

KRZYSZTOF TYMICKI, PhD

SUMMARY OF PROFESSIONAL ACCOMPLISHMENTS

1. Information on education and employment

In 2000, I graduated with distinction from the master's degree at the Institute of Sociology at the University of Warsaw in the field of "Quantitative methods in social sciences". A supervisor of my master's thesis entitled: "Sociological and demographic analysis of never-marrying in Poland" was dr hab. Anna Giza. In thesis, using data from the Central Statistical Office, I have analysed the social and demographic characteristics of unmarried men and women. The work also included the interpretation of results in the light of economic and evolutionary theory of partner selection.

In the fifth year of my studies (from September 1999 to December 2000) I stayed at Oxford University as part of a scholarship granted by the "Stefan Batory" foundation. During my stay, my academic supervisor was Dr. David Coleman from the faculty of Social Sciences. I spent the scholarship on collecting materials for my master's thesis and participating in classes and seminars on the use of quantitative methods in social sciences and demographics.

In October 2000, I began doctoral studies at the Institute of Statistics and Demography of the Warsaw School of Economics. My scientific supervisor was prof. dr hab. Janina Józwiak. As part of my doctoral studies in the years 2000-2002, I was on a scholarship at the Max Planck Institute for Demographic Research in Germany as part of the International Max Planck School for Demographic Research. During my stay I have completed a full program in the field of demographic analysis methods, including advanced methods of event history analysis. During the scholarship, my scientific supervisor was Dr. Hans-Peter Kohler, who - apart from prof. dr hab. Janina Józwiak - was an advisor in the process of writing my doctoral dissertation.

After returning from the scholarship in 2002, I was employed as a full-time assistant at the Institute of Statistics and Demography of the Warsaw School of Economics. In February 2005, I defended my doctoral thesis: "Reproductive behavior in historical population of Bejsce parish. The demographic analysis of parish registers reconstitution data from Bejsce, 18th-20th century, Poland", prepared under the supervision of prof. dr hab. Janina Józwiak, obtaining a doctorate in economic sciences. In October 2005, I was promoted to the position of adjunct at the Institute of Statistics and Demography of the Warsaw School of Economics.

After obtaining the doctoral degree in the years 2005 - 2006, I participated in an international project "*Job instability and changes in family and household trends: how to cope with these challenges through occupational and social policy actions based on a renewed Lisbon Strategy*" (2005-2007), coordinated by prof. Fiorenza Deriu from the "La Sapienza" University of Rome. The project was financed by the Directorate General of the European Commission for Social Affairs and Employment. The coordinator of the project in Poland was Prof. Janina Józwiak.



I was also a member of the team in two projects "Panel research on the transformation of relations between generations, in the family and between women and men: Generations, families and gender (the first round of the study)" (MNiSW / NCN, 2008-2011) and "Panel research on the transformation of relations between generations, in the family and between women and men: Generations, families and gender (second round of the study)" (NCN, 2013-2016) In these projects, two rounds of the GGS-PL survey were carried out, following a uniform methodological standard (Generations and Gender Survey - GGS) as part of the international program for demographic research Generations and Gender Program.

In 2011, I received a grant of 90,000 PLN, awarded by the Ministry of Science and Higher Education for the implementation of a research project entitled "Transformations of fertility in Poland in the years 1945-2010 in the context of the tempo and quantity effect: micro and macro perspective". The research project was carried out in 2011-2014. Its purpose was to characterize changes of fertility patterns in Poland and to explain their main causes in the period 1945-2010.

From 2011 to the present, I am also involved in the project of Human Fertility Database. This international research project, coordinated by the Vienna Institute of Demography and the Max Planck Institute for Demographic Research, aims to create a unified database on fertility of women. Data is available online on the www.humanfertility.org platform.

In March 2017, I received an NCN grant in the amount of PLN 87,500 thousand PLN for the implementation of the project: "Patterns of reproduction in the light of social class theory of Pierre Bourdieu" in 2017-2020. This grant was awarded as part of the OPUS program.

2. A synthetic description of scientific interests and research work carried out in the period before and after the defense of the doctoral dissertation.

In my scientific work, I tried to analyze demographic processes such as union formation, fertility and mortality in the context of biological-evolutionary, social and economic conditions. These works were a continuation of my research interests initiated in my master's thesis, which resulted in the publication of results as a scientific article. The idea of the doctoral thesis resulted from the desire to continue the subject of biological and evolutionary determinants of demographic processes. For this purpose, I managed to obtain data from the reconstruction of the registers from the Bejsce parish in the małopolskie voivodship, which, except for a monographic study by prof. Edmund Piasecki (1990), were not used in other demographic analyzes. This unique collection of data, collected and reconstructed by a team headed by prof. Edmund Piasecki, contains detailed information on demographic events (deaths and births) in the years 1746-1968. Therefore, it provides an opportunity to analyze population processes during the so-called first demographic transition. On the basis of this data set, I took up the following research topics:

- analysis of the reproductive behaviors of the population, which concerned: the age of giving birth to the first child, intervals between consecutive births and completed fertility,

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- factors affecting the mortality of children and infants with special regard to intergenerational factors (the presence of grandmother in the household, the so-called "grandmother hypothesis"),
- impact of the so-called extended family on fertility,
- the impact of mortality of children and infants at household level on likelihood of subsequent birth (the so-called "replacement behavior"),
- intergenerational correlations of the fertility rates.

Period before obtaining the doctoral degree (2000-2005)

After obtaining a master's degree at the Institute of Sociology of the University of Warsaw and starting doctoral studies at the Collegium of Economic Analysis, I published an article written on the basis of my master's thesis:

Tymicki, K (2001) "Starokawalerstwo i staropanieństwo. Analiza zjawiska". *Studia Socjologiczne*, 163(4): 77-106.

This article is a socio-demographic characteristic of a group of unmarried people, defined as people aged 35 and more who are not in marriages or informal relationships. In order to explain the observed characteristics, I used the theory of partner selection, with particular emphasis on the impact of social structure on the marital market.

In the period 2000-2005, my research interests focused on the study of social and biological-evolutionary determinants of demographic processes. These works were reflected in the doctoral thesis devoted to the analysis of registers from the parish of Bejsce. The analyzes focused on the aforementioned issues related to both determinants of mortality of children and infants as well as various aspects of reproductive behaviors. My special contribution was the analysis of a unique set of data from the reconstruction of parish registers in order to verify selected hypotheses flowing from the evolutionary theory of human behavior. The most important element was the so-called "grandmother's hypothesis" concerning post-reproductive investments of women in the menopause (care of grandchildren), which in historical populations could contribute to improving the survival of children and babies (Sear, Mace, and McGregor, 2000 Beise and Voland 2002, Voland and Beise 2002). As a result of the analyzes carried out before the defense of the doctoral dissertation, I published a research article devoted to this subject:

Tymicki, K. (2004) The kin influence on female reproductive behavior. The evidence from the reconstitution of Bejsce parish registers, 18th-20th centuries, Poland. *American Journal of Human Biology* 16: 508-522.

Period after obtaining the doctoral degree (2005-2018)

After completing my doctoral thesis, I continued my research using historical data from the reconstruction of parish registers, which involved the transformation and fundamental modification of the three chapters of the doctoral dissertation in order to publish my results. These works resulted in the publication of one two articles in magazines and one chapter in a book monograph:



Tymicki, K (2005) The interplay between infant mortality and subsequent reproductive behavior. Evidence for the replacement effect from historical population of Bejsce parish, 18th-20th centuries, Poland. *Historical Social Research* 30(5): 240-264.

Tymicki, K (2008) When do kinsmen really help? Examination of the cohort and parity specific kin effects on fertility behavior. Case of the Bejsce parish register reconstitution study, xvii-xx centuries, Poland. [In]: Tommy Bengtsson, (red.) "Kinship and demographic behaviour in the past", Springer Press.

Tymicki, K (2009) Correlates of infant and childhood mortality. A theoretical overview and new evidence, from the analysis of longitudinal data of Bejsce (Poland) parish register reconstitution study of the 18th-20th centuries. *Demographic Research* 20(23): 559-594.

My further scientific interests have evolved towards the study of contemporary demographic trends. In particular, I was interested in the issues of transformation of the fertility pattern under the influence of political changes that took place in Poland after 1989. These studies concerned such issues as:

- reconstruction of fertility measures in longitudinal (cohort) and cross-sectional (period) perspective,
- determining main causes behind the decline in the fertility rates in Poland in the context of delaying the decision on having the first child, and subsequent recuperation,
- biological consequences of postponing the decision on having a child (decrease of the female biological fertility level),
- the relationship between the decision to marry and having a child (the issue of the so-called "bridal pregnancies").

In my research, I used both macro data (from birth registration and fertility study at NSP 2002) as well as micro data from questionnaire surveys (GGS-PL study). I used a variety of research methods that include statistical analyzes of cross-sectional data (regression models) and longitudinal data (event history analysis, including multilevel models). In the case of data from the registration of demographic events, I used standard measures both in terms of cohort (longitudinal) and cross-sectional (period) approach. Additionally, in order to analyze the changes in the fertility rate, I used advanced demographic data analysis models to determine the extent to which the fertility decrease resulted from postponement process, as well as to determine if there was an increase in fertility in older groups age, i.e. the so-called recuperation effect.

Despite the change of the research field, i.e. the transition from consideration of demographic processes in historical terms to dealing with contemporary changes, my research ventures were in a way a continuation and development of the analyzes performed in the doctoral dissertation. While in PhD I was interested in the issue of fertility changes in the context of the first demographic transition (Coale and Watkins, 1986), in my scientific activity after obtaining a doctoral degree I focused on studying fertility changes in the context of the second demographic transition (Van de Kaa, 1987; Lesthaeghe, 1995). Research activity regarding contemporary changes in fertility pattern was associated with participation in several significant research



projects and culminated in the research grant I have been awarded from the Ministry of Science and Higher Education (2011).

In the project *"Job instability and changes in family and household trends: how to cope with these challenges through occupational and social policy actions based on a renewed Lisbon Strategy"*, financed by DG Employment, Social Affairs and Equal Opportunities, apart of the Polish research team lead by prof. dr hab. Janina Józwiak, researchers from Italy, Slovenia and Germany participated. The coordinator of the whole project was prof. Fiorenza Deriu from the university "La Sapienza" in Rome. As part of the project, a survey was conducted in these four countries, which concerned issues such as the history of respondents' employment, formation of relationships, breeding plans and attitudes, household time budgets and reconciliation of work and family responsibilities. The results of analyzes of data from this study along with a comparative analysis of the economic, demographic and institutional context were used to prepare a study describing social policy in these countries in the context of changes in the labor market, changes in families and households, and changes in social roles of women and men and gender equality.

In the years 2008-2011 I was a member of the research team (under the supervision of Prof. Janina Józwiak) implementing the project "Panel research on the transformation of relations between generations, in the family and between women and men: Generations, families and gender (the first round of the study)" (MNiSW / NCN). It is part of the international research program Generations and Gender Program - GGP, whose primary goal is to collect and provide scientifically available data (Generations and Gender Survey -GGS), which enable a better understanding of the demographic and social processes that take place in the modern world. The processes at the center of the program's interest include changes in behaviors concerning the creation, development and break-up of families, intergenerational relations as well as social roles of women and men in family and professional life. The innovative concept of the research project was developed by an international group of experts. The international research program includes: the implementation of a panel research, which includes three rounds carried in individual countries according to agreed methodology every three years and the creation of a contextual database containing data on the economic and social situation and cultural changes in these countries. In addition to European countries, the program also includes Australia and Japan, and those interested in joining the program are Canada, the United States, and China. The first round of the study was carried out in 20 countries. In Poland, the GGS-PL survey was conducted on a nationwide sample of people aged 18-79. The first round of the survey collected data on almost 20,000 respondents (Kotowska and Józwiak, 2011, Kotowska 2017). Data on biographies of family and professional people born in 1930-1992 were obtained along with information about their education, financial situation and social contacts. The questionnaire also included questions about the norms, values, intentions and expectations of the respondents. As part of the project, I was responsible for the preparation of a part of the biological reproduction survey. This was to determine whether, due to the growing age of first childbearing, there is a decline in female fertility and, consequently, the possibility of realizing reproduction plans. It was a unique adaptation of the questionnaire measuring the so-called "waiting time to pregnancy" (Olsen et al., 1998; Joffe et al., 2005). This measurement allows

to determine the decrease in biological fertility with the age of the woman, which manifests itself in the longer time necessary to become pregnant and in extreme cases the impossibility of conceiving a child. The analysis of this phenomenon is particularly important considering the postponement of decisions about having children observed in Poland since the early 1990s, hence the study of this phenomenon may contribute to a better understanding of the consequences of the observed demographic changes.

This research topic was continued as part of the second round of research carried out in the project "Panel research on the transformation of relations between generations, in the family and between women and men: Generations, families and gender (second round of research)" funded by NCN as part of the Harmonia program. The second round of the GGS-PL questionnaire was carried out at the turn of 2014 and 2015 in cooperation with the Office for Statistical Research and Analysis at the Polish Statistical Association (PTS). A re-interview was conducted on over 60% of respondents, and an additional group of women and men aged 18-20 who were too young to participate in the study four years ago. In total, in the second round of the study data from nearly 14,000 people were acquired, and in the second round of the study a module was also added that tests the waiting time for pregnancy.

Thanks to the use of the module to study the waiting time for pregnancy in the GGS-PL project, analyzes resulted in two publications relevant to my scientific achievements:

Tymicki, K. (2013) Zamierzenia prokreacyjne a możliwość ich realizacji w kontekście czynników biologicznych. *Studia Demograficzne*, 2(164): 11-33

Tymicki, K. (2017) Measuring the waiting time to pregnancy with the use of a retrospective questionnaire in the course of the GGS-PL study entitled 'generations and gender survey'. *Zdrowie Publiczne i Zarządzanie Zeszyty Naukowe Ochrony Zdrowia*, 15(2): 161-171

In parallel to the work on the GGS-PL project in 2008, based on the agreement between the Central Statistical Office and the Institute of Statistics and Demography Unit data sets from birth registration for the years 1985-2007 were received. The data sets provided by the Central Statistical Office contained information about all children born in the abovementioned period with information on, among others, the place of residence of the mother, birth weight, vitality, the order of birth, date of birth of the mother, mother's education, marital status of the mother, date of marriage. This detailed information allowed for the reconstruction of cohort fertility rates and the use of advanced methods for the analysis of fertility patterns (Bongaarts and Feeney 1998). By obtaining data from the Central Statistical Office, it was possible to continue the cohort analyzes of fertility initiated by prof. Jerzy Holzer (Holzer and Holzer-Żelażewska, 1997). The original analyzes have been expanded to include the measurement of fertility changes in the context of the tempo and level effect according to the Bongaarts and Feeney formula (1998). The results of the work were published in the article:

Holzer-Żelażewska, D., Tymicki, K. (2009) Cohort and period fertility of Polish women, 1945-2008. *Studia Demograficzne* 1(155): 48-69.



Data from birth registration are obtained on a regular basis to this day, which allowed to prepare an update of analyzes from 2009, including the extension of the scope of analyzes and the use of new analytical methods (Sobotka et al. 2011). The results were published in the article:

Tymicki, K., Zeman, K., Holzer-Żelażewska, D, (2018) Cohort fertility of polish women, 1945–2015: the context of postponement and recuperation. *Studia Demograficzne* 2(174): 5–21.

Acquiring individual data from birth registration from the Central Statistical Office coincided with the establishment of cooperation with the Vienna Institute of Demography and the Max Planck Institute for Demographic Research as part of the Human Fertility Database project (Jasilioniene et al 2009). This project aimed at collecting international data on births and their unification on a common analytical platform provided by the project website (www.humanfertility.org). Cooperation continues to the present. My role in the project is to develop Polish data from birth registration and transfer them to foreign project partners, as well as to prepare documentation and description of the methodology for the development of the data set.

In May 2011 from the funds of the Ministry of Science and Higher Education, I received a grant entitled: "Transformations of fertility in Poland in 1945-2010 in the context of the tempo and quantum effects: micro and macro perspectives." Grant implemented until May 2014. I dealt with the characteristics of fertility changes in Poland in the period 1945-2010 and the search for their main causes. I have distinguished the main components of these changes: the so-called tempo changes, i.e. the average age at birth of the first child (tempo effect) and changes in the fertility rate, i.e. the number of children born (quantum effect). In the analysis of fertility changes, I used various sources of data: data from the GUS birth registry, censuses (aggregated / macro level), as well as retrospective individual data (at the micro level) from the GGS-PL survey).

Based on data from birth registration and data from the fertility survey of women carried out during the 2002 National Census (NSP 2002), I reconstructed fertility measures in terms of cross-sectional (period) and longitudinal (cohort) perspectives. The result, which deserves special emphasis, is the reconstruction of cohort fertility measures. These fertility measures are not normally published by the Central Statistical Office, although without them it is not possible to fully assess the fertility changes. Measurement of completed (total) fertility allows full characterize female fertility. In addition, on the basis of data in a cross-sectional perspective (for subsequent calendar years), I performed a calculation of the cross-sectional theoretical fertility rate using the so-called Bongaarts-Feeney formula. This method allows to determine to what extent the observed changes in fertility levels resulted from the tempo effect and in which from the quantum effect (number of children). In order to supplement these findings, I carried out an analysis of data from the 2002 NSP fertility survey. These analyses were aimed at data validation, i.e. determining the degree of their reliability and usability in the context of the general objectives of the analyzes. Next, I carried out analyzes of fertility changes by the level of education of women, which is an important factor influencing childbearing decisions.



An additional analytical element implemented using a macro perspective was a comparative analysis of fertility of women and men, as well as the development of a methodology to take into account the fertility of women and men at the level of aggregate demographic measures. In the period under analysis (1985-2011), no significant differences in fertility of women and men were observed, which is mainly the result of low female mortality rates. Based on this analysis, in cooperation with dr. Vegard Skirbekk (Centre for Fertility and Health in Norway and professor of Columbia University) and dr. Nico Keilman (University of Oslo, Norway) we have developed a way to measure the total fertility of women and men. This innovative method of measurement is particularly applicable in populations characterized by high mortality of women, as well as disproportion in the number of women and men.

A very important element of this project was also the examination and measurement of the impact of postponement in reproductive decisions on the possibility of realization of reproductive intentions. As a result of the analyzes, I found that the decline in women's biological fertility with age can be a significant obstacle not only in the context of conceiving a pregnancy, but also in the context of reaching the intended number of offspring. Based on the data obtained from the answers to the questions included in the GGS-PL survey, I determined that the fall in fertility threatening the possibility of pursuing reproductive intentions concerns mainly women over 35 years of age. Thus, the observed tempo effect (delaying the decision about motherhood) can affect the permanent reduction of the fertility rate and the limitation of the possibility of pursuing procreative goals after the age of 35. It should be emphasized that this proposal particularly concerns groups of women deciding for late motherhood, i.e. those with a higher level of education and professionally active people, which constitute an increasing part of the population of potential mothers. As part of the tasks provided for in the research application, I published the following articles:

- Tymicki, K (2013) Zamierzenia prokreacyjne a możliwość ich realizacji w kontekście czynników biologicznych. *Studia Demograficzne* 2 (164): 11-33
- Tymicki, K (2010) Validation of data quality from Polish Fertility Survey 2002 with use of cohort fertility rates. *Studia Demograficzne* 1-2 (157-158): 61-77.
- Skirbekk, V., Tymicki, K. Keilman, N. (2014) Measures for human reproduction should be linked to both men and women. *International Journal of Population Research*: 908353.

In the NCN grant "Patterns of reproduction in the light of social class theories of Pierre Bourdieu" (2017 - 2020), which I direct, I strive to broaden knowledge about patterns of reproduction by using sociological theory of social classes by Pierre Bourdieu (Bourdieu 2005, Bourdieu and Passeron 1990). This theory can help to understand the diversity of individual decisions about having children in terms of class affiliation. This is particularly important given the changes in the structure of the population due to the level of education leading to a decrease in the importance of this characteristic as differentiating individual procreative behaviors. Thus, the social class, understood as a composite measure taking into account not only the level of education, but also cultural, social and economic capital, takes on a new meaning in the analysis of procreation.



The project has applied a quantitative approach involving the use of existing data for the construction of the "social class" variable. These are employment history data (ISCO codes) from the GGS-PL study. The social class is used as an alternative, to the level of education, measure differentiating demographic behavior of individuals. This seems justified, given the increasing unification of the educational structure of Polish society, which is manifested mainly by the growing share of people with higher education. This will enable the assessment of the usefulness of both the "social class" and the "level of education" as characteristics differentiating individual behaviors that are components of reproduction patterns.

As part of the studies prepared for the needs of the project, I used the methodology of constructing social classes based on the ISCO code, in the research of dr Mikołaj Lewicki from the Institute of Sociology at the University of Warsaw. On the basis of data from the Household Budget Survey, I have prepared analyzes on the characteristics of respondents burdened with a mortgage loan divided into the proposed social classes. These analyzes have been published in two chapters of the book which I have co-authored:

Lewicki, M., Tymicki, K. (2019) Stratyfikacja i moc klasotwórcza kredytu hipotecznego w Polsce. [w.]: Lewicki, M., "Społeczne życie hipoteki". Warszawa, Wydawnictwo Naukowe Scholar. (str. 219-260)

Lewicki, M., Tymicki, K. (2019) Klasy z hipotekami [w.]: Lewicki, M., "Społeczne życie hipoteki". Warszawa, Wydawnictwo Naukowe Scholar. (str. 261-270)

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3. The scientific achievement referred to in art. 16 ust. 2 bill of 14th March 2003r. on academic degrees and academic title, and on the degrees and title of the field of art (Dz.U. nr 65 poz 595 ze zm).

As a scientific achievement, I submit to the assessment a set of thematically related publications, which I am entitling: **"Transformations of fertility in Poland from macro- and micro-perspective. Context of postponement and recuperation."** It is made up of a series of eight scientific articles: seven of them are in English, one in Polish. Three articles were created as part of the scientific project "Transformation of fertility in Poland in the years 1945-2010 in the context of the effect of tempo and quantum: the micro and macro perspective", prepared according to my original concept and implemented by me. All publications submitted for evaluation, in which I am a co-author, have been prepared with researchers holding a PhD degree with a similar or longer time spend as a doctor.

No.	Publication	My contribution	IF according to the Web of Science	Points according to MNiSW
SCIENTIFIC ARTICLES PUBLISHED IN JOURNALS APPEARING AT JCR LIST				
1.1.	Tymicki, K., (2009) Correlates of infant and childhood mortality. A theoretical overview and new evidence from the analysis of longitudinal data of Bejsce (Poland) parish register reconstitution study of the 18th-20th centuries. <i>Demographic Research</i> 20(23): 559-594.	100%	1,116	25
SCIENTIFIC ARTICLES PUBLISHED IN OTHER JOURNALS				
1.2.	Holzer-Żelaźewska, D, Tymicki, K (2009) Cohort and period fertility of polish women, 1945-2008. <i>Studia Demograficzne</i> 1(155): 48-69.	60%		13
1.3.	Tymicki, K (2010) Validation of data quality from Polish Fertility Survey 2002 with use of cohort fertility rates. <i>Studia Demograficzne</i> 1-2 (157-158): 61-77.	100%		13
1.4.	Tymicki, K (2013) Zamierzenia prokreacyjne a możliwość ich realizacji w kontekście czynników biologicznych. <i>Studia Demograficzne</i> 2(164): 11-33	100%		13

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1.5.	Keilman, N., Tymicki, K., Skirbekk, V. (2014) Measures for human reproduction should be linked to both men and women. <i>International Journal of Population Research</i> : 908353	30%		
1.6.	Tymicki, K., (2017) Measuring the waiting time to pregnancy with the use of a retrospective questionnaire in the course of the GGS-PL study entitled 'generations and gender survey. <i>Zdrowie Publiczne i Zarządzanie Zeszyty Naukowe Ochrony Zdrowia</i> 15(2): 161-171	100%		11
1.7.	Tymicki, K (2018) Decomposition of first births in Poland, according to timing of marriage and conception. <i>Wiadomości Statystyczne</i> 12(691): 23-39	100%		12
1.8.	Tymicki, K., Zeman, K., Holzer-Żelażewska, D, (2018) Cohort fertility of polish women, 1945–2015: the context of postponement and recuperation. <i>Studia Demograficzne</i> 2(174): 5-21.	70%		13

The publications are related to the following research problems:

- measurement and analysis of changes in the fertility patterns during the first demographic transition,
- fertility measurement using longitudinal (cohort) measures and cross-sectional (period) measures during the second demographic transition,
- analysis of the biological consequences of postponement of the decision on having the first child,
- distinguishing the impact of the decrease in the number of children (level / quantity effect) and delaying the decision on having children (tempo effect) on the observed fertility,
- determination of the impact of delaying decisions on having offspring on biological fertility and the possibility of realization of reproductive intentions,
- assessment of the quality of data from the fertility survey at the National Census 2002,
- decomposition of the first births in Poland with respect to the relationship between marrying and conceiving a child.

The motivation to undertake research on the above topics was the desire to understand the mechanism and selected consequences of changes in the patterns of fertility both during the first and second demographic transition. The first demographic transition theory is characterized by changes in reproduction from the traditional one with high mortality and fertility to modern reproduction with low mortality and fertility, referring to social and economic changes, that create their context. Natural fertility was replaced by controlled fertility, which in turn lead to stabilization of the overall fertility rate at the replacement level (Coale and Cotts-Watkins, 1986, Szreter, 1993, Kirk 1996). However, in developed countries fertility

has continued to decline, and the number of countries with fertility below the simple replacement level is constantly growing. The second demographic transition theory describes the demographic changes leading to a further decline in fertility to the level called "lowest-low", i.e. with a total fertility rate below 1.35, and suggests an explanation to those changes (Van de Kaa, 1987; Lesthaeghe, 1995, Billari and Kohler 2004, Kohler, Billari and Ortega 2002).

Historical data sources indicate that the first demographic transition was characterized by a significant differentiation both in the moment of starting a permanent decline in fertility and its duration (Coale and Cotts-Watkins, 1986, Okólski, 1990). In the case of data used in my analyzes, it can be estimated that for the population of the Bejsce parish this process began in the second decade of the 20th century (Piasecki, 1990). It is assumed that the main factors influencing changes in the fertility patterns during the first demographic transition were the spread of contraception, a decrease in the mortality of children and infants, and a change in the social role of women. Improvement in the survival of children and infants was particularly important, as it is considered a necessary factor to initiate changes in the fertility patterns (Preston, 1978, Bideau, Desjardins and Brignoli, 1997). Considering the importance of the interaction between mortality and fertility patterns during the first demographic transition, the correct measurement is important here. This issue is the subject of one of the articles included in the collection creating my basic scientific achievement.

In the set of publications presented for evaluation, I place the main emphasis on the analysis of mechanisms and selected consequences of the second demographic transition, and thus the contemporary changes in the process of population reproduction. These changes were initiated in Poland in the second half of the 1980s. These changes manifested itself in a systematic decrease in the number of children born due to giving up births (second, third and subsequent), postponing the decision to have the first child (Bongaarts and Sobotka, 2012) and also the increase in the percentage of childless women (Frejka 2008a, 2008b). These changes were related to shifts in the pattern of family formation (decrease in the tendency to enter into marriages, postponement of marriage and dissemination of extramarital relationships), the growing number of extramarital births, and thus downwards shift in the frequency of bridal pregnancies (Matysiak, 2014).

Analyzes of fertility changes, constitute an important component of changes in the family formation process that have occurred in Europe since the mid-1960s. In the literature, these transformations are mainly explained by the already mentioned theory of the second demographic transition, which sees the main causes within the worldview, values, the labor market and education market or consumer aspirations (Van de Kaa, 1987; Lesthaeghe, 1995; Van de Kaa 1996, Surkyn and Lesthaeghe 2004). The second theoretical and research trend trying to explain the changes that were taking place refer to the changes in the socio-institutional context of decision making related to having children and starting a family. This concerned both the sphere related to the search for a partner on the marital market (Van Bavel, 2012), stability of employment and a stable source of income (Adsera 2005, 2011, Billari 2004, Kreyendfeld and others 2012), housing problems (Mulder and Billari 2012, Mulder 2006a) or problems in reconciling work with having children and changing the cultural role of women and men (Esping-Andersen and Billari, 2015, Billingsley and Ferrarini 2014, Goldscheider et


al. 2015). The above-mentioned analytical and theoretical currents are obviously not equivalent to the theory of the second demographic transition, but they constitute a significant contribution to understanding the mechanisms of contemporary demographic shifts in the context of changes taking place on the labor market and their significance for demographic behavior. They refer to the general concept of changes in social and cultural roles of women and men (Goldscheider, Bernhardt, Lappegard, 2015), changes in the social role of women (Esping-Andersen and Billari, 2015) and changes in the economic family model in the context of professional activity of both partners and the resulting economic benefits of combining income (Oppenheimer 1994, 1997).

In the literature on the subject, researchers emphasize that the way to deal with the above-mentioned constraints such as: partner search, employment stability or housing problems depends both on individual characteristics of individuals such as cultural capital (both in the institutionalized form as a level of education and a set of cultural and normative predispositions taken from the family home), material capital or social capital. These forms of capital will affect both the possibility of finding a partner with desirable traits (social and cultural capital), the possibility of finding stable employment (social, cultural and material capital) or the ability and reconciliation of work and having children (interchangeability of roles between partners or spouses as derivative of cultural capital owned). In addition, the ability to overcome the above-mentioned restrictions will largely depend on the institutional, economic and socio-cultural conditions of the country or region in which the individual lives (including: economic situation, unemployment level, access to housing resources, availability of pre-school care and nurseries, intergenerational transfer of material resources and assistance, education structure by gender).

The common demographic features of the fertility patterns described above were both changes in the age of first childbirth (a definite increase in the age of first childbearing for women) and often limiting the number of children to one or two. Deferring the decision on having a first child leads to the so-called the tempo effect, while limiting the number of offspring you have is determined as the effect of the quantum effect.

The issues described above have been reflected in a number of research projects that used extensive empirical material collected, among others, thanks to research programs such as Generations and Gender Program (GGP), under which a panel-based Generations and Gender Survey (GGS) was carried out. GGS research has enabled researchers to statistical modeling of demographic processes from the perspective of both changes in norms and values as well as individual determinants of procreative decisions, with particular emphasis on the age of first childbirth and analysis of determinants of transition between births (Vikat et. al, 2007; Kotowska and Józwiak, 2011, Kotowska 2017).

Another trend of fertility analyzes, complementary to analyzes using survey data, were analyzes based on data from birth registration obtained from statistical offices at both national and European level (Eurostat). Macro-demographic analyzes of fertility changes were to complement the analyzes made on the data from the surveys and enable international comparisons, as well as to describe in detail and accurately the fertility changes at the population level.



It can be said that the analysis of aggregated (macrodemographic) data accompanied the demography from the beginning of its existence as a separate scientific discipline and survived its renaissance thanks to the development of new analytical tools enabling more precise measurement of observed changes in fertility in the theoretical context characterized above. Although macro-demographic data in the context of fertility changes have been analyzed for many years (Hajnal 1947; Ryder, 1956, 1964, 1983) both in the cross-sectional and longitudinal (cohort) perspective, only relatively recently attention has been given to problems with the use of cross-sectional measures and cohort measures in the analysis of changes in the fertility pattern (Bongaarts and Feeney, 1998). This was mainly due to the observation that behind the decrease in the observed level of fertility there are two main mechanisms mentioned above, i.e.: postponing the decision about having a child and decreased propensity to progress to higher order births. The process of postponing the decision about pregnancy and the subsequent birth of the first child resulted from both the changes in norms and values (self-fulfillment, investments in human capital) as well as socio-institutional conditions such as employment stability, housing situation or problems in reconciling work and parental obligations (Frejka, 2008b).

These two mechanisms have led to a situation in which the use of only cross-sectional measures could lead to an incomplete picture of the fertility pattern in a given country due to the sensitivity of cross-sectional measures to changes in the average age of childbearing. These changes led to an overestimation of fertility decline when using only cross-sectional measures (Bongaarts and Feeney, 1998, Billari and Kohler, 2004). In response, a number of articles appeared to correct cross-cutting measures to eliminate the burden of fertility assessment resulting from changes in the average age of first-parent birth (Bongaarts and Feeney, 1998, Kohler and Philipov, 2001, Kohler and Ortega, 2002).

There was also a need to construct demographic measures to assess the phenomenon of so-called recuperation or compensation of fertility lost in younger age groups, increased fertility in older age groups. Measures of recuperation can be determined with the utmost precision in a cohort approach due to the fact that a decrease in fertility in a given cohort as a result of the delaying process can be compensated by reconstruction later (Frejka, 2011, Sobotka et al., 2011). The analysis of biological and social consequences of postponing the decision on having a child are of crucial importance from the perspective of possibility of rebuilding postponed births (Leridon, 2004, Liu and Case, 2011; Régnier-Loilier and Vignola, 2011; Schmidt, Sobotka and in. 2012). They can have an impact both on the measurement of this process at the macro level, and also or primarily on the possibility of realizing individual reproductive intentions. Problems with the recovery of births on a micro scale, that is in the course of life of individual units, may result from biological factors such as a decrease in female fertility with age, which may be manifested by difficulties associated with conceiving a child or reporting pregnancy.

The publications that make up my basic scientific achievement are part of the research discussed above both in terms of macro-demographic analyzes using cross-sectional measures and cohort measures as well as in the dimension concerning the consequences of the process of delaying motherhood at the micro-demographic level.



My macro-demographic analyzes are part of the wider context of research carried out in leading European research centers (Vienna Institute of Demography in Vienna and Max Planck Institute for Demographic Research in Rostock). Human Fertility Database is such a project. Its main purpose is the unification and standardization of fertility data in order to enable comparative analyzes both in cross-sectional and longitudinal terms (HFD, 2018). This project offers free access to data and the results of comparative analyzes (<http://www.humanfertility.org>). As part of this project, I was responsible for the preparation of data and documentation of the collection for Poland.

Personally, I contributed to the improvement of access to macro-demographic data, obtaining, within the cooperation between the Central Statistical Office in Warsaw and the Institute of Statistics and Demography of the Warsaw School of Economics, individual data from birth registration in Poland from 1985 to the present. I have independently developed the acquired data sets, which I then used for analyzes in the project financed by the Ministry of Science and Higher Education: "Transformations of fertility in Poland in 1945-2010 in the context of the tempo and quantum effects: micro and macro perspectives." Additionally, data obtained from Polish CSO was processed and then made available for the Human Fertility Database project mentioned above.

The preparation of these data for both Poland and other countries goes beyond the standard reporting of results by statistical offices mainly due to the cohort data development and the use of analytical methods to determine fertility changes in the context of postponement and recuperation. My research is part of a rich tradition of fertility analysis in Poland and is complemented by the analytical methods used (Boleslawski, 1974, 1993; Frątczak, Ptak-Chmielewska et al., 2011a, 2011b; Paradysz, 1992; Holzer, Holzer-Żelazewska, 1997)

As a result of research projects, analyzes and publications I contributed to:

- (1) measurement and explanation of selected aspects of changes in fertility patterns during the first demographic transition
- (2) development of available databases allowing to analyze fertility in the cross-sectional (period) and longitudinal (cohort) perspective and to assess their analytical usefulness,
- (3) to increase knowledge about fertility changes in Poland through the use of cross-sectional (period) measures, longitudinal (cohort) measures and the use of advanced analytical methods to estimate the influence of postponement and recuperation on changes in fertility patterns,
- (4) investigate the biological consequences of childbearing postponement with the use of survey data,
- (5) to deepen the knowledge about the relationship between the process of getting married and giving birth to the first child.



Below, I present my achievements in the five above-mentioned areas

(1) Measurement and explanation of selected aspects of changes in fertility patterns during the first demographic transition

In research works inspired by the analyzes made for the purposes of the doctoral thesis, I focused on the analysis of selected aspects of fertility pattern changes such as factors affecting the mortality of children and infants and the measurement of fertility for both sexes.

The publication (1.1.) aimed at discussing the theoretical context of the analysis of infant and child mortality and the construction of a statistical model of the analysis of the impact of factors selected as a result of the literature review. The analysis uses data from the reconstruction of the Bejsce parish registers. Statistical models on the impact of individual variables on the probability of death during the first 60 months of children's lives for individual cohorts under reconstruction were build. It should be emphasized that the analysis used not only the standard explanatory variables used in demography, such as: the sex of the child, intervals between births or the age of the mother at birth, but also variables resulting from the evolutionary approach. Such an explanatory variable is the presence of grandmother in the household. In the light of theory and empirical research, it can be stated that the presence of grandmother in a household can have a positive impact on the child's survival chances due to the post-menopausal period, in which women can support the reproduction of their daughters, thus indirectly contributing to increasing his own reproductive success (Beise and Voland, 2002, Sear et al 2000, Voland and Beise 2002, Graphene 1982, Hamilton 1964, Peccei 1995, Shanley and Kirkwood 2001).

In the publication (1.5.) together with dr. Vegard Sirbekkiem and dr. Nico Keilman, we proposed fertility measures for both sexes. By default, fertility rates are determined only on the basis of information on the number of children born by women. In this publication we proposed "net reproduction rate for both sexes (two-sex net reproduction rate - 2SNRR) and "general fertility rate for both sexes "(two-sex total fertility rate - 2STFR). These measures measure the fertility of women and men together, as well as the degree of substitutability of generation irrespective of sex. In the study I was responsible for the preparation and development of demographic analyzes using data from the reconstruction of parish registers from Bejsce. The proposed measures are of particular importance in populations with an unequal sex ratio. In this situation, the use of traditional demographic measures may lead to inaccurate measurements of the dynamics of changes in the size of the studied population.

(2) Development of available databases allowing to analyze fertility in the cross-sectional (period) and longitudinal (cohort) perspective and to assess their analytical usefulness,

The presented research achievements are largely based on the development of individual databases acquired from the Central Statistical Office, which contain information on births for subsequent years from 1985. These unique databases allow for in-depth demographic analysis using cross-sectional and longitudinal measurements. These analyzes are presented in the following publications: 1.2., 1.7., 1.8. In addition to using standard cross-sectional and longitudinal measures, I also used advanced methods of demographic analysis, such as the Bongarts-Feeney model (publication 1.2) and the "benchmark model" (publication 1.6), which



enable characterization of fertility patterns in Poland in the context of postponement and recuperation.

In addition, the analysis of individual level data from birth registration enabled the preparation of a publication aimed at examining the relationship between childbearing and entering into marriages or remaining in a relationship outside marriage (publication 1.7.).

My research also included a publication in which I made an assessment of the quality of available databases (fertility survey from the 2002 census) along with an assessment of analytical usefulness of this database (publication 1.3).

It should also be noted that the databases were not only used for own analyzes, but also made available to a wider community of researchers by including them in the Human Fertility Database project. As a result, comparative analyzes of data for Poland with data for other countries participating in the project are possible.

(3) Increase knowledge about fertility changes in Poland through the use of cross-sectional (period) measures, longitudinal (cohort) measures and the use of advanced analytical methods to estimate the influence of postponement and recuperation on changes in fertility patterns,

In addition to the reconstruction of standard cohort measures used in demography, the presented research output uses existing advanced methods of data analysis. These methods are particularly useful in populations in which the fertility pattern undergoes dynamic changes. In this situation Poland found itself after 1989, where not only a drop in the number of children born was observed, mainly due to the resignation from second, third and further births (quantum effect), but also and perhaps mainly due to delaying the decision concerning the birth of the first child. As noted above, this was not only the main factor of the observed decline in fertility, but also that the use of cross-sectional fertility measures could present a distorted picture of reality, and thus lead to erroneous conclusions about the intensity of fertility decline due to the increase in the average age childbirth. Researchers involved in the analysis of fertility patterns on the basis of macro data pointed out that the use of cross-sectional measures may lead to an erroneous assessment of fertility (Bongaarts and Feeney, 1998; Kohler and Phillipov, 2001; Kohler, Billari and Ortega, 2002; Kohler and Ortega, 2002). The results of these analyzes indicated that it is necessary not only to modify cross-sectional measures of fertility in order to improve the measurement, but also to popularize the use of cohort measures to reliably describe the fertility pattern changes.

Researchers pointed out that due to changes in the pace of reproduction (postponing the decision about having a first child) fluctuations in the fertility rate in individual calendar years will result from the process of postponement and then recuperation in fertility. Hence, the fluctuations in the total fertility rate, manifested by the decrease and then the increase in its value, will result from changes in the average age of birth of the first child and not individual preferences manifesting, for example, the resignation from having children. This situation may lead to negative interpretations of the decline in the level of fertility in a situation where it is only a temporary phenomenon. Hence, cohort analyzes, despite their limitations resulting from



time-consuming and lack of full information (especially for younger cohorts), may lead to a more reliable description of fertility changes.

It should be emphasized here that the described shortcomings of period measures do not disqualify them, but only indicate some limitations in their application and the necessity of proper interpretation of the calculated measures. As the researchers emphasize, period measures may still be very useful not only as relatively easy to calculate, but also as measures particularly useful in analyzing short-term stimuli affecting fertility such as economic crises or implementation of specific social policy solutions (Sobotka et al. 2011).

The usefulness of period measures to analyze fertility changes can be improved by the corrections proposed by many researchers (Bongaarts and Feeney, 1998, Kohler and Phillipov, 2001, Kohler, Billari and Ortega, 2002, Kohler and Ortega, 2002). These analytical methods allow to improve the efficiency and validity of period measures. In my research I used the Bongaarts-Feeney method (1998) to correct and adjust period fertility rates. Additionally, in order to assess the degree of postponement and recuperation, the so-called "benchmark model" has been used. This methodological approach has been originally proposed in the publication by Frejka and Calot (2001) and used in my analyses in the version proposed by Sobotka and others (2011) Both results of analyzes using the Bongaarts-Feeney method (publication 1.2) and using the "benchmark model" (Publication 1.8.) indicate that in Poland after 1989 we are dealing with the transformation of the fertility pattern manifested by a significant degree of postponement in the decision on having the first child while simultaneously, almost universal, resignation from third and subsequent births (publication 1.6) It should be emphasized, however, that unlike other European countries, Polish women still bear the first child, and a relatively low percentage of women never becomes mothers. While the resignation from third births and a strong limitation on the participation of women deciding to give birth to the second child is typical.

Considering such transformations of the fertility pattern in Poland, it should be emphasized that the use of cross-sectional measures, with incorrect interpretation, may lead to an overestimation of the scale of fertility decline in Poland (publication 1.2.). When analyzing cross-sectional measures, it should be remembered that we are dealing with calculations made for the so-called "synthetic cohorts" hence the calculated measures will be sensitive to changes in the average age of childbearing.

(4) Investigation of the biological consequences of childbearing postponement with the use of survey data

Research topics analyzed using macro data were deepened in publications regarding the consequences of postponing the decision about having a first child (1.4 and 1.6). In these publications, I focused on the analysis of the biological consequences of postponing the decision to have a first child in the context of changing the biological potential of women's procreation with age (Beets et al., 1994; Bianchi and Campana 1994). This phenomenon may lead to difficulties or inability to realize reproductive intentions due to the decline in women's biological fertility. This phenomenon is difficult to measure, especially on the basis of surveys (Toulemon and Testa, 2005, teVelde et al., 2012). An attempt to measure this phenomenon is



to determine the so-called "waiting time for pregnancy", the interval from the beginning of conscious efforts to have a child until pregnancy (Olsen et al., 1998, Jensen et al., 2005, Joffe et al., 2005). The measurement was proposed for a relatively simple set of questions addressed to women, which can be used in the survey (Joffe et al., 2005). The authors of the proposed method point out that the lengthening of waiting time for pregnancy in the case of women aged 35 and over may have consequences in the form of the inability to give birth to the intended number of children or in the case of an extreme threat of involuntary childlessness. These phenomena are important, taking into account the mechanisms of fertility pattern changes described above, consisting mainly in postponing decisions about the birth of a child.

In my research, I adapted the original questionnaire proposed by Joffe and colleagues (2005). The appropriate set of questions has been included in the first and second wave of the GGS-PL study. As a result of these studies, I was able to obtain unique data that became the basis for analyzes conducted on the basis of the first wave of the GGS study (1.4.) and both waves of the GGS-PL study (1.6.). As a result of these analyzes, I determined that women who start their efforts to conceive a first child over the age of 35 can expect a significantly longer waiting time for pregnancy than women who started earlier. Taking into account these results and information from analyzes on macro data, it can be stated that in Poland, a group of women affected by the problem of prolonging the time of waiting for pregnancy, and thus the potential threat of childlessness is still relatively small. However, it is also worth paying attention to the fact that the late start of efforts to conceive a child weakens the effectiveness of the potential intervention in the case of diagnosing problems with biological fertility. This is related to the fact that in the case of diagnosing such problems in women over 30 or 35 years of age, the effectiveness of medical intervention may be lower or not bring the desired effects in the form of pregnancy.

(5) Deepening the knowledge about the relationship between the process of getting married and giving birth to the first child.

As mentioned above, data from birth registration obtained from the Central Statistical Office were used not only to calculate cross-sectional and longitudinal measures, but also to decompose the first births with respect to the fact whether they were registered as extramarital, marital or conceived illegitimate, and children were born after marriage (publication 1.8.). The standard reporting method covers only the first two types of births, while the designation of the third type of births was possible on the basis of information from the date of birth of the child and the date of the marriage. The latter type of relationship is called in the Polish-language literature on the subject of "legitimization marriage" (Kałuza, 2008, Kukło, 2009, Szukalski, 2013), in English-language literature as "bridal pregnancy" (Hair, 1966, Raymo and Iwasawa, 2008). Both language versions contain a normative aspect, defining social pressure to legitimize a child born out of wedlock.

This issue is important due to changes in the fertility patterns in the aspect of the increase in the share of extra-marital births in the total number of first births. This is manifested, among other things, by weaker social pressure, as well as the availability of other forms of organization of family life such as unmarried couples or marriages preceded by a long period of cohabitation (Matysiak and Mynarska, 2014). An underestimated and poorly analyzed aspect of extramarital



births is precisely the phenomenon of the legitimacy of a child conceived outside of marriage. It can be assumed that the weakening social pressure, and thus the openness to new forms of family life, should lead to a reduction in the proportion of children conceived prematurely and born in a marriage in the total number of first births (Mynarska and Bernardi, 2007). In the publication, I showed that in fact since 1985 we have been observing a steady decrease in the share of this type of births with a systematic increase in the share of extra-marital births. It can therefore be concluded that changes in the norms and values surrounding the process of family formation and having children made that the legalization of extramarital births ceased to be as frequent as it was in the eighties, and couples more often decide to give birth to a child outside of marriage.

Summary of the results obtained, their practical use and contribution to the development of family and fertility research in Poland

To sum up, research works submitted as a set of thematically related publications entitled: **"Transformations of fertility in Poland from macro- and micro-perspective. Context of postponement and recuperation."** are a significant contribution to the knowledge about the processes of transformation of the fertility patterns in Poland. In my works, as part of a grant granted by the Ministry of Science and Higher Education, I made a pioneer study and analysis of individual birth registration data made available by the Central Statistical Office. Moreover, by participating in the Human Fertility Database project coordinated by the Vienna Institute of Demography and the Max Planck Institute for Demographic Research, the data was included in the database available to other demographers and allowing comparisons and international analyzes. Therefore, it is worth emphasizing the popularizing element of the development of individual data from birth registration.

In my works, thanks to cross-sectional and longitudinal analyzes, I have identified the most important features of changes in fertility patterns in Poland after 1989: an increase in the average age of first-child birth, a decrease in the proportion of women deciding for a second child, and a significant reduction in third and subsequent births, an increase in the extramarital births, as well as their significance for the assessment of fertility both in terms of cross-sectional and cohort. Thanks to the use of appropriate methods of demographic analysis, it was possible to determine to what extent cross-sectional measures are distorted due to changes in the age of birth of the first child (Bongaarts-Feeney model), and thus to what extent the cross-sectional fertility rate does not reflect real fertility trends. The analysis shows that the under-rating of cross-sectional measures resulting from the process of delaying the transition to motherhood were of the greatest importance at the beginning of demographic changes (in 1990-2010), while currently the rate of change in the average age of childbearing stabilized, which may increase the accuracy of fertility measurement in cross-sectional terms. At the same time, thanks to the use of the "basic-benchmark" model, it was possible to determine the extent of the recovery of lost birth due to the postponement process described above. As a result of analyzes including data up to 2015, I found that Polish women are characterized by a very high recuperation rate (around 65% for women cohort born in 1975 and older), a moderate recuperation rate for second births (around 40% for analogous cohorts) and the lack of recuperation of third births, which in turn means that women in Poland practically give up having a third child.



Analysis of the biological consequences of the process of delaying motherhood is a pioneering attempt of using the existing measurement tools to estimate the decline in fecundity with age. The analysis of this process is important, taking into account the transformation of the fertility pattern characterized above, consisting mainly in postponement in the decision on first child. This phenomenon may have negative consequences due to the decline in women's biological fertility with age (Wood, 1989). Thus, women postponing the decision to start efforts for a child may encounter difficulties in realizing their reproductive intentions. As I showed in my analyzes of waiting time for pregnancy based on data from the GGS-PL study, women postponing the decision to become pregnant may expect a longer interval between the start of efforts and the conception of the child due to the decline in biological fertility. Moreover, late start of the efforts to give birth to the first child may negatively affect the possibility of medical intervention in case of diagnosing fertility problems.

The decomposition of the first births due to marital, extramarital and bridal pregnancies is the first such analysis in Poland using data from birth registration. It provides information on the transformation of fertility patterns in the context of marriage and union formation. These analyzes confirm the results of other studies and indicate a decline in the share of marital births that are legalized via marriage in favor of an increase in the proportion of extra-marital births.

Publications presented in reported scientific achievement: "**Transformations of fertility in Poland from macro- and micro-perspective. Context of postponement and recuperation**" are the first such comprehensive and in-depth study on transformation of the fertility pattern in Poland during first and second demographic transition (after the year 1989). In my research I included not only standard demographic analyzes using longitudinal and cross-sectional measures, but also extended them with new analytical approaches to characterize fertility patterns due to changes in the age of childbearing and the number of children. Moreover, thanks to the presented analyzes, it was possible to determine the importance of these factors for the observed decline in the fertility rate in Poland. I also studied the consequences of these changes for the biological reproduction process by studying "waiting time for pregnancy", which allowed to show a significant decrease in procreative potential for women who are starting their efforts to conceive a child above 35 years of age. My research was carried out as part of individual research projects (MNiSW and NCN grants) or in teams consisting of academic staff of the Institute of Statistics and Demography of the Warsaw School of Economics (GGS-PL project). The analyzes were performed on the basis of various sources of quantitative data such as individual level data from birth registration or data from survey studies. I used a variety of research methods such as cross-sectional and longitudinal analysis of macro-demographic data or event history analysis carried out on retrospective survey data. My analyzes concern Poland. It is a justified choice, taking into account the lack of comprehensive analyzes of fertility patterns in Poland after 1989, as well as dynamic changes of this pattern in the analyzed period. I have always tried to interpret the results of my research in the international comparative context and use the latest theoretical and methodological findings in the field of demography. Presented scientific achievement can finally have a practical application thanks to showing the advantages and limitations of demographic (cross-sectional and longitudinal) measures and the



legitimacy of their use depending not only on the availability of data, but also on the nature of fertility patterns.

In addition, my research may contribute to a better diagnosis of the consequences of changes in the patterns of fertility resulting from postponement in decision about having a first child. The increase in the age of birth of the first child does not have to lead to a decrease in fertility and the persistence of its low level (see eg Sweden, France). This can be counteracted by rebuilding fertility in older age groups. However, rebuilding fertility depends not only on the decision of the child, but also on public awareness of biological and health limitations, that is, knowledge in the field of reproductive health, as well as access to appropriate diagnosis and treatment of infertility or, more broadly, adequate infrastructure for reproductive health services.

The issues discussed in the publications constituting my scientific achievement belong to the mainstream research on contemporary population processes, which represent a decline in fertility and persistence at a level that does not guarantee simple replacement of generations. Their consequences for population dynamics and changes in demographic structures, and especially the age structures of the population. Europe, in which the second demographic transition began, is not only the continent with the most rapidly declining population dynamics and the most advanced population aging process, but also the only continent with a decreasing number of working-age population. Growing awareness of the demographic situation in Europe and the resulting development challenges on the one hand, as well as the constantly expanded knowledge of changes in fertility patterns in European countries and their conditions on the other, have helped to understand: (a) how important fertility changes are for the demographic perspectives of Europe; and (b) the need to take action to encourage childbearing. In the second report of the European Commission on the demographic situation in Europe, the directions of such actions, called the constructive reaction to demographic changes on the continent and their consequences were defined. They included the promotion of demographic renewal in Europe, that is, actions to increase fertility in conditions of being at a level far away from guaranteeing simple reproduction (European Commission, 2006). It was an important signal of appreciating the importance of social policy, which supports the growth of fertility. In order to formulate its solutions at the level of individual countries and in the scale of the entire European Union, it is necessary to know about the mechanisms of fertility changes, or more broadly about family changes. The results of my research form an important contribution to this knowledge.

4. Discussion of secondary scientific achievements

In addition to the publications that I submitted for the evaluation as my main scientific achievement after the defense of my doctoral dissertation, I have published 5 other scientific articles (including 1 in journals from the JCR list). All the articles listed below were published after the defense of the doctoral dissertation, of which one (4.1) is a modified version of the chapter from the doctoral dissertation, where I introduced the comments and comments of the reviewers and significantly changed the scope of analyzes as well as the research methods used.



In addition, I was a co-author of 7 research reports. Below I present a list of these articles and research reports as well as a brief description of each of them.

Other scientific publications

No.	Publication	My contribution	IF according to the Web of Science	Points according to MNiSW
SCIENTIFIC ARTICLES PUBLISHED IN JOURNALS APPEARING AT JCR LIST				
4.1.	Tymicki, K., (2005) The interplay between infant mortality and subsequent reproductive behavior. Evidence for the replacement effect from historical population of Bejsce parish, 18th-20th centuries, Poland. <i>Historical Social Research</i> 30(5): 240-264.	100%	0,192	20
BOOK CHAPTERS				
4.2.	Tymicki, K., (2008) When do kinsmen really help? Examination of the cohort and parity specific kin effects on fertility behavior. Case of the Bejsce parish register reconstitution study, xvii-xx centuries, Poland. [w:] Bengsston, T., i Mineau, G.P., (red.) "Kinship and demographic behaviour in the past", Springer Press: London (str. 135-154)	100%		4
4.3.	Tymicki, K., (2015) From families to individuals, from spinsters to singles, from parents to childfree. Demographic and economic perspectives on changes in family formation patterns, [w:] Adamczyk, A., (red.) „Singlehood from Individual and Social Perspective“, Wydawnictwo Uniwersytetu Poznańskiego: Poznań (str.15-36)	100%		4
4.4.	Lewicki, M., Tymicki, K. (2019) Stratyfikacja i moc klasotwórcza kredytu hipotecznego w Polsce. [w.]: Lewicki, M., "Społeczne życie hipoteki". Wydawnictwo Naukowe Scholar: Warszawa (str. 219-260)	35%		4
4.5.	Lewicki, M., Tymicki, K. (2019) Klasy z hipotekami [w.]: Lewicki, M., "Społeczne życie hipoteki". Warszawa, Wydawnictwo Naukowe Scholar: Warszawa (str. 261-270)	35%		4

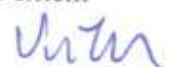
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The publication (4.1) concerns demographic analyzes with the use of data from the reconstruction of parish registers of the agricultural population from the Bejsce parish. The reconstruction of parish registers covering the period from the eighteenth to the mid-twentieth century was performed by a team led by professor Edmund Piasecki (1990). The purpose of the publication (4.1.) Was to analyze the relationship between premature death and the birth of the next child. The analysis of other historical sources shows that the early death of one of the children in the household can positively influence the probability of another child appearing in the family. I used the event history analysis to asses the length of the interval between the birth of subsequent children for families who experienced and did not experience rapid loss of a child. The results of the analyzes indicate the existence of a replacement effect, i.e. a faster conception and the birth of another child in the families where the previous child died prematurely.

The research goal of the publication (4.2.) was to determine the influence of the close and distant family on the characteristics of procreative behaviors of individuals. Family support was operationalized as the presence in the household of the so-called "extended family", that is relatives or people from the older generation (grandparents), as well as help received from older children (care for younger siblings). The analyzed dependent variables were: probabilities of transition between consecutive births, completed fertility and the number of children living through the age of 5. The analysis used a multilevel event history analysis together with the dynamics of the influence of explanatory variables depending on the analyzed cohort. The results of the study indicate the existence of a strong influence of the presence of all the above groups on selected dependent variables. Interestingly, this effect is clearly weaker for younger cohorts compared to older cohorts. The dividing line runs here according to the theory of the first demographic transition and the transition from natural fertility to controlled fertility.

Position (4.3.) is a review chapter devoted to the analysis of demographic changes in the meaning and function of the family from a social and economic perspective. The article presents an account on demographic change as a departure from a family-based society to an individualized society based on self-sufficient units. These considerations use a wide range of theoretical approaches as well as a review of existing empirical studies. I point out that the described changes were important for such spheres as: partner selection, forming relationships or having children. In each of these spheres there is a change consisting in the departure from the "traditional" pattern in favor of the "individualistic" pattern, which manifests itself, among others, by perception of people without a partner as "singles", not old bachelors or spinsters, no stigmatization of relationships informal or social acceptance of voluntary childlessness as a life choice. Thus, the changes described in the presented chapter also concerns the semantic layer, which has ceased to be negatively marked.

In chapters developed together with dr. Mikołaj Lewicki (Assistant Professor at the Institute of Sociology, University of Warsaw) (4.4 and 4.5), I was responsible for preparing analyzes of data from Household Budget Survey on the characteristics and diversity of households in Poland due to the fact of having a mortgage loan (broken down by loan currency) in comparison with households not burdened with a mortgage loan. This study was aimed at determining to what extent the burden on households with mortgage loans affects the wealth and demographic structure of households. An additional objective of the study was to determine to what extent



the possession of a mortgage loan may be a class-creative factor enabling social advancement. Considering the last of these research goals, it falls within the spectrum of my research activity related to the NCN grant: "Patterns of population reproduction in the light of social class theory of Pierre Bourdieu".

Scientific working-papers and research reports

1. Sytuacja demograficzna Polski. 2005, Janina Józwiak, Krzysztof Tymicki. Raport opracowany dla Komisji Europejskiej.
2. Job Instability and Changes in Family and Household Trends: how to cope with these challenges through occupational and social policy actions based on a renewed Lisbon Strategy. Fondazione Giacomo Brodolini, 2007. Co-author with prof. Janiną Józwiak and prof. Irena Kotowska. <http://www.fondazionebrodolini.it/publicazioni/i-quaderni/job-instability-and-family-trends>
3. Demographics and Higher Education in Poland. Janina Józwiak and Krzysztof Tymicki [in] Demographics and Higher Education in Europe - Institutional Perspective. Lazar Vlaseceanu i Laura Grunberg (ed.) UNESCO-CEPES, Cluj University Press, 2008. https://www.academia.edu/34335335/Demographics_and_Higher_Education_in_Europe_Institutional_Perspectives
4. Panelowe badanie przemian relacji między pokoleniami, w rodzinie oraz między kobietami i mężczyznami: Generacje, rodziny i płeć kulturowa (GGs-PL1). <http://kolegia.sgh.waw.pl/pl/KAE/struktura/ISiD/projekty/ggs-pl/Strony/default.aspx>
5. Analiza przemian dzietności w Polsce wraz z opracowaniem scenariusza rozwoju zmian współczynnika dzietności po roku 2015. Research report prepared for Kancelaria Prezesa Rady Ministrów, 2014.
6. Fertility and Family Policies in Central and Eastern Europe after 1990. Comparative Population Studies Preprint, Frejka, T., Gietel-Basten, S., 2016. As a „contributing autor“, preparation of demographic analyses for Poland. <http://www.comparativepopulationstudies.de/index.php/CPoS/article/view/212>
7. „Human Fertility Database documentation: Poland”. Tymicki, K., Zeman, K., 2017.D Database documentation. <https://www.humanfertility.org/Docs/POL/POLcom.pdf>

Work [1] was a general description of the demographic situation in Poland developed for the needs of the European Commission. In the report I was responsible for the preparation of macro-demographic data obtained from the Central Statistical Office, as well as the preparation of a description and interpretation of data on changes in the fertility pattern.

The project [2] aimed to conduct the survey study on such issues as the history of respondents' employment, forming relationships, breeding plans and attitudes, household time budgets and reconciliation of work and family responsibilities. The project was also designed to describe and analyze the institutional context of reproductive decisions in the countries covered by the study. The project collected data as a result of a survey, macro-demographic data, and also

conducted "desk-research" to determine the institutional context (social policy, availability of pre-school care). The collected data served to prepare a study characterizing social policy in these countries in the context of changes in the labor market, changes in families and households, and changes in the social roles of women and men and the issue of gender equality.

The report [3] aimed to determine the consequences of demographic changes in the higher education system in selected European countries. Demographic changes were included here as changes in the life course of individuals, the lifestyle of individuals and, finally, growing educational aspirations. The result of the analysis and research was to determine the type and direction of changes in the higher education system in response to the observed demographic changes of modern societies.

The development of the results of the GGS-PL study [4] concerned the reconstruction of the biographies of family and professional respondents together with the definition of the social and institutional context of making decisions about having children and starting a family. The report characterizes the surveyed group due to all aspects examined in the survey along with information on the financial situation of families, organization of life in the family, health status, social contacts and especially the relationship between parents, children and grandparents. The report also describes the issue of the implementation of reproductive intentions in the context of delaying decisions about the child and the resulting health consequences.

The report and database prepared for the needs of the Chancellery of the Prime Minister [5] concerned the issue of fertility forecasting on the basis of detailed data from birth registration obtained from the Central Statistical Office. Based on this information, I have constructed an analytical tool to generate development scenarios and changes in fertility rates in Poland from 2015 to 2030.

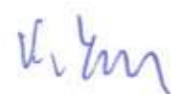
For the needs of the report [6] together with prof. Irena E. Kotowska and Anna Rybińska, MA, I was responsible for the development of fertility data and analyzes for Poland together with the description of family policies after 1989.

As part of work on the preparation of data for the purposes of the Human Fertility Database [7] project, together with dr. Krystofem Zeman, from the Vienna Institute of Demography, I developed a document characterizing databases for Poland. This characteristic includes not only the methodology of database preparation but also database limitations resulting from the phenomenon of migration of Poles to other EU countries.

Indicators of publication achievements

My publication output in the period after obtaining a PhD covers (authorship and co-authorship):

- 6 scientific articles in Polish scientific journals, 5 of which are in English
- 3 scientific articles in foreign scientific journals, of which 2 in journals from the JCR list



- 4 chapters in books, two of them in English
- 8 scientific reports from research, including 4 published online, the remaining are expert internal reports for the needs of the contracting authority.

Parametric evaluation of my publication output:

- H-indeks according to Google Scholar: 6; H-indeks according to Web of Science: 2; H-indeks according to Scopus: 3
- Number of citations according to Google Scholar: 207; Number of citations according to Scopus: 52; Number of citations according to Web of Science: 12
- Summary IF of my output of papers published after completion of my PhD according to JCR list: 1,308
- Total number of points for scientific articles published after PhD according to MNiSW (according to the list as of year 2017): 136, of which 45 for A list publications.

5. Other scientific achievement

Participation in research projects

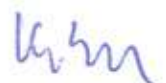
In the period after the defense of my doctorate I managed two national research projects (one project is completed, the other ends in May 2020). In addition, I participated in three research projects, two of which were of international character. Below I mention these projects along with the most important information about the project and my role in the project.

International research projects

Job Instability and Family Trends (JIFT), project implemented in 2006 by the Institute of Statistics and Demography of the Warsaw School of Economics, together with prof. Janina Józwiak and prof. Irena Kotowska in the scientific consortium with the university "La Sapienza in Rome, Koper University and Max Planck Institute for Demographic Research in Rostock. My role in the project was to develop data for Poland and to prepare a fragment of the report on behaviors and procreative intentions.

The main goal of the project was to conduct a survey on the situation of women in the labor market in the context of the decision about having a child and forming a family. The project was also designed to describe and analyze the institutional context of making procreative decisions in the countries covered by the study.

Human Fertility Database (HFD), project implemented since 2007 by the Max Planck Institute for Demographic Research in Rostock and the Vienna Institute of Demography. My role in the project was to develop databases for Poland and to adapt them to a format that allows international comparisons. Together with dr. Krystofem Zeman, from the Vienna Institute of Demography, I also developed documentation on data sets for Poland.



The main objective of the project is to integrate existing data sources to create an online analytical platform that allows generation of basic and advanced fertility measures in both cross-sectional and longitudinal terms.

National projects that I managed

Changes in fertility patterns in Poland in the years 1945-2010 in the context of the tempo and quantum effect: micro and macro perspectives, the Institute of Statistics and Demography, Warsaw School of Economics, a project implemented under a grant awarded by the Ministry of Science and Higher Education in 2011-2014. The role in the project: the manager.

The research project aimed to characterize the changes in fertility patterns in Poland in the period 1945-2010 and to explain its' main causes. In the analysis, the main components of these changes were distinguished, namely the so-called pace changes or the average age of first childbirth (tempo effect) and changes in the fertility rate, i.e. the number of children born (called quantum effect). Realization of the objectives of the research project has been achieved by applying micro and macro perspectives both in the analytical and cognitive dimension. In practice, this meant the use of various data sources: data from birth registration, censuses (data at macro level), and data from the survey "Generations and Gender Survey - GGS-PL".

Patterns of population reproduction in the light of Pierre Bourdieu's social class theory, The Institute of Statistics and Demography, Warsaw School of Economics, a project financed by the National Science Center as part of the SONATA program, 2017-2020.

The main goal of the project is to broaden knowledge about reproduction patterns by applying the sociological theory of social classes of Bourdieu (Bourdieu 2005, Bourdieu and Passeron 1990). The project applied a quantitative approach based on the use of existing data for the reconstruction of the "social class" variable based on the employment history (ISCO codes) based on data from the GGS-PL study. The social class is used here as an alternative, as compared to the level of education, a measure differentiating the demographic behavior of individuals. This seems justified considering the increasing unification of the educational structure of Polish society, manifested mainly in the growing share of people with higher education. Considering the above, the implementation of the research objectives of the project will make it possible to assess the usefulness of both the "social class" and the "level of education" as a feature differentiating individual behaviors that are components of reproduction patterns.

Other national research projects

Panel research on changes in relations between generations, in the family and between women and men: Generations, families and gender (GGS-PL1 and GGS-PL2), the first wave of research carried out in 2008-2011 by the Institute of Statistics and Demography of the Warsaw School of Economics as part of a project financed by the National Science Center (No. 554 / N-UNECE / 2009/0). The second wave of the study was carried out in the years 2014-2015 as part of the Harmonia project financed by the National Science Center (No. 2013/08 /



M / HS4 / 00421). In both waves of the project I was a member of the research team and was directly responsible for the preparation of the part of the questionnaire regarding the measurement of waiting time for pregnancy and I took part in writing the final report on both waves of the study.

The main objective of the research was to recreate the family and professional biographies of respondents together with obtaining detailed information on the financial situation of families, organization of life in the family, health status, social contacts and especially the relationship between parents, children and grandparents. The study also provided information on values, reproductive purposes, and an important problem of difficulties in implementing parental intentions related to delaying decisions about the child and the state of health was made.

The most important appearances at international scientific conferences

In the period after the defense of my doctoral dissertation, my works were presented at 34 international and national scientific conferences. All of these speeches were done by me. The most important conferences where I presented my work are:

- European Population Conference (held every two years) where I participated in all conferences from 2003. and at all these conferences I presented the results of my research (8 presentations on regular sessions).
- Population Association of America (held annually), where I participated in 2006, 2012, 2015 and at all these conferences I presented the results of my research (4 presentations on regular sessions and 2 poster presentations).
- International Population Conference (takes place every four years), where I have participated in all conferences since 2005 and presented all the results of my research at all these conferences. (4 presentations on regular sessions and 2 presentations in the form of a poster).

I have presented a full list of conference speeches in the list of published scientific papers or creative professional works.

Speeches at the invitation (delivered by me):

1. Demographic trends in Poland over the past 25 years. Presentation at conference entitled: „*Driving forces behind demographic trends in Visegrad countries: The role of migration and family formation*“, 10-11 September 2015, Prague, Czech Republic.
2. Fertility of Polish women in period and cohort perspective: context of postponement and recuperation. *Speech at an open plenary session of the Committee on Demographic Sciences*, 1 April 2019, Warsaw.

Awards and scholarships for scientific activities:

- (1) "START" Scholarship of the Polish Science Foundation in 2005 and 2006



- (2) The Award Gunther Beyer for the best article reported by a young scientist at the European Population Conference, Liverpool, 2006.
- (3) The Tygodnik 'Polityka' award for young scientists 'Stay with us', June 2007
- (4) Second degree award of the Rector of the Warsaw School of Economics for the overall scientific achievements, 2013

6. Teaching activities

In the period after the defense of the doctoral dissertation I conducted the following academic courses:

- **Statistics**, at the Warsaw School of Economics for undergraduate students (from the academic year 2005/2006 to the academic year 2018/2019) lecture and classes in Polish.
- **Demography**, at the Warsaw School of Economics for undergraduate students (from the academic year 2012/2013 to the academic year 2018/2019) lecture in English.
- **Demography**, at the Warsaw School of Economics for doctoral students (in the academic year 2012/2013) a lecture in Polish.
- **Qualitative methods of social research**, at the Warsaw School of Economics for undergraduate students (from the academic year 2005/2006 to the academic year 2008/2009), a laboratory in Polish.
- **Survey Methods and Statistical Analysis** at the Warsaw School of Economics for undergraduate students (from the academic year 20012/2013 to the academic year 2015/2016), lecture and classes in English.
- **Survey Methods**, at the Warsaw School of Economics for undergraduate students (from the academic year 20016/2017 to the academic year 2018/2019), classes in English.
- **Demography**, at the Institute of Sociology of the University of Warsaw (from the academic year 2007/2008 to the academic year 2012/2013), lecture in Polish.
- **Economic demography** at the Institute of Sociology of the University of Warsaw (in the academic year 2005/2005 and 2006/2007), seminar in Polish.
- **Contemporary fertility patterns: facts interpretations, analyzes**, at the Institute of Sociology of the University of Warsaw (in the academic year 2009/2010), research seminar in Polish.
- **Demography**, at the College of Ecology and Management, the direction of Public Health (from the academic year 2013/2014 to the academic year 2017/2018), lecture in Polish.
- **Demography**, at the Kozminski University (in the academic year 2009/2010), lecture in Polish.
- **Demography**, at Collegium Civitas (from the academic year 2007/2008 to the academic year 2017/2018) lecture in English.
- **Quantitative Methods of Decision Making**, as part of the MBA program at the Faculty of Management at the University of Warsaw (from the academic year 2012/20013 to the academic year 2016/2017), lecture and classes in English.

U. Zurek

- **Methodology of Social Research**, as part of the Executive Doctor of Business Administration program at the Institute of Economics of the Polish Academy of Sciences (in the academic year 2015/2016 and 2017/2018), lecture and exercises in Polish.

In addition, I have prepared two packages of teaching materials for the subject of "**Demography**" (30 teaching hours) and "**Survey Methods and Statistical Analysis**" (60 teaching hours) as part of the "Global SGH" project. I developed the teaching materials in the subject of "Demography" in cooperation with Dr. Anita Abramowska-Kmon and Dr. Pawel Strzelecki. I prepared the teaching materials for the subject "Survey Methods and Statistical Analysis". In order to prepare the teaching materials, I did an internship at the London School of Economics where I worked with academic teachers teaching a subject on similar subjects.

In the academic year 2013/2014 and 2014/2015 I was a scientific supervisor of four students studying at the "European Doctoral School of Demography", run by the Institute of Statistics and Demography of the Warsaw School of Economics.

In years 2009-2018 I was a supervisor of 49 BA dissertations, 17 master's theses (including 4 MA theses defended at the Institute of Sociology of the University of Warsaw) and an auxiliary supervisor of 1 doctoral dissertation (PhD student: Zuzann Brzozowska).



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