Are Fertility Responses to Local Unemployment Shocks Homogenous Across Social Strata? Evidence from England, 1994 to 2010

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Abstract

Are fertility responses to local unemployment homogenous across sub-demographic groups? This paper investigates how changes in local unemployment rates affect household fertility decisions in England while taking sub-demographic differences into account. Recognizing that labor market status is a major determinant of child rearing decision, and assuming that children are normal goods, this paper hypothesizes that an increase in male and female unemployment will have different effects on the current period fertility. Using the Labor Force Survey and Birth Statistics data from the Office for National Statistics, this study shows that female unemployment tends to increase births whereas male unemployment has the opposite effect. More importantly, reported results indicate that unemployment and fertility relation exhibits strong age group and educational attainment gradients. In addition, a persistent counter-cyclical fertility pattern has also been documented at the ceremonial county level.

Keywords: Unemployment, fertility
Jel Classification: J13, J19

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1 Introduction

This paper investigates how fluctuations in local unemployment rate affect household fertility decisions. The theoretical methodology is based on an economic model of fertility identifies that fluctuations in local labor market conditions have different effects on fertility. Assuming that children are normal goods, and identifying that labor market status (unemployment) is a major determinant of fertility decision, an increase in the unemployment will have negative effects on the demand for children in the current period, holding other factors constant. This is correct for societies in which traditional gender roles prevail and thus male unemployment leads to a decrease in births. Instead, among females, unemployment decreases the opportunity cost of child rearing -especially in countries like England- where the government does not make much investment in children, in day care, in subsidies for mothers and all sort of different ways to smooth the conflict between work and family. In this case, increase in female unemployment might potentially increase birth rates. The aggregate effect of unemployment on fertility will be contingent on demographic characteristics of society. Therefore, this paper is interested in identifying the causal relationship between changes in local unemployment rates and fertility rates by age group, gender and other socio-economic clusters. Ultimately, it argues that how local unemployment shocks affect current period fertility from 1994 to 2010 and concentrates on two crucial research questions:

1-) Does unemployment have same effects across different age-gender cohorts?

2-) Do other demograhic characteristics have any impact on different age-gender cohorts?[1]

The main ordinary least square (OLS) regression investigates the relationship between aggregate unemployment rate and fertility, controlling for demographic characteristics' of ceremonial counties along with fixed effects and time trends. To address the potential endo-

[1]Educational Attaintment, Country of Birth, Ethnicity, Marital Status.

geneity issue, an instrumental variables (IV) strategy is implemented based on the work of Bartik(1991) and Blanchard and Katz(1992) in which labor demand shocks are used as an identifying source of variation. Both OLS and IV results indicate that increase in aggregate unemployment rates -without age group & gender breakdown- associated with an increase in current period fertility rates. Further analyses show that age group-gender parities behave differently and there are persistent sub-demographic differences across social strata. In short, negative effect of male unemployment is dominant for the youngest age cohort (16-24) whereas negative effect of female unemployment becomes dominant for the prime-aged group (25-34), however the effect on the 35-44 age band is heterogenous.

The main contribution of the paper is to provide an empirical examination of how effects of local unemployment on birth rates vary across social strata. First and foremost, as a concern of economic demography, it is helpful to understand how changes in the local unemployment rates affect fertility decisions of different age groups. Secondly, while investigating effects of gender specific unemployment on fertility, literature commonly replaces aggregate unemployment with gender specific unemployment without controlling for opposite gender's labor market outcomes. However, such approach causes the identification problem in spotting individual effects of female and male unemployment and this issue is addressed in this paper. Thirdly, concerns on endogeneity of unemployment is tackled with well accepted Bartik type instrumental variable approach. Fourthly, in order to make sure results are not driven due to change in local house prices, additional analyses performed with house price index and generalized method of moments technic. Lastly, main findings provide clear empirical support for the idea that unemployment and birth rates are strongly associated while showing various contradictions of literature might be attributed to a neglect of cohort-specific dissimilarities.

The paper is organized as follows. Next section introduces the related literature, section 3 discusses theoretical background and the identification strategy, section 4 focuses on data

and methodology, section 5 presents the results and section 6 concludes.

2 Review of Literature

England has experienced a dramatic baby boom since the beginning of the millennium, despite many other developed nations undergoing a drastic baby bust. In particular, the English fertility rate rebounded after 2000 from 1.64 Total Fertility Rate (TFR) to 1.98 TFR in 2010 while its counterparts stayed below replacement fertility, as a result of a cluster of factors, including the increase in female labor force participation, high youth unemployment and economic uncertainty (Kögel 2004, Engelhardt & Prskawetz 2009, Ahn and Mira 2002, Adsera 2004 & 2011, d'Addio & d'Ercole 2005, Billari & Kohler 2004). [2]

The growing importance of labor market conditions for fertility decision led many researchers to explore this particular issue. A considerably high proportion of literature shows that the negative labor market outlook causes a decrease in birth rates, while another important body of research finds either positive or no effect on fertility.[3]According to New Home Economics Theory, male and female labor market conditions have contrasting impacts on fertility (Becker, 1960, Mincer 1962-1963, Becker and Lewis, 1973). As remarked in their analyses, a rise in male wages has an income effect, in the form of women are responsible with childbearing in the household. An increase in female wages also has an income effect, nevertheless it has a potential substitution effect that goes in the direction of reducing fertility and making the overall effect ambiguous as opportunity cost becomes higher. In order to address such contradictory predictions of economic theory, Butz and Ward (1979) and Ermisch (1988) have done empirical analyses and identified economic boom periods with low fertility

[2]Source: The Office for National Statistics birth statistics summary report, 2011.

[3]Adsera (2004), Adsera (2005), Ahn & Mira (2002), Brewster & Rindfuss (2000), Esping-Andersen (1999), Hoem (2000), Kravdal (2002), Kreyenfeld (2009) , Tölke and Diewald, (2002).

since it is the most expensive time to have children and highlighted counter-cyclical behavior in female unemployment and fertility rates, for the U.S. and UK, respectively.

The majority of studies in this field focus on gender specific labor market effects on fertility. Huttunen and Kellokumpu (2010) present evidence for Finland and show that wife's job loss decreases fertility only for high wage earners or for highly educated women whereas the husband's job loss has a much stronger impact on fertility. Kreyenfeld and Andersson (2013) conduct a comparative analysis for Germany and Denmark finding that male unemployment leads to a postponement of first and second childbearing in both countries and both male and female unemployment is positively correlated with third birth risks. Additionally, it is noted that fertility tends to be lower during the periods of unemployment among highly educated women and men, but not among their less educated counterparts. In their comparative analysis for East and West Germany, Ozcan, Mayer and Luedicke (2010) find that male unemployment delays the first birth, but female unemployment does not affect its timing in West Germany. In contrast, Schmitt (2008) reports positive effects of unemployment on the propensity to have a first child in Finland, Germany, and the UK. Schaller (2012) finds that improvements in male labor market conditions are associated with increases in fertility while improvements in female labor market conditions have the opposite effect in the U.S.

There is also a large volume of published literature concentrated on the OECD countries in which Brewster & Rindfuss (2000), Ahn & Mira (2002), Adsera (2004) show that countries with lower rates of female employment experience lower rates of fertility. This decreasing birth trend is explained by high female unemployment rates in Central European countries during the '90s. In their cross country analysis, Örsal and Goldstein (2010) disclose the procyclical nature of fertility behavior for the 1976-2008 period, and show that fertility becomes positively associated with good economic conditions.

Turning to individual level analysis, it has only been narrowly conducted in the litera-

ture, with results being inconclusive, so far. Kravdal (2002) finds that female unemployment has little impact on fertility in Norway. Conversely, Impens (1989) shows pronounced negative effect of female unemployment in Belgium. Kreyenfeld (2000) emphasizes the positive impact of unemployment on fertility in Germany while Kohler and Kohler (2002) show no negative association between labour market uncertainty and fertility, and even frequently find a positive association in Russia. Hoem (2000) and Andersson and Lundström (2012) conducted similar works for Sweden and show that first-birth rates rise and fall in step with municipal employment levels.

Even though this paper's main focus is exclusively on the unemployment and fertility behaviour at the ceremonial county level in England, it is necessary to mention following studies that provide evidence on the effect of Working Families Tax Credit (WFTC) reform on fertility.[4]Brewer, Ratcliffe and Smith (2012) find no increase in births among single women, but evidence to support an increase in births (around 15%) among coupled women and Francesconi and van der Klaauw (2007) show that the increase in labor market participation was accompanied by reductions in single mothers' subsequent fertility.

3 Theoretical Background and Identification

The neoclassic approach of fertility has sought to address the issue of timing of fertility and its determinants at both the aggregate and individual level. In this context, two different models were built, mainly based on the work of Becker (1960), Lewis and Becker (1973), and Willis (1973). The former encompasses static models of fertility (Easterlin & Crimmins, 1985; Montgomery, 1987) while the latter involves dynamic models of fertility behavior (Newman,

[4]In October 1999, the British government enacted the Working Families Tax Credit (WFTC), which aimed at encouraging work among low-income families with children.

1988; Barro & Becker, 1989).

Given the identification strategy used in this paper, it has been chosen to build on the life-cycle model of fertility rather than focus on the static model, since the latter does not incorporate the timing of fertility, and relies on the time allocation and demand for children model along with the quality and quantity approach. This chosen life-cycle, or otherwise stated dynamic framework of fertility allows individuals to take price and income changes into account before having a child so as to enable childbearing at different ages over the life cycle. In more depth, the effect of such price changes on contemporaneous fertility - which generally entails income and substitution effects - might shift the timing of births over the life-cycle and not have a considerable, if any, impact on the total number of births (Hotz, Klerman and Willis, 1996).

Happel et al. (1984) shows that in the presence of perfect capital markets, where father's income plays no role in the timing of births, couples prefer to have only one child and the timing of birth matters. In this case, the mother' s unemployment triggers a loss of income and therefore, parents' childbearing decision depends on the wife's initial earnings. Potentially low or even non-existent earnings combined with low educational attainment minimize the women's lifetime earnings if she decides to have baby at early ages of her life. In contrast, positive earnings and high skilled women are better off when they postpone their childbearing. In the case of perfectly-imperfect capital markets where the father's income plays an important role and mother's skills do not deteriorate during her absence from the market, the optimal time to have births is when the husband's income is the highest.

Moffitt (1984b) discusses that the childbearing decision depends on the opportunity cost of the human capital accumulation in early ages. If the skill accumulation exceeds the value of children, the couple's marginal utility of the first unit of the mother's time in leisure activities exceeds that of the utility achieved from having a child, even in the absence of the human

capital investment motive.

Accordingly, the present paper tests the predictions of a dynamic fertility model across age groups which generally considers traditional gender roles and entails a complementary division of roles within the household and the labour market. It hypothesizes that, for the prime aged (25-34) individuals, female unemployment would increase fertility due to low opportunity cost of child rearing and in order to minimize foregone earnings. Conversely, male unemployment would have a negative effect on births as the traditional breadwinner model has not entirely eroded yet, in England.[5]Moreover, in societies where traditional gender roles prevail, female unemployment has a higher potential of shifting the division of labour towards more traditional arrangements (Klein et al. 1996). Intuitively, for the 16-24 age cohort, it is expected to see a drop in birth rates in the case of male unemployment since younger men are more able to postpone their fertility until economic conditions improve. For the same age group, female unemployment might a positive impact on birth rates depending on the partner's labor market status, however it is not clear which effect would be dominant. For both genders in the 35-44 age band, unemployment might be perceived as unpromising labor market conditions and pose danger to economic foundation of a family. Furthermore, such threats might be intensified for those who have less educational attainment. Overall, dynamic models of the fertility rely on the assumptions that households aim to maximize their utility by choosing timing of transition to parenthood and the wife's allocation of time over the life cycle. They also imply that transitory unemployment would not affect completed fertility. However, it would positively affect timing of the births, as women will prefer to give birth when wages are low, via domination of the substitution effect (Ozcan et al. 2012).

[5]The British Time Use Survey 2013 Report: Women still report undertaking a disproportionate amount of housework and caring activities, spending an average of 13 hours on housework and 23 hours caring for family members each week, compared with eight and 10 hours respectively for men.

4 Data and Methodology

4.1 Data

The fertility data used in this analysis are from the Office of National Statistics (ONS) which includes counts of live births and stillbirths, fertility rates by age of mother and area of usual residence in England, from 1994 to 2010. Age Specific Fertility Rates (ASFRs) are constructed by dividing the number of births by the relevant female population using mid-year population estimates that are based on the censuses, in which female ages range between 16-44.[6] ASFRs constitute an appropriate measure of varying fertility rates, since they are unaffected by changes in population age distribution, while at the same time, are very convenient in comparing fertility rates for age bands across populations or sub-population groups. In this analysis, ASFRs are based on 16-24, 25-34, 35-44 intervals.[7] As best available measure of the labour market conditions prevailing at the time of the conception, births in calendar year are matched with one year lagged data of Labor Force Survey (LFS) in the corresponding ceremonial county.[8]

[6]Age-gender cohorts are as following: 16-24 male, 16-24 female, 25-34 male, 25-34 female, 35-44 male, 35-44 female.

[7]The ONS's age grouping have been used in this analysis.

[8]Both Birth Statistics and LFS data are available in a finer geography, however due to small cell size in some areas, it was preferred to aggregate up to the ceremonial county level. There are 49 ceremonial counties in England. After the exclusion of the City of London and Rutland remaining ceremonial counties are as following: Bedfordshire, Berkshire, Bristol, Buckinghamshire including Milton Keynes, Cambridgeshire including Peterborough, Cheshire consisting of Cheshire East, Cheshire West and Chester, Halton and Warrington, Cornwall including Isles of Scilly, Cumbria, Derbyshire including Derby, Devon including Plymouth and Torbay, Dorset including Bournemouth and Poole, County Durham including Darlington, Hartlepool, and Stockton-on-Tees north of the River Tees, East Riding of Yorkshire,including Kingston-upon-Hull, East Sussex including Brighton and Hove, Essex including Southend-on-Sea and Thurrock, Gloucestershire including South Gloucestershire, Inner and Outer London, Greater Manchester, Hampshire including Portsmouth and Southampton, Herefordshire, Hertfordshire, Isle of Wight, Kent including Medway, Lancashire including Blackburn with Darwen and Blackpool, Leicestershire including Leicester, Lincolnshire including North Lincolnshire and North East Lincolnshire, Merseyside, Norfolk, North Yorkshire including Middlesbrough, Redcar and Cleveland, York, and Stockton-on-Tees south of the River Tees, Northamptonshire, Northumberland, Nottinghamshire including Nottingham, Oxfordshire, Shropshire including Telford and Wrekin, Somerset including Bath and North East Somerset and North Somerset, South Yorkshire, Staffordshire including Stoke-on-Trent, Suffolk, Surrey,

Table 1: Summary Statistics for Local Unemployment Rates and Birth Rates

Variable	Mean	Std.Dev.
Birth Rates by Age Group		
Aged 16-24	48.69	8.705
Aged 25-34	99.61	11.23
Aged 35-44	27.74	7.689
Unemployment by Age Group		
Aged 16-24	13.40	4.512
Aged 25-34	5.772	5.314
Aged 35-44	4.197	2.064
Unemployment by Age Group & Gender		
Female Aged 16-24	11.46	4.450
Female Aged 25-34	5.207	2.476
Female Aged 35-44	3.961	1.861
Male Aged 16-24	15.09	5.604
Male Aged 25-34	5.922	3.582
Male Aged 35-44	4.384	2.790
Observations	2,397	2, 397

NOTE: The table provides averages for age specific birth rates based on data from the ONS Birth Statistics between January 1995-December 2011, and unemployment rates based on data from the Labor Force Survey between January 1994-December 2010.

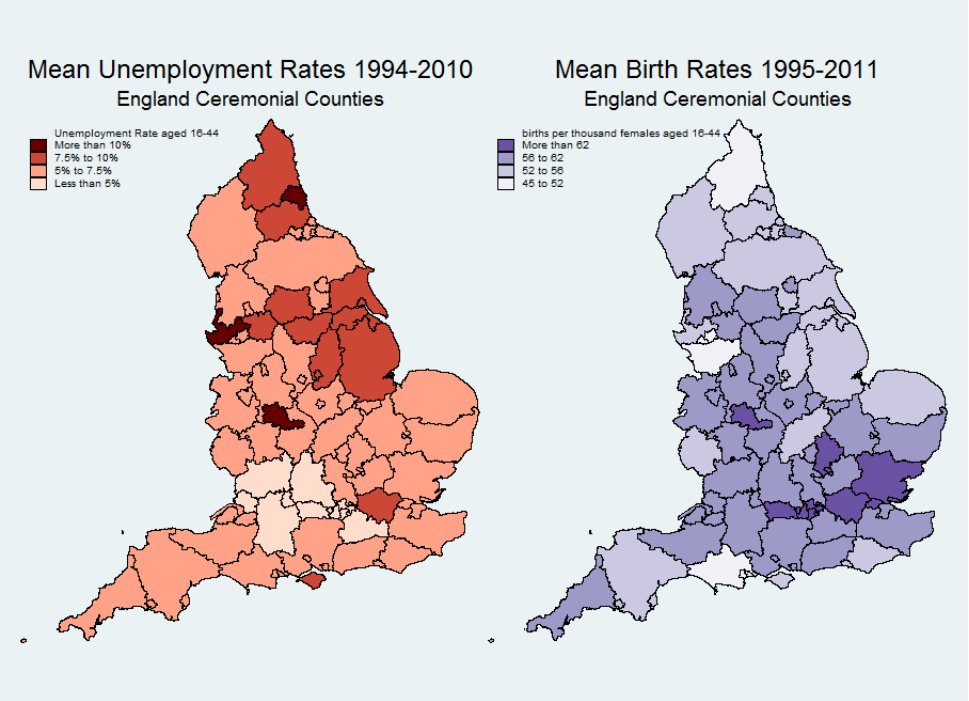
The confidential LFS offers detailed information on employment status, economic activity, demographic characteristics, education and training, at the time of each interview. The sample is being restricted in the age band 16-44 in order to study female who are in child-bearing ages. Mean birth rates and unemployment rates by age group over the sample period are presented in Table 1.[9]

Figure 1 illustrates the patterns among ceremonial counties. Northumberland, Cheshire and Dorset have the lowest average fertility rates in the country, while highly populated areas,

Tyne and Wear, Warwickshire, West Midlands, West Sussex, West Yorkshire, Wiltshire including Swindon, Worcestershire.

[9]All unemployment levels are based on the ILO definition (those who are out of work in the reference week, want a job, have actively sought work in the last four weeks, and are available to start work within the next two weeks).

Figure 1: Mean Birth Rates, 1995-2010, and Unemployment Rates ,1994-2009 Across Ceremonial Counties in England



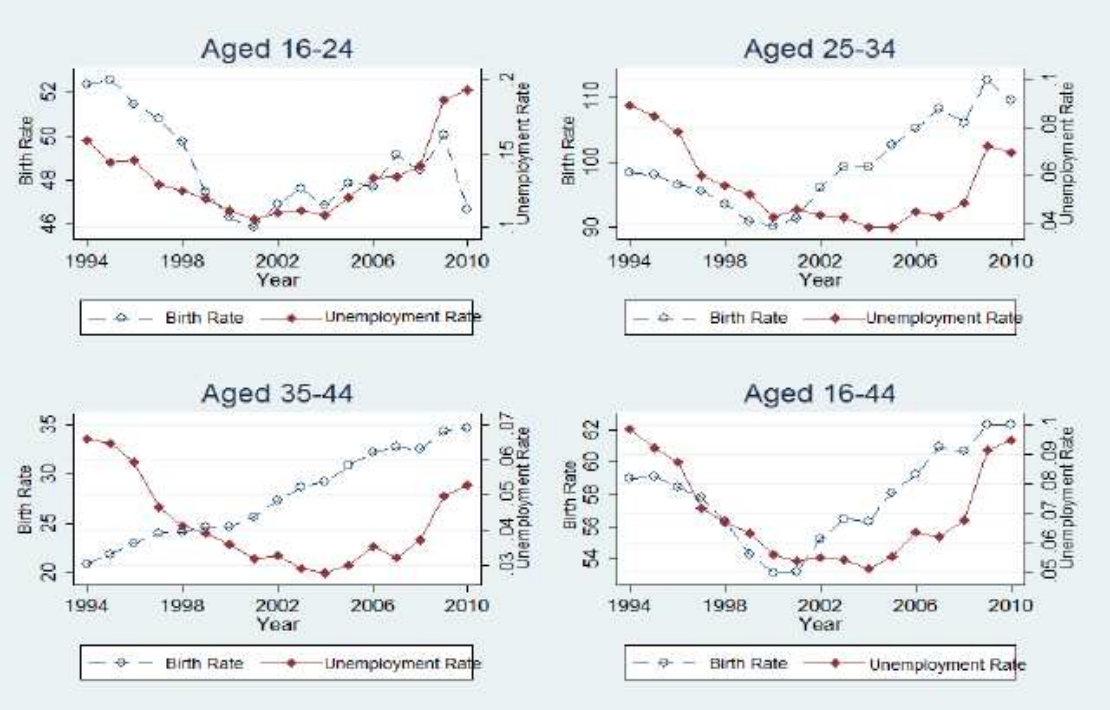
such as the South East region and Greater London experience the highest fertility. Merseyside, Tyne and Wear and West Midlands are the areas with highest unemployment rate over the sample period.

Figure 2 shows trends in birth rates and unemployment rates by age group at the national level.[10] Birth rates follow a decreasing trend for age group 1 after reaching a peak of 53.2 births per 1000 women in 1995. As regards, band 25-34, birth rates rebounded after 2000 and reached its highest 112.2 in 2009 over the sample period. Moreover, the oldest age group, 35-44, has experienced a tremendous rise in the own fertility rate, a steady increase from 21.3 to 35, between 1995 to 2011. Turning to the national time series data for mean unemployment rates, they notably differ in levels for each cohort but follow similar trends. After

[10]Figures that show trends in birth rates and gender-age specific unemployment rates could be seen in appendix.

reaching its the lowest point between 2002-2005, it increased for all age groups and peaked with the negative shocks of the financial crisis of 2008. Trends in gender specific unemployment rates do not vary from age specific unemployment rate, yet female unemployment rate is consistently lower than the male equivalent, in all periods.[11][12] Overall, substantial variation across counties in figure 1, and considerable shift in birth trends across age groups in figure 2 , strongly advice the inclusion of county specific and age specific linear time trends. Additionally, birth rates appear to follow a counter-cyclical pattern over the analyzed time interval. Table 2 presents basic descriptive statistics of the sample.[13]

Figure 2: Age-Specific Unemployment Rates and Age-Specific Fertility Rates in England, 1994-2010



Note: Birth rates are calculated as births per thousand females aged 16-44 & birth statistics are from the Office for National Statistics (ONS). Data on unemployment rates are from the Labor Force Survey (LFS).

[11]Female labor force participation is 12.5 % lower over the sample period.

[12]For more details see figure 3 and figure 4 in appendix.

[13]In the sample "separated" coded as single and was not treated as different category.

In all, a balanced panel is constructed for the 1994-2010 period, with forty-seven ceremonial counties and three age groups. The final version of the dataset contain information on age-specific fertility rates, age and gender specific unemployment rates, educational attainment, marital status, ethnicity and country of birth.

Table 2: Demographic Characteristics of the LFS Sample

Variable	Mean	Std.Dev.
Single	0.500	0.060
Married	0.418	0.058
Widowed	0.003	0.002
Divorced	0.079	0.016
UK Born	0.910	0.071
NOT UK Born	0.090	0.071
White	0.931	0.077
Others	0.069	0.077
Higher Education	0.238	0.061
Further Education	0.245	0.028
Compulsory Educ. or less	0.517	0.060
Observations	2,397	2,397

4.2 Methodology

In order to analyze the effects of age and gender specific unemployment on completed fertility, the following baseline fixed-effect specification is employed:

$$ln(Y_{gct}) = \beta U_{gc(t-1)} + \psi X_{gc(t-1)} + \alpha_c + \vartheta_g + \omega_c * T + \delta_g * T + \varepsilon_{gct}$$

where Y_{gct} is the birth rate in county c, age group g, in year t and $U_{gc(t-1)}$is the lagged unemployment rate.[14] County fixed effects, a_c, are included to control for differences in birth rates across counties due to time invariant unobservable factors and age group fixed effects, ϑ_g,

[14]The analysis for the gender specific unemployment performed with the similar specification in which both lagged male -MaleUnemp$_{gc(t-1)}$- and female -FemaleUnemp$_{gc(t-1)}$- unemployment rates are included.

are incorporated to control for changes in birth rates across age groups. County linear time trends, ω_c*T, which control for unobserved variables correlated with birth rates that change linearly over time within counties. Age group specific linear time trends, δ_g*T, control for different birth trends across age groups are also included in preferred specifications. As the demographic composition changes across counties and it is likely to correlated both with labor market conditions and fertility rates, the preferred specification also includes lagged time-varying county-level demographic controls $X_{c(t-1)}$,which account for changes in population composition by country of birth, ethnicity, educational attainment and marital status. The regressions are carried out for both male and female unemployment and weighted by the relevant population of women aged 16 to 44 in each county-year cell. Standard errors are clustered at the county-age group level.

The usage of panel data along with the inclusion of fixed effect model enables to control for potential differences across age groups and counties and to handle omitted variable bias where data consistently estimate the exogenous effect of interest. At this point, it should be noted that the interpretation issue of fixed-effect approaches are acquainted and coefficients are interpreted as identifying the effect of a deviation from the mean level of the covariate over time.

Unemployment rates are used as a proxy for the overall state of the economy and capture the individual-level effects of losing one's job on fertility along with changes in economic outlook. It is also less likely for unemployment rates to be endogenous to fertility decisions, compared to the case of individual wages and family income. To determine the effects of economic conditions on female and male separately, gender specific unemployment rates are also applied in the specification. As Orsal and Goldstein (2010) noted, unemployment rate is a better economic measure than GDP growth in analyzing the effects of economic conditions, because an individual is much more interested to whether he is employed or not, rather than

the growth of the economy, upon deciding to have a child. However, it is also arguable since unemployment rate is likely to be correlated with the changes in other unobserved variables which affect fertility decision of the individuals. There might also exist a direct reverse causality bias if exogenous increases in the fertility cause a decline in women's labor force participation. In other words, the denominator of the unemployment will decline and the measured unemployment rate will increase (Schaller, 2012). Therefore, OLS coefficients would be biased upwards. The last problematic aspect of unemployment is measurement error. According to the ILO definition of the unemployment rate, discouraged and hence not actively searching workers are not included in the construction of unemployment rate and, consequently, that does not capture the full extent of the effect of economic downturns.

In order to address the above mentioned concerns regarding unemployment rates as an exogenous regressor, an instrumental variables approach is employed. The method is based on the work of Bartik(1991) and Blanchard and Katz(1992) where the initial industry composition of employment with the corresponding national industry-specific trends in unemployment are interacted. Among others, similar approaches are also used by Bound and Holzer (2000), Schaller (2012) and Anderberg, Rainer, Wadsworth and Wilson (2013).

Particularly, the ceremonial counties' industry composition by gender and age group at baseline -which defined as the calendar year of 1993- combined with industry specific unemployment rates by gender and age group at the national level over the sample period.[15]For each ceremonial county, age group, gender and year industry-predicted unemployment rates are constructed as follows:

[15]Eight industries are used in the analysis based on a condensed version of the UK Standard Industrial Classification of Economic Activities, SIC(2007):"Agriculture, forestry, fishing, mining, energy and water supply", "Manufacturing", "Construction", "Wholesale, retail & repair of motor vehicles, accommodation and food services", "Transport and storage, Information and communication", "Financial and insurance activities, Real estate activities, Professional, scientific & technical activities, Administrative &support services", "Public admin and defense, social security, education, human health & social work activities", "Other services". The "industry unemployment rate" is defined as the unemployed by industry of last job as percentage of economically active by industry.

$$PredictedUnemp_{ghjt} = \sum_{k} \psi_{ghjk} UNEMP_{ghkt} \quad (1)$$

where $\psi_{ghjk}$is the share of industry k among employed individuals of age group g, gender h, ceremonial county j at baseline, and where $UNEMP_{ghjk}$ is the unemployment rate, at the national level, in industry k individuals of age group g, gender h and in time period t. Given that the predicted unemployment measure is a weighted average of the national industry-specific unemployment rates, these weights reflect the baseline ceremonial industry composition in the relevant gender and age group. For this reason, the weights are anchored to baseline year and do not mirror county categorization into industries, over the sample periods.

As mentioned earlier, the level of birth rate in a county is a function of both labor supply and labor demand. Using observed changes in local labor market confounds whether the results are driven by labor supply or labor demand. Instead, labor demand shocks are used as an identfying source of variation. Bartik instrument is employed to act as an exogenous change in local labor demand since it is able to isolate shocks that comes from change in local labor supply. The predicted unemployment in the next period relies only on initial industry composition and national level industry specific unemployment rates. However, one might be concerned for the earlier time periods of the panel. Later in the paper, this issue is investigated by dropping some of the years at the beginning of the sample period from the estimated model. This estimation does not send any warning signals that main results are substantially affected by underlying serial correlation in county-specific circumstances.

5 Results

5.1 Main Results

Results from the main fixed effect specfications are presented in Table 3, Table 6 and Table 7. Table 3 illustrates some of the main characteristics of the unemployment and fertility relation. When control variables and linear trends are not included in the specification, OLS coefficient is negative and statistically insignificant. However, coefficients on unemployment rates are positive and significant at the conventional level as demographic controls and trends are included in the ordinary least square (OLS) specification. As reported by Table 3, a one percentage point increase in unemployment rate is associated with a 0.57 percent increase in birth rates. Specifications with age specific trends show the importance of controlling for different birth trends across age groups which is presented in figure 2. Likewise, controlling for non-linear changes in counties seems to matter as coefficients on not UK born, other ethnicities and singles are significant. Column 6 in Table 3 employs age-specific linear trends, county-specific linear trends and demographics controls and it is determined as preferred specification of this analysis. Thus, the rest of the study is carried out based on this choice.

After establishing the counter cyclical fertility behavior in England, Table 6 concentrates on one of the main questions; whether effects of unemployment on fertility vary across age groups. It measures how the response in age group 2 (25-34) and age group 3 (35-44) differs from the age group 1 (16-24). Reported results suggest that compared to the youngest age cohort, a one percentage point increase in unemployment rate is associated with .054 percent increase in birth rates, in the 25-34 age band and a .067 decrease in 35-44 age band, effects are both statistically significant at one percent level. Evidently, these correlations are consistent with most of the life course literature which studies the role of economic uncertainties in fertility dynamics and presumes that youth unemployment leads people to postpone their

fertility (Mills & Blossfeld, 2003). Together these results provide important insights into sub-demographic differences and clearly indicates that the main effect is driven by the second age group.

Table 7 provides the results obtained from the age group breakdown by gender. This table is quite revealing in several ways. Firstly, unlike the rest of the literature, Column 3 controls for opposite gender's labor market outcome and addresses the potential identification problem. Secondly, different effects of male and female unemployment on fertility behaviour are also highlighted in this table. Analysis reveals that compared to the youngest age group and after controlling for male unemployment, one percentage point increase in female unemployment lead to a 0.52 percent increase in births for the 25-34 age group. For the oldest and youngest age group effects are not statistically significant. Results obtained for the male unemployment suggest that one percentage point increase in unemployment rate is associated with 0.4 percent increase in the youngest age group and coefficient on second age group does not significantly differ from the one in age group 1. Overall, the differences between male and female unemployment are highlighted in this table and a clear benefit of controlling opposite gender's labor market outcome in the prevention of identification problem is addressed in this analysis. The next section of the paper is concerned with endogeneity issue and instrumental varible estimation results are presented.

5.2 IV Estimation

Turning now to the IV estimation in Table 4, strong evidence of counter cyclical fertility behavior is found once and again. Comparing the OLS and IV results, it can be seen that the IV coefficients are larger in magnitude and leads to a 0.103 percent increase in births. Such difference might stem from the existence of reserve causality and omitted variables bias, which cause the OLS coefficients to be biased downwards. The F-statistics of the first stage

show that the chosen instrument is highly correlated with unemployment rates and satisfies thumb rule (F>10) while passing the identification test.[16]

As Table 6 presents, coefficients on age groups are considerably larger in magnitude compared to the OLS results and there are no differences in terms of significance and sign of the relationship. Column 6, in Table 7, strongly confirms previous findings that male and female unemployment have different impacts on fertility and reveals the importance of sub-group characteristics. In parallel to the main hypothesis of this paper, IV results imply that compared to age group 1, a one percentage point increase in male unemployment leads to a 3.03 percent decrease in birth rates whereas same amount of increase in female unemployment leads to a 6.47 percent increase in birth rates for the second age group. Comparison of the two results reveals the fact that older age cohorts experience an eye-catching deviation from the reference group and females minimize the foregone earnings, while gaining social approval through its compliance with group patterns. The following part of the results move on to explore whether the responses are homogenous across demographic characteristics.

5.3 Analysis by Demographic Characteristics

Further analysis show that fertility behaviour differs not only by male and female unemployment but also demographic characteristics -educational attainment, marital status, country of birth and ethnicity-. The first set of OLS analysis examines the impact of female unemployment by demographic characteristics and age group in Table 8. Panel (A) shows that as educational attainment increases, compared to youngest age group, fertility is raised by .031 percent, for 25-34 band, and .014 percent for 35-44 band. In particular, effect is pronounced among highly educated women who potentially want to take advantage of the low cost of childbearing during the economic bust terms. Panel (B) provides results for marital status in

[16]First stage regressions by age group and age group-gender are available upon request.

which single women's fertility are more influenced by local unemployment and significant decrease in birth rates is observed. OLS coefficients imply that a one percentage point increase in unemployment is associated with a 0.19 percent decrease in births for 25-34 age band and 7.13 percent decrease for the oldest age group compared to age group one that also faces 1.38 percent decrease in births. As noted by Schaller (2011), this may be due to the fact that the group of single mothers has a higher concentration of both younger women and women of lower socioeconomic status, both groups that are highly impacted by business cycles. Coefficients in panel (C) shed some light on the immigration issue in England. Women, aged 25-34 and Non-UK Born, respond to unemployment more than five times compared to UK Born cohort. Altogether, birth rates increase by 2.82 percent. In panel (D), non-white females follow a similar trend to their Non-UK Born counterparts. Even though data on birth rates do not allow to conduct deeper analysis on the immigration issue, present results are clearly documented that non-UK Born females significantly contribute to the recent increase in fertility rate as well as the fall in dependency ratio.[17]

The results for males with different demographic characteristics are reported in table 9. Apart from the educational gradient, coefficients are mostly negative and insignificant. Interestingly, male aged 25-34 with high level of education elevate the birth rate compared to the youngest age group, in which birth rate is 1.14 percent higher. For the oldest age group effect is always negative and statistically significant across educational attainement. That might reflect the fact that highly educated individuals display egalitarian gender role attitudes and suggests that childbearing activity is not solely women's responsibility but also carried out by men. The OLS coefficients in panel (B) indicate that unemployment is negatively associated with birth rates for single man. Overall, findings indicate that unemployment and fertility relation exhibits strong educational gradients across age groups and genders.

[17] A measure showing the number of dependents (aged 0-14 and over the age of 65) to the total population (aged 15-64).

5.4 Robustness Checks

Additional robustness checks are conducted in order to detect whether main findings remain stable to the different specifications. First Column in Table 10 presents results with additional control variable, house price index (HPI) which captures changes in the value of residential properties and controls for the potential impact of change in housing prices on getting into parenthood.[18] Results in Column 1 indicate that there is no significant difference in terms of magnitude and sign of the relationship compared to IV estimation. As discussed earlier, second column addresses the potential serial correlation issue and presents results after dropping first four years of the sample, 1994-1997.[19]Again, there are no significant differences in which coefficients tend to be larger compared to longer time horizon. In column 3 relatively high unemployment and birth rates are excluded from the sample. For that purpose, the top fourth quartile of both variables is removed and results are insignificantly changed for youngest and oldest female age groups. Lastly, column 4 employs the system GMM dynamic panel data estimator developed in Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). This approach addresses the issues of joint endogeneity of all explanatory variables in a dynamic formulation, and of potential biases induced by county specific effects. Moreover, to ensure that the estimated effect is not driven by the number of instruments, the analysis employs the "1 lag restriction" technique introduced by Roodman (2009) that uses only certain lags instead of all available lags as instruments. Overall, further robustness checks revealed that birth rates are responsive to changes in local unemployment rates while results are being trustworthy. [20]

[18]The HPI is calculated by using Land Registry's own 'Price Paid Dataset'.

[19]Results are also robust to drop in shorter and longer time intervals and available upon request.

[20]Along with coefficient estimates obtained using GMM system estimator, the tables also report three tests of the validity of identifying assumptions they entail: Hansen's (1982) J test of over-identification; and Arellano and Bond's (1991) AR(1) and AR(2) tests in first differences. AR (1) test is of the null hypothesis of no first-order serial correlation, which can be rejected under the identifying assumption that error term is not serially correlated; and AR (2) test is of the null hypothesis of no second-order serial correlation, which should not be rejected. In addition, to deal with heteroskedasticity, the Windmeijer (2005) small-sample correction is applied.

Taken together, this paper offers meaningful insights on the counter-cyclical nature of the births along with group specific differences across social strata, in England. Female unemployment is found to be strongly related with current period fertility in which 25-34 age band and non-UK born mothers constitute the main driven cohorts. Education is also found to be important determinant of unemployed females' transition to motherhood. Another remarkable finding is that youth male unemployment has a positive impact on fertility, even though the effect is low in magnitude. For the oldest age band, a persistent negative association is also found.

6 Conclusion

Drawing on labor force survey and birth statistics from the ONS, it has been investigated how the relationship between unemployment and fertility varies by age, gender, educational attainment, marital status, country of birth and ethnicity. In line with the main predictions of dynamic fertility models, results indicate that female unemployment leads to an increase in fertility, whereas male unemployment has the opposite effect. A comparison of age groups reveal that unemployment is more likely to affect the fertility of younger, rather than older women, in the sense that the former are more able to postpone their fertility until economic conditions improve than older women. It also has been argued that educated women might be more eager to have a child due to low opportunity cost during the economic bust terms terms, as they could focus on the labor market after giving a birth. Additionally, evidence from this analysis suggests the existence of strong variation across sub-demographic groups and shows that age cohorts and genders react differently to local unemployment shocks.

All in all, this research deem to be of pivotal contribution to the existing literature, given

the novel approach of isolating the effects of different age cohorts along with gender-specific unemployment rates. Particularly, controlling for the opposite gender labor market condition addresses to omnipresent identification issue of the literature while shift-share approach sorting out the endogeneity problem. Lastly, present analysis is the first one to analyze unemployment and fertility relationship at the local authority level in England.

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Table 3: Effect of Unemployment on Fertility - Different OLS Specifications.

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Unemp. Rate	-0.00224	0.00747***	0.00244**	0.00675***	0.00702***	0.00576***
	(0.00166)	(0.00108)	(0.00105)	(0.00096)	(0.00087)	(0.00087)
Single			0.00878***		0.00049	-0.00121**
			(0.00117)		(0.00069)	(0.00051)
Not UK Born			-0.00027		0.00080	0.00321***
			(0.00103)		(0.00087)	(0.00083)
Other Ethn.			0.02519***		0.00839**	0.00875***
			(0.00414)		(0.00356)	(0.00166)
Higher Educ.			0.00267***		-0.00130*	-0.00075
			(0.00102)		(0.00067)	(0.00054)
Further Educ.			-0.00962***		0.00028	-0.00006
			(0.00100)		(0.00060)	(0.00046)
County L.T.	No	No	No	Yes	No	Yes
Age L.T.	No	Yes	No	Yes	Yes	Yes
Observations	2397	2397	2397	2397	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include county and age group fixed effects.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Effect of Unemployment on Fertility - Different IV Specifications.

	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV
Unemp. Rate	-0.00300	0.01134***	0.00758***	0.01145***	0.01150***	0.01038***
	(0.00205)	(0.00143)	(0.00154)	(0.00141)	(0.00146)	(0.00148)
Single			0.00933***		0.00055	-0.00096*
			(0.00113)		(0.00064)	(0.00050)
Not UK Born			-0.00078		0.00024	0.00219**
			(0.00087)		(0.00081)	(0.00095)
Other Ethn.			0.02356***		0.00717**	0.00800***
			(0.00429)		(0.00293)	(0.00154)
Higher Educ.			0.00305***		-0.00115*	-0.00078
			(0.00105)		(0.00070)	(0.00054)
Further Educ.			-0.00968***		0.00071	0.00042
			(0.00101)		(0.00060)	(0.00048)
County L.T.	No	No	No	Yes	No	Yes
Age L.T.	No	Yes	No	Yes	Yes	Yes
Observations	2397	2397	2397	2397	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include county and age group fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Dependent Variable: Unemployment Rate (First Stage)

	(1) FS	(2) FS	(3) FS	(4) FS	(5) FS	(6) FS
Pred. U. Rate	1.177***	1.168***	1.190***	1.169***	1.182***	1.168***
	(0.036)	(0.031)	(0.039)	(0.032)	(0.039)	(0.034)
Demog. Con.	No	No	Yes	No	Yes	Yes
Coun.TT	No	No	No	Yes	No	Yes
Age L.T.	No	Yes	No	Yes	Yes	Yes
Observations	2397	2397	2397	2397	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include county and age group fixed effects.

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 6: Effect of Unemployment on Fertility, by Age Groups Interactions

	(1) OLS	(2) IV
Unemp. Rate	0.00531***	0.00802***
	(0.00096)	(0.00188)
Unemp.Rate*Aged_25-34	0.00543***	0.01211***
	(0.00146)	(0.00228)
Unemp.Rate*Aged_35-44	-0.00670***	-0.00852***
	(0.00188)	(0.00321)
Demog.	Yes	Yes
Coun.TT	Yes	Yes
Age L.T.	Yes	Yes
Observations	2397	2397

Standard errors in parentheses. All specifications include county and age group fixed effects. Standard errors clustered at county level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Effect of Unemployment on Fertility, by Age Groups & Gender

	(1) OLS	(2) IV
Male U. Rate	0.00401***	0.01346***
	(0.00049)	(0.00276)
Male U.Rate*Aged_25-34	0.00130	-0.03032***
	(0.00107)	(0.01030)
Male U.Rate*Aged_35-44	-0.00487***	-0.01135**
	(0.00130)	(0.00537)
Female U. Rate	0.00068	-0.01089***
	(0.00083)	(0.00393)
Female U.Rate* Aged_25-34	0.00521***	0.06470***
	(0.00125)	(0.01521)
Female U.Rate* Aged_35-44	-0.00123	0.00624
	(0.00207)	(0.00845)
Demographic Controls	Yes	Yes
County Specific Linear Time T.	Yes	Yes
Age Specific Linear Time T.	Yes	Yes
Observations	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include county and age group fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Effect of Female Unemployment on Fertility, Interactions with Demographic Characteristics

	OLS	OLS	OLS
(A) Interactions by Education	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
F_Unemployment*Higher_Educ.	-0.0277*** (0.0045)	0.0312*** (0.0047)	0.0133* (0.0074)
F_Unemployment*Further_Educ.	-0.0123*** (0.0036)	0.0178*** (0.0060)	-0.0147 (0.0099)
F_Unemployment*Comps_Educ.	0.0075*** (0.0029)	0.0106*** (0.0025)	-0.0013 (0.0042)
(B) Interactions by Marital Status	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
F_Unemployment*Single	-0.0138*** (0.0047)	-0.0019 (0.0052)	-0.0713*** (0.0148)
F_Unemployment*Married	0.0032 (0.0138)	0.0093 (0.0141)	-0.0041 (0.0144)
(C) Interactions by Country of Birth	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
F_Unemployment*UK_Born	-0.0015 (0.0036)	0.0057*** (0.0014)	-0.0017 (0.0024)
F_Unemployment*NON_UK_Born	-0.0139*** (0.0049)	0.0282*** (0.0064)	0.0078 (0.0108)
(D) Interactions by Ethnicity	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
F_Unemployment*White	0.0001 (0.0032)	0.0051** (0.0013)	-0.0019 (0.0022)
F_Unemployment*Others	-0.0130*** (0.0033)	0.0306*** (0.0079)	0.0043 (0.0118)
Observations	2397	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include demographic controls and county and age group fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Effect of Male Unemployment on Fertility, Interactions with Demographic Characteristics

	OLS	OLS	OLS
(A) Interactions by Education	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
M_Unemployment*Higher_Educ.	-0.0094** (0.0049)	0.0114*** (0.0048)	-0.0141***(0.0055)
M_Unemployment*Further_Educ.	-0.0037 (0.0048)	0.0020 (0.0054)	-0.0237*** (0.0062)
M_Unemployment*Comps_Educ.	0.0133***(0.0036)	0.0044* (0.0022)	-0.0067*** (0.0025)
(B) Interactions by Marital Status	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
M_Unemployment*Single	-0.0013*** (0.0047)	-0.0019 (0.0052)	-0.0713*** (0.0148)
M_Unemployment*Married	0.0421*** (0.0099)	-0.0316***(0.0097)	-0.0442*** (0.0086)
(C) Interactions by Country of Birth	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
M_Unemployment*UK_Born	0.0016 (0.0041)	0.0014 (0.0013)	-0.0054*** (0.0014)
M_Unemployment*NOT_UK_Born	0.0080 (0.0076)	0.0033 (0.0071)	-0.0259*** (0.0095)
(D) Interactions by Ethnicity	**Aged_16-24**	**Aged_25-34**	**Aged_35-44**
M_Unemployment*White	0.0031 (0.0036)	0.0013 (0.0012)	-0.0052***(0.0014)
M_Unemployment*Others	0.0030 (0.0063)	0.0082 (0.0068)	-0.0244*** (0.0107)
Observations	2397	2397	2397

Standard errors in parentheses and clustered at county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specifications include demographic controls and county and age group fixed effects.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Robustness Checks

	Controlling for House Prices	Exclusion of Years 1994 to 1997 (Inc.)	Exclusion of Fourth Quartile	System GMM Estimation
	(1) IV	(2) IV	(3) IV	(4) GMM
Male U. Rate	0.01109***	0.01008***	0.03107**	0.08900***
	(0.00254)	(0.00335)	(0.01247)	(0.03316)
Male U.Rate*Aged_25-34	-0.02387**	-0.03763***	-0.04555***	-0.10054***
	(0.00966)	(0.01069)	(0.01662)	(0.03373)
Male U.Rate*Aged_35-44	-0.02074***	-0.04025***	-0.02894**	-0.10283***
	(0.00745)	(0.00537)	(0.01326)	(0.03471)
Female U. Rate	-0.00282	-0.01136***	0.00598	-.0.05663
	(0.00298)	(0.00384)	(0.01388)	(0.03458)
Female U.Rate*Aged_25-34	0.05717***	0.05631***	0.04573**	0.08540***
	(0.01421)	(0.01418)	(0.02017)	(0.03234)
Female U.Rate*Aged_35-44	0.02804**	0.03619**	-0.00970	0.07185
	(0.01240)	(0.01899)	(0.01533)	(0.05116)
House Price Index	Yes	No	No	Yes
Observations	2397	1833	1797	2256

Standard errors in parentheses and clustered at the county level. Estimates are weighted by the number of women aged 16-44 in each county-year cell. All specification include county and age group fixed effects, demographic controls, age and county specific linear time trends. System GMM estimation performed with Windmeijer (2005) Small Sample Robust Correction.
* p < 0.1, ** p < 0.05, *** p < 0.01

SPECIFICATION TESTS	(p-values)
Hansen's J:	0.406
Serial Corr:	
First-order	0.002
Second-order	0.120

Appendix

Figure 3: Age-Specific Male Unemployment Rates and Age-Specific Fertility Rates in England, 1994-2010

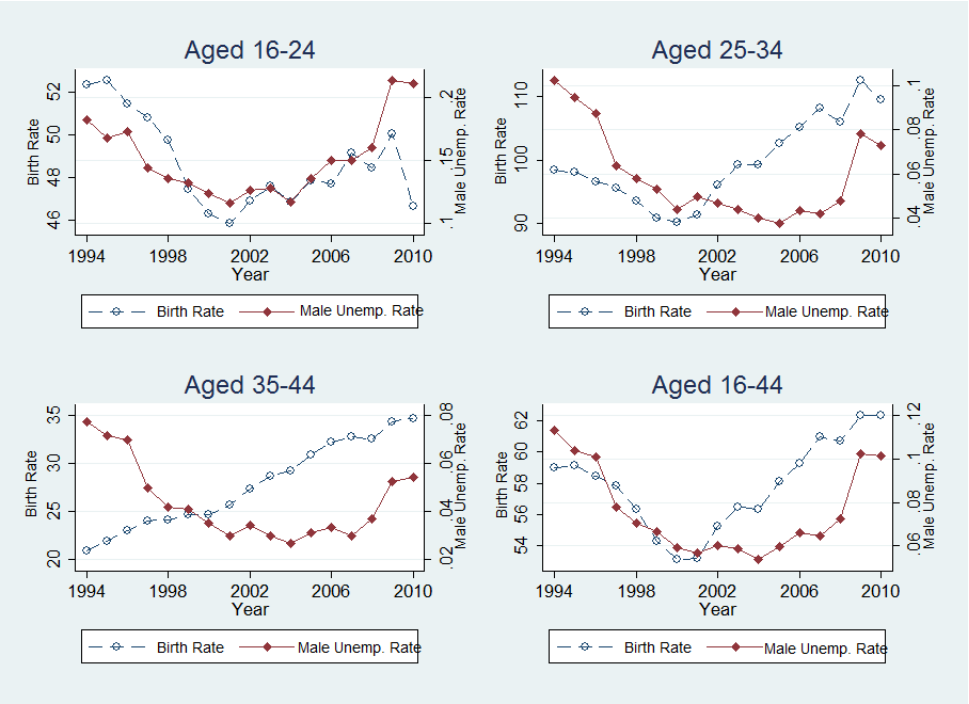

Figure 4: Age-Specific Female Unemployment Rates and Age-Specific Fertility Rates in England, 1994-2010