Charles University

Faculty of Social Sciences
Institute of Economic Studies

MASTER'S THESIS

Do family policies really affect fertility levels?

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Declaration of Authorship

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Prague, July 31st, 2019

Signature

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Abstract

One of the main objectives of family policies in countries with low fertility levels is to stimulate birth rates and incentivize the citizens to have more children. Nevertheless, the research on whether this objective is being met remains inconclusive. In this thesis, we analyze two reforms which took place in the Czech Republic in 1995 and 2008, which adjusted the period of reception of the parental allowance. We use data from selected European OECD countries along with the synthetic control approach to construct a synthetic counterpart to the Czech Republic which gives us an idea about how fertility levels would have developed if the interventions did not take place. In both cases, 1995 reform and 2008 reform, we do not find any conclusive evidence that the interventions affected fertility levels in the Czech Republic. Moreover, we observe a change in the trend of total fertility rate about 2 years *before* each reform which suggests that these reforms were more likely reactions to changing fertility rates rather than remedies.

JEL Classification	J13, J17, J11, J12, E61, E65, F68
Keywords	fertility, family policy, synthetic control estimator, parental allowance, parental leave

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Abstrakt

Jedním z hlavních cílů rodinné politiky v zemích s nízkou porodností je motivovat obyvatele k tomu, aby měli více dětí. Dosavadní vyzkum ale neprokázal, zda jsou tyto reformy opravdu efektivní. V této práci analyzujeme dvě reformy, které proběhly v České republice v letech 1995 a 2008, které upravily délku pobírání rodičovského příspěvku. S pomocí dat z vybraných evropských zemí OECD a za užití metody syntetické kontroly sestavíme syntetickou reprezentaci České republiky, která nám poskytuje představu o tom, jak by se porodnost vyvíjela, kdyby k intervencím nedošlo. U ani jedné z reform jsme nenalezli dostatečně velký efekt, který by indikoval, že intervence ovlivnily úroveň porodnosti v České republice. Navíc pozorujeme změnu trendu porodnosti asi 2 roky *před* reformou, což naznačuje, že tyto reformy byly spíše reakcí na změny míry porodnosti než jejich důvodem.

Klasifikace J13, J17, J11, J12, E61, E65, F68

Klíčová slova porodnost, rodinná politika, metoda syntetické kontroly, rodičovský příspěvek, rodičovská dovolená

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Acronyms

TFR	Total fertility rate
CR	Czech Republic
SCM	Synthetic control method
RMSPE	Root Mean Square Prediction Error

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Master's Thesis Proposal

Author:	Bc. Zuzana Jirakova
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Defense Planned:	July 2019

Proposed Topic:

Do family policies really affect fertility levels?

Motivation:

The goal of family-policies in developed countries is to improve families' wellbeing and increase fertility levels. Births per woman have been declining in developed countries since the 1960's (Robey 1993) and with the options of planned parenthood, socio-economic factors affect people's decisions to have children more than ever before. Governments can in this way try to influence the fertility levels by implementing family-policy aiming at poverty reduction and income maintenance, compensating the cost of having children, fostering employment, improving gender equity, support early child development and raising birth rates. (Nieuwenhuis & Lancker 2017) My diploma thesis will investigate whether one of the goals of family-policies, namely increasing fertility levels, was achieved by one off the family policy tools, namely provision of parental leave supported by parental allowance in the Czech Republic.

Hypotheses:

1. Hypothesis #1: Increase in parental allowance reception period length increases fertility levels in the subsequent years.
2. Hypothesis #2: Increase in parental allowance reception period length impacts the age at which women decide to have the first child in a downward manner.
3. Hypothesis #3: Increase in parental allowance reception period length increases the spacing out between having a second, third, etc. child.

Methodology:

The global discussions as to what policies are optimal for that purpose in the context of a country have been hindered by the mixing influence of social policies, cultural standards and other country specific factors which make comparison between countries imprecise. Therefore, intertemporal comparison within one country using separate instances in time when change in the country's family policy has occurred provides a much clearer picture as to what the impact of family-policies is.

In the Czech Republic, two reforms which saw changes in the length of parental allowance took place over the last 25 years – the 1995 reform, which extended the allowance receipt from 3 to 4 years, and the 2008 reform, which allowed some mothers to spread the total allowance receipt to only 2 or 3 years. To answer the research question, we will explore how fertility levels in the Czech Republic changed after these reforms to parental allowance systems. The simplest way how to approach this is to compare fertility levels (e.g. births per woman) before and

after policy changes. The data will be obtained from the national statistical database collected by the Czech Statistical Office.
However, as mentioned before, the decreasing trend in fertility levels is most likely also affected by other factors. Fertility levels were dropping in the 1990's and their drop might be independent of the policy change in 1995. (Kantorova 2007) One of the possible ways to isolate the effect of the changes in family-policies is to use the Synthetic Control Method. This will create a comparative study to determine the effects of the interventions. A group of control countries will be selected and combined using weights to create a synthetic comparison point to the Czech Republic. This synthetic control will represent how the fertility rates would evolve, had there been no policy changes. The weights will be determined in such a way so that the relevant characteristics (predictors of fertility levels) of the Czech Republic in the pre-intervention period are matched as closely as possible. For these purposes, choosing from the pool of OECD countries promises relevant results.
To make the work more complete, different fertility-related indicators will be analyzed. Not only births per woman in childbearing age (the usual measure of fertility), but also number of children per mother (as opposed to per every woman, including the childless), spacing between children (i.e. what is the age difference between siblings), deciding to have a second child conditional on having one.

Expected Contribution:

Research focused on the impact of family policies on research on family policy outcomes that include employment, wages, poverty, and fertility. Fertility impacts were explored in Sweden and comparisons have been done among selected OECD countries. The research in this thesis is country specific to the Czech Republic using comparison with fertility levels in Slovakia as a tool for achieving more meaningful results. In the Czech Republic similar research has been done studying impact of the two reforms on post-childbirth employment of the mothers. Adding a study concentrating on fertility levels helps deepen the academic discussion and determine whether further changes to family-policy are desirable.

Outline:

1. Introduction
2. Theoretical Discussion
    a. Family-policy goals and birth rate trends
    b. Literature review - consolidation of previous research results from other countries
    c. Family-policy in the Czech Republic with focus on the two relevant reforms, comparison to selected OECD countries
3. Data collection and Analysis
4. Discussion and Policy Recommendations, Further Research Suggestions
5. Conclusion

Core Bibliography:

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Author **Supervisor**

1 Introduction

Most countries in the developed world have been experiencing a downfall in their levels of fertility since the second half of the 20th century. This development has come because of changing economic environment, evolution of social norms, increasing demand for gender equality and woman emancipation, and other factors. The topic has been much discussed, and many policy makers made it their goal to combat this trend as something undesirable. As fertility rates dropped below the replacement threshold of the population in Europe and the United States, people began to worry about the consequences, especially in the light of increasing population levels in Asia. Pritchett and Viarengo (2013) say that large parts of Europe are committing "a gradual demographic suicide". Countries look for ways to motivate their citizens to have more children and fight the low fertility trend. Family policies are used to achieve this, consisting of maternity and parental leave policies, financial support for families with (young) children such as parental allowance, child subsidies or tax exemption, and public childcare provision. In this thesis we try to answer the question whether some of these policies have any effect on fertility rates. We will use two reforms which took place in the Czech Republic over the last 25 years and attempt to determine their effect in a larger European context by comparing the fertility development in the Czech Republic with the fertility trend in other European countries. This research can then serve as a basis for better informed policy decisions with respect to supporting families and reaching the desired policy objectives. Czech Republic is used because its fertility rates have been one of the lowest. In addition, it is of special interest to the author, as it is her home country.

The theoretical part of this thesis is structured as follows. To begin with, we describe the trends in fertility development in a context of OECD countries and explore some of the re-occurring patterns that have been linked to fertility rate evolution such as perceived ideal family size, consequences of the changing role of women in the labor market resulting in child bearing postponement, and economic and social factors affecting the planning of parenthood. Further we continue with a section dedicated to family policies and how they fit into the picture along with the relevant research

conclusions on their effect on child bearing and family economics. Special attention is paid to parental leave and parental allowance as these policies were applied in the Czech Republic with one of their goals being increased fertility. We also give detailed description of the fertility trend in the Czech Republic and the two policy changes, the data for which we later use in the empirical analysis. A short overview of fertility and family policies in selected European countries is included as a foundation for the construction of the synthetic control used for comparison purposes to isolate the effect of the policy changes in the Czech Republic. Subsequently, we discuss the theoretical aspects of our chosen methodology and prepare the ground for the empirical research found in the second half of this thesis.

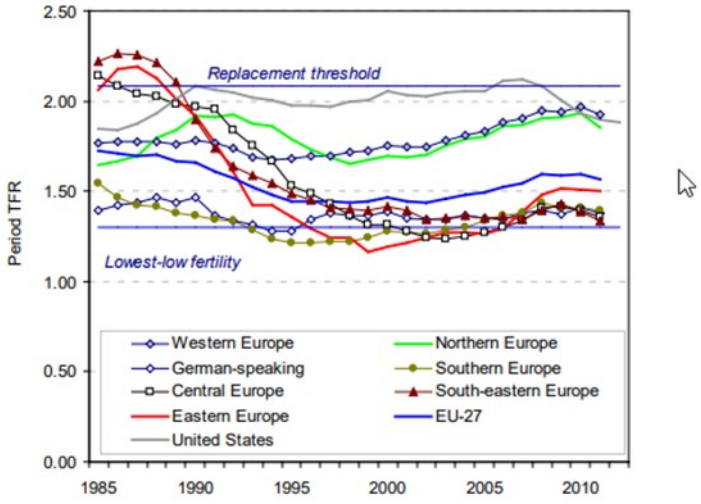
In the empirical part of the thesis, we focus first on the reform that took place in 1995 and subsequently on the reform in 2008. We discuss the results and their implications and contrast them for both interventions as the setup of the model is not entirely the same. We try slightly different approaches to constructing the model and discuss each approach and whether it leads to more reliable results. We conclude with a discussion on policy implications and suggestions for future research on the topic of how policy changes affect fertility levels.

2 Theoretical Background

2.1 Reasons for low fertility

Birth rates across Europe and in most economically advanced countries have been falling since the end of 1960s to varying degrees. In the Figure 1, we can see the sharp drop in total fertility rate which came about in the 1990 and the slight rebound of the 2000s.

Figure 1 Period TFR in major regions of Europe and in the US, 1990 - 2011



Source: Sobotka, T. (2013). Pathways to low fertility: European experience. UN Expert Group Meeting "Fertility, Changing Population Trends and Development".

Let us discuss a few of the main reasons for this development that have been identified in the relevant literature. Castles (2003) notes that in countries with the lowest fertility rates, there is a long-term change in family size preferences which partly manifests as the decision to have no children, but more importantly in the decreasing occurrence of second and especially third births. This makes intuitive sense – most people wish to become parents one day; however, the burden of raising one child may satisfy a great portion of this desire. Having additional children is then to a much larger extent determined by the economic conditions and consequences. An ideal family size has seen a reduction and today having two children is the most likely outcome conditional on being a parent. This conclusion comes from the rates of completed

fertility, i.e. the number of children that women have at the end of their reproductive cycle (hence their fertility has been completed) (Thevenon 2016; Sobotka & Beaujouan 2014).

An interesting take on the decreasing family size was presented by Becker, Tamura and Murphy (1990) who present two models in their paper – that where families are large and where families are small. This approach leaves out the emotional aspects of having children and presents them as an economic commodity which serves to grow the country's economy. According to the authors, the two family-size steady states are represented by the corresponding scarcity or abundance of human capital. They make two assumptions in their analysis of economic growth – first, that fertility is endogenous to economic growth and second that there is an increasing return on human capital as human capital rises. Thus, when human capital is scarce, the return on human capital investments is relatively small compared to having more children, and thus having more children becomes an economic asset and the family size is larger as a result. On the other hand, when human capital is abundant (as is the case in developed countries), in terms of economic growth, it is more rewarding to have fewer children and invest a great deal into them since the return on human capital is large. We should note that the smaller family size in the developed world today is surely not explained only by the economic usefulness of having more or less children. For example, one obvious difference between the developing and developed world is the rate of infant mortality which has significant impact on fertility in those countries where not all children can be expected to survive into adulthood. This approach is not all that suitable for explaining more subtle differences in family size changes among the OECD countries in European the more short-term horizon, i.e. decades in the second half of the 20th century in the developed world, which is the objective of this thesis. A more modern explanation is represented for example by the research done by Greenwood et al. (2005) who explain the baby boom as a consequence of the burst of technological progress that took place toward the end of the 20th century.

When it comes to explaining decreasing family size and fertility levels in the developed world a quite recent phenomenon is the postponement of childbirth. This is characterized by a decrease in the fertility rates of women under 30 and an increase for women who are in their thirties and is a persisting trend in most OECD countries.

Resulting from increasing level of women's education and thus a stronger attachment to the labor market, this behavior became prominent in the 1990s when fertility rate first fell below the replacement level. For the first time, women had the freedom to work and be more economically independent and capitalized heavily on it. For a woman, having a child can represent a decrease in economic independence as she is temporarily removed from the labor market and fully occupied with caring for her newborn. Of course, the fact that women want to be economically stable on their own does not take away from their desire to have children, however, since the decision now bears more weight in its economic consequences, starting a family is being put off. Sobotka (2004) suggests thatespecially at the break of the millennium, period low fertility can be interpreted as a temporary consequence of postponed motherhood and the fertility trend picked up again in the year 2000. For an illustration, let us consider the situation when women in their 30's already have children and because of external influences women in their 20's are postponing the birth of their first child. Naturally, as neither group is having children at the beginning of this period, the fertility level in this decade is low and picks up only when the younger women stop putting off the decision (perhaps in their 30's) and start a family. The postponement of childbirth has been associated with the economic boom, more university education, rise in women's employment, letting go of the social norms which tied reproduction to marriage, and the expansion of family policies (Sobotka 2013). Although Sobotka links the changes in fertility levels to family policies, he does not offer robust empirical evidence to support this claim. This is one of the motivations of this thesis – to see if the data provide empirical support to claims about whether family policies affect fertility or not.

Closely connected to these issues is another variable which impacts the decision to have a child - the child's economic cost. Direct cost of children has been estimated to be around 15-30% of the budget of a couple with no children (Thevenon 2016). There is also the indirect cost to the mother (or more generally, the parent who foregoes working to spend time in care for the child, especially in the first years of the child's life). Buddelmeyer et al (2018) used data about couples in Australia and Germany to explore the effect of having a child on the demand for parents' finances and time. Not surprisingly, they found that the time stress increases after the birth of the child and this is especially true for the mother. This time investment is again decreased when the child departs the household, however, this alleviation of the time constraints does not

make up in magnitude for the impacts the birth of the child had in the first place. The financial stress is also increased for both parents.

Career costs to the parents are also not negligible, be it the explicit forgoing of opportunities to earn income at the time when the child needs the most attention from its parents, or the more implicitly given costs such as the loss of skills during the employment interruption, lower opportunities for skill accumulation or opportunity costs endured while choosing to work in occupations that are more friendly to child-rearing (Adda et al, 2017).

These costs of children are especially relevant in the discussion about family policies as the economic cost of a child can be to a degree offset by the financial support received during a paid parental leave. Research on the connection of paid leave and labor market participation has been quite extensive and suggests that policies have a significant impact on the decision to start working again (see Spiess & Wrohlich 2006; Polachek & Das 2015; Bergemann & Riphahn 2015; Bicakova 2019).

Of course, the inevitable evolution of social intuitions also left its mark. A change in social norms that gradually ensued marked being married an obsolete condition for having children in most countries. Divorce levels were no longer negatively associated with fertility levels by the end of the 1990s (Billari & Kohler 2010). A new lifestyle pattern emerged where couples often live together in partnership and raise children without the union ever being lawfully recorded as a marriage. There is a relationship between marriage and fertility in more religious regions as having children out of wedlock tends to be disapproved of to a larger extend in traditional societies. Research regarding this matter has been often overlooked due to the fact that, especially in Western Europe, institutional forms of religious adherence have been in decline (Peri-Rotem 2016).

What impact do these socio-economic changes have on the well-being of (especially) women? Presently, the western cultures tend to view the above discussed developments as a positive thing and in many aspects, they are. However, this does not take away from the fact that childrearing is oftentimes an integral part of women's lives and all the deviations from the standard model, when women married young, had children early on and their world revolved around the family, cause friction. Stevenson

and Wolfers (2009) summarize how the lives of women have improved by many objective measures, but their subjectively perceived well-being has gone down in contrast. This is true for both absolute values of happiness compared to women who lived in the preceding time periods as well as relative values, i.e. compared to men. In the 1970s women generally reported higher levels of happiness than men – a trend which seems to be in the downfall. Not to be confused, women are aware of the immense progress that we have made in relation to gender roles and equality. Research indicates that women believe their lives are better than in the previous time periods and they have more opportunities to achieve happiness. Yet the outcomes of happiness polls suggest a consistent shift in the perceived well-being away from women toward men. This paradox can be explained by decreases in social cohesion and rise of anxiety and neuroticism; after all, one of the disadvantages that come with more freedom is typically less stability and sense of grounding. Another view is that as women were previously tied to their family, the measures of overall happiness captured predominantly "happiness at home". With the changing role of women in society, other environments became available besides the household and consequently the domains of happiness broadened, for example, from being happy at home to being happy at work. Since overall satisfaction is more difficult to achieve across these realms, the overall satisfaction might be going down. Given more opportunity to succeed, one might feel like they are not measuring up.

Margolis and Myrskylä (2011) explore the relationship that happiness has specifically with fertility levels to see if the changes in child bearing conclusively affect women's happiness as well. It is generally believed that having children increases the parents' well-being and especially women's well-being. However, the empirical research indicates that happiness decreases with the number of children. There are differences among age groups – for people after 40 who are more likely to benefit from having children in the later stage of their lives, the association between fertility and happiness is positive. This put together indicates that women who postpone having children reach the happiness threshold later than women whose children reached adulthood earlier in their lives because they had children at a younger age.

There is much that could be said about the possible reasons for decreasing fertility in the developed world and the consequences of this development. It remains

a fact, that the low levels of fertility now are viewed in a negative light and governments try to stimulate birth rates in order to bring it up again. Therefore, in the next section we will look at another factor influencing child bearing decisions – government-imposed family policies.

2.2 Role of family policies

Governments have been long attempting to influence fertility rates by introducing family policies aimed at supporting socially desirable behaviors. In the developed world low fertility rates contribute to population aging which affects workforce composition and makes it difficult to maintain the current levels of social welfare spending. Thevenon (2016) argues that the positive effects of policies on fertility raising should not be relied upon too much since even if policies are successful, the resulting increase in fertility may not be enough to cover the financial burden induced by the population aging. He also notes that higher education attainment may help offset the decrease in productivity caused by shrinking active workforce. Consequently, the replacement rate should not be referred to while setting a realistic policy target. Nevertheless, despite the limited capacity to raise fertility, family policies are still important for maintaining work-life balance, supporting gender equality and emancipation, reducing child poverty and increasing the family's well-being.

With the above said, the concern for "too high" or "too low" fertility rates has been a reason for many state interventions, manifesting through various policy approaches which in hindsight sometimes stood in stark opposition – i.e. supporting stay-at-home mothers or supporting working mothers, forbidding contraception and abortion or legalizing it, perpetuating gender roles or incentivizing fathers to stay at home with their children. Today family policies typically regulate the length of the job protection period (so that the mother can return to her pre-birth job) and the amount and duration for which the family receives financial support in the form of a parental allowance.

As they have the power to affect behavior of individuals, family policies are an important structural mechanism (Coltrane 2000). As such, their effects on fertility rates, economic productivity, child poverty, gender equality, labor market development, family income, and parents' wellbeing have been well studied (Glass,

Simon and Andersson 2016; Thévenon and Gauthier 2011; Richardson 2015; Duvander et al. 2016; Lacalle-Calderon et al. 2017). While spending on families as a percentage of GDP does not correlate with fertility, specific combinations of policies have been shown to raise fertility in Europe. Since planning parenthood is a major life decision it is important for family policies to be stable and predictable to create an environment stimulating fertility. Especially provision of financial security and childcare appears to affect fertility the most (Luci-Greulich & Thevenon 2013; OECD 2011). We will further discuss the research on the effects of family policies on fertility in the section dedicated to parental leave and parental allowance duration.

Even though we do not use this tool in our analysis, it is worth mentioning that to concisely quantify the effect of family policies on a wide range of variables, the Family Policy Index (XFPI) has been devised as an analytical measuring tool (Greco 2017; Elizalde-San Miguel et al. 2018). Specifically, XFPI offers a comparison of different models of educational services provision, parental leave and economic transfers to support families with children aged 0–3 years. The authors claim that the index provides robust results and can be used across different countries to help with the design of new policies.

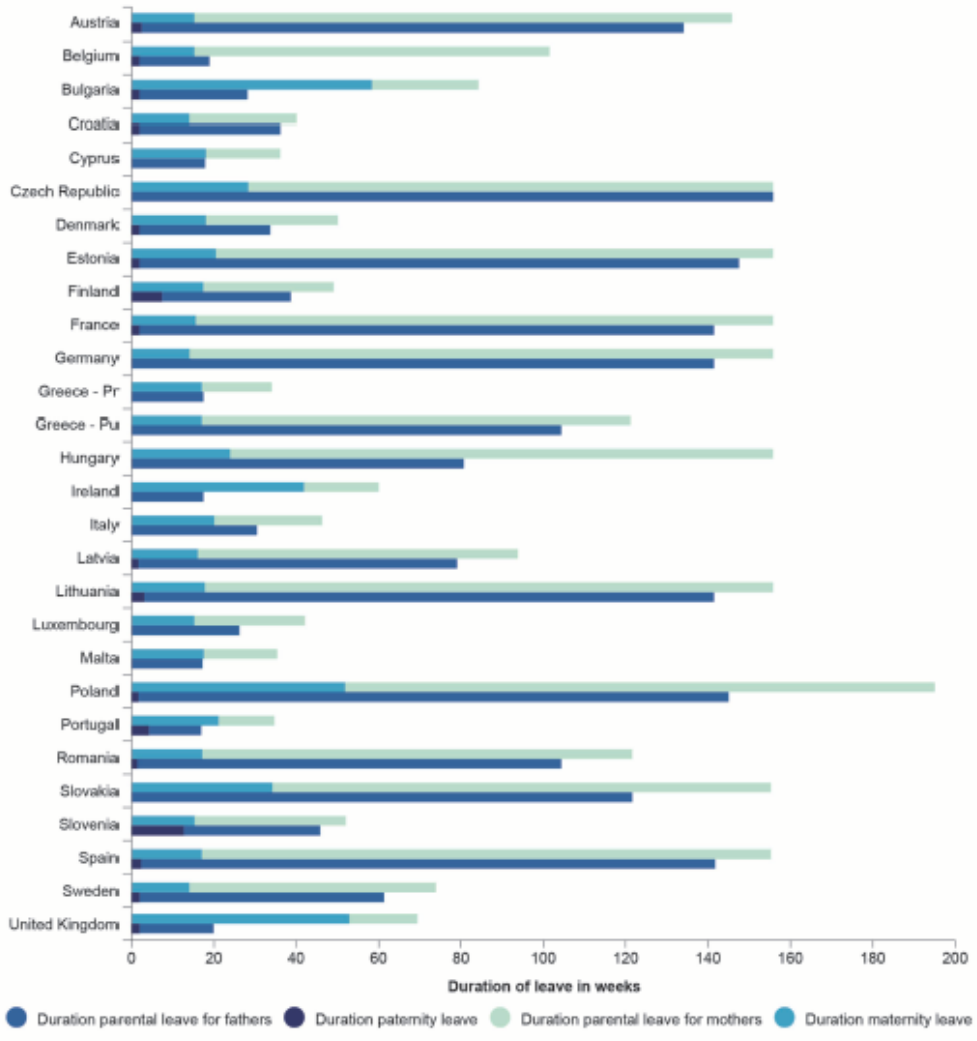
2.3 Parental leave and parental allowance

This paper works to determine the effect that changing the length of receipt of parental allowance has on fertility rates. We distinguish parental leave and parental allowance: Parental leave is a leave from work that a parent of a young child can claim, and it usually comes with job protection. Parental allowance is a financial support for a parent who takes care of a young child.

As we will see later in the case of the Czech Republic, these two do not necessarily coincide in a one on one relationship. In the reviewed literature, the researchers sometimes talk about one compounded variable called paid leave. This is because the focus of the papers is maternity leave which is a paid leave. It is different from the parental leave because, as is the case of a sick leave, it comes with a compensation of the forgone earnings. Parental leave is almost always unpaid leave (in Czech “neplacene volno”), but in many countries, there is some sort of parental allowance that can be collected by parents on leave. As depicted in the Figure 2, there

is much variation in the possible choice of leaves across Europe as they are used to serve different economic, social and demographic objectives.

Figure 2 Comparison of parental leave and parental allowance duration in European countries



Source: Paternity and parental leave policies across the European Union, J. van Belle, Based on data from 2012–2014, from European Parliament 2015b.

According to the published literature there seems to exist a positive relationship between the duration of the paid leave and fertility levels, especially for the birth of a second child. Evidence from previous research suggests that parental leave has a positive effect on the probability of birth, especially as the child parity increases (Averett & Whittington, 2001).

Lalive and Zweimüller (2009) found that extension of parental leave from 1 year to 2 years increased the probability that a woman would have a second child within 36 months after the first birth, however, a reduction of the parental leave by 6 months in a reform 6 years later did not have the reverse effect.

Kalwij (2010) studied the impact of increasing the expenditure on family policy programs and found positive effects on fertility as well.

Raute (2019) investigated fertility effects of a reform that took place in 2007 in Germany. In this reform, the maternity benefits were linked to pre-birth income for up to 14 months after birth, which was intended as an incentive for higher educated and higher earning women to have a child and take up parental leave. Raute found a sizable positive impact on fertility levels for women in at the middle and upper end of the education and income distributions.

Other research yields less clear results. Study of a series of Norwegian reforms extending maternity leave did not uncover any significant effect on children's schooling, parental earnings and labor force participation, completed fertility, marriage, or divorce (Dahl et al. 2016).

Olivetti and Petrongolo (2017) state that there is no obvious consensus about the interactions between parental leave rights and benefits on the labor market. The cross-country level studies seem to be better at detecting the positive effects on female employment for relatively short leave durations and negative effects for longer leave durations rather than micro-level studies. Research provides some evidence that the effects of maternity leave on female employment impact the gender employment gap in a negative way and this is true across OECD countries. A noteworthy observation is that in the case of parental leave, fertility rate is negatively affected by its length and financial coverage, and moreover, this effect is driven by four countries in particular – Poland, Hungary, Slovakia and the Czech Republic, all four being characterized by very generous leave provisions and very low fertility. Therefore, it seems that if the leave duration is long enough, fertility rates are negatively affected which would go against the intended objective of the family policies - to incentivize people to have more children. Olivetti and Petrongolo found that fertility decisions are not very responsive to changes in parental leave unless the leave is also adequately paid. Public

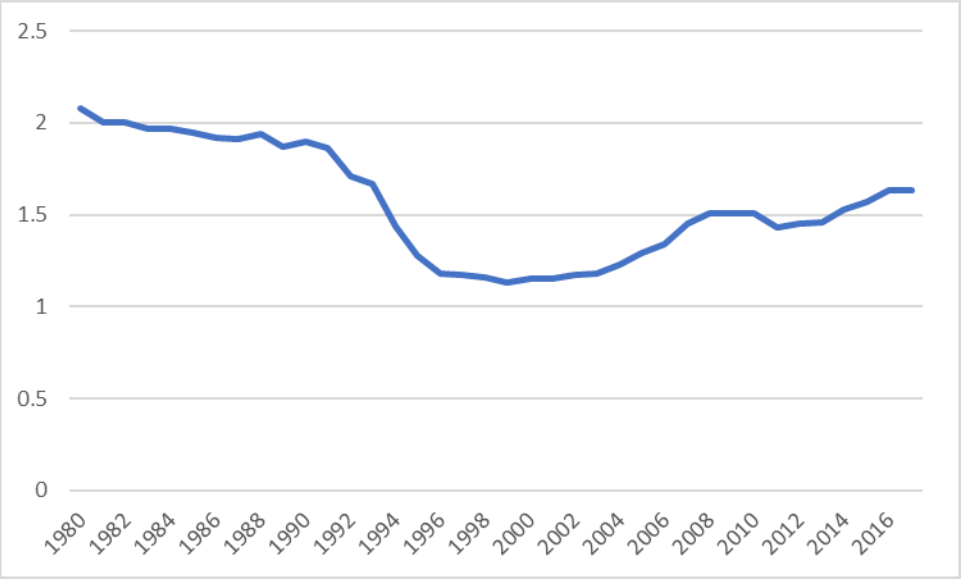
spending on family benefits and the length of child-related leave for mothers positively correlates with fertility as well.

The following section closer describes fertility trends and specific policy changes in the Czech Republic.

2.4 Fertility and family policy in the Czech Republic

Period fertility rates in the Czech Republic have been closely linked to external factors, such as wars, economic crises, population-related policies, and major societal changes. The progression of the total fertility rate (TFR) can be seen in Figure 3. The most prominent drop occurred after the collapse of the socialist regime in 1989. The total fertility rate fell from 1.9 to 1.18 children per woman and remained at this low until 2004. Unlike a few countries in the post-Soviet Eastern Europe and the Balkans, after 1992 the Czech Republic went through a relatively smooth economic transition with moderate unemployment and a gradual wage increase while income inequalities remained small. This contributed to a feeling of more predictable future and hence a postponement of the first birth (Sobotka 2008). We can also see the convergence to a two-child family model which has been mentioned before as a general trend in Europe. The total fertility rate picked up after 2004 and rose to levels at around 1.5, possibly as the result of child bearing postponement mentioned in the previous section.

Figure 3 TFR in the Czech Republic 1980 - 2017



Source: Human Fertility database (2018), Period total fertility rates for the Czech Republic (Czechoslovakia until 1993)

To determine the effects family policies have on fertility levels, this thesis will investigate two reforms which took place in the Czech Republic in 1995 and 2008. These reforms both changed the duration of receipt of the parental allowance. As mentioned above, it is useful to distinguish between parental leave (in the Czech Republic called "maternity leave" before 2000) which remained unchanged over the course of both reforms, and parental allowance. Czech Republic has one of the longest parental leaves in Europe - in total 156 weeks, or in other words, three years (European Parliament 2015).

The parental allowance in the Czech Republic is one of the allowances distributed as a part of state welfare support. It stands on the principle of a state driven solidarity of childless couples toward families and from high-income families to low-income families (Zlamalova 2012). Receipt of the allowance is not conditioned on being on parental or maternity leave; the main condition is day-long proper care of the youngest child in the family. Parental allowance can be taken only for the youngest child in the family – if another child is born, the parents can no longer get parental allowance for the older child.

The two previously mentioned reforms saw changes in the length of receipt of parental allowance. Until 1995 the duration of parental allowance was the same as the

duration of the three-year job-protected parental leave. In 1995 the receipt of parental allowance was extended from 3 to 4 years, extending beyond the parental leave period by one year. The allowance was paid monthly in a flat rate, i.e. was the same for all parents independent of their pre-birth earnings and family situation. The amount was however linked to the life minimum amount (in Czech ”zivotni minimum”) and so it gradually increased over years (Czech Statistical Office 2007).

In 2008 the respective law was altered, and the changes applied to parents of all young children (even those born before 2008). The parents newly had a possibility to choose the amount of the allowance and the corresponding length of receipt. The fast receipt set the amount at 11,400 CZK per month until the child’s second birthday. The standard receipt meant receiving 7,600 CZK per month until the child’s third birthday. This amount was the same for the slower receipt until 21st month of the child’s life and afterwards it dropped to 3,800 CZK per month until the child’s fourth birthday (Czech Ministry of Labor and Social Affairs 2008).

This thesis investigates the effect of these two reforms on fertility rates in the Czech Republic. To do so we will rely on the synthetic control method which offers a point of comparison to the subsequent fertility development.

Our hypothesis is that paid leave positively affects fertility – when the duration of the reception of parental allowance is longer (as in the case of the reform in 1995), fertility rises and vice versa, fertility levels fall when the period is shortened (as in the case of the reform in 2008).

2.5 Family policies across Europe

The methodology used in the empirical part of this thesis calls for a construction of a synthetic control country that will enable us to predict how fertility in the Czech Republic would have evolved in the absence of any structural shocks, i.e. reforms. The control country will be synthesized by constructing a weighted average of multiple countries in order to mimic the development in the Czech Republic if no policy change was implemented. Naturally, in the ideal case the countries used to construct this control should be as similar as possible to the Czech Republic for the analysis to yield valid results. Hence, we use European OECD countries as the base subset which shall be further refined. In this section, we will review the different approaches to family

policies across the different regions. We target the descriptions to the time of the reform in 2008 to obtain more insight into the types of support that countries provide for their citizens. Unfortunately, this type of qualitative analysis is difficult to do for the first reform in 1995 because due to the lesser resource availability and so we focus on the years around the other reform in 2008. This review should provide some guidance as to what variables should be considered while constructing the synthetic control country. The rationale is that if countries differ significantly from the Czech Republic by their policies, the family policy characteristics could possibly warp our country weights by influencing our dependent variable. If we account for these differences in the construction of our synthetic control, we stand a better chance of arriving to valid results.

Since most developed countries experience population aging, family policies tend to focus on stimulating birth rates and offering family support, however the approaches to achieve these objectives differ across countries. Thevenon (2011) offers a comprehensive description of the distinctions and persistent cross-national differences. To help explain why family policies do not converge as we would expect for a fairly similar set of countries, first, main objectives targeted by family policies are identified as follows.

1. Poverty reduction and income maintenance – This objective is targeted through allocating benefits especially to low-income families with children.

2. Direct compensation for the economic cost of children – While being less selective about the target group for support, the offering of cash benefits aims to narrow the gap between families with children and childless couples.

3. Fostering employment – As female participation in the labor force positively effects economic growth, policies try to make the reconciliation of employment and child-rearing easier by guaranteeing job protected parental leave, availability of childcare services and other incentives for parents to work. Though these policies mainly target women, as women still tend to be the ones staying at home with the child after its birth, paternity measures are appearing increasingly.

4. Improving gender equity – Policies can promote a more equal spread of responsibilities, alleviating the pressure on women to traditionally take on the role of the primary child caretakers. Tax and benefit systems can be of aid here, e.g. through differentiated tax rates for the household earners.

5. Support for early childhood development – Two beneficial factors for development of young children are time spent with their parents and enrollment into a formal childcare and pre-school education. While value of early education is widely recognized, consensus on what age is most appropriate for starting formal childcare varies across countries.

6. Raising birth rates – To counterbalance population aging, stimulating birth rates has become a subject of debate in developed countries due to the worries about its economic impact. The room for improvement is seen in two areas. Firstly, research suggests that families report wanting to have more children than they are having, which is something family policies might be able to help with. Secondly, since there are countries where high level of female labor force participation goes hand in hand with high fertility rates, raising female employment rates does not necessarily need be an obstacle for raising fertility.

Examples of family policy trends in OECD countries were also described by Sobotka (2013) and specifically include the following:

• Shorter, but well-paid parental leave, with up to 100% compensation of the previous wage (Estonia, Germany, Poland), stressing earlier return to employment

• Improving options of public childcare for children below age 3

• Multispeed parental leave: parents can choose different durations and different levels of support that comes with it (Czech Republic, Austria, Germany)

• Flexible leave arrangements: fathers and mothers can alternate (Norway)

• Stronger involvement of fathers, including extra parental leave for fathers only (Nordic countries, Germany, Austria)

• Cash support to newborns (baby bonus, Spain 2007-10), “maternity capital” established at the time of child’s birth (second births in Russia)

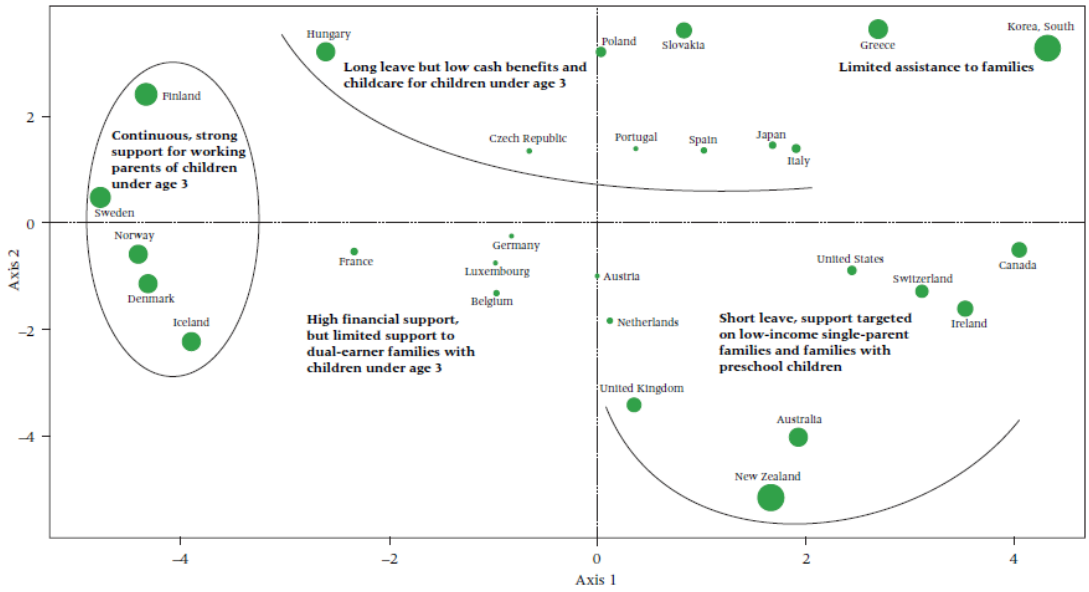
Thevenon uses a wide set of indicators which describe different dimensions of family policies to construct a comprehensive model of how countries vary in their approaches to family support. It should be noted that the data come from years 2005 through 2007 so the picture being described is applicable to our studied case of the 2008 reform, but less so to the 1995 reform as family policies undergo constant change and though some trends may persist, sorting into representative groups may not hold over time.

The main dimensions included in the comparison are the in-cash, in-kind and in-time benefits. This means using groups of variables to capture the entitlements to parental leave of differing duration (in-time), the level of availability of childcare services (in-kind) and overall income support for families with children through tax and benefit systems (in-cash). The analysis yields that similarities in family policies tend to correspond with geographical closeness – the further away countries are from each other, the more dissimilar they are.

For visual representation, Thevenon presents two axes graph which is depicted in Figure 4. The horizontal axis represents the level of support provided to working parents with young children, that enables them to combine work with childcare. The countries on the left-hand side are characterized by a higher level of spending on leave entitlements and services for families with very young children. In contrast, countries on the right-hand side focus their support more on the middle and late childhood (spending on education).

The vertical axis displays components related to the length of parental leave entitlements. The greater generosity of these entitlements is seen in the upper part of the chart, while the bottom part is represented by shorter durations of parental leave (while being offset by larger investments onto the educational services for pre-school children). Further detail on the specific policy characteristics determining he axes can be found in Table 16 of the Appendix. It should be noted that the depicted clusters, while sharing some common characteristics, are mostly heterogeneous. The size of a circle marking a country's position on the chart indicates its weight/typicality of the area defined by the axes.

Figure 4 OECD countries by similarity of their family policies



Source: Thévenon, O. (2011). Family policies in OECD countries: A comparative analysis. Population and development review, 37(1), 57-87.

Note: Dot size is proportional to the country's contribution to the axis. Numbers on the axes indicate the location of countries on each principal component.

We can see that comparing countries according to family policy characteristics yields some of the following groupings.

1. Nordic countries - Help is focused on enabling parents with young children under the age 3 to work. This group is characterized by a good availability of childcare services for children under the age of 3 and percentage of children in formal childcare is higher than average. Spending on parental leave is higher than average for these countries which results in longer leave durations. Gender equity is also prioritized, and fathers are entitled to a specific period of paternal leave (however, the majority of the total parental leave is still taken-up by women).

2. Anglo-Saxon countries – Support is focused on poor families, single parents and preschool children households. Paid leave entitlements after the child's birth are relatively short as is the supply of public childcare for children under the age of 3. This contrasts with a high rate of enrollment of preschool children into formal childcare and the spending in this area is also greater. More support is provided in-cash than in-kind compared to other countries.

3. Southern Europe – Limited assistance is offered to families. The length of paid leave is very short, and the provision of childcare services is limited. The representative feature of these countries which differentiates them from the Anglo-Saxon group is a very low volume of cash transfers. Limited assistance to families is offset by lower effective tax rates on the transition to work and parents are hence encouraged to combine family with work.

4. Eastern Europe – Parents are offered long leave but low cash benefits for children under age 3. The transition to market economy has been experienced by all of the Eastern European countries; however, their family policies vary from country to country. The shared feature is lower in-cash and in-kind support expenditures, but the leave entitlements and childcare provisions vary.

5. Continental European countries – The countries of continental Europe lie in between the patterns described previously. Spending on families is higher than the OECD average, but we can observe a more traditional approach where gender equality and combining family life and work are not strong policy drivers, making the typical family model a single earner one. Leave entitlements and childcare provisions, again, vary.

2.6 Methodological framework

Most relevant literature which analyzes the impact of changes in duration of paid parental leave uses the Difference-in-Differences strategy. Under this approach, the researchers study impact of the intervention on the treatment group (the unit of interest) and the control group (for which the intervention had no impact). The control group selection differs across papers. In the available literature (among others) the following were used: women with older children who were no longer eligible for the parental allowance (Bicakova & Kaliskova 2019), a country where no parental leave is available (Lakotova & Kalhammer 2017), men (who did not take up parental leave at the time) (Ruhm 1998), and children born in the same month but in a year when no reform took place (Dustmann & Schönberg 2012).

In our analysis, we use the synthetic control approach described by Abadie et al. (2015). The synthetic control method offers a systematic approach of selecting comparison units. Selecting appropriate comparison units is crucial as poorly chosen comparisons may lead to incorrect conclusions. The comparison units need to be sufficiently similar to the unit of interest, otherwise any difference that is found may

be a mere reflection of the disparities of the unit characteristics and may not have any explanatory value. The synthetic control approach lies on the premise that where comparative units are scarce and differ in too many aspects (as is the case with the aggregate country level comparisons), a weighted combination of several of them can offer a synthetic comparison unit that follows the characteristics of the unit of interest more closely than any single unit on its own.

Based on this observation, we will construct our control group as a weighted combination of selected European countries (i.e. donor pool) which will help us create a comparison unit mimicking the development in the Czech Republic before the two interventions and consequently estimate the effects of the policy changes more accurately than with any single country used as a comparison unit on its own.

2.6.1 Synthetic control estimator

In this section the synthetic control estimator will be described based on Abadie et al. (2015). As we will use countries as the sample units, the language is adjusted to this effect for better illustration.

In a sample of $J + 1$ countries indexed by j, where $j = 1$ is the country of interest (in our case the Czech Republic) and countries $j = 2$ to $j = J + 1$ are without the loss of generality the units of potential comparison. Note that since we are trying to create a comparison unit which reflects development in the absence of the intervention, it is important to select countries that were not subject to structural shocks to the dependent variable during the two sample periods.

We assume that the sample is a balanced panel of units observed at the same time periods $t = 1, \dots, T$ and that it also includes a few preintervention periods $T_0 > 0$, as well as postintervention periods $T_1 > 0$, and $T = T_0 + T_1$. The pre- and post-intervention periods are clearly determined by the year of intervention, in our case years 1995 and 2008.

As mentioned above, for the construction of the control unit we use weighted average of the countries in the donor pool. The synthetic control is represented by a $(J \times 1)$ vector with weights $W = (w_2, \dots, w_{J+1})'$ where $0 \leq w_j \leq 1$ for $j = 2, \dots, J$ and $w_2 + \cdots + w_{J+1} = 1$. A particular synthetic control is defined by the value of W. We

try to choose such W so that the control resembles the treatment group preintervention characteristics as closely as possible. Let X_1 be a $(k \times 1)$ vector of preintervention characteristics of the treated unit and X_0 be a $k \times J$ matrix collecting these characteristics for the countries in the donor pool. We then select a synthetic control W^* that minimizes the difference $X_1 - X_0 W$. Abadie et al. (2015) suggest minimizing

$$\sum_{m=1}^{k} v_m (X_{1m} - X_{0m} W)^2,$$

where $m = 1, \dots, k$, X_{1m} is the value of m-th variable for the treated country and X_{0m} is a $1 \times J$ vector collecting the values of the m-th variable for the countries in the donor pool, and v_m is a weight that reflects the relative importance we assign to the m-th variable. These are the variable which have a large predictive power on the outcome of interest and thus should be assigned large weights.

Further, let Y_{jt} be the outcome of unit j at time t and Y_1 be a $(T_1 \times 1)$ vector containing the post-intervention values of the outcome for the treatment unit, i.e. $Y_1 = (Y_{1T_0+1}, \dots Y_{1T})'$. Along the same lines, let Y_0 be a $(T_1 \times J)$ matrix where column j contains the post-intervention values of the outcome for unit $j + 1$.

The synthetic control estimator is given by the comparison of postintervention outcomes between the treated unit and the synthetic control $Y_1 - Y_0 W^*$. That is, for a postintervention period t (with $t > T_0$), the synthetic control estimator of the effect of the treatment is given by the comparison between the outcome for the treated unit and the outcome for the synthetic control at that period:

$$Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}.$$

2.6.2 Result validity

One of the possible issues with the synthetic control method is overfitting. This refers to the instance when the characteristics of the treated unit are artificially matched by using a very large number of poorly chosen control units which may have experienced idiosyncratic shocks to the dependent variable. To control for the overfitting of the model which would then lose its predictive power, the authors suggest conducting so called “placebo studies”. These checks switch up the designated treatment country with one of the countries from the donor pool and estimate the model again. The intuition behind this stands on the fact that this inference should not yield

significant results as the treatment unit is in this case a country which did not go through the intervention. In other words, the preferred outcome of a placebo test is a large effect on the treated unit and small effects on the untreated ones. If the difference between the results is small, then the effect of the intervention is probably low. The placebo test can be applied to every control unit and thus give a better idea about how well the model describes the researched outcome.

Another way to test the validity of results is to recalculate the model for more time periods with varying time of the intervention. Again, if we obtain significant effect for another time period than is the time period of the intervention, we should be suspicious about our results, since we select the data so that no similar intervention took place within the time range. This placebo test is unfortunately unsuitable for our model since we are limited by the large frequency of family policy changes and hence the length of the time period for which we can use data.

2.7 Variables and data

To the best of our knowledge, no synthetic control method analysis of fertility outcomes potentially triggered by family policy reforms has been done. Therefore, no literature suggesting potential covariates suitable for our model is available. To determine the covariates, we draw from literature studying the effects of family policy reforms on fertility rates utilizing other empirical approaches. Due to limited data availability for certain periods of interest, we construct a basic model and subsequently vary the estimation setup to see if our model achieves better fit under different permutations. We compare the results in the empirical discussion part of the thesis.

Since our analysis takes place at the country level, we use macroeconomic data representing the country in each year for each variable. Using these macroeconomic data, we build a panel dataset used in the empirical analysis.

Our outcome variable of interest is total fertility rate (TFR). Total fertility rate is defined as the number of children who would be born per woman if she was to complete her childbearing years and have as many children as is predicted by the current schedule of age-specific fertility rates. The data on fertility used in this paper come from the World Development Indicators (World Bank 2019).

2.7.1 Covariates selection

There is no clear-cut consensus among researchers as to which macroeconomic variables are the best predictors of fertility levels. Hence, for our covariates selection we use indicators suggested by other researchers alongside common sense. In the section below, we list the covariates that have been used in previous literature and most likely impact fertility rates. A short discussion is included for each covariate, highlighting the possible concerns of its usage as a predictor of fertility.

As Lacalle-Calderon et al. (2017) note, one of the most accepted empirical regularities in economic and social sciences is the negative association between economic development and fertility. Known as "demographic transition", birth rates fall because of various factors. These might be access to contraception, increase in wages, urbanization, a reduction in subsistence agriculture, an increase in the status and education of women, a reduction in the value of children's work, an increase in parental investment in the education of children, and other social changes. To capture the effects of economic development, we use GDP per capita (purchasing power parity (PPP), current international $) from the World Development Indicators (World Bank 2019). We should be cautious in our result interpretation using this variable though. Even if the correlation between economic development and birth rates holds, the exact relationship between GDP and TFR is ambiguous as the research failed to arrive at consistent outcomes when the two are compared in different settings. The correlation is in some cases weak and the differences might be attributable to cross-country differences instead (Balbo et al. 2013).

To capture the state of the labor market, the most common indicator to use is the unemployment rate. However, one drawback of using this indicator is that the decision to start a family depends on the parents' employment status and future employment options if they have a child, which introduces the skewness of the importance of the employment status of the male and the female. Data for unemployment were obtained from the World Development Indicators (World Bank 2019).

The next indicator we use is average education levels of countries' populations. As Kim (2016) states, the relationship of female education with fertility exists in the negative correlation of higher education levels and lower birth rates, however, the interpretation of this relationship is unclear. While higher education levels could affect fertility through their impact on the health of the population thus impacting the physical capability to give birth, other explanation might be the increased control women have over their reproductive system by wider availability and awareness of the various birth

control methods. We use three levels of education – primary, secondary and tertiary school enrollment (% gross) from World Development Indicators (World Bank 2019).

Historically, being married was a necessary condition for having children and even though more couples are having children without getting married, there is still a reasonable probability that the marriage rate is connected to birth rates,especially in religious regions. Hence, we use crude marriage rate from the World Development Indicators (World Bank 2019) to capture the social norm of having children when the couple gets married.

Probably the least controversial covariate in this list is the proportion of women in the fertile age (15 – 49 years). We use data from World Development Indicators (World Bank 2019). The original data cohorts grouped by five years were combined to form the total proportion of females in the fertile age range.

To encapsulate the state of child care services availability in the countries we use preprimary school enrollment (% gross) from World Development Indicators (World Bank 2019). While the availability of child care services should affect fertility levels as one of the tools that family policies use to incentivize births, this covariate might not be a reliable indicator for fertility rates because of their interdependent nature. Greater availability of preprimary school institutions might alleviate the pressure on parents to take care of the child full time or reduce the cost of the child by not having to hire a nanny. However, when more children are born due to other reasons, the preprimary school enrollment might increase correspondingly, but it also might decrease or stay constant if the newly born children are not enrolled in the preprimary care (in other words, there are more children in total but a smaller percentage of them visits preprimary childcare).

Having as many control variables as possible is not a recommended approach in empirical analysis because it leads to issues with overfitting. However, since the variables that we listed entail the danger of not accurately predicting our variable of interest, we might try to construct different models with different predictors of fertility and see if the results change based on the differences. Unfortunately, when it comes to gathering data on child care and the economics of childrearing for 21 countries in the span of 20 years, one runs into difficulties. Many European data from the Eurostat are not available around the first reform in 1995 since many countries were not EU members back then. When it comes to variables such as contraceptive prevalence which seem of a great value when trying to predict fertility, the available data is very sparse, rendering the variable useless for our analysis.

Consequently, when trying to modify the model with other variables, we were constrained by the data availability to more generic and to some extent less modern variable types. These include mother mortality and infant mortality obtained from the World Development Indicators (World Bank 2019). Since these indicators are not very relevant to fertility development in the developed world, we decided not to include them in our model.

The final list of variables considered in our model is thus:

Total fertility rate (TFR)
GDP per capita
Preprimary school enrollment
Primary school enrollment
Secondary school enrollment
Tertiary school enrollment
Ratio of women in reproductive age
Crude marriage rate

We used the same variables for both reforms which makes the results more easily comparable.

2.7.2 Donor pool selection

While deciding which countries to use to form the control group, we have to navigate among several limiting criteria. The control group countries would ideally satisfy the following aspects:

- no structural shocks to the dependent variable (total fertility rate) in a long enough period before and after the studied reforms

- similar to the analyzed country in economic indicators such as country size, economic performance, cultural aspects, etc.

- family policy setup comparable to the analyzed country

For the purposes of this thesis, priority was given to the above aspects in the order in which they are listed. Due to the research being constrained by the realities of the diversity present even within the pool of European OECD countries, we decided to first favor the research validity with regards to the elimination of the possible effect of structural shocks on the dependent variable. This means that during the research of the comparison countries, we initially focused on the absence of statutory reforms possibly

affecting fertility and family related decisions. The data on policy reforms were drawn from the Mutual Information System on Social Protection database (MISSOC database) and the database for Institutional Comparisons in Europe (CESifo DICE).

For the two reform periods in 1995 and 2008 we compiled the following overview of structural shocks in the form of a statutory reform relating to maternity/paternity and family benefits. The table depicts two intervals around the year of the reform of 3 and 5 years. We have determined 3 years as a minimum buffer to include a country in the construction of the control. Countries which experienced reforms up to 3 years before or after the two critical years were removed from the set. The X symbol indicates an occurrence of a statutory basis for a change in family policy in the given year.

Figure 5 Occurrence of family policy interventions in European OECD countries within a 5-year window from year 1995

country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Austria											
~~Belgium~~					x		x	x			
Denmark											
Estonia											
~~Finland~~			x	x							
France											
Germany											
Greece											
~~Hungary~~						x		x	x		
Ireland											
~~Italy~~									x	x	x
~~Latvia~~						x	x	x			
Luxembourg											
Poland										x	x
Portugal											
Slovakia											
Slovenia											
Spain										x	x
The Netherlands											
~~United Kingdom~~			x								

Source: author's representation of data from the MISSOC database (2019) and the CESifo DICE (2019)

*Note: Occurrence of an intervention in the given country is marked by an **x** in the given year. Gray countries are the ones chosen for the donor pool for the reform in year 1995.*

Figure 6 Occurrence of family policy interventions in European OECD countries within a 5-year window from year 2008

country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austria											
Belgium										x	x
Denmark										x	
~~Estonia~~							x	x	x	x	x
Finland		x									
France											x
~~Germany~~				x	x		x	x	x		x
~~Greece~~						x			x	x	
~~Hungary~~									x		
~~Ireland~~			x		x			x	x		x
Italy										x	x
Latvia											x
~~Luxembourg~~								x			x
Poland	x	x									
~~Portugal~~	x			x			x	x		x	
~~Slovakia~~	x		x			x	x		x		x
~~Slovenia~~			x	x				x			x
~~Spain~~			x		x		x				
~~The Netherlands~~			x							x	x
United Kingdom											

Source: author's representation of data from the MISSOC database (2019) and the CESifo DICE (2019)

Note: Occurrence of an intervention in the given country is marked by an ***x*** *in the given year. Gray countries are the ones chosen for the donor pool for the reform in year 2008.*

It is apparent that many more reforms took place around the year 2008 as compared to 1995. This fact along with different data availability for more recent years resulted in the subsequent analysis being done separately for the two periods.

In case of the 2008 reform, we also have further information on the comparability of family policies in different countries which was in broader terms discussed in the section Family policies across Europe. If the comparison group was limited to the closest of the segments sketched out by Thevenon (2011), our control would be limited to combining data from Spain, Italy and Poland for the 2008 reform. Since our model utilizes the construction of the synthetic control country through weighted average and thus the variation within the data is further handled to best resemble the situation in our country of interest, we have decided to keep as wide sample of countries as possible in the initial stage of analysis. The further country cut based on the similarity of the respective family policies could always be made later if the results prove to yield any suspicious contradictions or mixed results.

Based on the restrictions above, the final list of countries used in the empirical analysis for the two reforms is presented below.

Table 1 List of donor pool countries used for the empirical analysis

1995	2008
Austria	Austria
Denmark	Belgium
Estonia	Denmark
France	Finland
Germany	France
Greece	Italy
Ireland	Latvia
Luxembourg	Poland
Netherlands	United Kingdom
Poland	
Portugal	
Slovak Republic	
Slovenia	
Spain	

2.7.3 Data

We use the *synth* package in Stata to carry out the model computations. Specific datapoints for years in which certain donor pool countries experienced policy interventions within more than three and less than five years from the reform years 1995 and 2008 were ignored as well in order not to skew our results while keeping as much data as possible. These were data for Poland in years 1999, 2000, 2003 and 2004, Spain in years 1999 and 2000, Belgium in years 2012 and 2013, Denmark in years 2012 and 2013, Finland in years 2003 and 2004, France in year 2013, Italy in years 2012 and 2013, and Latvia in year 2013.

In all other cases all available data within the ranges 1990-2000 and 2003-2013 were considered in the analysis. Missing or unavailable data points were ignored for the averaging.

In the basic model, we restricted the list of covariates to GDP per capita (*gdp*), unemployment rate (*unemp*), primary school enrollment (*prim*), secondary school enrollment (*sec*), tertiary school enrollment (*ter*), crude marriage rate (*marri*), fertile age ratio (*fage*), and preprimary school enrollment (*preprim*).

Summary statistics of our dataset are presented below.

Table 2 Summary statistics of the whole data sample for reform in 1995

Variable	No. of observations	Mean	Std. Dev.	Min	Max
tfr	165	1.53897	0.2493935	1.13	2.11
gdp	156	18750.7	8706.997	5635.943	55348.9
unemp	151	8.555597	4.662639	0.637	24.209
prim	154	101.4063	7.018821	78.8116	122.384
sec	152	100.0127	13.4182	59.65154	140.6905
ter	149	34.97295	13.052	4.79002	57.21831
marri	161	5.447826	0.8976418	0.897642	8.8
fage	161	49.28231	1.677526	1.677526	52.85162
preprim	144	80.87822	19.10591	19.10591	114.0701

Source: Author's computations

Table 3 Summary statistics of the Czech Republic data for reform in 1995

Variable	No. of observations	Mean	Std. Dev.	Min	Max
tfr	11	1.422727	0.3058134	1.13	1.9
gdp	11	13660.58	1582.081	11595.62	16190.21
unemp	11	4.936573	2.037991	2.27	8.762
prim	11	101.6808	3.725155	93.19965	105.5303
sec	11	88.90398	4.543781	82.15731	97.9561
ter	11	20.31419	4.662834	14.38632	28.34885
marri	11	6.1	1.148913	5.2	8.8
fage	11	49.68281	0.577736	48.53162	50.29209
preprim	11	90.66532	5.86451	85.19743	105.9109

Source: Author's computations

From Table 2 and 3, we can see that the fertility levels in the Czech Republic are on the lower end, compared to the rest of the donor pool countries in the period between 1990 and 2000. It is also represented by a much lower rate of unemployment, lower rate of terciary education and proportionaly more children in formal childcare. The differences in values for the Czech Republic are not extremely large compared to the rest of the samle for any other variable.

Table 4 Summary statistics of the whole data sample for reform in 2008

Variable	No. of observations	Mean	Std. Dev.	Min	Max
tfr	110	1.617273	0.2457227	1.18	2.03
gdp	98	31583.13	8547.45	11026.62	47922.05
unemp	98	7.740898	2.881528	3.434	19.482
prim	97	101.3405	2.725642	94.5408	107.3417
sec	98	108.8195	17.89979	91.95508	161.0192
ter	94	67.35448	11.86083	37.00779	94.92139
marri	94	4.901064	0.8879716	3.4	7
fage	98	46.12921	1.726719	41.95206	50.2595
preprim	98	92.04453	17.40222	54.24008	120.6128

Source: Author's computations

Table 5 Summary statistics of the Czech Republic for reform in 2008

Variable	No. of observations	Mean	Std. Dev.	Min	Max
tfr	11	1.396364	0.1177517	1.18	1.51
gdp	11	25774.99	3701.255	14426.09	30485.71
unemp	11	6.829455	1.105608	4.392	8.21
prim	11	101.3048	2.843001	98.59442	105.9794
sec	11	96.16218	2.742906	93.85605	103.9586
ter	11	55.70812	9.8319	37.00779	65.65736
marri	11	4.772727	0.4451762	4.1	5.5
fage	11	47.57673	0.7542568	46.15745	48.62863
preprim	11	107.5836	5.448158	101.7188	116.4411

Source: Author's computations

Tables 4 and 5 summarize our data sample for the years from 2003 to 2013. Again, we can see that the level of fertility for the Czech Republic is much lower compared to the average of the whole sample and there are more children in preprimary childcare. Level of unemployment is closer than in the previous case. Secondary and tertiary education are a bit lower for the Czech Republic, but no extreme values are present compared to the rest of the sample.

The number of observations for this time period is slightly less than for the first reform even while considering the lower number of countries in the donor pool. This is due to some data points not being usable since an intervention took place in the country within the time window around the reform.

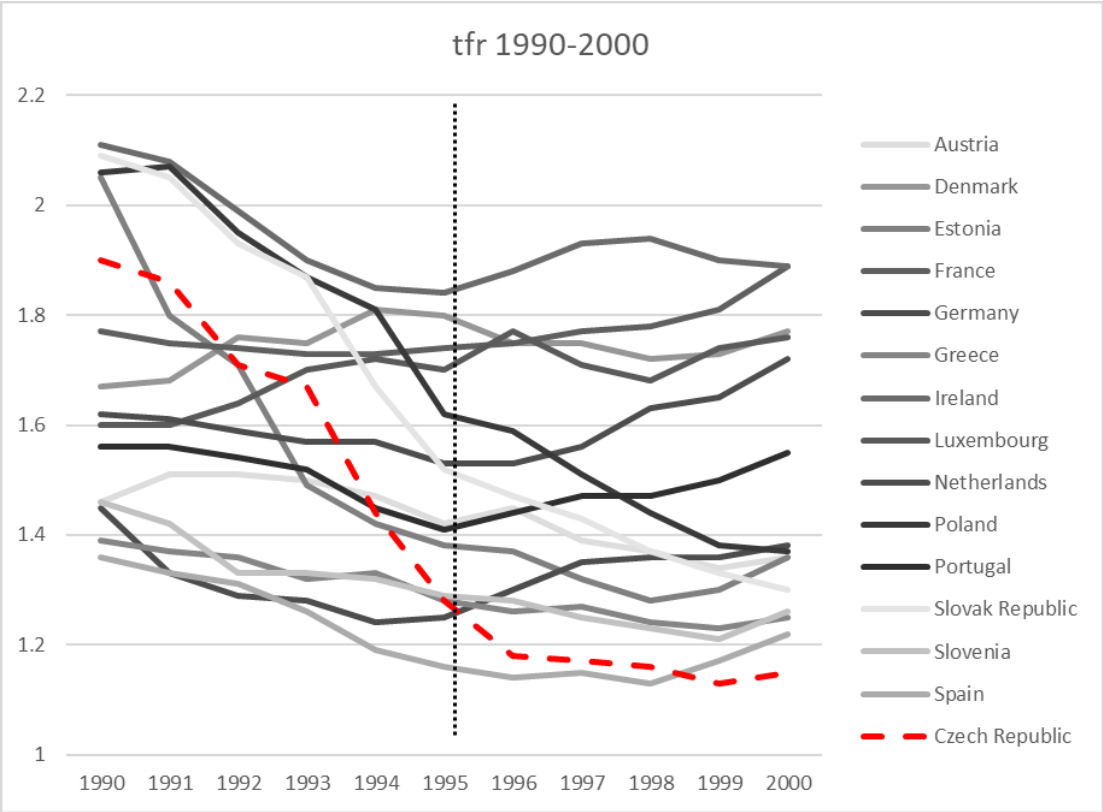
3 Empirical Analysis

This section presents the results of the empirical analysis using the synthetic control method. The results for the basic model are presented separately for the 1995 reform and for the 2008 reform.

3.1 Reform in 1995

For the 1995 reform we use 14 countries to form the donor pool: Austria, Denmark, Estonia, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, and Spain. Graphing out the development of the total fertility rate in these countries gives us Figure 7.

Figure 7 Development of TFR around year 1995 in the Czech Republic and the donor pool countries



Source: World Development Indicators (World Bank 2019)

The TFR forms a compact belt with the mean of 1.54 children per woman which is slightly above the mean of the Czech Republic of 1.42 children per woman. It is visible that within this belt the TFR in the Czech Republic followed a steady decline

which started to level off after 1995 and reaching one of the lowest numbers compared to the other countries.

After running the optimization in Stata, we obtain the synthetic Czech Republic with the mean indicator values depicted in Table 6. The column Treated represents the mean of the covariate calculated over the course of the pre-treatment period (1990 – 1994) for the Czech Republic. Column Synthetic depicts the covariate mean values over the pre-treatment period for the synthetic Czech Republic which was constructed as a weighted average of the 14 donor pool countries. The Mean column represents the simple pre-treatment period mean for the donor pool countries (not weighted). Ideally, the synthetic Czech Republic development should follow the covariate development in the actual Czech Republic as closely as possible. Our fit is not the best in this regard as covariates such as unemployment rate differ substantially. However, when we look at the mean values for the donor pool countries, the synthetic fit is still much closer than if we were to use a simple average.

Table 6 Synthetic fitting of covariates in the pre-treatment period (reform in 1995)

Variable	Treated	Synthetic	Mean	Std. Err.
gdp	12155.7	12169.44	15353.61	774.6459
unemp	3.79166	6.473611	9.150985	0.6663
prim	99.68708	99.33174	101.3303	0.971226
sec	88.96957	88.95156	98.73285	1.824737
ter	16.11251	19.13033	31.84241	1.386561
marri	7.02	6.26096	5.64	0.1209
fage	49.35194	47.87791	49.31652	0.189095
preprim	92.14947	79.13368	78.7536	2.953321

Source: Author's computations

Table 7 shows the weights assigned to countries which were used to construct the synthetic control. We see that out of the group of 14, only 4 countries have positive weights – in the order of importance these are Estonia, Slovak Republic, Luxembourg, and Portugal. Aside from Slovakia, it is not very intuitively clear how these countries are a good comparison to the Czech Republic. They are not geographically close, nor do they share any notable cultural similarities (compared to other countries from the donor pool). If we were to assign weights intuitively, we might opt for countries which are geographically closer to the Czech Republic like Poland or Austria which nonetheless have zero weight in the resulting synthetic control country.

Table 7 Weights of the donor pool countries in the synthetic control (reform in 1995)

Country	Weight *w*
Austria	0
Denmark	0
Estonia	0.399
France	0
Germany	0
Greece	0
Ireland	0
Luxembourg	0.173
Netherlands	0
Poland	0
Portugal	0.153
Slovak Republic	0.275
Slovenia	0
Spain	0

Source: Author's computations

Next, we look at the relative importance of the covariates depicted by v_m in the theoretical model framework. This is the weight that reflects the relative importance we assign to the m-th variable and we can see the matrix in Table 8. What is interesting, is that the variables with the largest weight are the variables which have a large predictive power on the outcome variable of interest. In our model, over 92% of the weight is on GDP per capita and the rest is almost entirely taken by secondary education with a weight of 7%. In our discussion about the selection of control variables we mentioned that the relationship between GDP per capita and total fertility rate is not clear-cut, therefore it is worth noting that our data indicate that GDP per capita has the largest predictive power on birth rates among all our other variables.

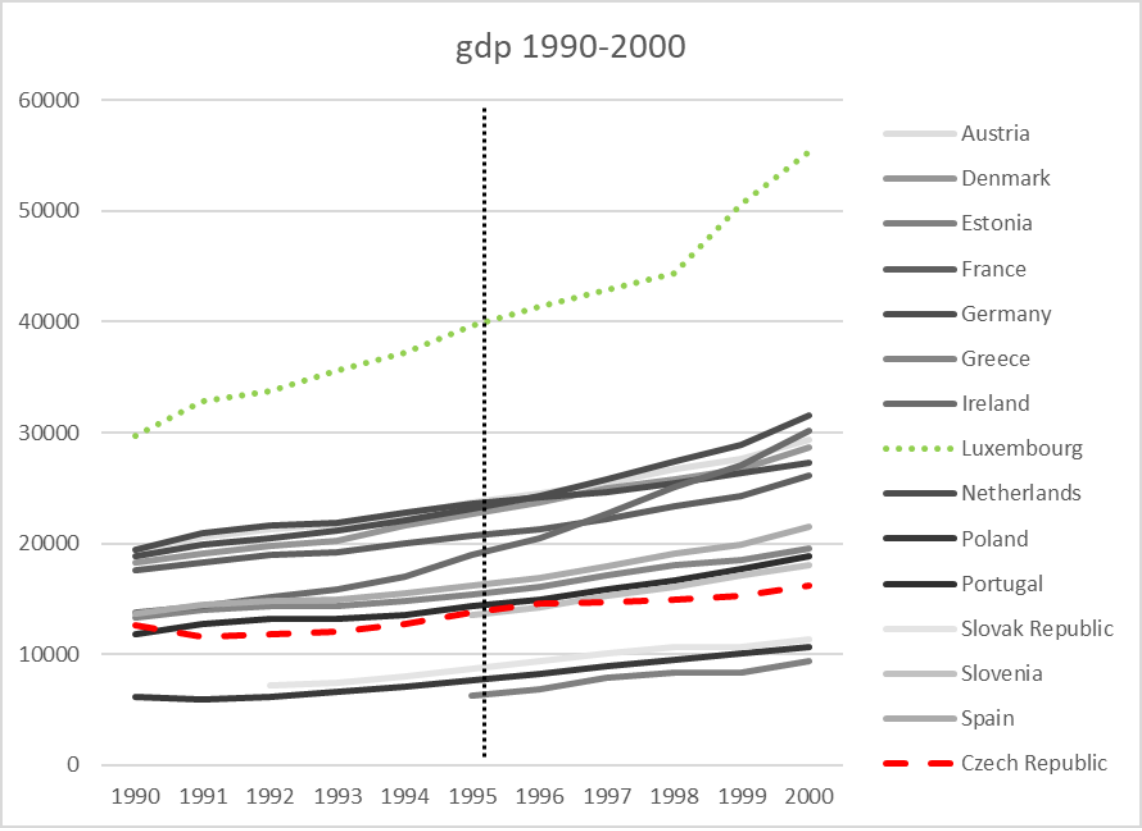
Table 8 Weights of the covariates in the synthetic control (reform in 1995)

Covariate	Weight *v*
gdp	0.92108667
unemp	0.00028787
prim	0.00275666
sec	0.07217008
ter	0.00090847
marri	0.00130337
fage	0.00001128
preprim	0.00127560

Source: Author's computations

Additionally, when we look at the graph of GDP per capita in our country sample, we can see that Luxembourg is an outlier among the other countries with a significantly higher level of GDP per capita than the other countries. Nonetheless, it has a weight of 17.3 % in our model.

Figure 8 Development of GDP per capita in the Czech Republic and the donor pool countries (reform in 1995)



Source: World Development Indicators (World Bank 2019)

We tried to exclude Luxembourg from the donor pool and run the estimation again to see if the results would improve in any significant manner, but they did not. The w weight of Luxembourg was redistributed to Estonia, Portugal and the Slovak Republic and the weight of other countries remained at zero. The relative importance of the covariates changes substantially and is depicted in the Table 9. The importance of GDP per capita fell from 92.1% to 0.1% and the importance of secondary education rose to 99%, carrying almost all the predictive power on fertility rate in our model.

Table 9 Comparison of the weights of the donor pool countries in the synthetic control with and without Luxembourg (reform in 1995)

Covariate	Weight *v* with Luxembourg	Weight *v* without Luxembourg
gdp	0.92108667	0.00090243
unemp	0.00028787	0.00182554
prim	0.00275666	0.00037889
sec	0.07217008	0.98976069
ter	0.00090847	0.00499295
marri	0.00130337	0.00162344
fage	0.00001128	0.00000000
preprim	0.00127560	0.00051183

Source: Author's computations

The fit of our synthetic country worsened when Luxembourg was excluded as shown in Table 10 where the values for the synthetic country constructed without Luxembourg are highlighted in the middle column. All variables have worse fit, except for the ratio of women in fertile age and this variable has negligible predictive power in both cases – with or without Luxembourg.

Table 10 Comparison of the synthetic fitting of covariates in the pre-treatment period with and without Luxembourg (reform in 1995)

Variable	Treated	Synthetic	Synthetic without Luxembourg	Mean	Std. Err.
gdp	12155.7	12169.44	8707.855	15353.61	774.6459
unemp	3.79166	6.473611	7.62651	9.150985	0.6663
prim	99.68708	99.33174	104.2491	101.3303	0.971226
sec	88.96957	88.95156	89.06271	98.73285	1.824737
ter	16.11251	19.13033	21.96316	31.84241	1.386561
marri	7.02	6.26096	6.4189	5.64	0.1209
fage	49.35194	47.87791	48.16029	49.31652	0.189095
preprim	92.14947	79.13368	70.76922	78.7536	2.953321

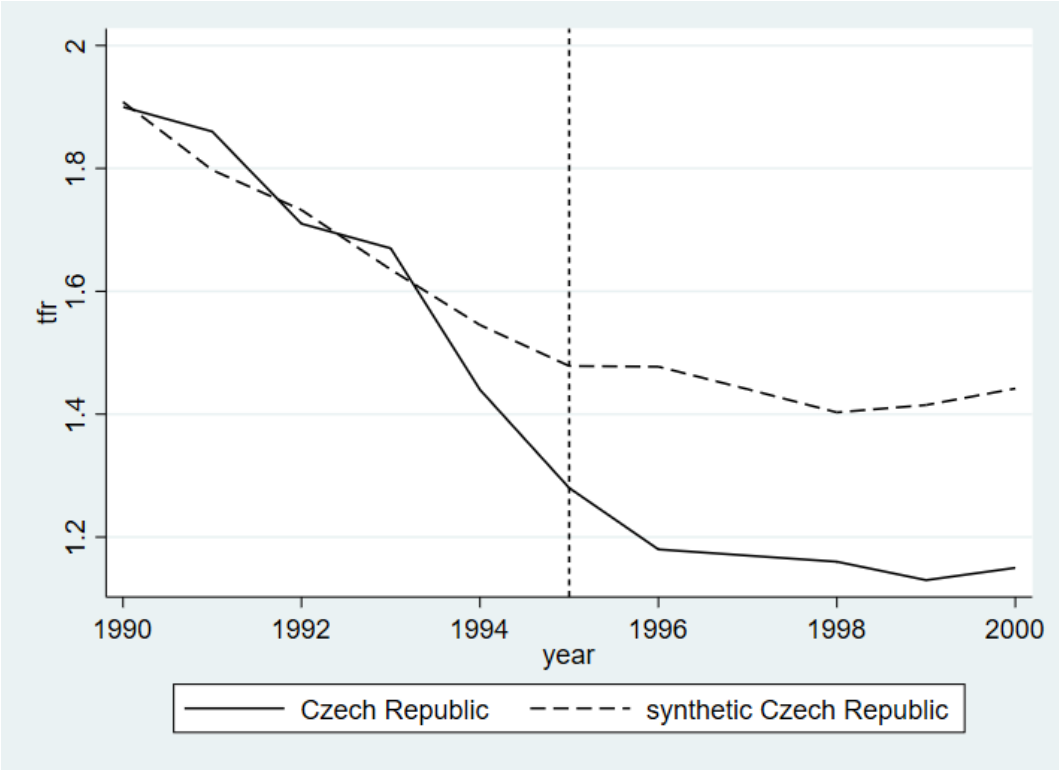
Source: Author's computations

Because the exlusion of Luxembourg did not result in a model with a better fit, we proceeded while keeping Luxembourg in the donor pool.

The plot of TFR of the Czech Republic and its synthetic counterpart is shown in Figure 9. It is apparent, that the fit of the synthetic country is good up to about 1993 after which the two curves start to deviate and continue to do so after the intervention year. The root mean square prediction error is 0.0578436. The value of this error does not tell us much on its own as its values differ across research areas and it needs to be

viewed in the context of the model. In our case, the RMSPE for the Czech Republic can be compared to RMSPE values which we would if we reassigned the treatment unit to another country and tried to fit its development of TFR with the donor pool data (now including the Czech Republic as one of the donor pol countries). Further discussion about this measure of goodness of fit will follow below in the section with placebo tests where we discuss the comparison.

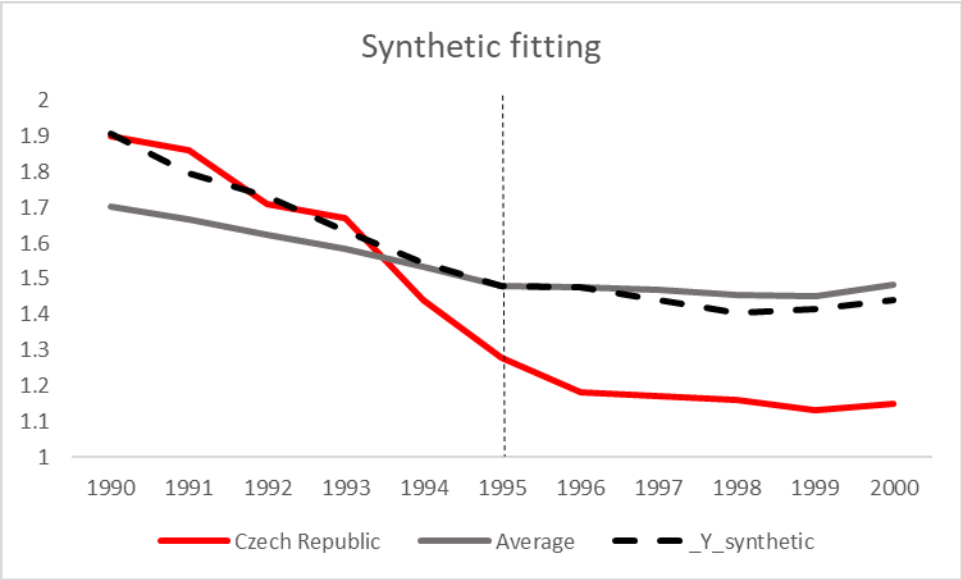
Figure 9 Development of TFR in the Czech Republic as compared to its synthetic counterpart (reform in 1995)



Source: Author's computations

The reason for the gap ensuing between the two curves is visible in Figure 10, depicting the TFR progression for the Czech Republic, the synthetic Czech Republic and the average of the donor pool countries. The synthetic control TFR follows the development in the Czech Republic closely right up to the point when it crosses with the curve of the average donor pool values and follows this curve afterward.

Figure 10 Synthetic fitting of TFR in the Czech Republic as compared to its synthetic counterpart and the donor pool average (reform in 1995)

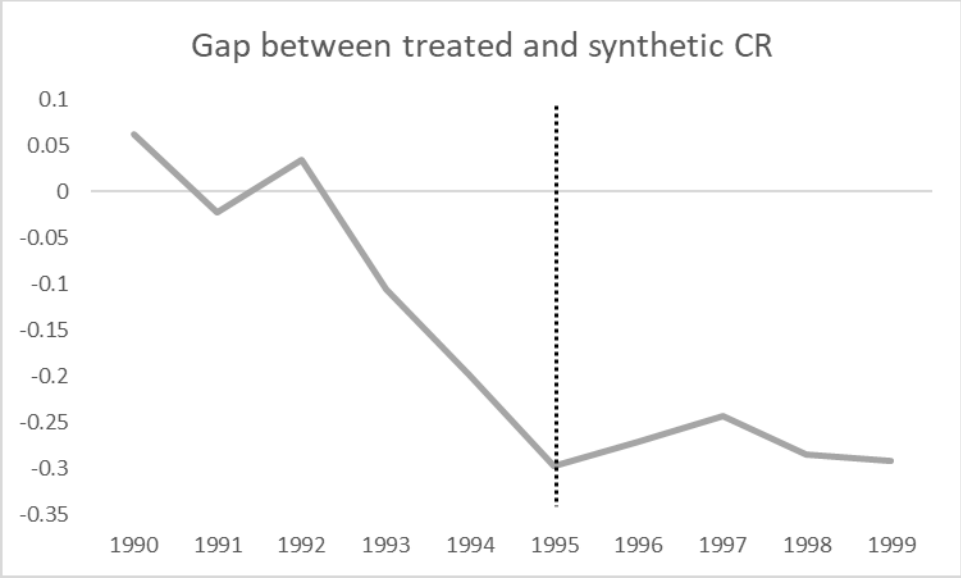


Source: Author's computations

This fitting issue does not have a clear explanation because the synthetic control should copy the development closely in the whole pre-treatment period. If it deviates before, this might be an indication of an earlier change in the trend than expected based on the year of the intervention. In other words, if people knew that the intervention would take place, they could plan for it. This however seems unlikely because if the gap began to grow in 1993 it would mean that the conception would take place another 9 months before, which is simply too early for this explanation to be the case. The law changing the length of the parental allowance reception period comes from a parliament record on 26th May 1995 with the enacted and in force dates coming even later than that. Therefore, it seems more likely that the fault lies in our model or data. Alternatively, it is possible that the fertility trend change occurred before the intervention which subsequently happened as a reaction to this drop.

This being said, there still does seem to be a change in the trend of TFR in 1995. In Figure 11, depicting difference between the synthetic and actual Czech Republic, there is a clear break in 1995 and the growing gap suddenly levels off and remains relatively steady.

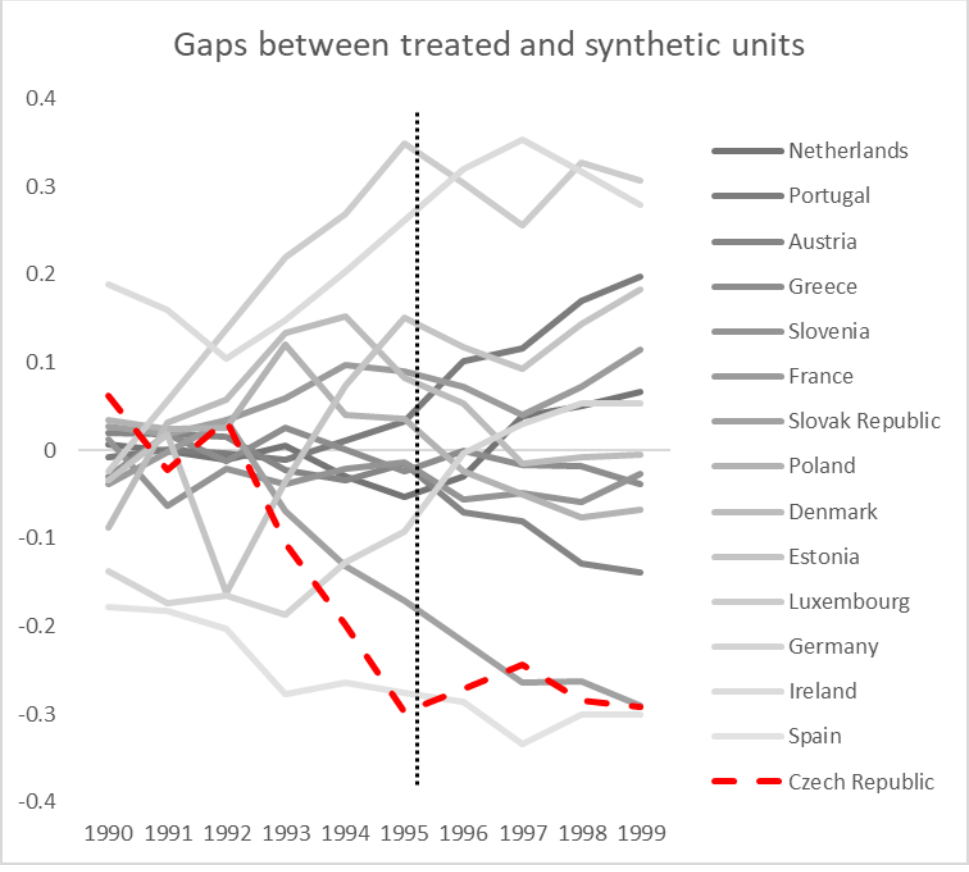
Figure 11 Difference between TFR values in the Czech Republic and its synthetic counterpart (reform in 1995)



Source: Author's computations

To see if this behavior is unique to the case of the Czech Republic, we run 14 placebo tests in which all else being equal, we mark another country as the treated unit and run the optimization again. The gaps between the placebo synthetic and actual countries are graphed in Figure 12. For the majority of placebo tests the gap remains relatively small even after 1995 but there are a few lines which resemble the line for Czech Republic which we obtained. Nevertheless, the line for the Czech Republic is still one of the more prominent in the size of the post-treatment period gap which suggests there is some effect.

Figure 12 Difference between TFR values in the countries and their synthetic counterparts (reform in 1995)



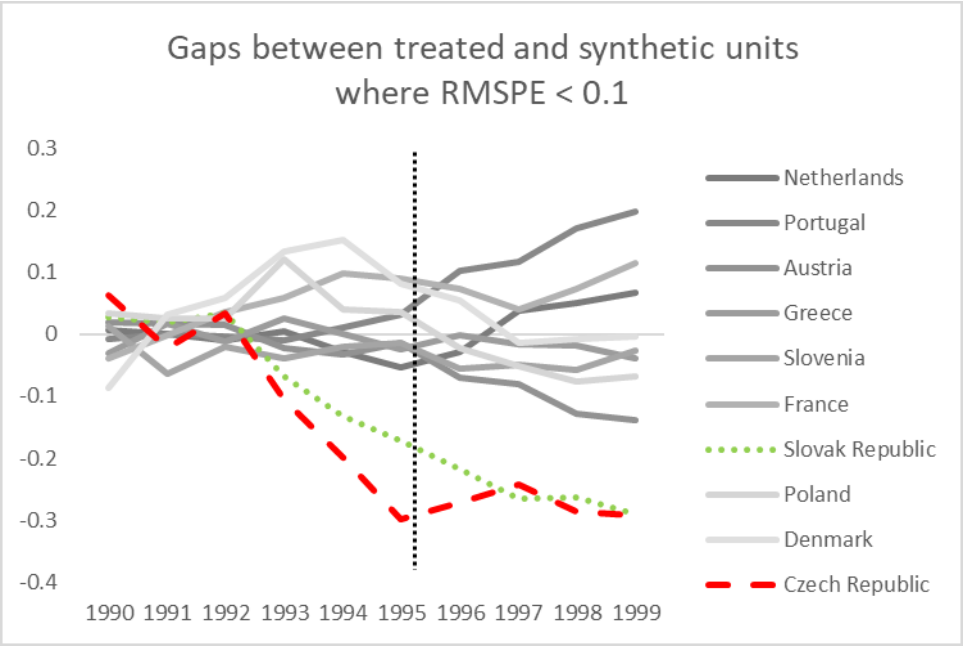
Source: Author's computations

Since several countries exhibit poor fit even in the pre-treatment period, we decided to look what the gaps look like for countries which achieved a good fit in the pre-treatment period and hence the results of the method can be interpreted with more confidence. Since the RMSPE of the countries ranges from 0.007 (The Netherlands) to 0.204 (Spain) and for Czech Republic it is around 0.058, we set the cut-off level at RMSPE equal to 0.1. This resulted in removal of Spain, Ireland, Germany, Luxembourg and Estonia from the graph[1]. In Figure 13, the difference in TFR between the countries and their respective synthetic counterparts shows that the ensuing gap in the case of the Czech Republic really seems to be more prominent in comparison. In addition, although larger than in other countries, the gap ensuing in the middle of the

[1] The fact that RMSPE values for Estonia and Luxembourg in the placebo tests are larger and hence their fit with their synthetic version is poorer, does not necessarily indicate how suitable these two countries are for being in the donor pool for the Czech Republic. It only means that their development of TFR is not very well explained by the development in the rest of the countries.

pre-treatment period does not seem to be unique to the Czech Republic as around the same time, other country lines begin to deviate as well.

Figure 13 Differences between TFR values in the countries and their synthetic counterparts for countries with RMSPE lower than 0.1 (reform in 1995)



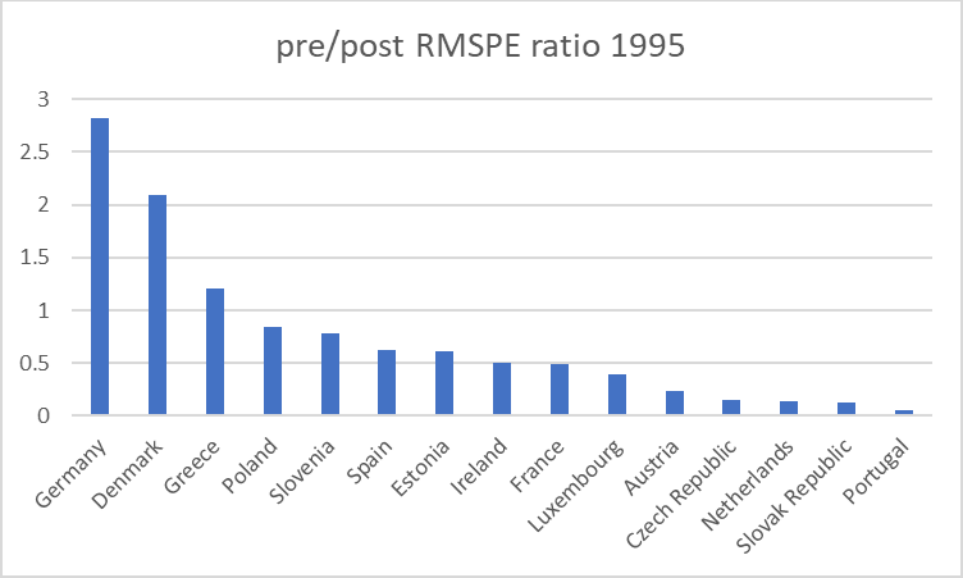
Source: Author's computations

A very similar progression of the line is displayed in the case of Slovakia (highlighted in green). If we were to use the difference in differences approach as many of the researchers before us have done, we would have used Slovakia as the comparison country since it is very similar to the Czech Republic. If this were the case of our approach, we would find almost no difference in development of fertility levels. Our methodology – the synthetic control function – offers a slightly more nuanced insight, nevertheless, the hypothesis that the intervention into the length of reception of parental allowance led to any consequent increase or decrease in fertility levels is not strongly supported.

An additional check we can perform is to look at the pre-post intervention ratios of the RMSPE. The rationale behind this ratio value is, that if the ratio is small, this means that the RMSPE in the pre-intervention period was small (the actual country followed the synthetic country closely) and the post-intervention RMSPE was large (i.e. the gap between the synthetic and actual country grew after the intervention took place), which in turn suggests a large effect of the intervention on our dependent variable. If the ratio is large, there is evidence for no effect of the intervention.

Figure 14 depicts the values of the pre/post-intervention RMSPE ratios for each country. We observe that the Czech Republic displays one of the lower values, suggesting as we already said above that the intervention effect was larger than for the other countries in the placebo tests. However, even smaller ratio values were computed for Slovakia and Portugal, which are two of the donor countries used in the construction of the synthetic control[2]. These countries did not see any family policy interventions in the window around the year 1995 and thus we cannot claim that the intervention effects in the Czech Republic were significantly large in the overall context of our model.

Figure 14 Pre/post-treatment period RMSPE ratios (reform in 1995)



Source: Author's computations

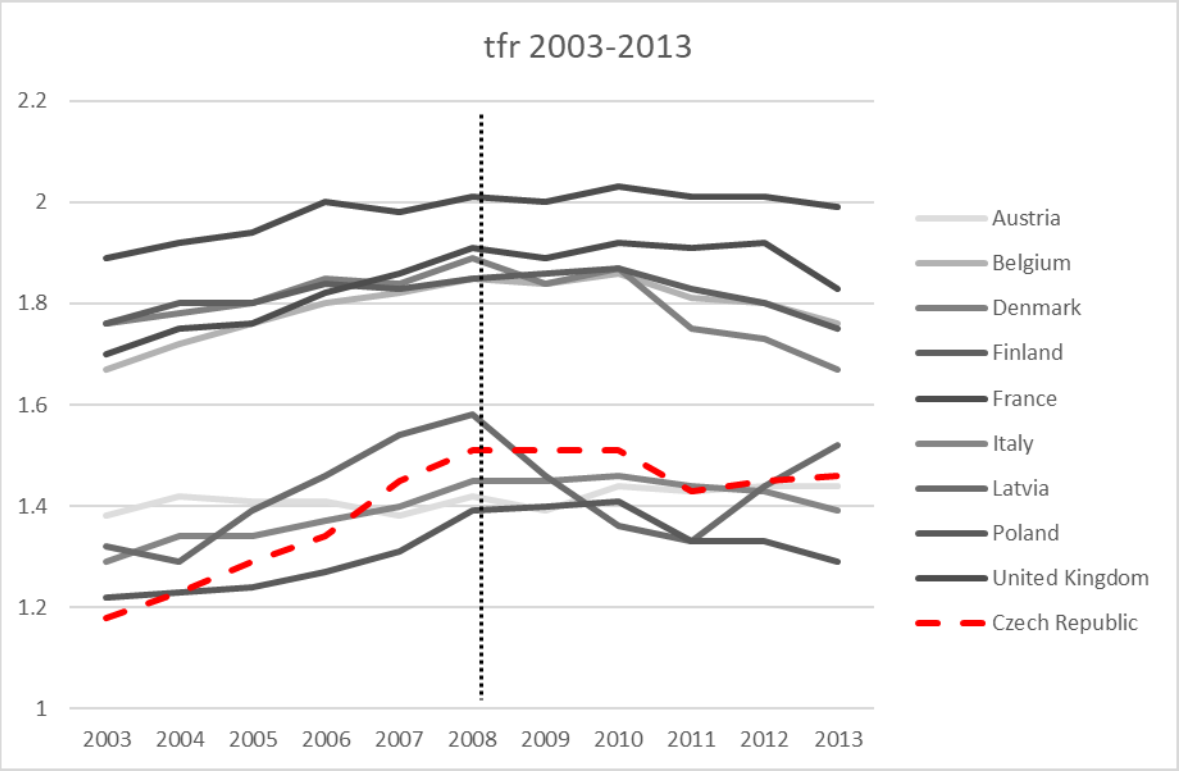
Our hypothesis that the reform of 1995 in the Czech Republic affected the fertility levels in subsequent years is not strongly supported. In the next section, we analyze the reform which took place in the Czech Republic in 2008.

[2] While the values of RMSPE in the pre-treatment period alone did not tell us much about the reliability of our results, the small value of pre- and post-treatment ratios in case of Slovakia and Portugal are concerning. These countries display a small difference between the synthetic and actual country in the pre-treatment period and a large difference in the post-treatment period, but no intervention took place in them in the relevant time period.

3.2 Reform in 2008

For the 2008 reform we use 9 countries to form the donor pool: Austria, Belgium, Denmark, Finland, France, Italy, Latvia, Poland, and United Kingdom. Graphing out the development of the fertility rate in these countries gives us Figure 15.

Figure 15 Development of TFR around year 2008 in the Czech Republic and the donor pool countries



Source: Author's computations

We can see two levels of fertility in the figure which do not intersect. The Czech Republic is in the lower TFR group along with Latvia, Poland, Austria, and Italy. The overall trend seems to be a slow and steady growth which levels off after 2008 for most countries. This timing coincides with the breakout of the economic crisis.

Similarly, as was done in the case of the 1995 reform, the mean indicator values are presented in Table 11. Comparing the mean values from the pre-treatment period among the columns Treated, Synthetic and Mean, we observe that while not offering a perfect fit, the mean values for the covariates for the synthetic Czech Republic mimic the country closer than the simple mean of the other countries in most cases.

Table 11 Synthetic fitting of covariates in the pre-treatment period (reform in 2008)

Variable	Treated	Synthetic	Mean	Std. Err.
gdp	12155.7	12169.44	15354	774.646
unemp	3.79166	6.473611	9.151	0.6663
prim	99.68708	99.33174	101.3	0.97123
sec	88.96957	88.95156	98.73	1.82474
ter	16.11251	19.13033	31.84	1.38356
marri	7.02	6.26096	5.64	0.1209
fage	49.35194	47.87791	49.32	0.18909
preprim	92.14947	79.13368	78.75	2.95332

Source: Author's computations

Table 12 shows the weights assigned to countries which were used to construct the synthetic control. We see that out of the group of 9, only 3 countries have positive weights – in the order of importance these are Italy, Poland, and Latvia.

Table 12 Weights of the donor pool countries in the synthetic control (reform in 2008)

Country	Weight *w*
Austria	0
Belgium	0
Denmark	0
Finland	0
France	0
Italy	0.483
Latvia	0.176
Poland	0.341
United Kingdom	0

Source: Author's computations

When we look at these countries and their family policy approach as described in a previous section of this thesis about comparison of family policy setup in countries across OECD, we see that Italy as well as Poland happen to be in the same section of family policy setup as the Czech Republic which is favorable for the meaningfulness of our subsequent results. Even though we are not including the measures quantifying various aspects of family policies in this model, synthetizing the control country from countries which have a similar family policy outlook as our treated unit should implicitly capture these nuances and lower the omitted variable bias. Additionally, all three positive weight countries are from the group with low TFR rates, rendering them even more similar to the Czech Republic. This lends more confidence to the findings resulting from the analysis. The inclusion of Poland makes intuitive sense too, due to

its geographical closeness and similar cultural background (although Poland is a more religious country than the Czech Republic which might affect attitudes toward marital and consequently child bearing matters). The inclusion of Italy and Latvia are less clear from the intuitive reasoning standpoint. They are perhaps more likely to be chosen as a comparison to the Czech Republic than some of the other countries from the donor pool (e.g. UK or Finland), however, a clear intuitive explanation for their selection is not readily available.

All three countries: Italy, Poland, and Latvia, experienced some reforms of family policies within the five-year window around the year 2008 (see Figure 6 on page 27). In Poland these were the change in Law on Family Benefits (Ustawa o świadczeniach rodzinnych) of 28 November 2003 and Health Care Services financed from Public Means (Ustawa o świadczeniach opieki zdrowotnej finansowanych ze środków publicznych) of 27 August 2004 which refined the circumstances of medical care received during the pre- and post-natal period. In Latvia, a government support program commenced in 2013, providing financial support to parents whose children were not admitted to municipal kindergartens. In Italy, the interventions which took place were the Law No. 92 of 28 June 2012, Article 4, paragraphs 24 to 26, providing measures in support of paternity (recante le disposizioni in materia di riforma del mercato del lavoro in una prospettiva di crescita) and the Law No. 97 of 6 August 2013, Article 13, containing provisions issued to abide by EU obligations (Disposizioni per l'adempimento degli obblighi derivanti dall'appartenenza dell'Italia all'Unione europea: "Estensione del diritto all'Assegno per il nucleo eriodr con almeno tre figli minori ai cittadini di Paesi Terzi che siano soggiornanti di lungo eriod") and affected the reception of family benefits.

In the span of the ten years from 2003 to 2013 most European countries reformed their family policies, so these changes are not unique our three donor countries which received positive weights in our model. We made sure to only use data from the years not affected by the reforms.

This considered, a concern naturally arises again as to how good the fit of our model might be. It is much easier to fit development during a pre-intervention period in one country if that pre-treatment period is shorter. If we had the luxury of fitting data over a period of 15 years before the intervention, our results would carry much different weight than when the pre-treatment period with which we can use is just 3 years long. Since Poland received a positive weight of 34.1% in our model, but only three years in the pre-treatment period were usable for it, we decided to re-run the estimation without it. As in the case of the 1995 reform, when we tried excluding Luxembourg from the

data sample, the fit changed for the worse (the differences in fitof the model with and without Poland are discussed below).

Table 13 depicts the v_m weights of relative importance of the covariates. This time the weights are more evenly distributed than was the case for the 1995 reform. A weight of 32% was given by the variable depicting the crude marriage rate, closely followed by secondary education with weight of 31%. GDP per capita remains considerable with its share of importance at 21%.

Interestingly, primary education has a share of 10%. A larger predictive power on fertility might be expected to fall on a more directly linked variable such as fertile age (4%), preprimary education (1.3%) or unemployment rate which remains insignificant (similarly as in the case of the reform in 1995).

Table 13 Weights of the covariates in the synthetic control (reform in 2008)

Covariate	Weight *v*
gdp	0.20829581
unemp	0.00000000
prim	0.10189717
sec	0.31491116
ter	0.00621695
marri	0.32012984
fage	0.03600864
preprim	0.01254042

Source: Author's computations

When we excluded Poland from the donor pool, Italy received an increased weight of 88.1%, Latvia's weight decreased to 11.9% and no other country received a positive weight. The relative importance of the covariates in their effect on predicting fertility changed dramatically. As we can see in Table 14, the importance of marriage rate when predicting fertility decreased from 32% to negligible levels by excluding Poland from the model. This might be due to the previously mentioned fact that the larger religious prevalence in Poland could influence the importance of marriage when having children.

Table 14 Comparison of the weights of the donor pool countries in the synthetic control with and without Poland (reform in 2008)

Covariate	Weight *v* *with Poland*	Weight *v* *without Poland*
gdp	0.20829581	0.25555607
unemp	0.00000000	0.04636213
prim	0.10189717	0.26921968
sec	0.31491116	0.20468244
ter	0.00621695	0.08846329
marri	0.32012984	0.00020538
fage	0.03600864	0.03015153
preprim	0.01254042	0.10535949

Source: Author's computations

The synthetic fit without Poland being in the donor pool is highlighted in Table 15. We can see that except for marriage rate, the averages of covariates with a large predictive power (primary education, GDP per capita, and secondary education) fit the values for the Czech Republic worse than when Poland is included in the model.

Table 15 Comparison of the synthetic fitting of covariates in the pre-treatment period with and without Poland (reform in 2008)

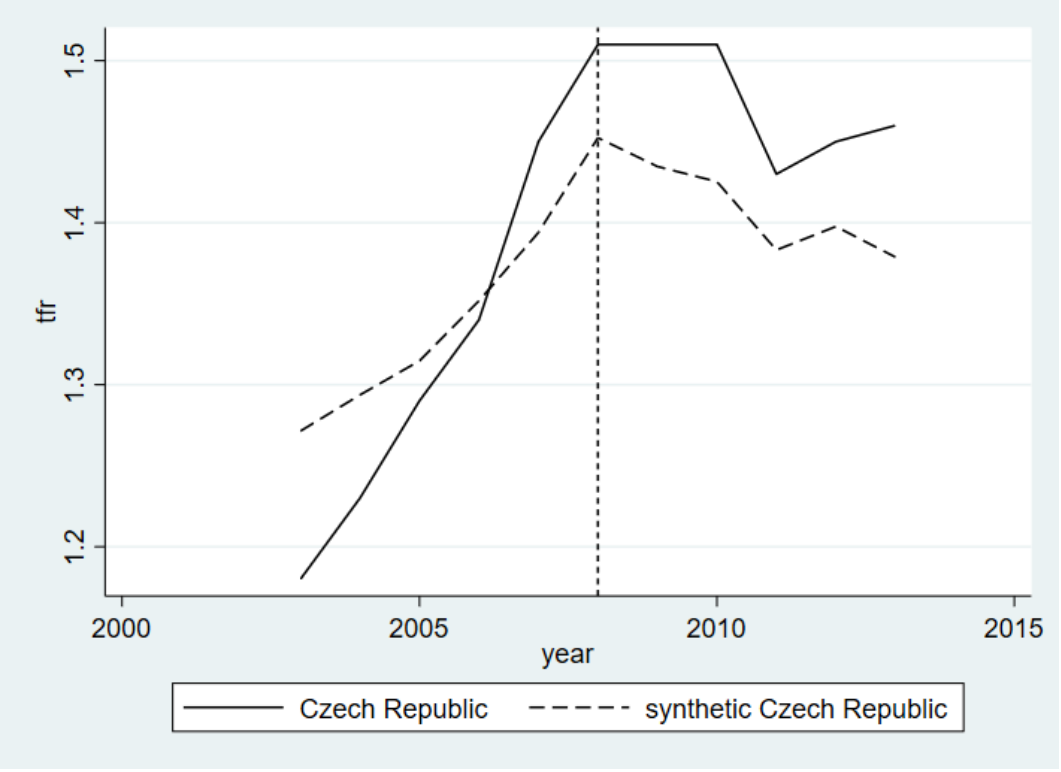
Variable	Treated	Synthetic	Synthetic without Poland	Mean	Std. Err.
gdp	12155.7	12169.44	8707.855	15353.61	774.6459
unemp	3.79166	6.473611	7.62651	9.150985	0.6662996
prim	99.68708	99.33174	104.3491	101.3303	0.9712259
sec	88.96957	88.95156	89.06271	98.73285	1.824737
ter	16.11251	19.13033	6.4189	31.84241	1.383561
marri	7.02	6.26096	48.16029	5.64	0.1209001
fage	49.35194	47.87791	48.16029	49.31652	0.1890949
preprim	92.14947	79.13368	70.76922	78.7536	2.953321

Source: Author's computations

Since the model was not improved by excluding Poland from the donor pool, we proceed while including it in our data set. The plot of TFR of the Czech Republic and its synthetic counterpart is shown in Figure 16. The root mean square prediction error is 0.0571111 which is comparable to the reform in 1995. In comparison with the RMSPE obtained by fitting the other countries from the donor pool with their synthetic counterparts in the placebo test it is one of the larger values though. More discussion on this will follow in the section with the placebo tests.

Interestingly, even though the graph looks very different from the one we obtained for the 1995 reform, we observe the same diversion of the two lines about two years before the intervention took place. Planning for the intervention from the side of families again does not seem at all likely since the law went through the parliament as early as 19th September 2007, was enacted 16th October 2007 and came into force on the 1st January 2008. This would not allow enough time for fertility to rise as early as 2006.

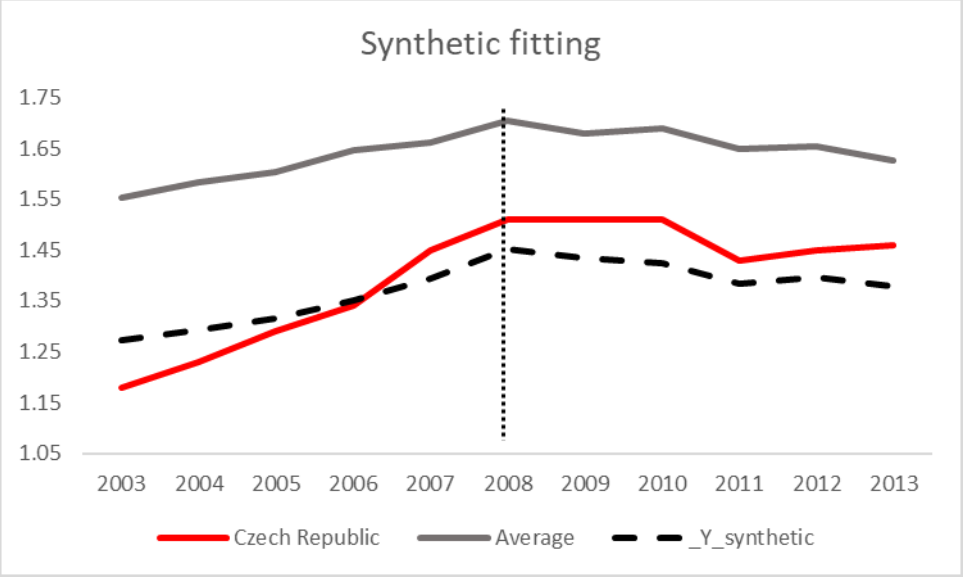
Figure 16 Development of TFR in the Czech Republis as compared to its synthetic counterpart (reform in 2008)



Source: Author's computations

When we look at the progression of the fertility trend in the synthetic and actual Czech Republic in comparison with the donor pool average we see, that the synthetic Czech Republic follows the development of the real country fairly closely, as opposed to what we saw in the case of the 1995 reform. The gap does not grow very much after the year of intervention, contrary to the previously studied case. This suggests that the reform's effect on fertility rate was not large.

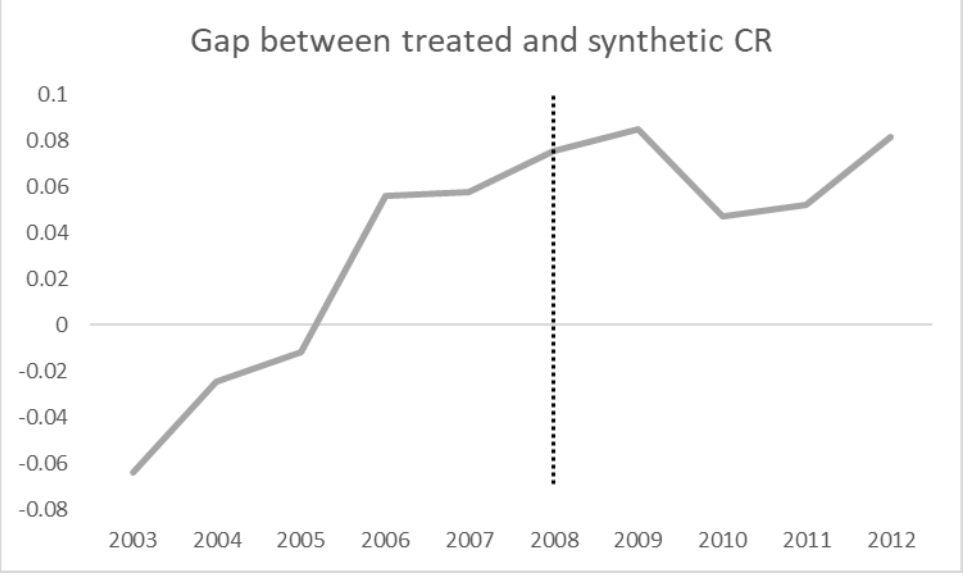
Figure 17 Synthetic fitting of TFR in the Czech Republic as compared to its synthetic counterpart and the donor pool average (reform in 2008)



Source: Author's computations

The gap evolution is depicted in Figure 18. Although on the first glance it looks like an inverse of the curve we observed for the 1995 reform, the scale is much smaller. In the case of the 1995 reform, the difference in fertility level between the synthetic and actual Czech Republic was almost 0.3 at its highest, and only 0.08 for the 2008 reform.

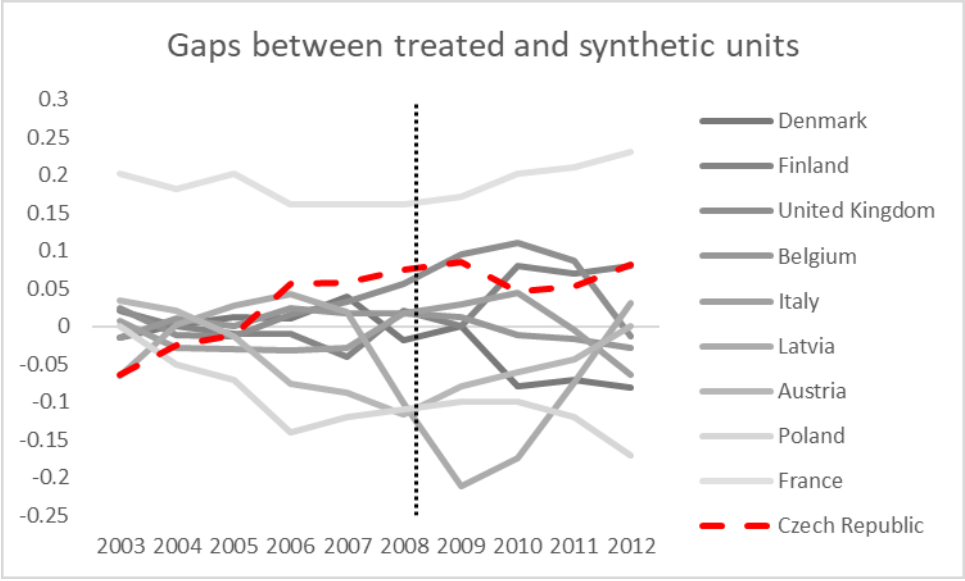
Figure 18 Difference between TFR values in the Czech Republic and its synthetic counterpart (reform in 2008)



Source: Author's computations

To gain some perspective on the results above, we ran 9 placebo tests for the donor pool countries and graphed out the gap between the resulting synthetic counterparts and the TFR development in the real countries. We can see right away that synthetic France is a very poor fit for real world France compared to the other countries. Notably, when we look at the rest of the values of the RMSPE in the pre-treatment period, Czech Republic has one of the larger values, suggesting that we were able to obtain a better pre-treatment period fit for most of the other countries from the donor pool.

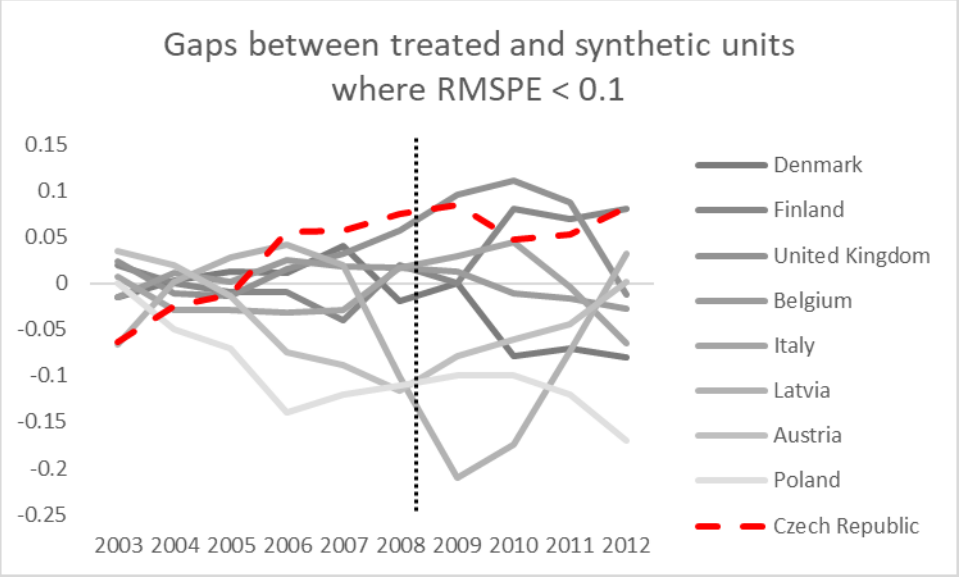
Figure 19 Differences between TFR values in the countries and their synthetic counterparts for countries (reform in 2008)



Source: Author's computations

When we remove the line for France as the only country with a RMSPE larger than 0.1, we can see that compared to the other countries in this graph, the development in the Czech Republic is not exhibiting any extraordinary post-intervention changes which would suggest any significant effect of the reform on fertility rate.

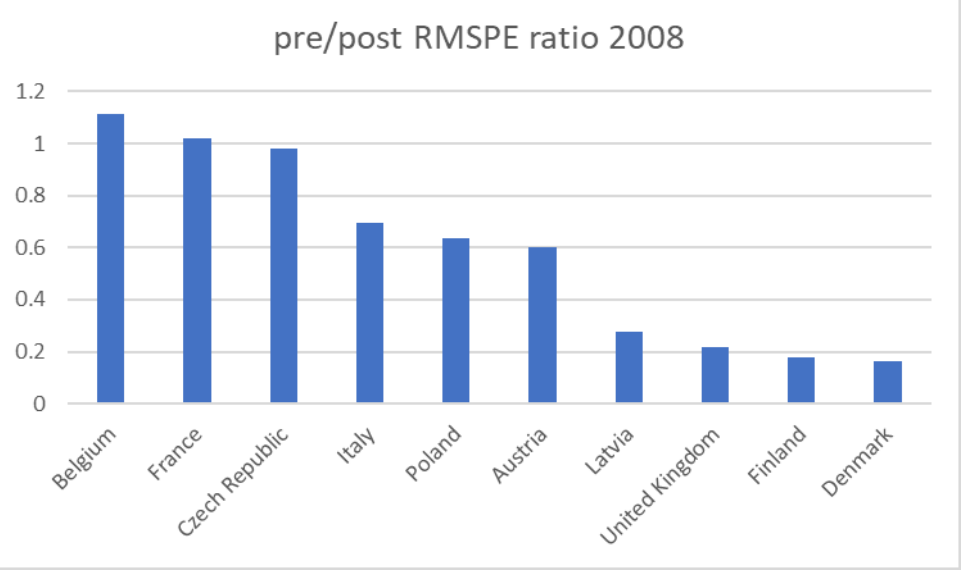
Figure 20 Differences between TFR values in the countries and their synthetic counterparts for countries with RMSPE lower than 0.1 (reform in 2008)



Source: Author's computations

Next, we compute the pre/post-intervention RMSPE ratios and plot them. In Figure 21 we see that the Czech Republic has the third largest value and the RMSPE's in the pre and post-intervention periods has almost the same magnitude.

Figure 21 Pre/post-treatment period RMSPE ratios (reform in 2008)



Source: Author's computations

Thus, our analyses of the effect of the reform in 2008 suggests that it had no effect on fertility levels.

4 Conclusion

There is much debate on what might influence people to have more or fewer children and whether the funds invested into family support are can affect fertility.

One of the main objectives of family policies in countries with low fertility levels is to stimulate birth rates and incentivize the citizens to have more children. Nevertheless, the research on whether this objective is being met remains inconclusive. Policy makers should take this into account when making decisions about the allocation of resources.

In this thesis, we have analyzed two reforms which took place in the Czech Republic in 1995 and 2008. The reforms adjusted the period of reception of the parental allowance – the first one increased the length, the other one offered the possibility to shorten it. We reviewed family policy changes in the rest of European OECD countries and for those which did not have any policy interventions, we collected data on fertility and its possible macroeconomic predictors. We then used the synthetic control approach to construct a synthetic Czech Republic which gave us an idea about how fertility levels would develop if the interventions did not take place.

In both cases, 1995 reform and 2008 reform, we did not find any conclusive evidence that the interventions affected fertility levels in the Czech Republic. Moreover, we observe a change in the trend of total fertility rate about 2 years *before* the reform which suggests that these reforms were more likely reactions to changing fertility rates rather than remedies. If anything, we observe a stagnation in the total fertility rate development after each of the reforms.

4.1 Limitations and suggestions for future research

As is true for any other approach, the synthetic control method offers the best results with the clearest interpretation when used in a setting which satisfies certain requirements. We have tried to meet as many as possible, nonetheless, there were drawbacks concerning data availability and the limited set of comparable countries which did not experience family policy interventions in the given period. For future research on this topic, we suggest trying to obtain data on more indicators which have predictive power on fertility. These might be for example the availability and spread of use of contraceptives, cultural factors such as social attitudes toward child-rearing,

or indicators capturing the different aspects of family policies like family support systems and childcare services. Our model also did not empirically consider the postponement of childbirth and its implications on fertility over time.

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Appendix

Table 16 Main Family policy indicators by group of countries, 2005-2007

Family policy model	Spending per child as % of GDP per capita	Full-time equivalent[a] of maternity plus parental leaves (in weeks)	Full-time equivalent[a] of father-specific leave (in weeks)	Spending on childcare services (% of GDP)	Childcare services coverage (% of children ages 0–2 years)	Average hours of childcare attendance per week	Preschool services coverage (% of children ages 3–5 years)	Net childcare costs for dual-earner family[b]	Benefits and tax breaks for families (% of GDP)	Support to low-income families[c]	Fiscal privilege to dual-earner households[d]
Nordic countries	52.6	44.6	6.7	1.52	46	33	82	9	1.5	2.2	5.1
Continental European countries	22.3	31.9	0.7	0.87	36	26	85	9	2.2	1.1	3.0
Anglo-Saxon countries and Switzerland	8.1	10.6	0.0	0.50	30	24	72	24	1.7	4.7	3.0
Southern Europe, Japan, and South Korea	12.5	27.8	0.7	0.57	28	32	74	8	0.6	3.6	5.3
Eastern European countries	51.1	58.5	1.3	0.62	7	29	71	7	1.5	2.9	3.9
OECD average	28.6	31.7	1.7	0.79	30	28	71	13	1.5	3.0	4.0

Source: Thévenon, O. (2011). Family policies in OECD countries: A comparative analysis. Population and development review, 37(1), 57-87.

Note: Unweighted averages.