Do Labor Market Conditions Affect Childbearing Behavior?

by

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ABSTRACT

The question of the thesis is whether labor market conditions affect childbearing behavior. I am using a panel data set with 29 OECD countries and 11 years to analyze if the change in the unemployment rate has an effect on next year's fertility rate. The preferred model specification finds a relatively small and negative, but statistically significant effect. In particular, a one percentage point increase in the unemployment rate decreases the fertility rate by approximately 0.005 children. This also implies that in the developed countries the expectations about future well-being and the opportunity cost of having a child do, in fact, play role in the decision about having a child. Thus, labor market conditions do affect childbearing behavior.

ACKNOWLEDGMENT

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1 Introduction

In the last few decades the fertility rate went through a major decline in many developed, and transition countries, and the level of unemployment also shows a great variation across countries over these years. The analysis of the relationship between economic factors and childbearing behavior represents a blooming research area with many attempts aimed at exploring different incentives and execute quantitative assessments.

The exact relation between different macroeconomic variables together with proxies for well-being on a micro level and the timing of a child in a family was the key question in a recent paper by Adsera (2011), who investigates 50,000 families from 13 European countries with different and changing environments. There are various specific questions that can be answered in this framework related to the well-being and the timing of a child in a family. The author finds that high and persistent unemployment postpones childbearing on average. In contrast, a large employment rise in the public sector leads to higher childbearing on average (independently of the number of children already born in the family).

There is a broad literature focusing on specific countries rather than doing a cross-country analysis. For instance, Andersson (2000) explores this relationship in Sweden. Anderson's finding is that women with lower income are less likely to bear children. The same is true for women who are still studying. Obviously, these findings are based on the close circumstances of women that directly influence her decisions. Most of the papers dealing with movements in the fertility rate consider salaries, education and government incentives as the primary driving forces. This can be considered as a micro channel that affects women directly. Although these starting points are very reasonable, the micro level data is not very informative about future expectations. The forces on the macro level could give new insight about the factors influencing the fertility rate.

In the set of micro channels, there is another channel that should be taken into account. When people are unemployed, and spend more time at home, it is reasonable to assume an increased intention of having a child driven by present circumstances rather than future expectations. This factor moves the effect of unemployment rate on the willingness to bear a child to the other way around. However, Adsera (2005) shows negative relationship between women's unemployment rate and total fertility rate as a stylized fact for OECD countries. A reasonable explanation for that comes from an alternative cost argument. Namely, there was a rise in the demand for female labor which implies a rise in the alternative cost of bearing a child (Becker, 1991, 1965). This can be a reason for the negative correlation between the fertility rate and women unemployment. However, with the same argument this micro channel can work in the opposite direction as in case of being in an unemployed status, the alternative cost of bearing a child and spending time on it is relatively low.

In the same topic, but already on a macro level, Ahn and Mira (2002) conduct an analysis explaining in a neoclassical framework the negative correlation from 1970's till the middle of 1980'S and the positive correlation in the following period till 1995 between Total Fertility Rate and Female Participation Rate in OECD countries. They argue, the Female Participation Rate is an important link between unemployment and fertility rate. If the female participation rate is low in a country the loss of the husband's income is decisive and directly lower the willingness of childbearing. This implies positive correlation between the female participation rate and the magnitude of the effect of unemployment rate on fertility rate. There are also various dynamic models trying to embed the childbearing as an endogenous variable for which the expectations of the decision maker plays a huge rule.[1] These models contain the future expectations for decision making including the childbearing. My analysis also exploits this channel rather than the above mentioned micro channels.

This thesis focuses on the relationship between the unemployment rate and the fer-

[1] The most cited models are Barro and Becker (1989), Arroyo and Zhang (1997), Joseph Hotz et al. (1997). However, in this paper I do not try to execute a structural model based estimation.

tility rate. I attempt to shed light on the relationship between expectations about economic outlook and childbearing behavior. Although the most direct factor is childbearing propensity, or willingness for a given individual, I argue, that this is very much influenced by the expectations about the economy, which is greatly affected by the level of unemployment. This chain of relations creates the basis for expecting a negative relationship between unemployment and the willingness to bear a child. To see how this channel works in practice, let us imagine a country with increasing unemployment. In bad labor market conditions women can see that many of their friends and relatives are unemployed and have difficulties finding a job or raising enough money to cover the living expenses. This worsens expectations and results, on average, in a lower propensity for childbearing. In this context the unemployment rate is functioning rather as a proxy variable for expectations about future financial well-being which influences directly women's childbearing behavior. Also, the alternative cost argument is valid, namely that in case of high unemployment rate the expected time being unemployed is high, which results in a higher opportunity cost for having a child, as it is harder to go back after birth giving to the labor market.

The contribution of the thesis is to take into account the expectations in case of decision making about having a child. For this I use macro level data as the expectations about future well-being and possible opportunity cost for having a child are not based on micro level data. The existing literature was analyzing micro data, or specific countries, however making reliable time series inference requires long series that most likely contain structural breaks. Thus, I am doing cross-country analysis in a panel framework to answer my question. The database consists of 29 countries and time span from 2000 till 2010.

The major finding of the thesis that the relationship between fertility rate and unemployment rate for the OECD countries in the last decade is negative. The coefficient on the one year unemployment rate lag seems to be around -0.005 which means that a 5 percentage point increase in the unemployment rate decreases the fertility rate by 0.025. This is not a very large effect, however compared to the very small year-to-year variation in the fertility rate it is not negligible. Also, the significant negative effect shows that the above described macro channel is, in fact important and expectations about future well-being and opportunity cost are playing role in the decision of having a child. Thus, I can answer the question, the labor market conditions do affect childbearing behavior.

2 Data and Descriptive Statistics

2.1 Data description

I use the World Data Bank (WDB) as the source for the fertility rate and the Eurostat for the unemployment rate. These collections contain internationally comparable numbers about the Unemployment Rate (UR) and Total Fertility Rate (TFR). The exact definitions of the variables are:

- UR: Number of unemployed people over the active population, where unemployed persons are persons: aged 15-74,[2] who were without work during the reference week, but currently available for work, who were either actively seeking work in the past four weeks or who had already found a job to start within the next three months.
- TFR: Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with prevailing age-specific fertility rates.

The Word Data Bank is richer in terms of unemployment data; however it is working with country specific unemployment definitions, so that cross country variations would be. To capture this information I have to use harmonized indexes such as Eurostat UR. Although the fertility rate is hard to interpret compared to the crude birth rate, the advantage of TFR is that it is independent of the age structure. Thus, it is informative about the changes in the willingness of childbearing and does not contain the changes in the age structure of the population. To illustrate the strength of the definition imagine the following. If the childbearing propensity (strictly speaking the fertility) does not change, but there are less and less women of reproductive age, the expected crude birth rate must

[2] In Spain, Switzerland (between 1995-2000), United Kingdom, Iceland and Norway the age interval is 16-74

fall, however there were no changes in the childbearing behavior. To identify the effect I am after, I use the fertility rate as the dependent variable.

The subjects of the analysis are 29 OECD countries.[3] The reason why I choose these countries is because they represent a relatively homogeneous group from an economic point of view, as so their reactions to an increase in unemployment can also be assumed to be similar. Moreover, these are mostly developed countries where the family planning and expectations are playing bigger roles than on those countries where inhabitants have more decisive factors to worry about. The time span I choose starts from 2000 and finishes in 2010. While there were data available from earlier periods[4] that would increase the number of observations, my concern is that the relationship may have changed during a longer period. I am interested in the latest observable effect so I use data till 2010.[5]

2.2 Descriptive statistics

To understand the data better before the analysis I present here descriptive statistics for the dataset. First, Figure 2.1 shows the evolution of the fertility rate and unemployment rate cross-country averages. As it is expected, the fertility rate shows a very high persistence and does basically just slightly move away from 1.9. The average unemployment experiences a plunge between 2004 and 2008 and overshoots the original state for 2010.[6] Although it may seem from the figure that the fertility rate does not contain much variation, the time variation is not zero and most of the variation comes from the cross-country variations presented in Table 2.1, even if it is very modest.

The UR has high variation both across time and across countries. There are countries (e.g Slovakia and Lithuania) that have a higher unemployment rate than 0.15 in 2000, while the Norwegian and Austrian UR at the same period is around 0.03. To show an

[3]Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Republic, Slovenia, Spain, Sweden, United Kingdom

[4]However, the database contains just a very few observations for the unemployment rate from earlier periods

[5]There are many countries for which one or more variables are not yet available for the year 2011.

[6]Obviously, a big part of this variation comes from the global crisis, which - in this case - increases the explanatory power of our model, as it can be considered as an exogenous shock in this framework.

Figure 2.1: Average UR and TFR

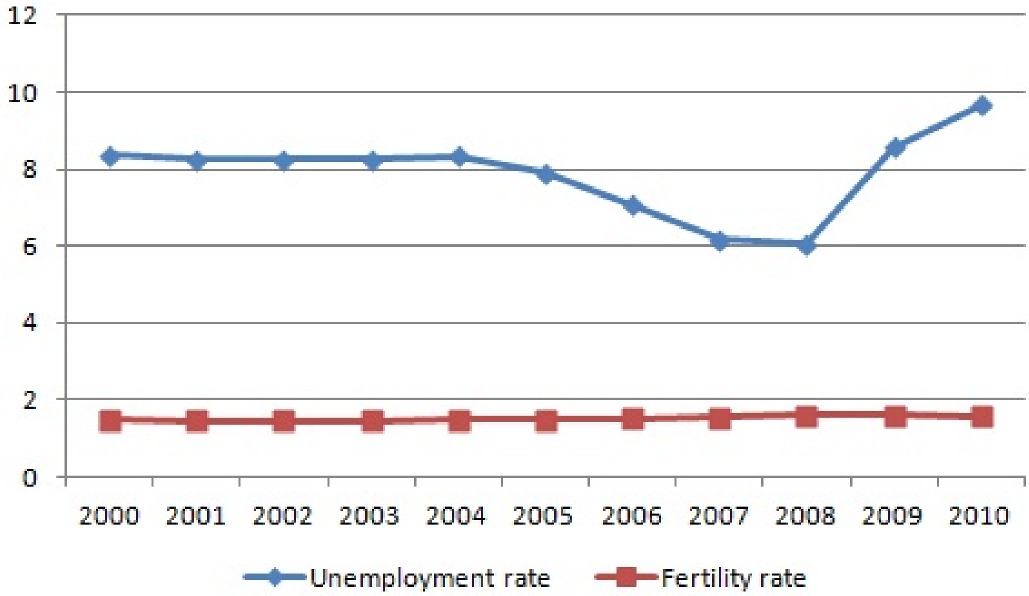

Table 2.1: Descriptive statistics for TFR and UR

	TFR	UR
mean	1.5160	7.8928
median	1.42	7.2
variance	0.0588	14.7253
N	319	319
range	0.96	18.2
min	1.14	1.9
max	2.1	20.1

example for across time variation, the same number for Slovakia in 2008 is 0.095 – almost half that the country had in 2000. As described above, there is a little time variation in the TFR. There is no country that would have a higher TFR than 2 in 2000 and there is no fertility rate constantly above 2 during this period.

3 Methodology and Results

3.1 Pooled OLS

The parameter of interest can be defined by the following thought experiment. Imagine that the UR is exogenously increased by one percentage point in a year in a country in a form of an exogenous surprise shock. The question is how the fertility rate will change the following year. This number would measure the questionable effect. There is certainly at least nine months difference between the circumstances that are influencing the childbearing propensity and the actual birth and I am using the TFR as the dependent left hand side variable. Thus, the simplest model to estimate is the following Pooled-OLS model:

$$TFR_{it} = \beta_0 + \beta_1 \cdot UR_{it-1} + u_{it} \tag{3.1}$$

Where TFR_{it} is the TFR for country i in year t, UR_{it-1} is the unemployment rate for country i in year $t-1$ and u_{it} is an unobserved disturbance. The results are shown on Table 3.1. The results imply a significant negative correlation between UR and TFR. As the UR is also assumable persistent and affecting the TFR the disturbance term contains lags of UR that makes UR endogenous.

A necessary condition for this estimate to be consistent for the casual effect is that $Cov(UR_{it-1}, u_{it}) = 0$. This is unlikely to hold. Beside the UR lags, there can be other factors that influence the TFR and are correlated with UR_{it-1}. For instance, the traditions for bearing children and the working habits are two such factors that are country specific and can be seen as a correlation between UR and the error term. Moreover, there can be economic trends that affect TFR in all the countries in the same way and correlated with the UR.

Table 3.1: Pooled-OLS results

	(1)
	fert_rate
unemp_lag	-0.0299***
	(-8.72)
Constant	1.749***
	(59.61)
Observations	290

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.2 Fixed Effects and Random Effects

In the previous section I was arguing that there must be unobserved effects that are constant across time or across country. Thus, the specification should be modified accordingly, as so a general form for such panel is,

$$TFR_{it} = \beta_0 + \beta_1 \cdot UR_{it-1} + c_i + d_t + e_{it}. \tag{3.2}$$

So, the unobserved part can be decomposed as $u_{it} = c_i + d_t + e_{it}$, where c_i is the country specific effect, d_t is the time specific effect and e_{it} is the idiosyncratic error. With this specification only those unobserved effects mean bias, that are not constant either in time or across-countries and are correlated with UR. There are three ways to estimate the model. The first is the fixed-effect estimation where the fixed-effects can be canceled out using the within transformation. The second case is the random-effect estimation, which is basically a GLS estimation. The third is the First Difference estimation method. An important question is the conditions for which the estimation is consistent. A necessary condition[7] for the consistency of $\hat{\beta}_{1GLS}$ is $Cov(UR_{it-1}, c_i) = 0$ and $Cov(UR_{it-1}, d_t) = 0$. Otherwise, the estimate for β_1 is not consistent. Obviously, these are very strong assumptions. Under certain regularity conditions and the previous assumptions the FGLS estimation method is consistent and with a special "homogeneity" assumption efficient.[8]

[7] I am not giving sufficient conditions for consistency or efficiency unless it adds something important to the analysis. The methodology I use is explained in more detail in Wooldridge (2002), Greene and Zhang (2003) and Baltagi (2005).

[8] Wooldridge (2002) p.259-260.

The random effect estimates can be seen on Table 3.2. There are four different specifications for which the model is estimated by simple GLS. The first specification does not contain the year specific effects and as in all four specification the country specific effect is handled as a random effect. The form of this specification is,

$$TFR_{it} = \beta_0 + \beta_1 \cdot UR_{it-1} + c_i + e_{it}. \tag{3.3}$$

The standard error comes from the standard calculation, which relies on the assumption,

$$E(\mathbf{e_i}\mathbf{e_i}'|UR_i, c_i) = \sigma_e^2 \mathbf{I}_T, \tag{3.4}$$

$$E(u_{it}u_{is}|UR_i, c_i) = 0, t \neq s \tag{3.5}$$

Which in words means there is no heteroskedasticity and there is no serial correlation respectively. There is also one more assumption which is that the errors for different countries are independent. Based on these assumptions the estimate for β_1 is -0.018 and significant at any usual significance level. Note, that the effect in absolute value is more modest than in the Pooled-OLS estimation due to the handling of the unobserved country specific effects. This magnitude shows that a 5 percentage point increase in the unemployment rate decreases the fertility rate by 0.09.[9]

Obviously, in general more assumptions can push down the standard errors of the estimate, but usually it is possible to relax the assumptions and learn from the sample without loosing to much from the efficiency. Figure (3.1) shows the evolution of the fitted residuals and there is a strong sign for serial correlation. To solve this issue I use cluster errors in the second specification which only keeps the third assumption, namely that there is no correlation between countries, and drop the first two. As expected, it raises the standard errors and the t-statistic in the table drops down. However, the estimate is still significant at any usual significance level. The cluster error uses the fitted residuals and

[9] Keep in mind that the highest fertility rate appear in the sample is just around 2, so 0.09 is in fact a big effect.

give consistent estimates for the variance-covariance matrix used for the GLS estimation.

The third specification contains year specific effects which are expressing the unobservable effects that are changing across years but are not changing across countries. These are world trends that are common for this group of countries. To capture these world trends I use year dummies[10]. The fourth column, as before, contains the estimates with the same specification, but with cluster errors.

In the t-statistic again we see the drop due to the cluster error, however estimate for the lag of the UR is still significant at any usual significance level. The magnitude is contracting in absolute value. However, this decrease is not as huge as from Pooled-OLS to random effect for the countries. Almost all of the year dummies are significant even at 0.001 level. Note also that the year dummies are negative and strictly increasing to 0, which implies that after 2000 the fertility rate dropped and then raised back close to the original level and this move is not attributed to the variation in the UR.

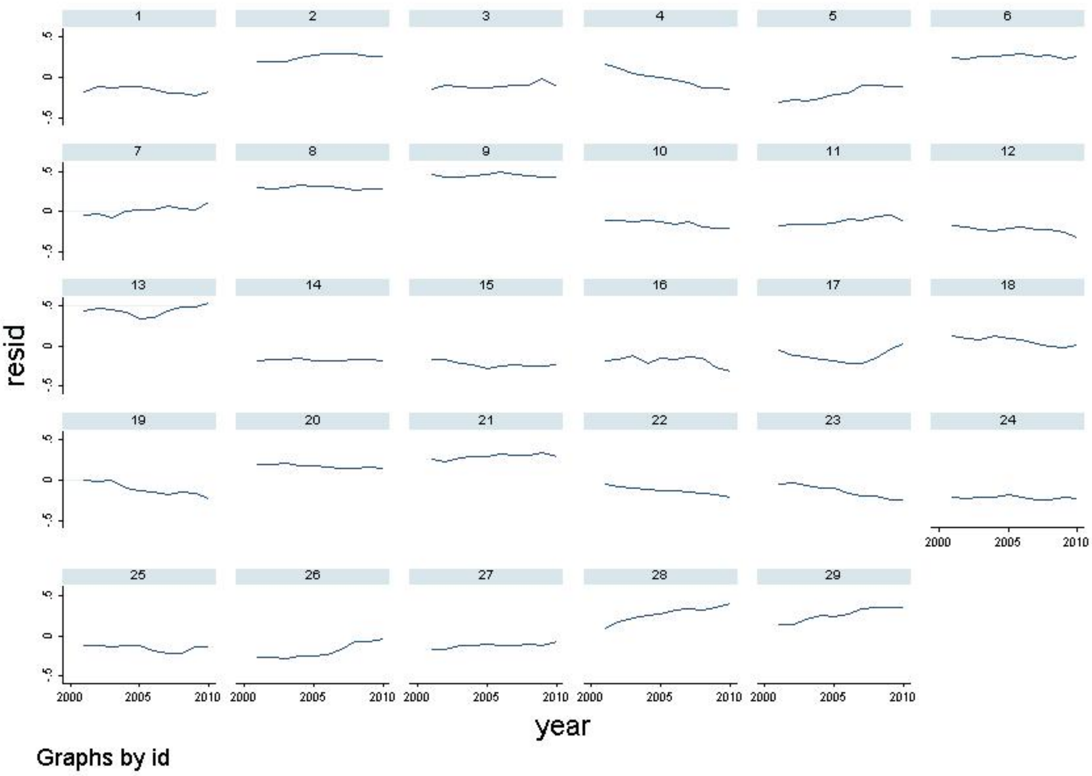

Figure 3.1: The fitted residuals

[10]In the literature it is called year fixed effect, however at this point I think it would be confusing to call it this way.

Table 3.2: Random effect estimates (with/without time fixed effects and cluster errors)

	(1)	(2)	(3)	(4)
	fert_rate	fert_rate	fert_rate	fert_rate
unemp_lag	-0.0180***	-0.0180***	-0.0124***	-0.0124***
	(-8.72)	(-6.70)	(-6.93)	(-3.91)
dy2			-0.131***	-0.131***
			(-8.58)	(-4.93)
dy3			-0.132***	-0.132***
			(-8.68)	(-5.53)
dy4			-0.120***	-0.120***
			(-7.90)	(-5.31)
dy5			-0.101***	-0.101***
			(-6.66)	(-5.45)
dy6			-0.0925***	-0.0925***
			(-6.08)	(-4.91)
dy7			-0.0647***	-0.0647***
			(-4.24)	(-3.96)
dy8			-0.0566***	-0.0566***
			(-3.66)	(-4.52)
dy9			-0.0167	-0.0167
			(-1.06)	(-1.61)
dy10			-0.0226	-0.0226*
			(-1.43)	(-2.32)
_cons	1.657***	1.657***	1.688***	1.688***
	(39.35)	(44.19)	(39.06)	(39.23)
N	290	290	290	290

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Earlier, I mentioned a crucial assumption which is necessary for the $\hat{\beta}_{1GLS}$ to be consistent, and this is the uncorrelatedness of the year and country specific effects and UR. Obviously, this is very unlikely to hold in our case. If I just think about a plunge in the economy that raises the UR there are direct effects from the plunge that pushes down the fertility rate (through the direct well-being channel for instance) and does not effect through the UR channel. This results strong correlation and the GLS estimate to be biased.

The solution is to use fixed effects for the country specific unobservables. The specification stays as in Equation (3.2), however the country fixed effect should be treated as country specific dummies. The fixed effect estimation is consistent even if the UR is correlated with any of the fixed effect. I present the fixed effect estimates in four columns analogously to the above random effect estimates. The results can be seen on Table (3.3).

The numbers are very close to the random effect estimates just a little bit smaller in magnitude, and the so far most trusted estimate in the fourth row for β_1 is still significant at a 0.1% significance level.

3.3 What if not a simple fixed effect estimation?

The major concern about the above estimates is that although the correlation between the year- and country-specific effects and the UR will not make our estimates inconsistent, the strict exogeneity assumption is required for the FE estimate to be consistent.[11] This means that the unobserved error e_{it} has to be uncorrelated not just with the current, but also with the past and future values of the independent variable. The reason is that the fixed effect (or usually called in textbook and papers "within") estimator uses the time averages for the estimation. One way to test for strict exogeneity is described in Wooldridge (2002).[12] The test regression that needs to be estimated is

[11]While the within estimator requires the strict exogeneity, the First Difference (FD) estimator needs just the current and neighboring periods for UR and the unobservables to be uncorrelated, however with the lag dependent specification both are biased.

[12]Wooldridge (2002) p. 285.

Table 3.3: Fixed-effect estimates with with/without cluster errors

	(1)	(2)	(3)	(4)
	fert_rate	fert_rate	fert_rate	fert_rate
unemp_lag	-0.0175***	-0.0175***	-0.0119***	-0.0119**
	(-8.39)	(-5.89)	(-6.63)	(-3.45)
dy1			.	.
			.	.
dy2			-0.109***	-0.109**
			(-6.94)	(-3.67)
dy3			-0.111***	-0.111***
			(-7.06)	(-4.04)
dy4			-0.0987***	-0.0987***
			(-6.30)	(-3.86)
dy5			-0.0798***	-0.0798**
			(-5.10)	(-3.59)
dy6			-0.0709***	-0.0709**
			(-4.52)	(-3.17)
dy7			-0.0429**	-0.0429*
			(-2.77)	(-2.31)
dy8			-0.0345*	-0.0345*
			(-2.26)	(-2.51)
dy9			0.00587	0.00587
			(0.39)	(0.71)
dy10			.	.
			.	.
dy11			0.0215	0.0215*
			(1.36)	(2.05)
_cons	1.654***	1.654***	1.662***	1.662***
	(99.22)	(72.18)	(108.86)	(90.89)
N	290	290	290	290

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

$$\Delta TFR_{it} = \Delta UR_{it-1} \cdot \beta_1 + \beta_2 \cdot UR_{it-1} + d_t \tag{3.6}$$

Where the estimate for β_2 has to be insignificant under the null hypothesis of strict exogeneity. The results are in the Appendix in Table (5.2) in the first column. The $\hat{\beta}_2$ is in fact not significant, however still has a not very high p-value. With that low standard error it would be hard to say that the effect is in fact 0.

At this point the serial correlation problem has to be addressed that partly comes from the assumable strong persistence of the TFR. Most likely there is a sluggish adjustment in the childbearing habits which result the lagged TFR variable to be important in the current level of TFR. A sign for that is the high value of the estimate for the autoregressive parameter in the following specification,

$$TFR_{it} = \beta_0 + \beta_1 \cdot TFR_{it-1} + d_t + e_{it}. \tag{3.7}$$

The results are presented in the Appendix in the Table (5.3). To tackle with the problem of serial correlation and handle the sluggish adjustment, the common method is to include the lag dependent variable as an explanatory variable. Thus, the new specification is

$$TFR_{it} = \beta_0 + \beta_1 \cdot UR_{it-1} + \beta_2 \cdot TFR_{it-1} + c_i + d_t + e_{it}. \tag{3.8}$$

Running again the test for the strict exogeneity[13] the coefficient of interest is much closer to 0 and has a very high p-value. Including the lag dependent variable induces bias in the estimation as the exogeneity assumption does not hold any more. Hsiao (2003) derives that if the variables are weakly dependent and the autoregressive coefficient is smaller than one in absolute value, the order of the bias for the within estimator is T^{-1} while the First Difference (FD) estimator [14] bias has an order of $T \to \infty$. I can be almost sure that the autoregressive coefficient is smaller than one considering the sluggish movement, where there would be no reasonable explanation for amplification in the process

[13]The results are in the Appendix in Table (5.2) in the second column.

[14]The FD estimator also based on a transformation that cancels out the unobserved specific effects.

and also Table (5.3) shows much lower value for the coefficient than one. I present here the fixed effect estimates for the Equation (3.8) specification in Table (3.4) and show the FD estimates in the Appendix in Table (5.4). The two estimates for the effect of UR on TFR are very close and significant.

The magnitude dramatically dropped after including the lag dependent variable, which is reasonable as the coefficient on UR no more captures the persistent feature of the TFR. In case of endogeneity problem the common method is to look for instrumental variables. One frequently used estimation method relies on orthogonality conditions in case of dynamic-panel regression is the Arellano-Bond estimation (Arellano and Bond, 1991).

The estimates are shown in Table 3.5. The estimate on the lagged UR dropped a little, but still significant at 5 percent significance level. It is also possible that the instruments are week as it is a usual problem with Arellano-Bond in practice.

3.4 Handling the persistence in UR

Above I was writing that the UR is very likely to be persistent and so the unobservables contain the 2 and 3 years lagged values of the UR. In spite of the use of fixed-effects, it is possible that, because of the lagged values, a heterogeneity stayed in the idiosyncratic disturbance term which is correlated with UR. I estimate here the specification containing the 2 and 3 years lagged values for UR using within, and Arellano-Bond estimation methods.

Table 3.6 shows the result for the fixed effect estimates and cluster errors and Table 3.7 presents the estimates for the Arellano-Bond estimation with gmm errors. Again the Arellano-Bond estimate is a little bit higher than the within estimate, but in both cases greater than 0.005 in absolute vales. Both estimates have a high t-statistic but lost from the very strong significance. One reason for that is the smaller sample size. Note, that the coefficients on the second and third lags are small, but the sum of the coefficients approximately gives back the results of the previous specifications with one lag for UR.

Table 3.4: Fixed-effect estimate with cluster standard errors

	(1)
	fert_rate
fert_rate_lag	0.767***
	(17.47)
unemp_lag	-0.00554***
	(-5.16)
o.dy1	.
	.
dy2	-0.0435**
	(-3.49)
dy3	-0.0163
	(-1.48)
dy4	-0.00417
	(-0.42)
dy5	0.00570
	(0.57)
dy6	-0.000566
	(-0.05)
dy7	0.0240*
	(2.56)
dy8	0.0126
	(1.14)
dy9	0.0444***
	(5.15)
o.dy10	.
	.
dy11	0.00925
	(0.86)
_cons	0.401***
	(5.60)
N	290

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.5: Estimating the dynamic-panel form by Arellano-Bond

	(1)
	D.fert_rate
LD.fert_rate	0.751***
	(14.47)
D.unemp_lag	-0.00440*
	(-2.34)
D.dy3	0.0207**
	(2.80)
D.dy4	0.0268**
	(3.26)
D.dy5	0.0309***
	(4.28)
D.dy6	0.0188*
	(2.29)
D.dy7	0.0380***
	(5.48)
D.dy8	0.0221**
	(2.70)
D.dy9	0.0492***
	(5.55)
D.dy10	-0.000318
	(-0.03)
_cons	0.00601***
	(6.12)
N	261

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.6: Including more lags in the regression for Fixed-effect estimation

	(1)	(2)
	fert_rate	fert_rate
fert_rate_lag	0.800***	0.773***
	(19.55)	(15.02)
unemp_lag	-0.00616	-0.00543
	(-1.80)	(-1.40)
unemp_lag2	0.00153	0.00101
	(0.34)	(0.22)
unemp_lag3		0.00000460
		(0.00)
_cons	0.355***	0.393***
	(5.25)	(4.67)
Year fixed effect	Yes	Yes
N	261	232

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.7: Including more lags in the regressio for Arellano-Bond estimation

	(1)	(2)
	D.fert_rate	D.fert_rate
LD.fert_rate	0.776***	0.771***
	(13.98)	(13.90)
D.unemp_lag	-0.00610	-0.00594
	(-1.93)	(-1.68)
D.unemp_lag2	0.00263	0.00147
	(0.70)	(0.34)
D.unemp_lag3		0.000956
		(0.22)
_cons	0.00381**	0.00261*
	(2.98)	(2.05)
Year fixed effect	Yes	Yes
N	232	203

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Conclusion

In this thesis I was using data from 29 countries and from 11 years to answer the question whether labor market conditions affect childbearing behavior. I analyzed the question in a panel framework and was trying to estimate the causal effect of unemployment rate on fertility rate to see if expectations about the future affect childbearing propensity.

I showed that labor market conditions do affect childbearing behavior. If the unemployment rate increases in a country it will cause the fertility rate to go down as a short-run response. The move in the fertility rate is modest but significantly negative. A 5 percentage point increase in the unemployment rate results in an approximately 0.025 decrease in the fertility rate on average for the OECD countries.

Both the unemployment rate and the fertility rate are very persistent variables. In the estimation I had to handle these properties and correct for serial correlation and include lags in the specification. After estimating many different specifications, the fixed-effect estimates with the lag of the dependent variable on the right hand side and lags for the unemployment rate seems to be the most reliable specification for this problem. The estimates on the second and third lags for the UR are decreasing in absolute value. There is no convincing evidence that the effect is distributed over a long period of time.

5 Appendix

Table 5.1: Averages for TFR and UR

	TFR	UR
2000	1.490448	8.362069
2001	1.453834	8.251724
2002	1.453548	8.255172
2003	1.465414	8.237931
2004	1.484483	8.32069
2005	1.492379	7.906897
2006	1.52531	7.055172
2007	1.543897	6.155172
2008	1.594931	6.062069
2009	1.590172	8.558621
2010	1.581931	9.655172

Table 5.2: Testing for strict exogeneity

	(1)	(2)
	dffert_rate	dffert_rate
dfunemp_lag	-0.00708***	-0.00571**
	(0.000)	(0.001)
unemp_lag	-0.000274	-0.000106
	(0.656)	(0.859)
dy1	0	0
	.	.
dy2	0	0
	.	.
dy3	-0.0452***	-0.0331***
	(0.000)	(0.001)
dy4	-0.0322***	-0.0292**
	(0.001)	(0.001)
dy5	-0.0251**	-0.0251**
	(0.007)	(0.006)
dy6	-0.0356***	-0.0374***
	(0.000)	(0.000)
dy7	-0.0142	-0.0125
	(0.124)	(0.161)
dy8	-0.0319***	-0.0356***
	(0.001)	(0.000)
dy9	0	0
	.	.
dy10	-0.0501***	-0.0591***
	(0.000)	(0.000)
dy11	-0.0346**	-0.0339**
	(0.002)	(0.002)
dffert_rate_lag		0.245***
		(0.000)
_cons	0.0464***	0.0420***
	(0.000)	(0.000)
N	261	261

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.3: Sign for serial-correlation

	(1)
	fert_rate
fert_rate_lag	0.811***
	(25.72)
o.dy1	.
	.
dy2	-0.0618***
	(-7.12)
dy3	-0.0324***
	(-3.64)
dy4	-0.0203*
	(-2.28)
dy5	-0.0109
	(-1.23)
dy6	-0.0184*
	(-2.11)
dy7	0.00811
	(0.94)
o.dy8	.
	.
dy9	0.0360***
	(4.17)
dy10	-0.0102
	(-1.14)
dy11	-0.0146
	(-1.64)
_cons	0.307***
	(6.34)
N	290

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.4: FD estimate with cluster standard errors

	(1)	(2)
	dffert_rate	dffert_rate
dffert_rate_lag	0.245***	0.245***
	(3.71)	(3.71)
dfunemp_lag	-0.00573**	-0.00573*
	(-2.64)	(-2.64)
dy3	0.000839	-0.0333***
	(0.09)	(-3.93)
dy4	0.00473	-0.0294**
	(0.46)	(-3.63)
dy5	0.00884	-0.0253*
	(0.85)	(-2.50)
dy6	-0.00353	-0.0376***
	(-0.33)	(-4.14)
dy7	0.0214	-0.0127
	(1.91)	(-1.72)
dy8	-0.00159	-0.0357***
	(-0.14)	(-4.08)
dy9	0.0341**	0
	(2.74)	.
dy10	-0.0250	-0.0591***
	(-1.81)	(-6.57)
dy1		0
		.
dy2		0
		.
dy11		-0.0341*
		(-2.74)
_cons	0.00722	0.0413***
	(0.88)	(6.23)
N	261	261

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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