variance in the desired number of children in 1982. The odds of having a(nother) child within the next three years increase by 29% for every one unit increase in the desired number of children. As in the model for the intended number of children, the

change in the measurement error between Models 11 and 12 is surprising. Noteworthy, the direction and size of the other coefficients in the models remain unchanged across all models and are very similar to the models that include the intended number of children.

In the last step, I combine the two previous specifications and include both measures of desires and intentions in the model. For brevity, only two models are presented here – the one with all four measures introduced as observed and all four measures introduced as latent. In this specification, desires influence intentions but background and situational factors have impact on both intentions and desires. Only intentions influence behavior, not desires. Models in which background factors and situational factors had only indirect impact on intentions through desires were misspecified (see Appendix 2). Model that included a direct path from desires to behavior were also misspecified (see Appendix 2). Results are presented below in Table 7 and 8.

In this specification, the effect of the intended number of children in 1982 on the childbearing behavior is identical as in the Model 1. However once, the measurement error in all of the measures have been adjusted and the measures of the desired number of children were included in the estimation, the effect increased to 40%, as in the Model 6. All the effects of the desires on intentions and the measures of 1979 on measures of 1982 change once the equations include the measurement error. The direction of the change is not equal. The influence of the measures of 1979 on the measures in 1982 increases after adjusting for the measurement error but decreases for the impact of the desired number of children on the intended number of children. In this specification, measurement error explains 38% of the intended number of children in 1979, 50% of the variance in the intended number of children in 1982. In regards to the desired number of children, the measurement error explains again 38% of the variance in the measure of 1979 and 50% of the variance in the measure of 1982. Although the fit of the initial model is satisfactory, the model with latent concepts has a moderately better fit. The effects of background covariates and situational factors increase slightly in the models with measurement error.

Table 4 Desires: Results for Models 7-12.

	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Coefficients						
Desired number of children 1979 – observed			0.49			
Desired number of children 1982 – observed ^a	1.19		1.19			
Desired number of children 1979 – latent				0.52	0.52	0.79
Desired number of children 1982 – latent ^a				1.23	1.21	1.29
R-squared^b						
Desired number of children 1979					0.96	0.69
Desired number of children 1982				0.87	0.94	0.58
Fit statistics						
Chi-square	0		0.08	0	119.48	42.59
dF	0		1	0	20	20
p-value	0		0.77	0	0	0.00
CFI	1		1	1	0.97	0.99
TLI	1		1.01	1	0.89	0.98
RMSEA	0		0	0	0.04	0.02
BIC	0		-8.25	0	-47.13	-124.03
N	4,149		4,149	4,149	4,149	4,149

*All coefficients are statistically significant on the level of 0.001. ^a - odds for logistic regression. ^b - R-square reported only for models with latent concept. It should interpreted as the amount of the variance in the observed indicators that is explained by the latent measure.

Table 5 Complete results: Estimation of models with the intended number of children.

	Model 1		Model 3		Model 4		Model 5		Model 6	
Regression: intended number of children in 1982										
Intended number of children 1979 observed			0.36	***	0.4	***				
Intended number of children 1979 latent							0.46	***	0.65	***
# of children in 1982	-0.36	***	-0.30	***	-0.33	***	-0.35	***	-0.41	***
Age in 1982	-0.04		-0.01		-0.01		-0.01		-0.03	
Mother work while growing up	-0.01		-0.01		-0.01		-0.01			
Years of education – mother	0.00		0.00		0.01		0.01			
Years of education – father	0.03		0.02		0.03		0.03			
Race: Hispanic (ref. White)	0.04	*	0.03		0.03		0.03			
Race: Black (ref. White)	-0.01		0.00		0.00		0.00			
# of siblings - 0 (ref. 2)	-0.01		-0.02		-0.02		-0.02			
# of siblings - 1 (ref. 2)	0.00		0.00		0.00		0.00			
# of siblings - 3+ (ref. 2)	0.06	**	0.02		0.03		0.03			
Goes to church at least once a week	0.07	***	0.04	**	0.04	**	0.04	**		
Lives in urban area	0.01		0.00		0.00		0.00			
Lives in the South	-0.09	***	-0.06	***	-0.06	***	-0.07	***		
Education: not enrolled finished high school (ref. In college)	-0.08	***	-0.06	***	-0.07	**	-0.07	**	-0.09	***
Education: in high school (ref. In college)	-0.04		-0.02		-0.03		-0.03		-0.04	
Education: not enrolled, did not finish high school (ref. In college)	-0.08	***	-0.07	***	-0.07	***	-0.08	***	-0.09	***
Married in 1982 (ref. Single)	-0.02		-0.04		-0.04		-0.04		-0.06	**
Separated in 1982 (ref. Single)	-0.04	**	-0.02		-0.03		-0.03		-0.03	
Unemployed in 1982 (ref. Employed)	-0.02		-0.01		-0.01		-0.01		-0.01	
Out of labor force in 1982 (ref. Employed)	-0.03		-0.03		-0.03		-0.03		-0.04	
Equation of having a(nother) child within the next three years - odds										
Intended number of children 1982 observed	1.20	***	1.20	***						
Intended number of children 1982 latent					1.29	***	1.29	***	1.42	***
# of children in 1982	0.93		0.93		0.97		0.97		1.02	
Age in 1982	0.97		0.97		0.97		0.97		0.98	
Mother work while growing up	1.04		1.04		1.04		1.04		1.04	
Years of education – mother	1.00		1.00		1.00		1.00		1.00	

Years of education – father	0.97		0.97		0.97		0.97		0.97	
Race: Hispanic (ref. White)	1.18		1.18		1.17		1.17		1.17	
Race: Black (ref. White)	2.23	***	2.23	***	2.25	***	2.24	***	2.28	***
# of siblings - 0 (ref. 2)	0.45		0.45		0.45		0.45		0.44	**
# of siblings - 1 (ref. 2)	1.04		1.04		1.04		1.04		1.04	
# of siblings - 3+ (ref. 2)	1.12		1.12		1.11		1.11		1.10	
Goes to church at least once a week	1.04		1.04		1.03		1.03		1.01	
Lives in urban area	0.99		0.99		0.99		0.99		0.98	
Lives in the South	0.67	***	0.67	***	0.68	***	0.68	***	0.69	***
Education: in high school (ref. In college)	1.60	**	1.60	**	1.62	**	1.62	**	1.65	**
Education: not enrolled, did not finish high school (ref. In college)	2.74	***	2.74	***	2.79	***	2.78	***	2.84	***
Married in 1982 (ref. Single)	4.25	***	4.25	***	4.29	***	4.29	***	4.34	***
Separated in 1982 (ref. Single)	1.74	***	1.74	***	1.77	***	1.77	***	1.82	***
Unemployed in 1982 (ref. Employed)	1.18		1.18		1.19		1.19		1.19	
Out of labor force in 1982 (ref. Employed)	1.46	***	1.46	***	1.46	***	1.46	***	1.47	***

Regression: intended number of children in 1979

Mother work while growing up									-0.01	
Years of education – mother									0.03	
Years of education – father									0.05	
Race: Hispanic (ref. White)									0.07	***
Race: Black (ref. White)									-0.06	**
# of siblings - 0 (ref. 2)									0.00	
# of siblings - 1 (ref. 2)									0.01	
# of siblings - 3+ (ref. 2)									0.08	**
Goes to church at least once a week									0.17	***
Lives in urban area									0.01	
Lives in the South									-0.15	***

* p-value below 0.001; ** - p-value below 0.005 ; ***p-value below 0.01. Model 2 did not converge.

Table 6 Complete results: Estimation of models with the desired number of children.

	Model 7		Model 9		Model 10		Model 11		Model 12	
Regression: desired number of children in 1982										
Desired number of children 1979 observed			0.49	***	0.52	***				
Desired number of children 1979 latent							0.52	***	0.79	***
# of children in 1982	0.16	***	0.13	***	0.15	***	0.14	***	0.18	***
Age in 1982	-0.02		-0.02		-0.03		-0.02		-0.02	
Mother work while growing up	-0.01		-0.01		-0.01		-0.01			
Years of education – mother	0.01		0.01		0.01		0.01			
Years of education – father	0.03		0.02		0.02		0.02			
Race: Hispanic (ref. White)	0.03		0.03		0.03		0.03			
Race: Black (ref. White)	-0.02		0.01		0.01		0.01			
# of siblings - 0 (ref. 2)	-0.01		0.00		0.00		0.00			
# of siblings - 1 (ref. 2)	0.01		0.00		0.00		0.00			
# of siblings - 3+ (ref. 2)	0.06	**	0.03		0.03		0.03			
Goes to church at least once a week	0.08	***	0.04	**	0.04		0.04			
Lives in urban area	0.01		0.01		0.01		0.01			
Lives in the South	-0.10	***	-0.05	***	-0.05	***	-0.05	***		
Education: not enrolled finished high school (ref. In college)	-0.07	***	-0.05	***	-0.05		-0.05		-0.07	**
Education: in high school (ref. In college)	-0.04		-0.02		-0.03		-0.03		-0.03	
Education: not enrolled, did not finish high school (ref. In college)	-0.08	***	-0.06	***	-0.06	**	-0.06	**	-0.08	**
Unemployed in 1982 (ref. Employed)	-0.01		0.00		0.00		0.00		0.00	
Out of labor force in 1982 (ref. Employed)	-0.01		0.01		0.01		0.01		0.01	
Equation of having a(nother) child within the next three years - odds										
Desired number of children 1982 observed	1.19	***	1.19	***						
Desired number of children 1982 latent					1.22	***	1.21	***	1.29	***
# of children in 1982	0.79	***	0.79	***	0.79	***	0.79	***	0.78	***
Age in 1982	0.96		0.96		0.96		0.96		0.96	
Mother work while growing up	1.03		1.03		1.03		1.03		1.03	
Years of education – mother	0.99		0.99		0.99		0.99		0.99	
Years of education – father	0.96		0.96		0.96	**	0.96		0.96	**
Race: Hispanic (ref. White)	1.18		1.18		1.18		1.18		1.19	
Race: Black (ref. White)	2.24	***	2.24	***	2.25	***	2.24	***	2.27	***

# of siblings - 0 (ref. 2)	0.43	**	0.43	**	0.43	**	0.43	**	0.43	**
# of siblings - 1 (ref. 2)	1.03		1.03		1.03		1.03		1.03	
# of siblings - 3+ (ref. 2)	1.11		1.11		1.11		1.11		1.11	
Goes to church at least once a week	1.03		1.03		1.02		1.03		1.02	
Lives in urban area	0.98		0.98		0.98		0.98		0.98	
Lives in the South	0.67	***	0.67	***	0.68	***	0.67	***	0.68	***
Education: not enrolled finished high school (ref. In college)	3.76	***	3.76	***	3.79	***	3.77	***	3.85	***
Education: in high school (ref. In college)	1.6	**	1.61	**	1.61	**	1.61	**	1.62	**
Education: not enrolled, did not finish high school (ref. In college)	2.75	***	2.75	***	2.77	***	2.76	***	2.81	***
Married in 1982 (ref. Single)	4.24	***	4.24	***	4.25	***	4.24	***	4.28	***
Separated in 1982 (ref. Single)	1.72	***	1.72	***	1.73	***	1.73	***	1.75	***
Unemployed in 1982 (ref. Employed)	1.18		1.18		1.18		1.18		1.18	
Out of labor force in 1982 (ref. Employed)	1.44	***	1.44	***	1.44	***	1.44	***	1.44	***
Regression: desired number of children in 1979										
Mother work while growing up									-0.01	
Years of education – mother									0.00	
Years of education – father									0.03	
Race: Hispanic (ref. White)									0.02	
Race: Black (ref. White)									-0.04	
# of siblings - 0 (ref. 2)									-0.01	
# of siblings - 1 (ref. 2)									0.01	
# of siblings - 3+ (ref. 2)									0.07	**
Goes to church at least once a week									0.12	***
Lives in urban area									0.01	
Lives in the South									-0.14	***

* p-value below 0.001; ** - p-value below 0.005 ; ***p-value below 0.01. Model 8 did not converge.

Table 7 Desires and intentions: results for Models 13 and 14.

	Model 13	Model 14
Coefficients		
<i>Odds of having a(nother child)^a</i>		
Intended number of children 1982 – observed	1.20	
Intended number of children 1982 – latent		1.39
<i>Regression: intended number of children in 1982</i>		
Intended number of children 1979 – observed	0.05	
Intended number of children 1979 – latent		0.21
Desired number of children 1982 – observed	0.73	
Desired number of children 1982 – latent		0.58
<i>Regression: intended number of children 1979</i>		
Desired number of children 1979 – observed	0.50	
Desired number of children 1979 – latent		0.89
<i>Regression: desired number of children 1982</i>		
Desired number of children 1979 – observed	0.66	
Desired number of children 1979 – latent		0.83
R-squared		
Intended number of children 1979		0.62
Intended number of children 1982		0.50
Desired number of children 1979		0.62
Desires number of children 1982		0.49
Fit statistics		
Chi-square	220.91	153.87
dF	45	41
p-value	0.00	0.00
CLI	0.99	0.99
TFI	0.97	0.98
RMSEA	0.03	0.03
BIC	-153.97	-187.69
N	4,149	4,149

*All coefficients are statistically significant on the level of 0.001. ^a - odds for logistic regression. ^b - R-square reported only for models with latent concept. It should be interpreted as the amount of the variance in the observed indicators that is explained by the latent measure.

Table 8 Full results of models 13 and 14.

	Model 13	Model 14	
Regression: intended number of children in 1979			
Desired number of children 1979 observed	0.66	***	
Desired number of children 1979 latent		0.83	***
Mother work while growing up	0.00	0.00	
Years of education - mother	0.02	0.02	
Years of education - father	0.02	0.01	
Race: Hispanic (ref. White)	0.04	***	0.05
Race: Black (ref. White)	-0.03		-0.03
# of siblings - 0 (ref. 2)	0.02		0.02
# of siblings - 1 (ref. 2)	0.00		0.00
# of siblings - 3+ (ref. 2)	0.03		0.02
Goes to church at least once a week	0.07	***	0.06
Lives in urban area	0.01		0.00
Lives in the South	-0.04	**	-0.02
Regression: desired number of children in 1979			
Mother work while growing up	-0.01		-0.01
Years of education – mother	0.00		0.01
Years of education – father	0.03		0.04
Race: Hispanic (ref. White)	0.01		0.03
Race: Black (ref. White)	-0.04		-0.04
# of siblings - 0 (ref. 2)	-0.02		-0.02
# of siblings - 1 (ref. 2)	0.01		0.01
# of siblings - 3+ (ref. 2)	0.06	**	0.08
Goes to church at least once a week	0.10	***	0.13
Lives in urban area	0.01		0.02
Lives in the South	-0.12	***	-0.15
Regression: intended number of children in 1982			
Intended number of children 1979 observed	0.05	***	
Intended number of children 1979 latent		0.21	**
Desired number of children 1982 observed	0.73	***	
Desired number of children 1982 latent		0.58	***
# of children in 1982	-0.47	***	-0.62
Age in 1982	-0.02		-0.03
Education: not enrolled finished high school (ref. In college)	-0.02		-0.04
Education: in high school (ref. In college)	-0.01		-0.02
Education: not enrolled, did not finish high school (ref. In college)	-0.02		-0.03
Married in 1982 (ref. Single)	-0.01		-0.03
Separated in 1982 (ref. Single)	-0.02		-0.03
Unemployed in 1982 (ref. Employed)	-0.01		-0.01
Out of labor force in 1982 (ref. Employed)	-0.02		-0.03
Regression: desired number of children in 1982			
Desired number of children 1979 observed	0.50	***	
Desired number of children 1979 latent		0.90	***
# of children in 1982	0.13	***	0.23
Age in 1982	-0.02		-0.01
Education: not enrolled finished high school (ref. In college)	-0.05	**	-0.07
Education: in high school (ref. In college)	-0.02		-0.03
Education: not enrolled, did not finish high school (ref. In college)	-0.06	***	-0.09

Married in 1982 (ref. Single)	-0.01	-0.03
Separated in 1982 (ref. Single)	-0.02	-0.02
Unemployed in 1982 (ref. Employed)	0.00	0.00
Out of labor force in 1982 (ref. Employed)	0.01	0.01

Equation of having a(nother) child within the next three years - odds

intended number of children 1982 observed	1.20	***		
intended number of children in 1982 latent			1.40	***
# of children in 1982	0.93		1.01	
Age in 1982	0.97		0.97	
Mother work while growing up	1.04		1.04	
Years of education – mother	1.00		1.00	
Years of education – father	0.97		0.97	
Race: Hispanic (ref. White)	1.18		1.19	
Race: Black (ref. White)	2.23	***	2.28	***
# of siblings - 0 (ref. 2)	0.45		0.45	
# of siblings - 1 (ref. 2)	1.04		1.04	
# of siblings - 3+ (ref. 2)	1.12		1.10	
Goes to church at least once a week	1.04		1.01	
Lives in urban area	0.99		0.98	
Lives in the South	0.67	***	0.69	***
Education: not enrolled finished high school (ref. In college)	3.76	***	3.94	***
Education: in high school (ref. In college)	1.60	**	1.64	**
Education: not enrolled, did not finish high school (ref. In college)	2.74	***	2.83	***
Married in 1982 (ref. Single)	4.25	***	4.32	***
Separated in 1982 (ref. Single)	1.74	***	1.81	***
Unemployed in 1982 (ref. Employed)	1.18		1.19	
Out of labor force in 1982 (ref. Employed)	1.46	***	1.47	***

CHAPTER 4: CONCLUSIONS

The aim of this paper was to assess the statistical reliability of two widely used measures of childbearing preferences – the intended and the desired number of children and verify any change in the impact of these measures on the childbearing behavior between specification with no measurement error and with measurement error. In addition, I compared the models that utilize only the intended number of children, the desired number of children and both of these measures to predict the childbearing behavior to verify which specification has the best statistical fit. To reach this aim, I utilized the structural equations framework to simultaneously estimate the measurement models for the childbearing measures and the explanatory models for the childbearing behavior. The outcome of interest was the odds of having a(nother) child within the next three years and I estimated the models for a sample of young American women from the National Longitudinal Survey of Youth.

The results indicate that measures of the intended and desired number of children both contain a significant amount of measurement error. In the final specification, measurement error explains 38% of the intended number of children in 1979, 50% of the variance in the intended number of children in 1982. In regards to the desired number of children, the measurement error explains again 38% of the variance in the measure of 1979 and 50% of the variance in the measure of 1982. However, this measurement error does not alternate the results in a marked way. In the model that utilizes only the intended number of children to predict the odds of having a child within the next three years, the increase of the intended number of children by one increases the odds by 20% when no measurement error is assumed and by 40% in the final model with measurement error. In the model that utilizes only the desired number of children to predict the odds of having a child within the next three years, the increase of the intended number of children by one increases the odds by 19% when no measurement error is assumed and by 29% in the

final model with measurement error. In addition, the measurement error in the measures of intentions and desires does not markedly alternate other effects in the model that remain stable across different specifications.

The effects of the intended number of children and the desired number of children on the odds of having a(nother) child within the next three years when only one of these measures was utilized were similar – 40% for the intentions and 30% for the desires. Additionally, the measurement error accounted for the similar amount of the variance in both measures. Background covariates such as family size or parental education as well as situational factors such as enrollment, employment and marital status seem to influence both intentions and desires in the same way. Both specifications also had a similar, acceptable statistical fit. Yet, preliminary analysis established that these measures are distinguished by the respondents. To summarize these results, one might conclude that however the desired and intended number of children of children are distinct concepts, they are influenced by the same situational and background factors and have a similar influence on the childbearing behavior. In the absence of one of the measures, utilizing another one would yield very similar results in the prediction of behavior. Lastly, the background and situational factors have both direct effects on the behavior and indirect effects mediated through desires and intentions. The latter result is not supported by the existing theories of the relationship between intentions and fertility however a similar results was observed by Mencarini and colleagues (2015).

The analysis of the model with both the intended and the desired number of children provided additional evidence about the relationship between these concepts and the childbearing behavior. First, the influence of the desires on the behavior is fully mediated by the intentions in the models that include both variables. Second, desires have a strong positive influence on the intentions. The measurement error caused a bias in this relationship – the influence of the desires on intentions in 1979 increased from 0.66 to 0.83 but the influence of the desires on the intentions in 1982 decreased from 0.73 to 0.58 when the estimation accounted for the measurement error. The desired number of children had the strongest influence on the intended number of children among all the explanatory variables. It is noteworthy that

the intended number of children in 1979 had a strong positive impact on the intended number of children in 1982; same relationship was observed for the desired number of children.

Desires and intentions were not influenced by the situational and background factors included in this analysis. Only the desired number of children had a significant and marked (sufficiently large) effect on the intended number of children in 1979 and predicted the majority of the variance in the measure (73.5%). Only religiosity and residence in the South had any marked influence on the desired number of children in 1979 and the included covariates explained only 5% of its variance. The intended and desired number of children in 1982 were influenced only by their previous values and the number of children a woman already had (the intended number of children was also influenced as mentioned before by the desired number of children). These covariates alone explained over 80% of the variance in both of these measures. This analysis provides evidence that desires have a strong influence on the intentions and preferences from previous years influence current preferences however little can be said about other determinants of the initial desires that seem to explain future desires and current intentions. Net of desires, none of the background or situational factors impacts the intentions in a significant way. This highlights the importance of the desires in the childbearing decision research.

This study suffered from several limitations. Measurement models were build using only one indicator for each latent concept and I needed to introduce a constraint on the error variances of the observed measures to identify the models. Future analysis should include more indicators of the latent concepts to gain better understanding of the childbearing preferences. The theoretical model could not be fully implemented due to the data limitation – the NLSY-79 does not include all the information to estimate the full theory of planned behavior model. It would be insightful to see how the measurement error influences the results under the full implementation if better data becomes available. Furthermore, this study did not focus on the reverse relationship between the intentions and desires in 1979 and the situational factors in 1982. It is possible that one's desires and intentions might influence other life decision such as educational choices or employment, especially for young respondents. However the models presented had a good fit even without this relationship, this possibility needs to be addressed in

future research. This study analyzed only the intentions and desires of women and the next step should include the analysis of men as the relationship between these concepts and the size of the measurement error might be different for males. At last, the analysis was conducted for a young sample of American women. Future analysis of older individuals and respondents from different cultural background could provide an insight on the statistical reliability of childbearing preferences measures across different populations.

APPENDIX 1: DIMENSIONALITY

This Appendix contains a discussion about the dimensionality of desires and intentions. Two specifications are being analyzed – a model where the intended and the desired number of children are treated as separate latent concepts and a model where they are treated as indicator of a one latent concept. In the first step, I compare the means for the variables in 1979 and in 1982 and the correlation between the measures. I started with utilizing the t-test to determine whether the means of the variables are significantly different. I compare the means for the entire population and I later divided the sample by race. I decided to use the 0.001 p-value limit because the NLSY-79 sample is large and even small differences could be marked as significant. Results are presented in Table 10.

Table 1 Means and t-test for the difference between measures of the intended and desired number of children.

	All women		White		Black		Hispanic	
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.
Intended number of children 1979	2.31	.022	2.34	.026	2.07	.053	2.52	.06
Desired number of children 1979	2.54	.024	2.57	.029	2.36	.052	2.63	.06
Intended number of children 1982	1.86	.019	1.89	.025	1.68	.047	1.97	.05
Desired number of children 1982	2.37	.020	2.35	.025	2.31	.045	2.49	.05
t-test p-value								
Intentions = Desires 1979	0.0000		0.0000		0.0000		0.0346	
Intentions = Desires 1982	0.0000		0.0000		0.0000		0.0000	

In general, the means between desires and expectations in 1979 and 1982 are significantly different. Only Hispanic women might treat the intended and desired number of children in 1979 as similar measures. The correlation between the measures is high but not close to 1 which would be expected if the measures were truly indistinguishable. However the relationship between the measures can be blurred by the measurement error that is in the center of this study. In the second step, I build a measurement model which treats the desired and the intended number of children as separate but correlated measures. This will be model 1 presented in the Figure 1 below. If this specification is correct,

the model will have a good statistical fit. If this specification is not correct and the measures load on one latent concept, the model will have a poor fit and the measure should be highly correlated. In some cases, when the measures are indistinguishable, the estimated correlation between the measures in the sample might exceed the value of 1. I will verify if this happens for this model. In the third step I build a measurement model that treats both measures as indicators of one concept – if this specification is correct, the model fit should be much better than the fit of the models with two concepts. This model is presented in the Figure 2. The fit statistics and the correlations between the concepts are presented in the Table 11.

Model 1 has a better fit than model 2. However, the values of CFI, TLI and RMSEA are comparable, they are always slightly better for model 1. In addition, BIC is negative for model 1 indicating a better fit than the positive BIC for model 2. Positive BIC indicates that the model does not fit the data better than the saturated model. In addition, the correlation between the concepts in model 1 is equal to 0.83 for the measures in 1979 and 0.969 for the measures in 1982. However the correlation is higher for the latent concepts than it was for the observed measures, is it not equal to zero. To summarize, this analysis provides evidence that however the concepts are closely correlated, they are distinguishable by the respondents and should be treated as separate.

Table 2 Fit statistics of models presented in Figure 1 and 2.

	Model 1	Model 2
Fit statistics		
Chi-square	20.69	101.58
dF	4	10
p-value	0.00	0.00
CFI	0.99	0.99
TLI	0.99	0.98
RMSEA	0.03	0.05
BIC	-12.64	18.27
N	4,149	4,149

Figure 1 Model 1: the desired and intended number of children as separate concepts.

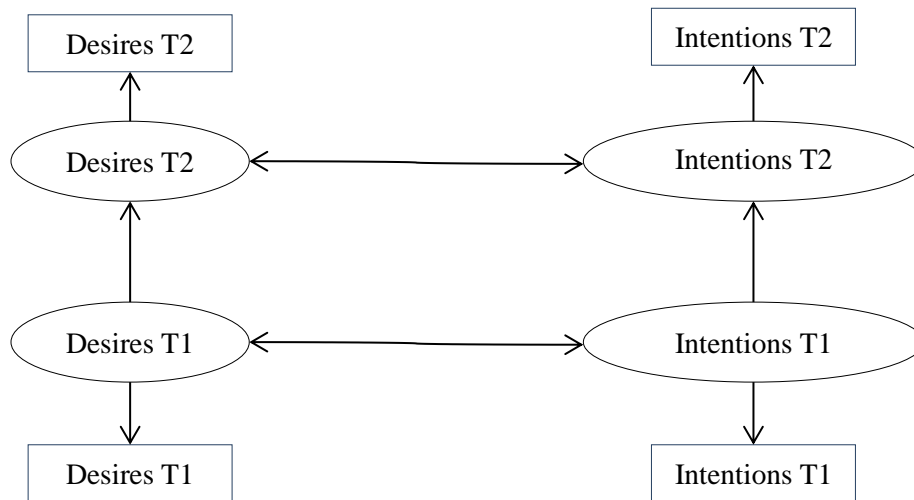
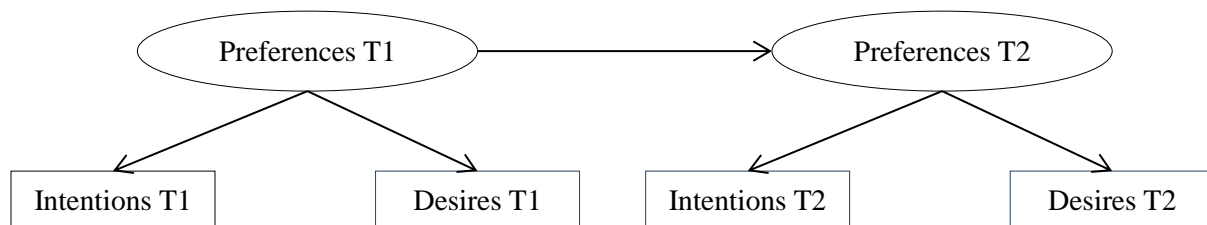


Figure 2 Model 2: the desired and intended number of children as indicators of the same concept.



APPENDIX 2: RELATIONSHIP BETWEEN THE DESIRED, INTENDED NUMBER OF CHILDREN AND THE CHILDBEARING BEHAVIOR

In this appendix, different specifications of the relationship between the intended, desired number of children and the childbearing behavior outcome – having a(nother) child within the next three years are analyzed. In the first model, I assume that all the background and situational factors impact is mediated through desires. The impact of desires is mediated through intentions. In the second model, the background and situational factors influence both desires and intentions. In the third model, the background and situational factors influence desires, intentions and behavior. In the fourth model, the background and situational factors influence desires, intentions and behavior and desires influence behavior net of intentions. Figures 1-4 below present estimated models. Models that include only observed measures are usually exactly identified and I cannot obtain similar fit statistics and models with only two measures in 1982 or two measures in 1979 will not converge therefore I had to compare the fully developed models with all four latent measures. In all of the models, the variance of the errors of the observed measures of intentions in 1979 and 1982 are set to equal. The variances of the errors of the observed measures of desires in 1979 and 1982 are set to equal. Measures of desires and intentions in 1979 are correlated. Measures of desires and intentions in 1982 are correlated.

Table 1 Fit statistics for the models presented in Figures 1- 4 below.

	Model 1	Model 2	Model 3	Model 4
Chi-square	855.49	632.15	153.93	141.26
Df	83	61	41	40
p-value	0	0	0	0
CFI	0.94	0.96	0.99	0.99
TLI	0.93	0.87	0.98	0.98
RMSEA	0.04	0.05	0.03	0.03
BIC	164.05	123.98	-187.63	-191.96
	Negative residual variance of the latent concept of intentions in 1982			Negative residual variance of the latent concept of intentions in 1982
Additional warnings	1982			1982

Figure 1 Background factors and situational factors influence only desires. Desires influence only intentions.

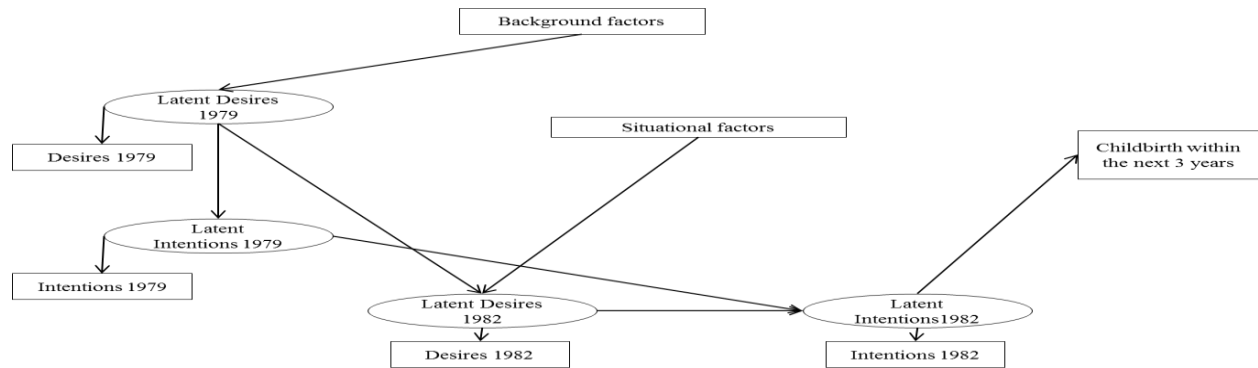


Figure 2 Background factors and situational factors influence desires and intentions. Desires influence only intentions.

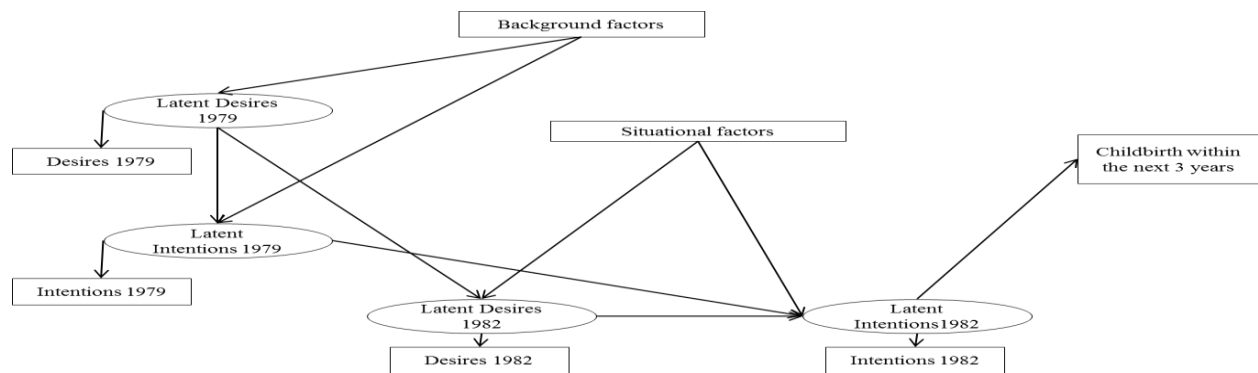


Figure 3 Background factors and situational factors influence desires, intentions and behavior. Desires influence only intentions.

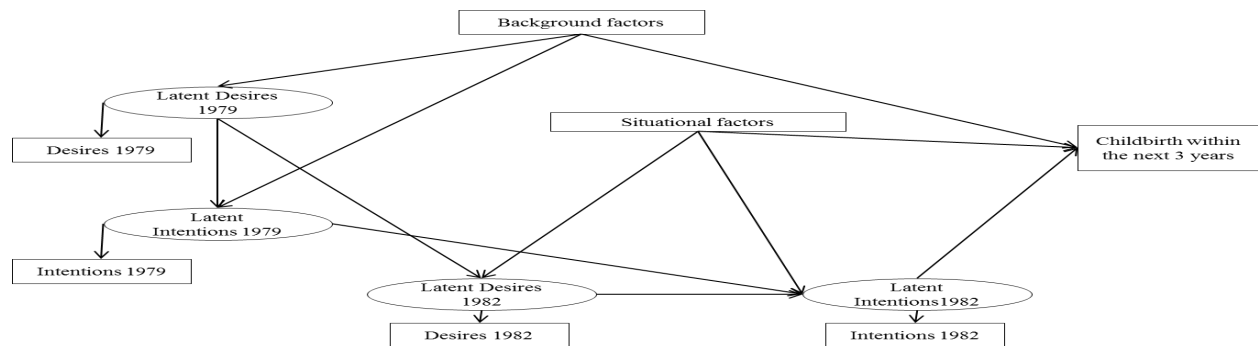
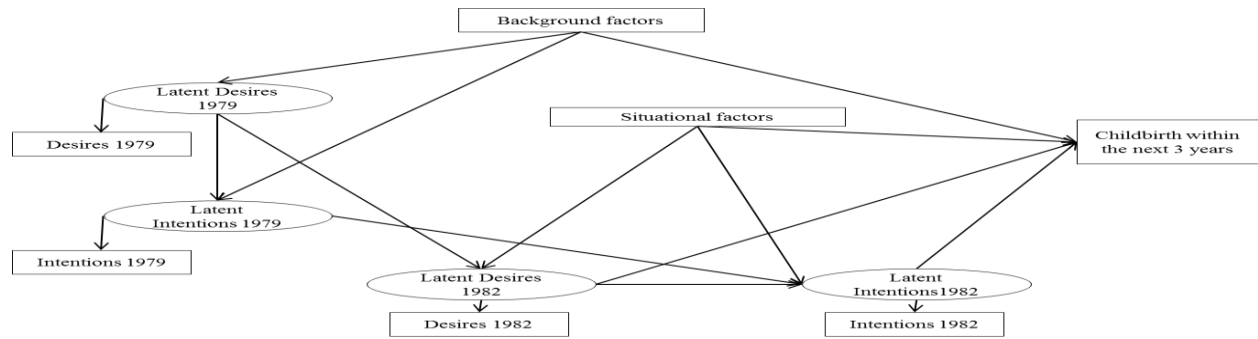


Figure 4 Background factors and situational factors influence desires, intentions and behavior. Desires influence intentions and behavior.



APPENDIX 3: ALTERNATIVE SPECIFICATION OF THE MEASUREMENT MODEL

This appendix includes information about measurement models that included observed measures at two points in time as indicators of the same latent variable. In this example, observed measures of the expected number of children in 1979 and 1982 were used as indicators of one latent variable called hereafter “latent expectations”. I compare this specification to the specification used in the paper, i.e. treating each measure as the indicators of a separate concept – “latent intentions 1979” and “latent intentions 1982”. Models are presented in the Figures 1 and 2 below.

Table 1. Fit statistics for the model with two and four latent concepts.

Fit statistics	Model 1	Model 2
Chi-square	196.871	153.877
Df	46	41
p-value	0	0
CFI	0.989	0.992
TLI	0.974	0.978
RMSEA	0.028	0.026
BIC	-186.338	-187.679
R-Square – percent of the variance in the observed measure explained by the latent concept		
Intentions 1979	0.583	0.715
Intentions 1982	0.39	0.66
Desires 1979	0.588	0.636
Desires 1982	0.436	0.514

Both specifications have a similar good statistical fit. However, what is alarming in the first specification is the discrepancy between the amount of variance explained by the latent concept in the observed measures in 1979 and 1982. For the intended number of children, the latent concept explains 58% of the variance in the measure in 1979 but only 39% of the variance in the measure in 1982. For the desired number of children, the latent concept explains 58% of the variance in the measure in 1979 and 44% of the variance in the measure in 1982. These estimates change when we assign each measure to a separate indicator, especially the result for the measure of the intended number of children in 1979 increases from 39% to 66%. These results indicate that using two measures of the same concept from two points in time cannot serve as a proper solution in this case. It is possible that this result is specific to the population of the survey. Possibly, in adolescents and young adulthood, the desires and intentions are still being formed and their value might vary markedly over the period of 3 years. To summarize, to obtain

more precise results for the measurement error in these variables, I decided to estimate the model with four latent concepts – two for 1979 and two for 1982.

Figure 1 Two latent concepts. Measures of desires both load on one latent concept, measures of intentions both load on one latent concept.

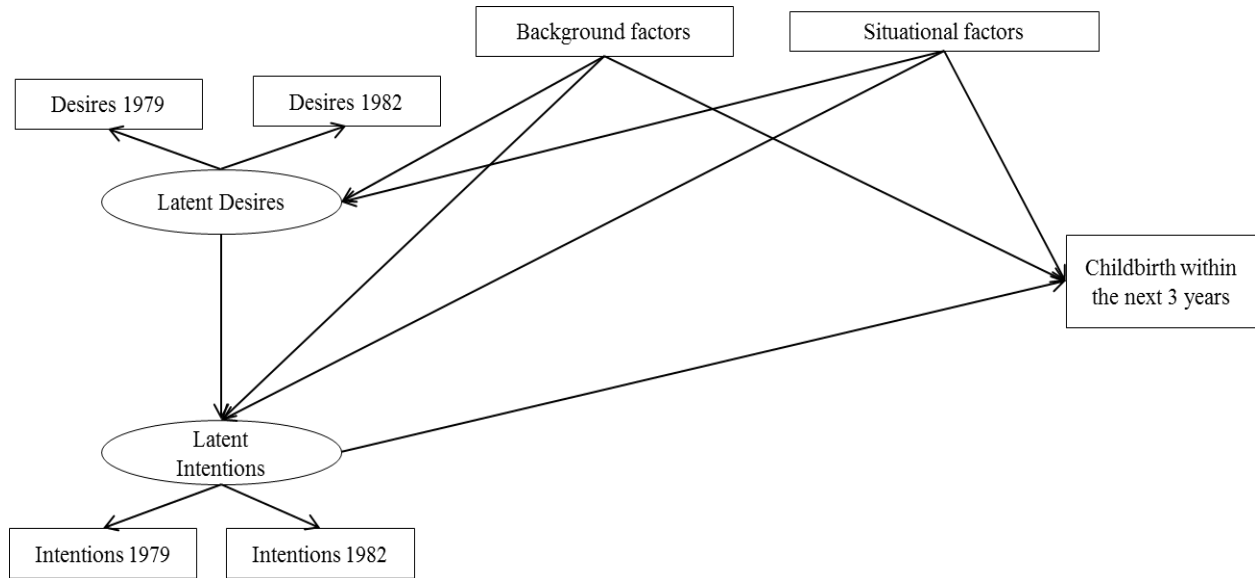
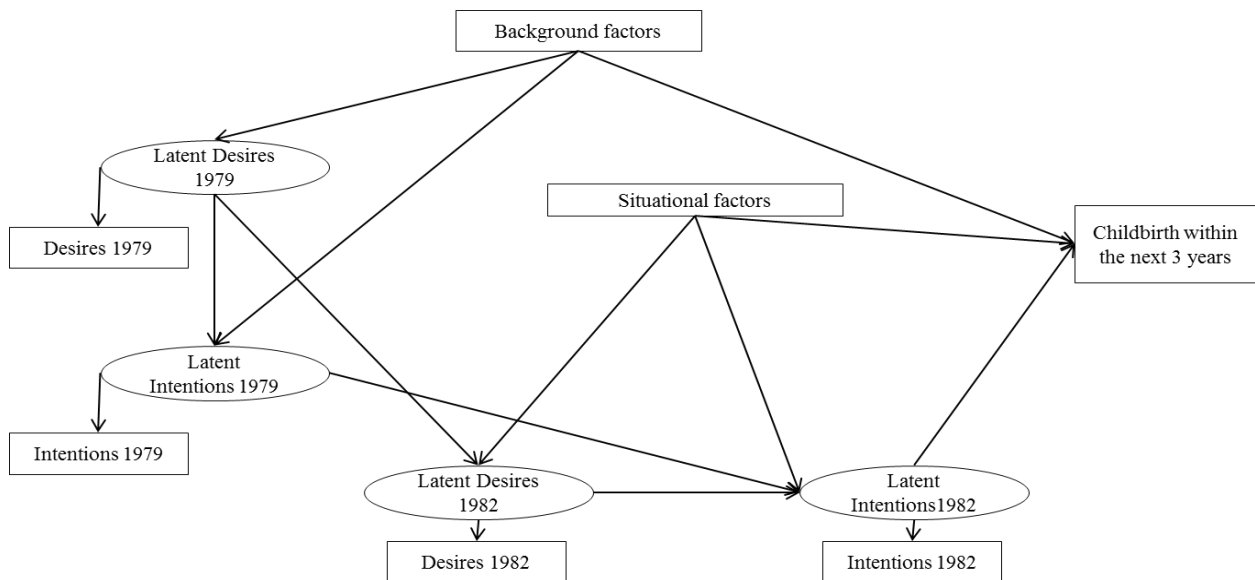


Figure 2 Four latent concepts. Each measure of intentions and desires load on a separate latent concept.



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