Previous works addressing the effects of sociopolitical instability on fertility are relatively rare. The majority of the existing studies have focused either on the impact of instability resulting from natural disasters, wars, and famines (Palloni 1990), or on the effect of economic instability, particularly unstable employment and other types of market insecurities such as term-limited working contracts (Kreyenfeld, 2010; Perelli-Harris, 2008). In order to address these theoretical and empirical limitations, this paper analyzes the impact of various types of sociopolitical instability on fertility rates. We address two major questions in this regard: 1) the extent and direction of fertility change caused by various types of sociopolitical instability; and, 2) the mechanism of various instabilities' impact on micro-level decision-making with respect to fertility. We use empirical data to distinguish between stable time periods and those characterized by various types of sociopolitical instability, and examine their impact on fertility rates.

As a basis for the first set of hypotheses, we use and reformulate the core assumptions of the uncertainty reduction theory. The uncertainty reduction theory assumes the existence of both *immanent* and *instrumental* values. Reduction of uncertainty is an immanent value. According to the theory, actors prefer decision-making under risk (where probabilities are known) to decision-making under uncertainty (where probabilities are unknown). Therefore, actors try to reduce uncertainty by converting it to a situation under risk. Actors may do this in two ways. First, they might gather information that would transform uncertainty to risk. Second, they might adopt global strategies designed to reduce uncertainty about a set of future courses of action (Friedman, Hechter and Kanazawa 1994, 382). Both Soviet and post-Soviet Russia provide a unique opportunity to study the relationship between fertility rates and sociopolitical instability. The USSR and its successor, Russia, had both minor and major instabilities, including permanent shortages of consumer goods and a breakdown of a social welfare system. In order to identify the timing and ranking of such instabilities, we distinguish between two major types of sociopolitical instabilities, one associated with the so called “reciprocal accountability”, and the other with “social contract”, that were proposed by Roeder (1994) and Cook (1995) respectively.

The period of research interest covers the years 1959--1998. This choice is informed by the fact that Roeder’s and Cook’s analyses apply mostly to this period, and also because the year after the 1998 financial crisis marks a new era when the Russian economy bottomed out of its secular decline and started to rapidly grow, which affected demographic trends, including fertility.

The data used in this research were obtained from the Roskomstat (Russian State Committee on Statistics), a Russian government agency. The statistical method used in this paper is a version of APC (age-period-cohort) modelling. The method allows for the estimation of period effect on fertility rates while controlling for age and cohort effects.

The main fertility trends for the period of our research interest are as follows (e.g. Frejika and Zakharov 2012). Total period fertility rate declined in the 1960s, mostly due to the end of the first demographic transition that, according to Zakharov (2003, 2008), started in Russia in the 19th century and was completed in the mid-1960s. The first demographic transition is a move from high fertility and mortality to low mortality and low fertility. Then, total fertility rate was stable between the late 1960s and the early 1980s but increased in the 1980s, being stimulated by pronatalist measures (this is at least one of the contributing causes). It declined precipitously from the late 1980s through the mid-1990s, which was no doubt caused by the turbulent political, social and economic environment. The TPFR decline of the 1990s was caused in part by childbearing postponement. TPFR then increased in 1999--2004 due to childbearing recuperation at older ages.

The state policy related to birth control did not change much in 1959--1998. For instance, major changes regarding abortion had taken place earlier: abortions were legalized in 1920, then banned in 1936, and legalized again in 1955. The abortion rate was very high in the 1960s and 1970s. Then some new restrictions on abortion were adopted, including reducing the range of acceptable “social” reasons after 12 weeks of pregnancy and a mandatory waiting period to “reconsider” the decision to abort. According to leading scholars in this area (Agadjanian 2016), the actual decline of abortion rate started in the 1980s and accelerated in the post-Soviet era, although it still remains high compared to many other countries.

With most of the demographic developments during the period of research interest covered and explained in the existing literature, there are, however, some gaps. In particular, the extant research fails to adequately explain short-term fluctuations in fertility in at least two instances: first, the increase of total fertility rate in the early 1980s and, second, the increase of the same indicator in the years 1986--1987.

Many demographers attributed the first fertility increase to a pronatalist population policy. It included partially paid maternity leave, tax deductions for families with two and more children, allowances and deductions for housing and kindergartens, opportunities to work part-time, and sliding shifts for young mothers. These measures were implemented in three stages: the first one started on November 1, 1981, in the areas with lowest fertility, such as the Far East, Siberia, and some northern territories of the Russian Federation; the second stage was launched in November 1982 and covered the rest of Russia; the third stage started in November 1983 and included the other republics of the USSR.

However, there are reasons to consider factors other than this population policy. The policy can hardly explain the fertility increase of 1981 as it was only in effect for two months of that year and involved few sparsely populated areas with aged populations. Zakharov (2006, 42) notes that the fertility increase of 1981--1983 was highest in those territories where the measures were implemented later than in the others. Furthermore, Kuzmin (1993, 54) and Arkhangeslky (1994, 134) note that fertility had started to increase in some territories as early as in 1980 (that is, before the policy was implemented). The increase happened in spite of the predictions by some scholars of a further reduction of fertility (Avdeev and Monnier 1995).

As for the 1986—1987 spike, Klupt (1990, 23) points to an unknown disturbance that disrupted the expected fertility decrease after several years of the 1981 policy implementation (a pattern typical for all countries that implemented similar policies, e.g. Hungary or former Czechoslovakia). Some demographers attribute the fertility increase in Russia in 1986--1987 to the expectations raised by the policy of *perestroika* ("reconstruction") announced by the Soviet leader Mikhail Gorbachev in 1985. Such causation cannot be ruled out. The question, however, remains as to why fertility in the USSR entered a steep decline in 1988, when hopes for the success of perestroika had not yet evaporated, and economic hardship had not yet unfolded.

Another explanation links the fertility increase of 1986--87 to Gorbachev's anti-alcohol campaign launched in 1985. The vast literature on the effects of this campaign mostly covers its impact on mortality, as well as on crime rates, work, and family. However, there is little research on the campaign's effects on fertility. One of the rare studies that touch upon this connection (Rimashevskaya & Milovidov 1988) alleges the campaign's effect on fertility increase, yet it does not describe any causal mechanism. Klupt (2008, 317) briefly mentions a possible campaign's effect on fertility, suggesting that women might hope that their husbands would stop drinking.

It is indeed possible that the anti-alcohol campaign positively affected fertility. Improvement of relations within family, reduction of crime rate, and diminishing suicide rates could have impacted fertility to some extent. Although the magnitude of this impact has not yet been studied, there is a reason to believe it could hardly lead to such a significant increase in fertility as the one observed in 1986 and 1987. One of the possible reasons for a specific fertility increase could be the reduction in female suicide after the start of the anti-alcohol campaign. However, this most likely had very limited impact on fertility because, according to the account of Wasserman, Varnik, and Eklund (1998), the attributable fraction of alcohol for female suicides and female violent deaths were at 27 percent (about half of those of males). Of course, not all of those suicides were committed by women in fertile age groups. The abrupt reversal of this upward trend in 1988, while the anti-alcohol campaign was still on the way, casts further doubt on sufficiency of this explanation.

In this paper we attempt to apply the extended uncertainty reduction theory to the Russian data in order to test the hypotheses on instability being the major factor behind these mostly unexplained short-term fluctuations in fertility.

Literature Review

None of the major existing demographic theories, such as transition, wealth-flow, microeconomic, cultural and institutional, explain instability's impact on fertility. There are several reasons for that. Most of the listed demographic theories focus on changes in fertility over relatively long-term periods while sociopolitical instabilities often last for a short time. While there have been some attempts to understand short-term fertility fluctuations, notably in the Chicago-Columbia School of microeconomic theory (Becker 1976, 1991), these typically relate to changes in the cost-benefit equation in fertility decision-making and are criticized as holding only in the state of equilibrium.

Another explanation as to why there is so little work on short-term fluctuations in fertility is that existing theories have not effectively developed macro-micro links. Institutional theory, for example, may provide a macro-micro link by specifying how institutional changes shape the segmented decision-making environment that is taken into account when an individual makes a fertility decision (McNicoll 1994). However, this theory does not provide a clear algorithm as to how the segmented decision-making environment is formed and fails to predict the level and direction of fertility change under the influence of any particular societal development (Greenhalgh, 1994; DeKaa, 1995).

These shortcomings of the current demographic theories in explaining short-term fertility fluctuations have led to a search for a more general theory that would address the missing points – such that would encompass macro-micro links, be applicable to short-term fluctuations, incorporate value changes in the periods of societal instability, and address the specific impact of societal instability on fertility decision-making. The theory that satisfies all of these criteria is the uncertainty reduction theory (Friedman, et. al, 1994). The theory starts with an assumption of a rational actor who maximizes value in his fertility decision-making. This initial general assumption shares the premise with the rational-choice-based microeconomic theory of fertility. The breakaway point that distinguishes the uncertainty reduction theory from the traditional rational-choice explanations is the assumption about *what kind of value* is maximized. The theory emphasizes the *universal immanent value* of uncertainty reduction. Decision-making under uncertainty differs from that under risk in the knowledge of probabilities of the alternative outcomes.

The uncertainty reduction theory's major assumption may be formulated as follows: *Actors will always desire to reduce uncertainty by converting it into a certain, even if risky, situation*. As the authors of the uncertainty reduction theory stress, it is an *immanent* rather than an *instrumental* value because actors value uncertainty reduction as an end in itself rather than just as the means to various other ends (Friedman, et. al, 1994, 382). The uncertainty reduction theory provides a set of hypotheses linking types of uncertainty with strategies for its reduction. Specifically, it predicts that those who face uncertainties in such areas of life as career or marriage will turn to various means of reducing uncertainties, including parenthood (Friedman, et. al, 383). The latter is considered to be an important means to reduce uncertainty since parents are supposed to be involved in social interactions and expenditures on children for many years ahead.

The uncertainty reduction theory satisfies important criteria for researching the impact of societal instabilities on short-term fertility fluctuations: it encompasses macro-micro links, applies to short-term changes in demographic processes, and addresses the issue of values in fertility decision-making. However, there are several issues in explaining and researching instability that are not addressed by the original version of the theory. Therefore, in the next sections we propose an extension of the uncertainty reduction theory for an application to empirical research on the impact of societal instability on fertility. In doing so, we develop a model that links macro-societal instabilities with their micro-level perceptions as uncertainties and with fertility decision-making.

Application to Empirical Research: The General Model

The first step in applying the uncertainty reduction theory to empirical research linking societal instability with fertility is to define all macro-micro links. The uncertainty reduction theory operates mostly at the micro-level, linking individual or family unit's perceptions of the situation they are facing in regard to uncertainty with decision-making on fertility that reduces uncertainty. The uncertainty reduction theory does not elaborate on the relationship between societal instability and its perception as uncertainty by individuals, leaving macro-micro connections largely implicit. The current empirical research, however, deals with various types and levels of societal instabilities at the macro-level (Roeder 1994; Cook 1995). The first general assumption links macro-level societal instabilities with their micro-level perceptions as an uncertainty:

(1) *Instability at the macro-societal level produces uncertainty at the individual or family level.*

This assumption is based on the connection of societal instabilities with increased uncertainty in such institutions as career and marriage, as well as uncertainties related to crime, accidents and fear of war. Different types of societal instability could have various impacts on changing individual strategies in career, migration, investments, etc. due to perceptions of these instabilities as uncertainties. The second general assumption links the micro-level perception of uncertainty with decision-making on fertility, with its general premise being borrowed from the uncertainty reduction theory:

(2) *The greater the perceived uncertainty at the micro-level, the greater the number of births per individual or family.*

The second assumption has a large body of empirical support, according to Friedman et. al (1994). Directly or indirectly, several works support this premise of the uncertainty reduction theory. It is, however, important to acknowledge that even if correlations between the above mentioned variables are found, they do not always necessarily imply causation.

A part of the discussion related to the proposed hypothesis is whether the intention to reduce uncertainty only involves the move from non-parenthood to parenthood, or also a move to increase the number of children. Friedman et. al state that the main way of reducing uncertainty is to become a parent. However, there are some reasons to believe that increasing the number of children could also serve as a means to reduce uncertainty. First, several studies (e.g. Cherlin 1977; Morgan et. al 1988; Waite and Lillard 1991) have convincingly demonstrated that reduced risk of marital disruption is associated with greater numbers of children in the family. Second, as the child's sex affects the odds of preserving marriage (Morgan, Lye and Condrad, 1988, 115), this may motivate the decision to have more children. Finally, higher parity births could serve as a means for marital stability in stepfamilies where a joint biological child could appear regardless of the number of children born in previous unions.

Therefore, we look at the overall increase of fertility, regardless of parities. Likewise, the impact of reducing uncertainty could manifest itself both in splicing the calendar of births and in increasing the total fertility. Therefore, we are not distinguishing between tempo and quantum effects in order to test our hypotheses.

It is worth emphasizing that the uncertainty reduction theory propositions are valid for decision-making in a state of uncertainty caused only by a sociopolitical instability that is not directly related to changes in available economic resources. The reason for this is that economic and sociopolitical instabilities are assumed to have opposite effects on fertility, the former negative and the latter positive. While sociopolitical instability is perceived as uncertainty (and therefore, according to the uncertainty reduction theory, increases birth rates), economic instability oftentimes leaves one a possibility to assess risks and therefore is not perceived as uncertainty, but rather as a risk. Though economic uncertainty at the individual level negatively affects fertility, macro-level economic instability in Russia in the 1990s create appraisable risks rather than uncertainties.

As Koehler and Koehler (2002, 243-244), who studied the effects of economic instability in Russia in the 1990s, wrote:

"The individual's expectations about such persistent changes in unemployment or job insecurity are likely to be strongly influenced by current changes in unemployment and labor-market conditions: the worst recent conditions constitute the relevant experience that can be extrapolated into the future by individuals, and this 'learning on the basis of recent experience' is likely to be particularly relevant to the transition countries where individuals are faced with new institutional contexts that share few commonalities with the pre-1990 situation…"

This relevant experience in Russia included downsizing wages and delaying payment for several months. As Koehler and Koehler argued, these experiences were extrapolated in the future with the risks being assessed. Therefore, fertility behavior during the periods of economic instability in the 1990s Russia is better explained by the microeconomic theory of fertility predicting decreasing birth rates. The assumption about the prevalent influence of economic instability on fertility when it coincides with sociopolitical instability is based on the fact that people always prefer situations with known risk to uncertainty (Friedman et. al, 1994, 133).

Thus the premises of the uncertainty reduction theory could only be applied to such periods of sociopolitical instabilities that are not coupled with an economic one. Finally, the assumption that links micro- and macro-level fertility rates is simple:

(3) *Changes at the micro-level will be reflected at the macro-level.*

The general model encompassing these three assumptions can be represented in the following way:

(Figure 1 ABOUT HERE):

The model is tested by comparing fertility rates at periods marked with various types of societal instabilities. It allows linking these societal instabilities and short-term fluctuations of fertility in empirical research. It also allows distinguishing between macro-societal instability and its perception as uncertainty at the micro-level. This distinction has been typically ignored in the literature on the subject, which resulted in confusion of two levels of analysis – macro- and micro ones. The proposed model resolves this problem by divorcing these two levels of analysis, thus allowing for better empirical tests of hypotheses about the impact of societal instabilities on short-term fluctuations of fertility. The model can be tested directly if information about individual perceptions of uncertainty is available. Otherwise, the model can be tested indirectly by comparing different types of societal instabilities with fertility rates at any given period.

The proposed model has, however, certain limitations. First, it fails to divorce the effects of instability on fertility from other period effects, such as population policies. It would take additional analysis to disentangle them (we attempt this in the Discussion section). Second, although the model can be tested indirectly by comparing fertility rates at various periods; hypotheses testing could be by far more precise if micro-level data on the individual perceptions of societal instabilities were available.

It is obvious that instabilities of various types and intensity generate different levels of uncertainty at the micro-level. The uncertainty reduction theory does not elaborate on ranking uncertainties in scope and intensity, much less relates them to the corresponding types of instability. The key to translating macro-level instabilities to micro-level uncertainty is to look at how particular types of instabilities could be perceived by individual as generating uncertainty.

Here are our assumptions based on the previous discussion that can be used as a bridge to the formulation of testable hypotheses:

1. *All periods marked with any kind of instability are perceived as containing more uncertainty than relatively stable periods*.

2. *The greater level of instability generates the greater level of uncertainty.*

Hypotheses

First of all, in order to test the validity of the extended uncertainty reduction theory premises in possible explanations of the short-term fluctuations of fertility in the country, it is important to relate our assumptions to the exact periods that are characterized with various kinds, intensities and magnitude of instabilities.

To analyze the effects of instability on fertility, it is important to investigate the possibility of this concept's operationalization. Sonfranko and Bealer (1972) acknowledge the wide range of types of domestic instability and their relative seriousness. On one end of the spectrum are mild dislocations that do not require police action. On the other end, Sofranko and Bealer locate such events as strikes, civil disobedience, riots, coups, power struggles and the like.

A very useful conceptualization of instability is proposed by Alesina and Perotti (1993). They define political instability as the "propensity to observe governmental changes." These changes could be either constitutional or non-constitutional, in the form of a coup d'état. Authors stress that the likelihood of executive change is associated with policy uncertainty and, in some cases, with threats to property rights.

A helpful implication of this approach is the consideration of milder forms of sociopolitical instabilities that could be limited to power struggle in the ruling elites. These kinds of instabilities could also create uncertainties and affect demographic behavior; however, they are rarely researched. Among the few works explicating such kinds of relatively moderate types of instabilities are Roeder's (1993) work on power struggle within the Soviet elite and Cook's (1994) on erosion of the social contract in the USSR. A typology of instabilities that would identify and rank periods of instability in the recent Russian history is necessary to test our hypotheses. We make an attempt at periodization in the following sections.

Roeder (1993) and Cook (1994) rank instabilities based on, correspondingly, the "reciprocal accountability" and "social contract". The first theory, "reciprocal accountability", implies oscillation between the directive and collective leadership that resulted in instabilities within the ruling elite and affected various policies. The second theory, "social contract", specifies the periods of provision, erosion, deterioration and, finally, breakdown of the social contract between the ruling elite and the population.

Roeder's theory of the ”reciprocal accountability” concentrates on the shifting cycles of leadership in a totalitarian state, the USSR. According to that theory, the Secretary General of the Communist Party appoints the members of the Central Committee, while the latter vote for the same leader; thus there is a mutual dependency, and, correspondingly, a ”reciprocal accountability”. There is a constant tug of war between the ruler and the upper tier, the Central Committee, going on as they maximize their own share of power. The cycling of leadership goes through four stages, each one represented by a certain political regime. The four distinctive types of political regime, based on changing cycles of leadership, are: first, a stable directive leadership (that is singular, unilateral rule); second, a stable collective leadership; third, a contested (or limited) directorship; and, fourth, the leader's breakout. This struggle and corresponding cycles of leadership had a significant impact on policy processes and issues. Roeder explained major sociopolitical instabilities (such as, for instance, the Cuban missile crisis) with the logic of power struggle.

Another theory that deals with instability and crisis in the USSR/Russia is Cook's theory of the social contract. Cook proposes that stability in the USSR after Stalin's death was based on an unwritten agreement between the political elite and the population: the political elite provided economic security, including employment and social welfare, and in return expected political compliance and quiescence (Cook, 1993). The key element of this model is that the population can present a threat to stability should the political elite violate the social contract. To prove his point, Cook proposes two approaches. First, to demonstrate that it is a fear of unrest that motivates the political elite to stick to the contract, Cook introduces so-called "pressure points." At certain periods of time, the ideological and economic constraints provide strong motivation, or pressure points, for the political elite to reverse some parts of the contract, either by increasing prices, or by cutting social welfare. If the government manages to keep up with the social contract, it thus proves the existence and importance of the social contract. One example of such pressure points is when Gorbachev proclaimed a new emphasis on self-efficiency of factories and plants. Despite that, the government subsidized and bailed out potential and actual bankruptcies when faced with the prospect of rising unemployment.

Disproving alternative explanations of workers' political quiescence, Cook also demonstrates a strong correlation between failure to deliver the social contract and worker unrest. The deterioration of the social contract in the early 1980s and its acceleration in the early 1990s not only increased the number of strikes but also changed the very nature of workers' demands. Workers shifted from making locally focused demands (such as improving working conditions) to making broader political claims (e.g. to reduce the role of the Communist Party at the factories).

Cook identifies several periods in the Soviet history: first, the period of stable delivery of the social contract (1953-1979); second, certain failures in the delivery or the deterioration of the social contract (1980-1985); third, further deterioration of the social contract (1986-1991); and fourth, complete breakdown of the social contract (with the breakdown of the socialist state USSR in 1991).

The hierarchy and periodization of these instabilities can be arranged as follows:

(TABLE 1 ABOUT HERE):

The following section presents our hypotheses:

H1. Periods of sociopolitical instability not coupled with economic instability are characterized by increasing fertility. This stems from the major premise of the uncertainty reduction theory and defines linkages between instability and its perception as uncertainty.

Hence, fertility rates in each period of sociopolitical instability not coupled with economic instability are increasing. Consequently, by the end of each such period, i.e. 1954-1957, 1960-1964, 1965-1969, 1982, and 1978-1988[1], fertility rates should be higher than at the beginning; even more so, than in the years preceding each of these periods.

H2. The greater the extent of sociopolitical instability at the societal level (if not accompanied by severe economic crisis and instability), the greater the fertility rate for a given period should be.

Accordingly, each period marked with higher instability levels should be characterized by higher fertility rates. Hence, a hierarchy of fertility rates should appear across instability periods in the following way (arranged from lowest to highest instability):

1) 1965 – 1969: the Brezhnev's breakout

---

1 In fact, the erosion of the social contract continued until 1991, the year of the breakdown of the USSR. However, severe economic crisis struck the USSR in 1989; thus, for the purposes of testing the impact of sociopolitical instability, I limited this period to the year 1988.

2) 1954 – 1957: the Khrushchev's breakout

3) 1982: Brezhnev's contested directorship[1]

4) 1960 – 1964: Khrushchev's contested directorship

5) 1978 (especially 1981) – 1985[2]: deterioration of social contract

6) 1986-1990: erosion of social contract

H3. Stable periods are characterized by lower fertility rates than periods with sociopolitical instabilities. This originates from the premise of the uncertainty reduction theory to expect an increase of fertility during periods of uncertainty, caused by sociopolitical instability.

Hence, the stable periods of 1953-1954, 1965, 1957-1959, and 1970-1977 should be characterized by lower fertility rates than the periods of 1965-1969, 1954-1957, 1960-1964, 1978-1985, and 1986-1988 that, albeit being marked with sociopolitical instabilities, escaped severe economic crises.

Data Analysis and Results

Dataset

The data on fertility used in this research are published by the *Roskomstat* (Russian State Committee for Statistics), a Russian official body that is a major source of statistical information on economics, demography, social policy, etc. Data on demographic processes including fertility are obtained in the course of population census. The *Roskomstat* complements the census data with surveys taken at different times

1 The short period of instability related to Brezhnev's contested directorship overlapped with the broader period of the deterioration and erosion of the social contract.

2 Here, the period of 1970-1981, which has been defined as stable according to the "reciprocal accountability" theory, was shortened since in 1978, the deterioration of the social contract began to manifest itself. For the same reason, a further period that has been defined as stable by the "reciprocal accountability" theory (1982-1986) has not been included here.

between censuses, with its data used to adjust demographic data for the inter-census years and to supplement the household data.

An important step to take before we start working with the obtained data is to estimate its validity. There is a huge amount of literature analyzing the *Roskomstat* data. These data combine the results of the Soviet-era censuses taken by the *Roskomstat*'s predecessor, *Goscomstat*, and the data from post-Soviet censuses of the Russian Federation. There have been many publications criticizing the Soviet practice of census-taking, including the problems of determining ethnic identity (because ethnicity and language were linked to territorial rights) and consequent distortions of the Soviet ethnic composition, violating privacy rights, undercounting migrants, especially those living without registration; counting the total population based on the official registration rather than on actual residence; and excluding the whole groups of population such as prisoners, military personnel and inhabitants of closed territories (secret towns) (Arel 2002, pp. 801-828; Blum 1996, pp. 81-95; Tolts, 2001).

Regardless of the Soviet/Russian census flaws, the Goskomstat data on fertility have been used and referred to in numerous studies conducted by Russian, Israeli, European and American scholars, e.g. Coale & Anderson (1979), Tolts (2001) and Zakharov (2008). We are therefore confident that using Goskomstat and Roskomstat statistical data in our research is valid. Here are the major reasons for this confidence: Goskomstat material is based on the combination of census data and the data obtained in intermediate surveys; covers a period the most part of which was typified by improved methods of obtaining data or with data which were corrected later; covers fertility processes which were arguably the least impacted by data collection flaw; and is on the aggregate level, without division at the regional units (which are most prone to heavy bias).

The data obtained from the *Roskomstat* and used in this study contain age-specific fertility rates for five-year interval groups for women ages 15 to 49. The dependent variable is measured as the number of births per 1000 of women of childbearing ages. These data are available for all years of our research interest, namely from 1959 to 1998. The obtained data on age-specific fertility for the period of interest is represented in the Table 2. Note that, while we focus on the period effect, we still have to disentangle it from the age and cohort effects in our analysis (cf. Mason et al 1973).

(TABLE 2 ABOUT HERE).

Method

In order to test the hypotheses formulated in the previous section, one must first compare fertility levels at different periods marked with various scopes and levels of societal instability; and, second, compare fertility rates at the unstable and stable periods. While comparing fertility at different periods, age and cohort effects should be controlled for in order to single out the period effect. This control is essential for the purposes of this research since level and scope of societal instability vary across time periods. Age, period and cohort effects are typically confounded in macro-level fertility analysis that uses its annual rates (Mason et. al). At the same time, the effects of age, period and cohort on a dependent variable can be causally distinctive.

APC has been used extensively for about fifty years in researching various issues such as trends in abortion rates (Philipov, D., Andreev, E., Kharkova, T., Shkolnikov, 2003), obesity (Ryder, Houser and Yang 2014), socioeconomic attainment, marriage, fertility, and family structure across several cohorts (HIghes and O'Rand 2004), cancer rates (Clayton and Schiffers 1987), tobacco consumption and its consequences (Ravenholt 1990), political alienation (Kahn and Mason 1987), political partisanship (Marcus 1983), social capital (Schwadel, Philip and Stout, 2012), education (Guimarãe, Rios-Neto and Loschi, 2014) and many others. Research on mortality and fertility often features APC models (Kye 2012; Yasmeen and Mahmud 2012; Willekens, F.J. and N. Baydar. 1986. Li, Wang, Gao, Xu and Chen 2016).

APC models have been applied to Soviet and post-Soviet Russian and Ukrainian mortality data by Andreev (1990), Willikens and Shcherbov (1991), Anderson and Silver (1989) and Shkolnikov, McKee, Vallin, Aksel, Leon, Chenet, and Meslé (1999). Shcherbov and van Hianen (2002) is one of the few works using a related model (Coale-Trussell) for studying fertility trends in Russia and Ukraine.

In order to test our hypotheses, we have to compare fertility levels at different periods marked with various degrees of societal instability. While doing so, age and cohort effects should be controlled for in order to single out the period effect. Age, period and cohort effects are typically confounded in macro-level analysis that uses annual rates (e.g. Mason et al. 1973). At the same time, these effects are causally distinctive.

A major problem that APC models face is that of identification; this arises from the fact that, within the set of three variables (age, period and cohort), each one is a linear combination of the other two. Various versions of the APC method apply different techniques to overcome this problem. In particular, Mason et al. (1973) suggest to use equality constraints on two pairs of the coefficients (in two different dimensions) in ANOVA models where each of the three variables (dimensions) is represented by a series of dummy variables. Each of the three dimensions is treated as discrete.

The ANOVA equation has the form of $Y_{ij}=\mu+\beta_i+\gamma_j+\delta_k+\varepsilon_{ij}$ where Y is the dependent variable, the effect of the i-th age group is given by β_i , the effect of the j-th period by γ_j , the effect of the k-th cohort by δ_k ; μ is the grand mean of the dependent variable and ε is a random disturbance. This model would have a negative number of degrees of freedom because the number of coefficients to estimate exceed the number of data points in the dependent variable. Equality constraints reduce the number of parameters to estimate, making the residual degrees of freedom positive. In a set of models using different equality constraints, the model with the largest R^2 is considered the best.

The decision as to which particular parameters the equality constraints are imposed on is made based on either prior theoretical assumptions or posterior empirical observation. The estimates are then obtained by ordinary least squares, the cells of the underlying contingency table being the units of observation.

Application of APC models

As seen from Table 2, the Roskomstat provides fertility rates for each year of the period under consideration, whereas in regard to ages the rates are provided for five-year groups. We use an interpolation of these data to obtain a fertility indicator for each age.

In accordance with the Mason et al. approach, we have initially set up equality constraints for two dimensions, one for cohorts of 1942 and 1943, and the other for all years from 1972 through 1977. The rationale for choosing these parameters is the following: cohorts of 1942 and 1943 are the ones that appeared in the hardest times of the Second World War, which implies their similarity. The whole period between 1972 and 1977, according to our typology, is stable, resulting in minimal differences of period effects.

However, many of the obtained coefficients appeared to be not statistically significant. The probable reason may be the fact that the model is still overspecified, with too many free parameters. For this reason, we have increased the number of equality constraints in all three dimension alternatively (age and cohort, age and period, period and cohort) and performed ANOVA with all of these constraints. This approach resulted in significant coefficients.

We present the results of APC analysis with enhanced equality constraints in all three dimensions in Table 3. These results are presented graphically in the following figures (Figs. 2, 3, 4a and 4b):

Figure 2 presents pure age effects on fertility in the observed period as modeled by the APC regression. Although age effects are not the focus of this research, it is worthwhile to consider this result. One can see that fertility rises rapidly from a near-zero level until it peaks at about 23 years and thereafter it falls down smoothly back to a near-zero level at this side of forties. This is precisely what one would expect to see, which confirms the validity of the Mason et al. method employed here.

The units in which beta-coefficients are measured are the units of our dependent variable that is the number of births per 1000 women of childbearing ages. The greatest beta-coefficient for the age category 23 means that this age group's contribution to fertility, disentangled from the period and cohort effects, is about 170 births per 1000 childbearing aged women.

Figure 3 shows pure cohort effects on fertility from the APC model. All effects are negative because it follows from the basic equation:

Age=Period – Cohort

where age, period, and cohort are linearly related. Therefore, age and period effects are all going to have positive effects in the model whereas cohort effects will be negative. The pattern of relative differences of the cohort effects against each other is the point here. As in the case of the age effects, beta-coefficients indicate the contribution of one cohort group to fertility, cleansed from age and period effects. The difference between betas for the cohorts of 1931 and the 1971 years of births, 20.39, means that there were 20.39 less births for 1000 childbearing aged women, controlling for period and age effects, for the 1971 cohort.

Whereas the pattern of age effects shown in Figure 2 is relatively universal, the pattern of cohort effects is more complex and relates to Russian history. However, the same pattern was found by Zakharov (2006, 2008), which again corroborates the validity of Mason et al. method. As we focus our study on period effects rather than cohort or age effects, we are not going to discuss this issue further.

Figures 4a and 4b present pure period effect cleansed of age and cohort. These are the central findings of this paper and are discussed further below.

Results

This section presents the results of hypotheses testing.

H1. Periods of sociopolitical instability not coupled with economic crisis are characterized by increased fertility.

This hypothesis assumes that fertility rates of each period of sociopolitical instability should be increasing. Consequently, by the end of each such period (i.e., 1965-1969, 1954-1957, 1982, 1960-1964, and 1978-1988), fertility rates should be higher than at the beginning; even more so, than in the years immediately preceding these periods.

As shown by Figures 4a and 4b, fertility has in fact declined during the period of 1965-1969. Data was not available for 1954-1957 and thus, H1 could not be tested for this duration. The year 1982 was part of a broader period of increased instability (1978-1986) and thus, could not be tested separately. Fertility has indeed increased during the period of 1978-1986, which is associated with both deterioration and erosion of the social contract. The difference in betas between these extreme years is quite substantial, comprising 10.69; furthermore, the difference between betas for 1978 and 1987, the years of peak fertility for this period, was even higher, equaling 13.08.

This supports the hypothesis for the period of 1978-1988, as the period with the steepest increase of sociopolitical instability (see Figure 4b).

(FIGURE 4 ABOUT HERE).

H2. Increased sociopolitical instability at the societal level (if not accompanied by severe economic instability and crisis) will lead to higher fertility rates for a given period.

Accordingly, each period marked with higher instability should feature higher fertility rates. Hence, a hierarchy of fertility rates should appear across instability periods in the following ascending order (arranged from lowest to highest instability): 1965--

1969: Brezhnev's breakout; 1954--1957: Khrushchev's breakout; 1982: Brezhnev's contested directorship[1]; 1960--1964: Khrushchev's contested directorship; 1978--1988 (especially 1981).[2]

To test this hypothesis, we compare the average beta across the periods. The following lists their values for the corresponding periods:
For 1965-1969, the average beta equaled 20.43; for 1954-1957, data was not available. Brezhnev's contested directorship during 1982 overlapped with a stronger type of instability, related to the deterioration and erosion of the social contract (1978-1988)[3]; the average beta for 1960-1964 equaled 29.85, and for the period of 1978-1988 the average beta was 24.56.

Since the trend of fertility increase lasted until 1987, it is worth investigating the average beta for this period (up to 1987). It equals 24.08. Thus, the hypothesis could not be confirmed.

H3. Stable periods are characterized by lower fertility rates than periods with sociopolitical instabilities. Therefore, in accordance with the earlier assumption, the level of uncertainty increases during periods of instability, leading to an increase of fertility.

The stable periods of 1953-1954, 1965, 1957-1959, and 1970-1977 should therefore be characterized by lower fertility rates than the periods of 1965-1969, 1954-

1 The short period of instability related to Brezhnev's contested directorship overlapped with the extended period of the deterioration and erosion of the social contract.

2 The period of 1970-1981 was defined as stable according to the "reciprocal accountability" theory. This period was shortened because the deterioration of the social contract began to manifest itself in 1978. For the same reason, a further period, which was defined as stable by the "reciprocal accountability" theory, was not included here (1982-1986).

3 Although the erosion of the social contract has lasted up to the very breakdown of the USSR in 1991, the part of this period from 1989 to 1991 was marked with the propagation of a severe economic crisis, followed by instability and thus, was tested as a separate hypothesis

1957, 1960-1964, and 1978-1988[3] that were marked with sociopolitical instabilities without simultaneous severe economic instability and crisis.

To test this hypothesis, the average betas of stable periods were compared with those of periods marked with sociopolitical instabilities. They can be ordered according to the following four stable periods: for 1953-1954 no data was available; for 1965, the average beta equaled 23.38; for 1957-1959: data was available for 1958-1959 and for these years, the average beta equaled 38.77; for 1970-1977 the average beta was 19.92. For unstable periods, average betas had the following values: for 1965-1969: 20.43; for 1954-1957: no data available; for 1960-1964: 29.85; for 1978-1988: 24.5; and for 1978-1987: 24.08.

This hypothesis was partially confirmed: the betas for unstable periods were indeed higher than for stable periods, with the exception of one stable (1957-1959) and one unstable (1965-1969) period. An in-depth exploration, further confirming the partial substantiation of this hypothesis, is provided in the Discussion section.

Discussion

The application of the APC model allowed estimating the period effects on fertility. However, the period effect was not necessarily equal to the impact of social and political instability. Period effects are also affected by first and second demographic transitions, population policy, changes in housing policies, and specific governmental policies (e.g. campaigns against alcohol), which could also account for fertility swings. Thus, the major purpose of this discussion is to determine whether the findings are attributable to the impact of the very sociopolitical instabilities, or it is rather some other period effect that accounts for changes in fertility rates. Furthermore, we will discuss how the obtained results resonate with the hypotheses and with our theory.

First and foremost, it is important to determine whether demographic transitions overlap with any of the periods for which specific hypotheses have been formulated and for which findings have been provided. The reason for this is that demographic transitions imply long-term radical shifts in fertility that overshadow any prospective short-term fluctuations, including those due to societal instabilities. This applies to all hypotheses, since their testing involved periods that coincide with the uncompleted First Demographic Transition.

As noted by previous studies, the demographic transition, which has manifested as a steady decline of fertility in Russia, began at the very end of the 19th century and continued throughout the first half of the 20th century (Zakharov 2008; Shcherbov & Van Vianen 2001). Furthermore, it was noted by many scholars (e.g. Zakharov 2003, 2008) that the first demographic transition in Russia was completed in the 1960s.

In contrast to the hypothesis about increasing fertility during periods of sociopolitical instability, two of the periods with mild instability, 1960-1964 and 1965-1969, were characterized by a decline of birth rates. Since these periods coincided with the completion of the demographic transition, fertility decline is not likely attributable to the sociopolitical instability. Since long-term demographic transition, typified by a decrease of fertility to a level close to population replacement (TFR = 2.1), is more powerful than a short-term influence of instability, the possible impact of sociopolitical instability on fertility could be nullified. This enhances the plausibility of Hypothesis 1, since the remaining instability period (1978-1986)[1] (the one that does not coincide with the advance of the First Demographic Transition) largely demonstrated a steady and statistically significant increase of fertility. For further confirmation of the positive impact of instability on the fertility hypothesis, other possible period effects of processes during that period should be ruled out.

We have already elaborated on the other explanations of the short-term increases

[1] The instability period of 1954-1957 remained outside of the available data coverage, while Brezhnev's contested directorship of 1982 lies within the period of deterioration and erosion of the social contract (1978-1986).

in fertility in the early 1980s and 1986-87, and attempted to demonstrate that they failed to fully explain them (see pages 3-5). An explanation that employs the uncertainty reduction theory fills this gap and contributes to a coherent interpretation of fertility dynamics during this period. According to this explanation, 1981 was the year when the erosion of the "social contract" became especially evident and, consequently, fertility increased to compensate for the resulting uncertainty. This increase was enhanced by the introduction of a pronatalist population policy and by a shifting of births to younger ages. After three years of increasing fertility rates, these should have decreased again, as was the case in all countries where pronatalist population policies were implemented. However, the impact of instability related to the erosion of the "social contract" did not allow fertility to "bend"; it had not yet declined as in other countries, but instead just leveled off. Then, during the next couple of years, fertility continued its upward trend as a result of further erosion of the "social contract", possibly, also being enhanced by the anti-alcohol campaign.

The notion of demographic transition during the 1960s also clarifies why Hypothesis 2 has not been confirmed. During the pre-completion of the transition period, fertility was obviously higher; therefore, the basis for comparison of two periods of instability at that decade is biased. Unfortunately, there is no way to test this hypothesis, comparing fertility during periods controlled for the stage of demographic transition or during periods after its completion.

Similarly, the coincidence of demographic transition with sociopolitical dynamics may blur the results of our test of Hypothesis 3. However, a comparison of adjacent periods of stability and instability (e.g. the stable period of 1957-1959 and the unstable one of 1960-1964) that are close with respect to the demographic transition, may indicate its validity or, at least, a partial confirmation. Indeed, most of the unstable periods, both during and after the completion of demographic transition, demonstrated larger betas than those for most of the stable periods.

The following provides a brief summary on how the overall results resonate with the our hypotheses. All formulated hypotheses were related to assumptions about various types and intensities of sociopolitical instabilities, affecting the individual perception of uncertainty, thus leading to increased fertility. Some of these hypotheses were largely or partially confirmed, while others were dismissed. It is hard to tell whether the rejected hypotheses were dismissed because they were not correct, or because of incomplete data, and/or the inability to control for other factors (such as the advance of the demographic transition).

We obtained the strongest support for the hypothesis that fertility was impacted by the sociopolitical instability caused by the erosion of the social contract in the 1980s. This is in line with the premises of the uncertainty reduction theory, involving a desire to reduce uncertainty by increasing fertility (Friedman et. al, 384).

Conclusion

This study demonstrated the impact of certain types of societal instabilities, especially the erosion of the "social contract", on fertility. It is very plausible that this strong type of sociopolitical instability was the major reason for the fertility increase in Russia in the 1980s. We interpret this evidence from the perspective of the uncertainty reduction theory, which may explain some phenomena that other theories failed to interpret. We could not unambiguously confirm the impact of other types of sociopolitical instabilities on fertility dynamics and in some cases had to rule out such impact. Further research along these lines may refine the application of the uncertainty reduction theory: while some types of instabilities may create uncertainties that lead to fertility increase, others may not. We also demonstrated that it is possible to test the hypotheses based on the extended uncertainty reduction theory without micro-level data.

References

Agadjanian, V. Is Induced Abortion Really Declining in Armenia?// *Studies in Family Planning 47(2):163-178* · June 2016

Alesina, A. and R. Perotti. 1993. Income Distribution. Political Instability and Investment. // *Working Paper* #4486. Cambridge, MA

Anderson, B. and B. Silver. 1989. "Patterns of Cohort Mortality in the Soviet Population." *Population and Development Review*, 15(3): 471-501

Andreev, E.M. 1990b. Life expectancy and causes of death in the USSR. Pages 90-116 in

A.G. Volkov, Ed. *Demographic Processes in the USSR.* Nauka, Moscow (in Russian)

Arel, D. Demography and Politics in the First Post-Soviet Censuses. Mistrusted State, Contested Identities. // *Population-E*, 2002, 57(6), 801-28

Arkhangelsky, V. 1994. Semya i semeinaya politika v Pskovskoi oblasti. (Family and Family Policy in the Pskov's Region). Pod. red. N. Vasilievoi I V. Arkhangelskogo. Pskov

Avdeev, A and A.Monnier. 1995. A Survey of Modern Russian Fertility.// *Population* (an English selection), Vol.7, (1995), p.p. 1-38

Becker, G. 1976. The Economic Approach to Human Behavior. Chicago: University of Chicago Press

Becker, G. 1991. A Treatise on the Family. Revised and Enlarged Edition. Cambridge, MA: Harvard University Press A

Blum, A. (1996). Society, Politics and Demography: The Example of Soviet History.// *Sociologický časopis / Czech Sociological Review*, *4*(1), 81-95

Cherlin, A. The effect of children on marital dissolution. // *Demography* August 1977, Volume 14, Issue 3, pp 265–272

Clayton, D. and Schiffers, E. 1987. Models for Temporal Variation in Cancer Rates. II: Age-Period-Cohort Models. // *Statist. Med. 6*, 469-481

Coale, Ansley J., Barbara A. Anderson, and Erna Härm (1979). *Human Fertility in Russia since the Nineteenth Century*. Princeton, NJ: Princeton University Press

Cook, L. 1993. The Soviet Social Contract and why it Failed: Welfare Policy and Workers' Politics from Brezhnev to Yeltsin. Cambridge, Harvard University Press

DeKaa, D. Anchored Narratives: The Story and Findings of Half a Century of Research into the Determinants of Fertility. //*Population Studies*, Volume 50, 1996 , issue 3, pp. 389-442

Freijka. T. and S. Zakharov. The Apparent Failure of Russia's Pronatalist Family Policies. // *Population and Development Review 39(4)* · December 2013

Friedman, D., M.Hechter and S.Kanazava. 1994. A Theory of the Value of Children. //*Demography 31(3):* 375-40
Greenhalgh, S. 1994. Anthropological Contributions to Fertility Theory.// *The Population Council division Working Papers*
Kahn JR, Mason WM. Political Alienation, Cohort Size, and the Easterlin Hypothesis. // *American sociological review. 1987*; *52(2):*155-169
Klupt, M. 1988. Economicheskoye Izmerenie Demograficheskoi Dinamiki. (Economic Dimension of Demographic Dynamics). "Financi i statistika", Moskva
Koehler, H.-P. and I. Koehler. 2002. Fertility Decline in Russia in the early and Mid 1990s: The Role of Uncertainty and Labor Market Crisis. //European Journal of Population 18 (2002): 233-62
Kuzmin, A. 1993. Semya na Urale. Demograficheskiye aspekti vibora zhiznennogo puti. (Ural Family. Demographic Aspects of the Life Trajectory Choices). Ekaterinburg: Nauka
Kreyenfeld, M. 2010. Uncertainties in female employment careers and the Postponement of Parenthood in Germany. // European Sociological Review 26: 351-66
Kye, B. Cohort Effects or period Effects. Fertility Decline in South Korea and the Twentieth Century. *// Population Research and Policy Review*, 2012, 31: 384-415
Mason, K.O., H.H. Winsborough, W.M. Mason, and W.K. Poole. 1973. "Some Methodological Issues in Cohort Analysis of Archival Data." //*American Sociological Review* 38, pp. 242-58
McNicoll, G. 1994. Institutional Analysis of Fertility. // In Population, Economic Development and Environment: The Making of Our Common Future, edited by K. Lindhal-Kiessling and H. Landberg. Pp. 199-230. Oxford: Oxford University Press
Palloni, A. Assessing the Levels and Impact of Mortality in Crisis Situations. // CDE Working Paper 87. 1990, pp. 87-138
Perelli-Harris, B. Ukraine: On the Border between Old and New Uncertain Times. // *Demographic Research*, 19:29, pp. 1145-1178. 2008
Philipov, D., Andreev, E., Kharkova, T., Shkolnikov, V. 2004. Recent trends in induced abortion in Russia and under-reporting in surveys. //*European Journal of Population*. June 2004, Volume 20, Issue 2, pp 95–117
Rimashevskaya, N. and A. Milovidov. O sovershenstvovanii gosudarstvennoi pomoshchi semiam, imeushchim detei. (Improving State Welfare for the Families with Children). // *Planovoye khozyaistvo*, 1988, N1, pp. 82-85
Roeder, Ph. 1993. Red Sunset: The Failure of Soviet Politics. Princeton (N.J.): Princeton .
Safranko, A. and R. Bealer. Unbalanced modernization and Domestic Instability: A Comparative Analysis. Sage Publications/Beverly Hills/London. 1972. Pp. 7-65
University Press
Scherbov, S., Harrie van Vianen. 2002. Period Fertility in Russia since 1930: an application of the Coale-Trussell fertility model. *DEMOGRAPHIC RESEARCH.* volume 6, article 16, pages 255-470

Shkolnikov, V., M. McKee, J. Vallin, E. Aksel, E. Leon, L. Chenet and F.Meslé 1999. Cancer mortality in Russia and Ukraine: validity, competing risks and cohort effects.// *International Journal of Epidemiology28, 19-29*
Tolts M. The Failure of Demographic Statistics: A Soviet Response to Population Troubles// Paper presented at the IUSSP XXIVth General Population Conference, Salvador-Bahia, Brazil, 18-24 August 2001. – [22 P.]
Waite LJ, Lillard LA. Children and marital disruption. //*American Journal of Sociology. 1991;96(4*): 930–953
Wasserman,D., A. Varnik and G. Eklund. Female Suicides and Alcohol Consumption during Perestroika in the former USSR. //*Acta Psychiatrica Scandinavica Supplementum*, v. 98, No. 394, (1998), p. 26-33
Willekens, F.J. and N. Baydar. 1986. Age-period-cohort models for forecasting fertility. Working Paper No. 45. Netherlands Interdisciplinary Demographic Institute, The Hague
Willikens, F. and Shcherbov, S. 1991. Age-Period-Cohort (APC) Analysis of Mortality with Applications to Soviet Data. IIASA Working Paper. WP-91-042
Yasmeen Farah and Mahmud Zahid. 2012. Forecasting Age-Specific Fertility Rates of Pakistan Using Functional Time Series Models. Materials of the conference
Zakharov, S. 2003. Demographic Transition and Generations Replacement in Russia. // *Vorposi statistiki: 2003, pp. 3-12 (In Russian)*
Zakharov, S. Demogaficheskii analiz effect mer demograficheskoi politiki v Rossii v 1980-h godah. (Demographic Analysis of the Demographic Policy Effect in Russia in the 1980s) // *Spero*, N5, Winter, 2006, pp.33-69
Zakharov, S. Russian Federation: From the First to Second Demographic Transition. // *Demographic Research*, vol. 19, article 24, pp.907-972. July 2008

FIGURES

FIGURE 1. The General Model for Evaluating Societal Instability's Impact on Fertility

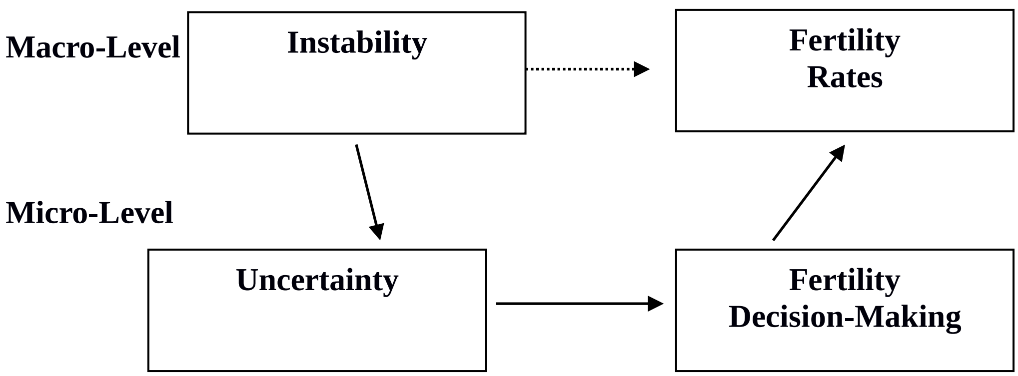


Figure 2. Pure Age Effects

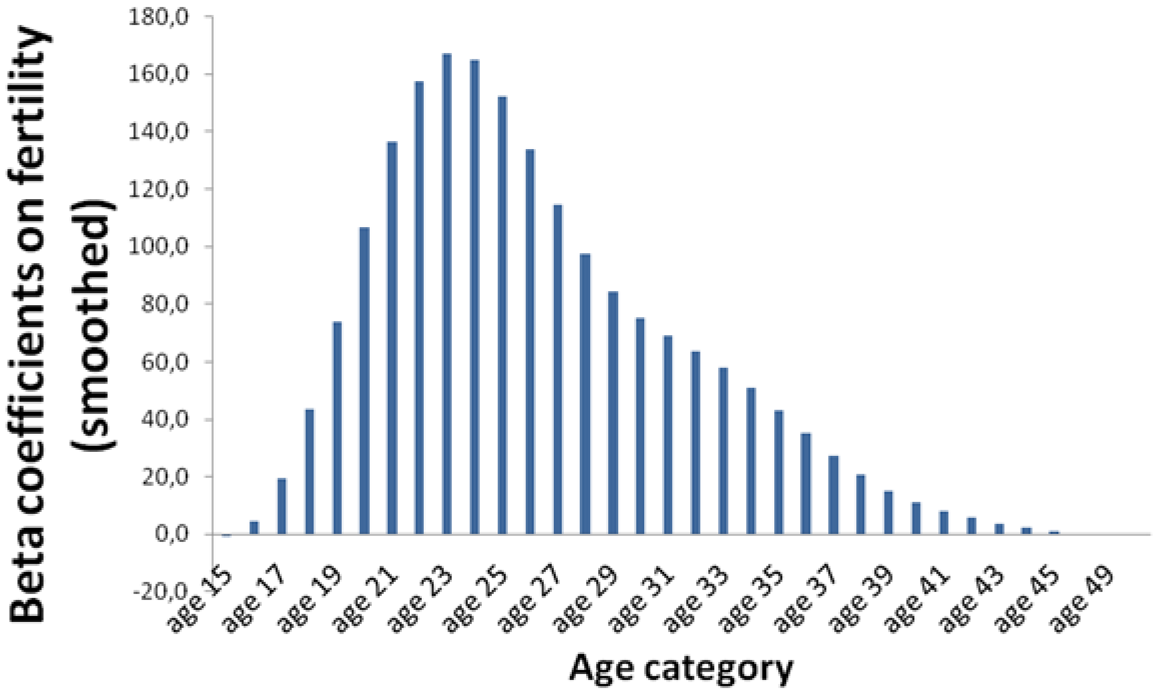


Figure 3. Pure Cohort Effects

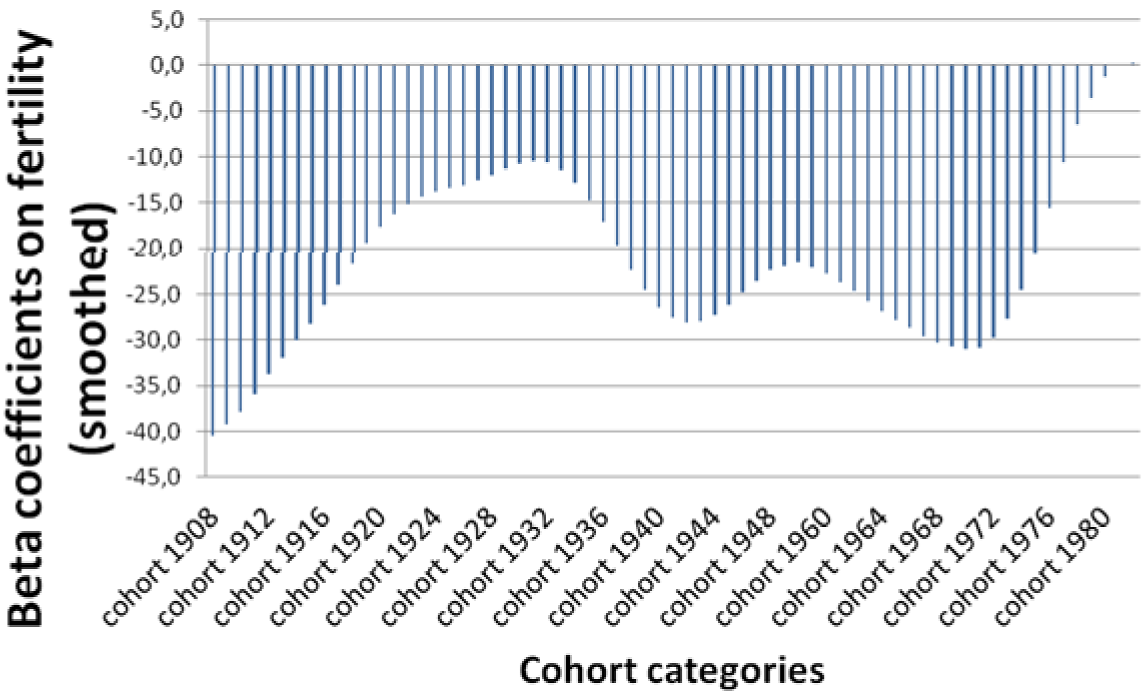


Figure 4a. Period Effect of Fertility

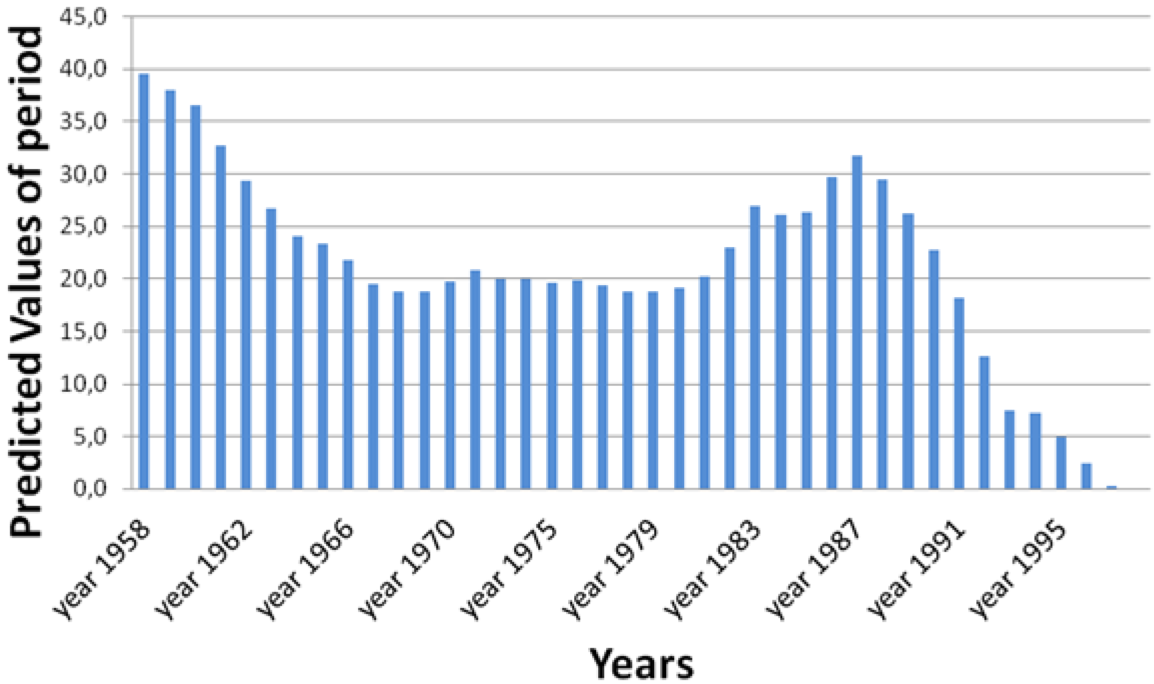
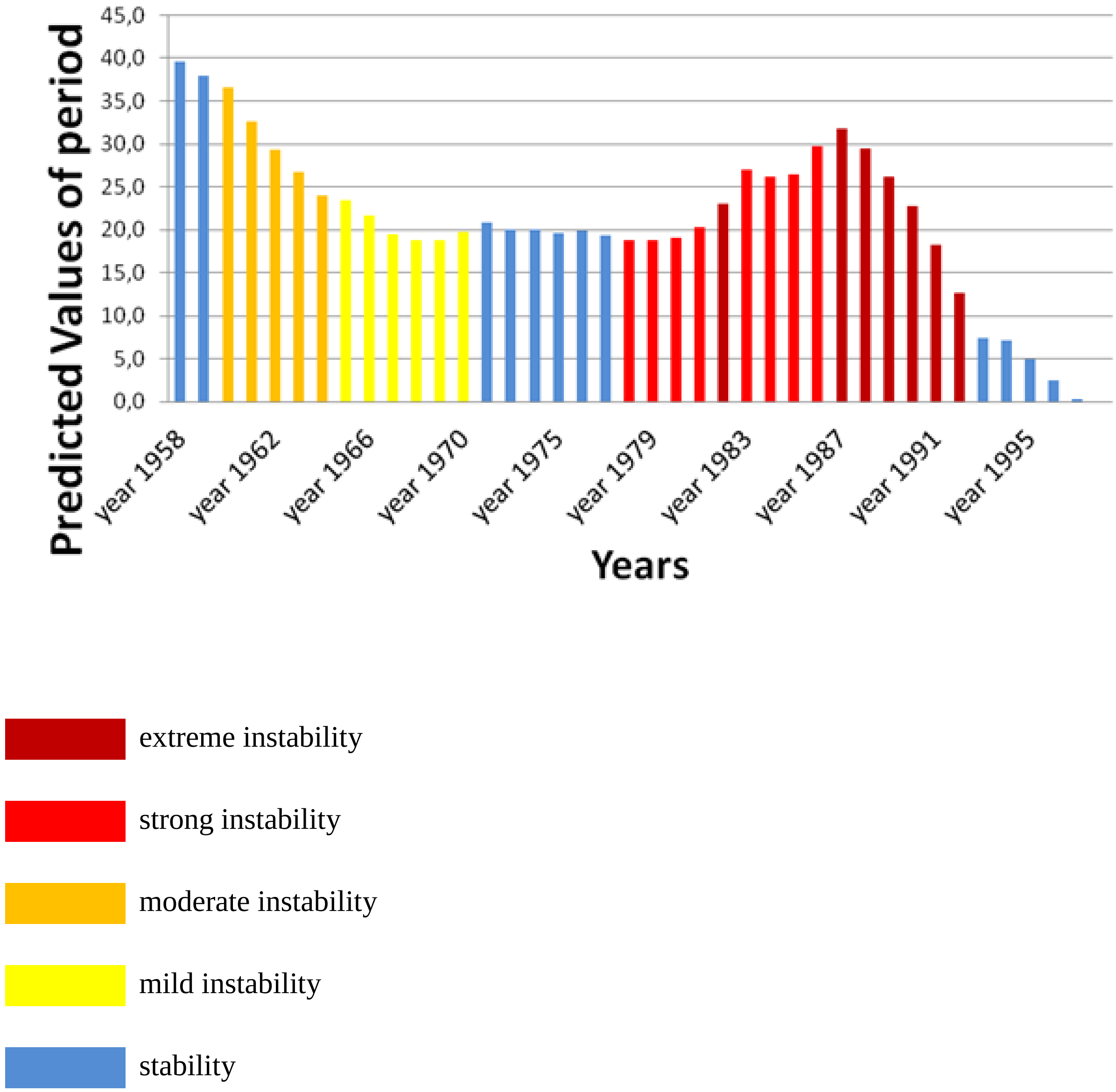


Figure 4b. Period Effect of Fertility (with the Exposure of Correspondence with Instabilities)



TABLES

Table1. Ranking of strength of various types of instabilities in the USSR/Russia

(1 to 6 – arranged from lowest to highest)

Rank	Type of instability	Corresponding years
1	Brezhnev's breakout	1965-1969
2	Khrushchev's breakout	1954-1957
3	Brezhnev's contested directorship	1982
4	Khrushchev's contested directorship	1960-1964
5	Deterioration of social contract	1978-1985
6	Erosion of social contract	1986-1990

TABLE 2. Age-Specific Birth Rates per 1000 Women: Russian Federation, 1959-1998														
TOTAL														
Age group	Years													
	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
15-19	28.4	27.5	26.7	27.2	21.3	21	22.7	24.7	25.6	26	27.3	28.3	29.7	30.9
20-24	157.9	157.7	157.5	156.7	156.3	156.2	150.8	150.3	147.8	143.1	142.9	146.9	152.6	156.1
25-29	156.4	154.5	152.7	142.8	137.3	130.3	122.8	120.1	114.9	110.9	109	107.4	109.5	116.3
30-34	101.9	100.2	99.5	91.8	86	80.5	77.3	77.7	77	74	72.4	69.3	68	65.6
35-39	57.7	56.5	54.3	47.3	44.5	41.4	39.2	38.1	36.1	33.5	32	32.2	32.5	33
40-44	19.9	17.3	16	15.7	14.9	14.1	13.4	12.6	11.6	10.8	10	9	8.3	7.9
45-49	3	2.5	1.9	1.7	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.1	0.8	0.7
15-49	82.9	83	81.8	78.4	73.4	67.6	62	59	56.4	53.6	52.9	53.4	54.4	55.2
CONTR	2.626	2.581	2.543	2.416	2.31	2.225	2.139	2.125	2.072	1.998	1.974	1.971	2.007	2.053
TFR	2.626	2.58	2.54	2.417	2.311	2.227	2.139	2.125	2.072	1.998	1.975	1.972	2.007	2.053

Age group	Years													
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
15-19	31.5	32.8	33.9	34.5	35.6	37	40.8	42.7	43.3	43.8	45.3	46.3	47.4	47.4
20-24	154.7	155.5	158.8	158.8	158.6	156.2	155	157.1	157.2	161.5	167.3	165.8	167.5	167.5
25-29	114.4	112.8	110.5	108	107.8	106.5	103.1	101.2	103.5	107.9	118	112.9	119.7	119.7
30-34	63.3	60	58.6	58.2	60	59.2	55.6	52.6	53.5	56.6	63	59.9	65.1	65.1
35-39	32.5	30.9	28.9	26.5	23.7	21.6	19.6	18.4	19.1	22.9	24.2	23.6	25.8	25.8
40-44	7.5	7.3	7.3	7.3	7.1	6.7	5.9	5.1	4.5	4.3	3.9	3.6	5	5
45-49	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
15-49	54.9	55.3	56.6	57.1	57.7	58.1	59	59.6	61.1	63.7	67.7	65.6	66.9	66.9
CONTR	2.023	2	1.993	1.969	1.967	1.938	1.902	1.888	1.908	1.987	2.11	2.062	2.154	2.154
TFR	2.023	2	1.993	1.969	1.967	1.938	1.902	1.888					2.007	2.007

Age group	Years											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
15-19	48.5	49.6	52.5	55.6	54.9	51.36	47.9	49.9	45.59	39.74	36.2	34
20-24	170.6	167.9	163.9	156.75	146.6	133.95	120.4	120.3	113.46	106.38	99	99
25-29	122.6	114.1	103.1	93.19	83	72.7	65	67.2	67.16	66.53	66.2	68
30-34	67.8	61.8	54.6	48.18	41.6	34.98	29.6	29.6	29.72	30.33	31.5	33.4
35-39	27.8	25.6	22	19.37	16.5	13.94	11.4	10.6	10.65	10.83	10.8	11.5
40-44	6.1	5.6	5	4.16	3.7	3.19	2.6	2.3	2.19	2.27	2.2	2.3
45-49	0.2	0.2	0.2	0.15	0.2	0.19	0.2	0.1	0.12	0.11	0.1	0.1
15-49	68.2	64.5	59.8	55.27	49.9	43.89	38.4	38	36.03	34.11	32.8	33.1
CONTR	2.218	2.124	2.007	1.887	1.733	1.552	1.386	1.4	1.344	1.281	1.23	1.242
TFR	1.887	1.732				1.552	1.385	1.4	1.344	1.281	1.23	1.242

Source:

Roskomstat of the Russian Federation (State Committee on Statistics of the Russian Federation)

TABLE 3

TABLE 3. PARAMETER ESTIMATES OF AGE, PERIOD, AND COHORT EFFECTS ON AGE-SPECIFIC FERTILITY per 1000 WOMEN (SPLINE)				
Parameter	B	Std.Error	T	Sig.
Intercept	0.82	14.70	0.06	0.96
YEARS				
year 1958	39.58	10.75	3.68	0.00
year 1959	37.96	10.50	3.62	0.00
year 1960	36.54	10.24	3.57	0.00
year 1961	32.65	9.99	3.27	0.00
year 1962	29.35	9.75	3.01	0.00
year 1963	26.68	9.50	2.81	0.01
year 1964	24.01	9.25	2.60	0.01
year 1965	23.38	8.97	2.61	0.01
year 1966	21.72	8.71	2.50	0.01
year 1967	19.53	8.45	2.31	0.02
year 1968	18.81	8.20	2.30	0.02
year 1969	18.72	7.95	2.35	0.02
year 1970	19.78	7.72	2.56	0.01
year 1972	20.80	7.26	2.86	0.00
year 1973	20.00	7.06	2.83	0.00
year 1974	20.03	6.82	2.94	0.00
year 1975	19.62	6.59	2.98	0.00
year 1976	19.83	6.35	3.12	0.00
year 1977	19.36	6.12	3.16	0.00
year 1978	18.73	5.89	3.18	0.00
year 1979	18.74	5.66	3.31	0.00
year 1980	19.13	5.43	3.52	0.00
year 1981	20.25	5.21	3.89	0.00
year 1982	22.99	4.99	4.61	4.40
year 1983	26.95	4.77	5.65	1.96
year 1984	26.16	4.56	5.74	1.18
year 1985	26.38	4.35	6.06	1.73
year 1986	29.67	4.15	7.15	1.44
year 1987	31.80	3.96	8.04	1.99
year 1988	29.41	3.77	7.80	1.22
year 1989	26.21	3.59	7.30	5.01
year 1990	22.78	3.42	6.65	4.20
year 1991	18.19	3.27	5.56	3.18
year 1992	12.69	3.13	4.06	5.22
year 1993	7.48	3.00	2.49	0.01
year 1994	7.21	2.89	2.49	0.01

year 1995	4.94	2.80	1.76	0.08
year 1996	2.45	2.73	0.90	0.37
year 1997	0.33	2.68	0.12	0.90
year 1998	0.00	.	.	.
AGES				
age 15	-0.82	9.45	-0.09	0.93
age 16	4.50	9.20	0.49	0.62
age 17	19.48	8.95	2.18	0.03
age 18	43.43	8.69	5.00	6.64
age 19	73.93	8.44	8.75	6.07
age 20	106.85	8.20	13.04	1.19
age 21	136.51	7.95	17.17	6.91
age 22	157.63	7.70	20.47	3.44
age 23	167.22	7.46	22.42	8.65
age 24	164.78	7.21	22.85	8.83
age 25	152.27	6.97	21.85	1.02
age 26	133.98	6.73	19.91	1.82
age 27	114.61	6.49	17.67	6.28
age 28	97.49	6.25	15.60	1.57
age 29	84.34	6.01	14.03	8.48
age 30	75.28	5.78	13.03	1.29
age 31	68.96	5.55	12.43	1.14
age 32	63.55	5.32	11.95	2.31
age 33	57.78	5.09	11.35	1.42
age 34	50.99	4.87	10.48	9.56
age 35	43.22	4.65	9.30	5.49
age 36	35.07	4.43	7.91	5.17
age 37	27.36	4.22	6.48	1.28
age 38	20.64	4.02	5.14	3.16
age 39	15.22	3.82	3.99	7.09
age 40	11.09	3.63	3.06	0.00
age 41	8.02	3.46	2.32	0.02
age 42	5.66	3.30	1.71	0.09
age 43	3.76	3.15	1.19	0.23
age 44	2.17	3.00	0.72	0.47
age 45	0.86	2.87	0.30	0.76
age 47	-0.47	2.22	-0.21	0.83
age 49	-0.44	2.52	-0.17	0.86
age 50	0.00	.	.	.
COHORTS				
cohort 1908	-40.46	25.46	-1.59	0.11
cohort 1909	-39.19	23.90	-1.64	0.10
cohort	-37.88	23.13	-1.64	0.10

1910				
cohort 1911	-35.89	22.69	-1.58	0.11
cohort 1912	-33.79	22.38	-1.51	0.13
cohort 1913	-31.91	22.06	-1.45	0.15
cohort 1914	-30.01	21.77	-1.38	0.17
cohort 1915	-28.20	21.50	-1.31	0.19
cohort 1916	-26.19	21.23	-1.23	0.22
cohort 1917	-23.93	20.98	-1.14	0.25
cohort 1918	-21.64	20.74	-1.04	0.30
cohort 1919	-19.47	20.51	-0.95	0.34
cohort 1920	-17.64	20.28	-0.87	0.38
cohort 1921	-16.21	20.04	-0.81	0.42
cohort 1922	-15.13	19.83	-0.76	0.45
cohort 1923	-14.35	19.61	-0.73	0.46
cohort 1924	-13.83	19.40	-0.71	0.48
cohort 1925	-13.43	19.19	-0.70	0.48
cohort 1926	-13.06	18.97	-0.69	0.49
cohort 1927	-12.59	18.77	-0.67	0.50
cohort 1928	-12.00	18.56	-0.65	0.52
cohort 1929	-11.35	18.35	-0.62	0.54
cohort 1930	-10.77	18.15	-0.59	0.55
cohort 1931	-10.47	17.95	-0.58	0.56
cohort 1932	-10.65	17.75	-0.60	0.55
cohort 1933	-11.48	17.55	-0.65	0.51
cohort 1934	-12.82	17.36	-0.74	0.46
cohort 1935	-14.67	17.16	-0.85	0.39

cohort 1936	-17.03	16.97	-1.00	0.32
cohort 1937	-19.68	16.78	-1.17	0.24
cohort 1938	-22.26	16.59	-1.34	0.18
cohort 1939	-24.56	16.41	-1.50	0.13
cohort 1940	-26.38	16.22	-1.63	0.10
cohort 1941	-27.57	16.04	-1.72	0.09
cohort 1942	-28.07	15.86	-1.77	0.08
cohort 1943	-27.98	15.68	-1.78	0.07
cohort 1944	-27.22	15.51	-1.76	0.08
cohort 1945	-26.15	15.34	-1.71	0.09
cohort 1946	-24.84	15.17	-1.64	0.10
cohort 1947	-23.51	15.01	-1.57	0.12
cohort 1948	-22.35	14.84	-1.51	0.13
cohort 1949	-21.96	14.68	-1.50	0.14
cohort 1954	-21.45	13.87	-1.55	0.12
cohort 1959	-22.10	13.35	-1.66	0.10
cohort 1960	-22.74	13.23	-1.72	0.09
cohort 1961	-23.64	13.13	-1.80	0.07
cohort 1962	-24.70	13.02	-1.90	0.06
cohort 1963	-25.82	12.92	-2.00	0.05
cohort 1964	-26.88	12.83	-2.09	0.04
cohort 1965	-27.83	12.75	-2.18	0.03
cohort 1966	-28.71	12.66	-2.27	0.02
cohort 1967	-29.57	12.59	-2.35	0.02
cohort 1968	-30.30	12.52	-2.42	0.02
cohort	-30.75	12.46	-2.47	0.01

1969				
cohort 1970	-31.02	12.41	-2.50	0.01
cohort 1971	-30.86	12.37	-2.50	0.01
cohort 1972	-29.80	12.33	-2.42	0.02
cohort 1973	-27.66	12.31	-2.25	0.02
cohort 1974	-24.57	12.30	-2.00	0.05
cohort 1975	-20.48	12.31	-1.66	0.10
cohort 1976	-15.61	12.33	-1.27	0.21
cohort 1977	-10.65	12.38	-0.86	0.39
cohort 1978	-6.44	12.46	-0.52	0.61
cohort 1979	-3.53	12.60	-0.28	0.78
cohort 1980	-1.22	12.81	-0.09	0.92
cohort 1981	0.04	13.18	0.00	1.00
cohort 1982	0.30	13.91	0.02	0.98
cohort 1983	0.00	.	.	.

\

	extreme instability
	strong instability
	moderate instability
	mild instability