Explaining the Decline in Fertility among Citizens of the G.C.C. Countries: the Case of the U.A.E.

Mouawiya Al Awad
Carole Chartouni

Institute for Social & Economic Research (ISER)
Zayed University
PO Box 500320, Knowledge Village, Dubai,
UAE
www.ISER.org
ISER@zu.ac.ae
The Institute for Social & Economic Research (ISER) at Zayed University conducts empirical research on important social and economic matters facing the UAE and the GCC region. The Institute aims to provide policy makers and practitioners with analyses and recommendations which enhance understanding and decision-making.

Views presented in this working paper are those of the authors and do not necessarily represent views of ISER or Zayed University.
Abstract

This paper examines certain factors that have contributed to the decline in fertility in the Gulf Cooperation Council G.C.C. countries in recent years, taking the United Arab Emirates “U.A.E.” as a case study. Employing data from the 2008 U.A.E. Household Expenditure Survey, this paper analyzes the determinants of fertility using a Poisson fertility count model. The results show that economic factors, in terms of the costs and benefits that families derive from children in the U.A.E. are not important determinants of fertility due to the large size of social insurance provided by the U.A.E. government. Moreover, labor market participation by either males or females do not play a critical role in determining fertility in the U.A.E. The two primary causes of declines in fertility are a) late marriages or late first births, and b) higher levels of female education. Other contributors to drops in fertility are marriages between U.A.E. national males and foreign females and increases in child birth intervals. Conversely, the size of household residences and the number of domestic workers working in a household contribute positively to fertility.

Keywords: Fertility, Gulf Cooperation Council, United Arab Emirates, Poisson Count Models

JEL Codes: J13, C35, R23

Mouawiya Al Awad
Institute for Social & Economic Research, Zayed University, Knowledge Village, PO Box 500320, Dubai, U.A.E.
email: mouawiya.alawad@zu.ac.ae

Carole Chartouni
Georgetown University, Washington D.C., 20057.
email: caa26@georgetown.edu
Introduction

The Gulf Cooperation Council “G.C.C.” countries experienced noticeable declines in fertility rates in recent years. From 1970 to 2005, total fertility rates in the G.C.C. dropped from an average of 6.8 births per woman to less than 3 births per woman. The decreases in fertility many demographic consequences including changes to the age structure of the population, a reduction in population growth, and decreasing the proportion of citizens within the total population.

The decline in fertility accompanied other changes in the region. Oil revenues financed massive investments in infrastructure, health and education programs. As a result, literacy and educational levels among men and women increased dramatically and child mortality rates plunged.¹

There were also significant changes in the national character of the populations of the respective G.C.C. countries. G.C.C. Development projects in the region necessitated an enormous influx of foreign workers and families, especially Asians and Arabs. The large presence of foreigners in the G.C.C. countries impacted the social and cultural norms of its citizens, and influenced their consumption patterns. Moreover, the availability of cheap foreign labor provided an impetus for G.C.C. nationals to pursue higher levels of education to enable them to better compete in the labor market. Obtaining an acceptable educational degree became socially, and to a certain degree economically, important for most females, and as a result, their participation in the labor market steadily increased.² Growing wealth and changes in consumption patterns also drove the cost of living up, which in turn caused a delay in marriage among the youth.

¹ Mortality rates for children under 5 declined from 15 to 8 deaths per 1000 between 1990 and 2006 (UN Stat data).
² U.A.E. national females’ participation rates increased from 2.6% in 1975 to 27% in 2005 (Al Awad and Chartouni 2009).
With all of these changes, fertility rates in the G.C.C. dropped rapidly. By 2005, fertility rates were less than half those witnessed in the seventies. The largest drops took place in Kuwait where average fertility rates decreased from 6.9 children per female during 1970 to 1975 to 2.3 children per female during 2000 to 2005, and in the U.A.E. from 6.4 to 2.5 for the same periods. Oman and Saudi Arabia still have higher fertility rates in comparison to other G.C.C. countries.

### Table 1 Total Fertility Rates in the G.C.C. (births per woman)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>5.9</td>
<td>4.1</td>
<td>3.4</td>
<td>2.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Kuwait</td>
<td>6.9</td>
<td>3.9</td>
<td>3.2</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Oman</td>
<td>7.2</td>
<td>6.8</td>
<td>6.3</td>
<td>5.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Qatar</td>
<td>6.8</td>
<td>4.7</td>
<td>4.1</td>
<td>3.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>7.3</td>
<td>6.2</td>
<td>5.4</td>
<td>4.6</td>
<td>3.8</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>6.4</td>
<td>4.8</td>
<td>3.9</td>
<td>3.1</td>
<td>2.5</td>
</tr>
</tbody>
</table>


With the exception of Oman, G.C.C. countries implemented pro-growth policies which indirectly counter the declining proportion of nationals in the overall population and labor force. Governments started providing maternity benefits, children allowances and marriage funds to their citizens. However, these policies were aimed primarily at easing living expenses rather than directly targeting fertility rates among citizens (Alnuaimi and Poston 2009). On the other hand, Oman began in 1994 to promote birth-spacing among women of child-bearing age in an effort to increase the percentage of the economically active population relative to total population (Oman Population Committee 2009).

Little has been done in the literature to explain the fast drop in fertility in the G.C.C. countries. This may be due to the limited availability of data in this region. There are a few exceptions such as Bean and Zohry (1994) that examined the relationship between marriage and fertility in the G.C.C. countries using surveys that focused on child health rather than fertility. They concluded that variations in fertility rates mainly reflected variations in the age of marriage which in turn is affected by females’ educational attainment and the degree of urbanization in the
G.C.C. Alnuaimi and Poston (2009) examined the relationship between polygamy and fertility among married Emirati women in the U.A.E. during the period of 1998-1999. They used logistic regression models and found that, contrary to other regions, fertility is positively related to polygamy in the oil-rich U.A.E.. Abdal (1999) examined the determinants of fertility from a random sample of birth registrations in Kuwait. Using path analysis, he showed that age at first marriage is the most relevant predictor of fertility in Kuwait while other variables, such as education, mother’s working status, religion, place of residence and nationality influenced fertility through their effect on the age at first marriage. Al-Qudsi (1998) in his study of four Arab countries, two of which are G.C.C. countries, used a two-step micro-econometric model that combined a Poisson count function with a Probit binary function to study the fertility-female labor force participation link. He showed that age at marriage, women’s education, infant mortality and preferences for male off-springs are all important determinants of fertility in Arab countries. Moreover, he found that fertility negatively affects labor force participation of Arab females, while education is positively related to it. He also showed that the age of females is positively related to labor force participation up to a certain point after which it negatively affects it. Khraif (2002) studied the determinants of fertility in Saudi Arabia using the demographic survey of 1999. He found that the age at first marriage and female’s education are the most important determinants of fertility. On the other hand, a female’s participation in the labor force, the husband’s educational level and birth control methods are not vital factors of fertility in Saudi Arabia.

This paper uses the U.A.E. family budget survey conducted in 2008 to investigate the factors that contributed to the decline of fertility in U.A.E. households. Section two describes the econometric methodology and the variables used in the study, section three explains the data and the empirical findings, and finally section four concludes and suggests some policy implications.
Methodology and Variables Description

We use the Poisson regression model to study the determinants of fertility in the U.A.E.. The dependent variable is a count variable denoting the number of children ever born to a spouse which takes on non negative integer values. The expected value of the count variable \( y \) conditional on a set of explanatory variables \( x \) is modeled as

\[
E(y|x) = e^{(x' \beta)}
\]

The specification above insures that \( E(y|x) > 0 \). Thus, the number of children ever born to a spouse conditional on \( x \) is the Poisson distribution with the probability density of

\[
P(Y = y | x) = \frac{e^{-(x' \beta)} (x' \beta)^y}{y!}
\]

where \( y=0, 1, 2, 3,...,N \)

The maximum likelihood Poisson fertility equation is then specified as

\[
L(\beta) = \sum_{i=1}^{n} \left( y_i x_i \beta - e^{x_i \beta} \right)
\]

The explanatory variables \( x_i \)'s in the fertility equation refer to demographic and economic variables describing household and parents’ characteristics. The variables pertaining to the parents are age, years of education, income, labor market status, and nationality of the mother.

The variable age is a control variable in the model. The two education variables are measured in years of schooling.\(^3\) The mother’s education captures the opportunity cost of having

---

\(^3\) The years of education were imputed as follows: Illiterate: 0 years; Read & Write: 2 years; Primary: 7 years; Intermediate: 11 years; Secondary: 14 years; Diploma: 16 years; Bachelor: 18 years; Diploma further: 17 years; Master’s degree: 20 years; PhD: 23 years. For the respondents who answered “Null”, education years were computed as follows: those below 18 and above 7: education years=age- 7; for those below 36 (that was when primary schooling became mandatory: 7 years; for those above 36:0 years.
children, and both the father and mother’s education impact fertility directly by enhancing their knowledge about the uses of contraceptive methods and the benefits of small-size families. Moreover, their education indirectly increases the demand for higher quality children which is associated with a higher spending on children, and as a consequence, with a reduction in the desired number of children in the family.

The income variable is the father and mother’s annual gross incomes measured in AED. The use of the family gross income is not realistic in this context as it comes from different members of the family and thus, it does not demonstrate the link between fertility and the financial contribution toward children. Income can be either positively or negatively related to fertility depending on whether the income or substitution effect dominates. The economic theory of Becker (1960, 1974) suggests that children are similar to consumer durables, like automobiles. As family income increases, parents demand more children but also better quality children. Therefore, parents have to take a decision to substitute quality for quantity. The average spending per child is used to proxy quality in the model.

We assign dummy variables to capture whether the mother or father is working or not. There is a tradeoff between spending time at home and at work especially for the mother. A non-working woman would have more time to bear children and conversely we would expect fertility to decrease with more time devoted by the female to work. We also include a dummy variable denoting whether the mother is U.A.E. national in order to examine the impact of marriage between U.A.E. nationals and foreigners on fertility.

As for the household characteristics, they mainly reflect the social class of the family such as the number of domestic workers working in the household and the number of bedrooms in the
house, but they may impact fertility by impacting the space or the time available to raise and take care of children.

We also include two proxies for the age at first birth and the birth intervals between children. The proxy for the age at first birth of the spouse\(^4\) is calculated as the difference between the age of the mother and the age of her first child. The proxy for the average birth interval among the children in the family\(^5\) is computed by the following ratio:

\[
\text{birth interval} = \frac{\text{age of eldest child} - \text{age of youngest child}}{\text{number of children in the household}}
\]

\(^4\) The age at first marriage proxy can only be calculated for families that have at least one child, and as such the number of observations decreases.

\(^5\) The birth interval proxy can only be calculated for families with two or more kids, and as such the number of observations decreases even more.
Data and Empirical Results

The data used in this study are from the Household Expenditure Survey (HES) conducted in the U.A.E. in 2008. The survey contains information on 13,992 households relating to their income and spending patterns. The data were collected in all of the seven emirates of the U.A.E. and encompassed both U.A.E. national and non-U.A.E. national households. The survey also included information on the socio-economic characteristics of all the individuals in the household such as their age, gender, educational level, labor market status, household size and occupation. Therefore, a comprehensive data set of 84,733 observations was generated containing information on children, parents, and other family members of the household. For the purpose of this study, we restrict the sample to females aged between 15 and 49 and who live in local households since we assume that the childbearing age in the U.A.E. lies within this range. We are thus left with 10,305 individual observations.

The variable of interest in this paper is the number of children born to every female in the sample. Due to data limitations, we can only impute the number of children for females who were declared as:

1. Heads of the households,
2. Spouses,
3. Married daughters of the heads of households who live in a household where there are no daughter-in-laws living with them, and there are no other married, divorced, or widowed in that household,

A household is defined to be local if the head of the household is a U.A.E. national.

We have also excluded all females who were declared as employees of the households (domestic workers). Moreover, we have eliminated all households in which the difference between the mother’s age and her eldest child is lower than 13 years. This is either a mistake in the reporting of the data or the spouse in the household is not the biological mother of the child.
4. Daughter-in-law of the heads of households who live in a household where all daughters of that household are single and they are the only daughter-in-laws in that household, and

5. Single Daughters of the head of households.

Moreover, we can only assign children to their respective mothers in households that contain one spouse only\(^8\). The sample then is reduced to 7437 observations and comprises around 72% of the original female sample (10,305 observations).

\(^8\) The data is arranged in such a way that we cannot discern which spouse has which children.
Descriptive Results

This section provides some statistics on total and marital fertility rates in the U.A.E. according to various factors such as females’ age, education, labor market status, and parents’ income.

Table 2 illustrates the substantial drop in fertility as the age cohort to which the female belongs to decreases. The total fertility rate declines from 5.8 for females in the 45-49 age cohort to 1.18 for females in the 25-29 age cohort. Fertility rates become close to zero for the youngest age cohort.

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-19</td>
<td>0.01</td>
<td>0.43</td>
</tr>
<tr>
<td>20-24</td>
<td>0.25</td>
<td>1.21</td>
</tr>
<tr>
<td>25-29</td>
<td>1.18</td>
<td>2.36</td>
</tr>
<tr>
<td>30-34</td>
<td>2.80</td>
<td>3.78</td>
</tr>
<tr>
<td>35-39</td>
<td>4.75</td>
<td>5.29</td>
</tr>
<tr>
<td>40-44</td>
<td>5.51</td>
<td>5.95</td>
</tr>
<tr>
<td>45-49</td>
<td>5.80</td>
<td>6.01</td>
</tr>
<tr>
<td><strong># of Observations</strong></td>
<td><strong>7437</strong></td>
<td><strong>3278</strong></td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

A female’s education and participation in the labor force also impact her fertility by postponing the age of marriage, and enhancing the knowledge of contraceptive methods and the benefits of small-size families. It also forces females to adopt a form of birth-spacing strategy in order to cope with the work responsibilities. Indirectly, education increases the demand for higher quality children which with higher spending on children. This increase in the cost of having children reduces the desired number of children in the family.
Table 3 shows the negative relationship between a female’s education and fertility. The total fertility rate for women who have at most completed primary schooling is 4.82, while more educated females have fertility rates below 2. The marital fertility rate also declines from 6.15 to 2.82 as the years of education decrease. The fertility rates in this paper are less than those reported by Lee and Zohry (1994) for the late eighties who estimated total fertility rates of 8.1 and 4.6 for illiterate and literate U.A.E. women respectively.

<table>
<thead>
<tr>
<th>Education of Female in years</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7 years</td>
<td>4.82</td>
<td>6.15</td>
</tr>
<tr>
<td>11 years</td>
<td>1.60</td>
<td>4.87</td>
</tr>
<tr>
<td>14 years</td>
<td>1.27</td>
<td>3.27</td>
</tr>
<tr>
<td>16-18 years</td>
<td>1.56</td>
<td>3.09</td>
</tr>
<tr>
<td>20-23 years</td>
<td>1.33</td>
<td>2.82</td>
</tr>
<tr>
<td># of Observations</td>
<td>7437</td>
<td>3278</td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

Table 4 estimates fertility rates according to female participation in the labor force. Total fertility rates in the U.A.E. are estimated to be around 1.5 and 3.7 for working and non-working women respectively. There is a negative relationship between women’s labor force participation and fertility; however, its direction is not clear. Women who participate in the labor force tend to have fewer children as they have less time to take care of their offspring. On the other hand, a reduction in fertility can cause a drop in the overall supply of labor, which in turns increases wages and encourages further increases in female labor force participation rates.

<table>
<thead>
<tr>
<th>Labor Market Status of Female</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working</td>
<td>1.54</td>
<td>3.12</td>
</tr>
<tr>
<td>Not Working</td>
<td>3.74</td>
<td>4.75</td>
</tr>
<tr>
<td>Full Time Student</td>
<td>0.03</td>
<td>0.96</td>
</tr>
<tr>
<td># of Observations</td>
<td>7436</td>
<td>3278</td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.
The increase in females’ educational attainment and labor force participation has induced women to postpone the age of marriage. Early marriages used to be very common in the U.A.E. However, as individual education, occupation, and wealth in the Gulf countries began to replace marriage as a method towards achieving a respected social membership (El-Haddad 2003), the age of marriage began to increase. During 1975, for example, the proportion of women aged between 15 and 19 years who were married was almost 57%; however, by the year 1995, this proportion decreased to 8% (Rashad et. al. 2005). Moreover, economic development and rapid urbanization began to impose costly consumption styles on families (Begader 1993) which forced young males to also postpone marriage or marry foreign women. Using the HES 2008 dataset, we estimate the mean age of marriage for females in the U.A.E. to be less than 20 years in 1988, 20.25 years in 1993, 22.8 in 2003, and finally 23.5 in 2008. This current phenomenon of postponing marriage has led to a decrease in fertility. We can see from table 5 that females who married at very early ages (13 to 15) have on average 7 children; whereas, females who married after the age of 25 have less than 3 children.

Table 5 Total Marital Fertility Rates by the Age of Marriage (births per woman)

<table>
<thead>
<tr>
<th>Age of Marriage</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-15</td>
<td>6.81</td>
</tr>
<tr>
<td>16-20</td>
<td>5.46</td>
</tr>
<tr>
<td>21-25</td>
<td>3.85</td>
</tr>
<tr>
<td>26-30</td>
<td>3.08</td>
</tr>
<tr>
<td>&gt;30</td>
<td>2.44</td>
</tr>
<tr>
<td># of Observations</td>
<td>2633</td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

The increase in the demand of higher quality children as well as females’ work responsibilities outside of the house can also broaden the birth intervals. Wider intervals reduce fertility as they decrease the number of years available for conceiving. Table 6 shows that fertility
in the U.A.E. is not affected by birth intervals of 1 or 2 years. However, when birth intervals begin to exceed 2 years then fertility levels start to decline.9

Table 6 Total Marital Fertility Rates in the U.A.E. by Birth Intervals (births per woman)

<table>
<thead>
<tr>
<th>Birth Interval</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.18</td>
</tr>
<tr>
<td>2</td>
<td>5.71</td>
</tr>
<tr>
<td>3</td>
<td>4.64</td>
</tr>
<tr>
<td>4</td>
<td>3.88</td>
</tr>
<tr>
<td>&gt;5</td>
<td>0.72</td>
</tr>
</tbody>
</table>

# of Observations 2623

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

The negative impact of the increase in women’s labor force participation on fertility can be partly mitigated by the presence of babysitters or domestic workers.10 Therefore, one should expect fertility to rise as the number of domestic workers in the household increases. However, the employment of domestic workers is a common practice among U.A.E. families, and is not restricted to households with working women. It is largely an urban culture that resulted from the sudden increased wealth in these societies (El-Haddad 2003). Indeed, table 7, shows that fertility rates do not seem to vary with the number of domestic workers. There is though a slight decline in fertility levels for families who employ 3 or more domestic workers, and a minor increase from not employing any domestic workers or simply hiring one domestic worker.

---

9 Lee and Zohry (1994) point out to the possibility that women in the U.A.E. limit fertility later in life, after a given number of children have been born. This means that birth intervals may be short during early years of marriage and start to widen later on.

10 Although we should take into consideration the cost of foreign household keepers into account as part of the cost of having children, their actual monetary cost percentage is not important in the U.A.E. family budget and thus their cost is not expected to have direct negative effect on fertility.
Table 7 Total Fertility and Marital Fertility Rates in the U.A.E. by No. of Domestic workers in the Household (births per woman)

<table>
<thead>
<tr>
<th>No. Domestic workers</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.92</td>
<td>4.04</td>
</tr>
<tr>
<td>1</td>
<td>2.06</td>
<td>4.14</td>
</tr>
<tr>
<td>2</td>
<td>2.01</td>
<td>4.50</td>
</tr>
<tr>
<td>3</td>
<td>1.79</td>
<td>4.43</td>
</tr>
<tr>
<td>&gt;4</td>
<td>1.73</td>
<td>4.48</td>
</tr>
</tbody>
</table>

# of Observations | 7437 | 3278 |

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

Aside from the factors described above, income is usually an important determinant of fertility. According to Becker (1960), income increases both the quality (spending on children) and the quantity of children. He believes that there is a tradeoff between spending on children and consuming other goods and services. However, the idea that rich families demand relatively higher quality children than the poor is questionable. It is usually not the case that if income decreases, parents demand less quality children in order to consume more goods.

Table 8 shows the variation in fertility by parents’ gross income in the U.A.E. Contrary to international empirical evidence, there is no clear relationship between income and fertility rates in the U.A.E. Total fertility rates and marital fertility rates are approximately 2 and 4 children per female respectively for all income categories.

Table 8 Total Fertility and Marital Fertility Rates in the U.A.E. by Parents’ Gross Income Levels (births per woman)

<table>
<thead>
<tr>
<th>Parents Gross Income</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20,000</td>
<td>1.78</td>
<td>4.29</td>
</tr>
<tr>
<td>20,000-40,000</td>
<td>2.08</td>
<td>4.22</td>
</tr>
<tr>
<td>40,001-60,000</td>
<td>2.38</td>
<td>4.09</td>
</tr>
<tr>
<td>60,001-80,000</td>
<td>2.23</td>
<td>4.03</td>
</tr>
<tr>
<td>80,001-100,000</td>
<td>2.49</td>
<td>3.96</td>
</tr>
<tr>
<td>&gt;100,000</td>
<td>2.16</td>
<td>4.37</td>
</tr>
</tbody>
</table>

# of Observations | 7437 | 3278 |

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.
Table 9 depicts the fertility rates across the emirates in the U.A.E. Despite the differences in the degree of economic development and magnitude of wealth between the emirates, fertility rates do not seem to vary. Total fertility rates range from 1.7 in Umm Al Quwain to around 2.5 in Fujeirah, while marital fertility rates range from around 3.9 in Dubai to 5.1 in Fujeirah.

**Table 9** Total Fertility and Marital Fertility Rates in the U.A.E. by Emirate (births per woman)

<table>
<thead>
<tr>
<th>Emirate</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abu Dhabi</td>
<td>2.10</td>
<td>4.00</td>
</tr>
<tr>
<td>Dubai</td>
<td>1.90</td>
<td>3.91</td>
</tr>
<tr>
<td>Sharjah</td>
<td>1.89</td>
<td>4.14</td>
</tr>
<tr>
<td>Ajman</td>
<td>1.97</td>
<td>4.55</td>
</tr>
<tr>
<td>Umm Al Quwain</td>
<td>1.73</td>
<td>3.96</td>
</tr>
<tr>
<td>Ras Al Khaimah</td>
<td>1.91</td>
<td>4.04</td>
</tr>
<tr>
<td>Fujeirah</td>
<td>2.52</td>
<td>5.11</td>
</tr>
<tr>
<td><strong># of Observations</strong></td>
<td>7437</td>
<td>3278</td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.

Finally, we look at the effect of polygamy on fertility. In many countries such as the Cameroon and the Central African Republic, polygamy is inversely related to fertility (Wasao 2001). However, in the U.A.E., this relationship is reversed (Alnuaimi and Poston 2009). Total and marital fertility rates increase as the number of spouses rise in the household. This result may be due to the competition that arises among women in polygamous marriages to have more children so that they can either establish superiority in the household or secure more inheritance from the household wealth.

**Table 10** Total Fertility and Marital Fertility Rates in the U.A.E. by Number of Spouses (births per woman)

<table>
<thead>
<tr>
<th>No. Spouses</th>
<th>TFR</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.15</td>
<td>4.34</td>
</tr>
<tr>
<td>2</td>
<td>2.05</td>
<td>3.94</td>
</tr>
<tr>
<td>3</td>
<td>2.95</td>
<td>4.87</td>
</tr>
<tr>
<td>4</td>
<td>4.06</td>
<td>5.42</td>
</tr>
<tr>
<td><strong># of Observations</strong></td>
<td>6911</td>
<td>3448</td>
</tr>
</tbody>
</table>

Source: Authors calculations based on U.A.E. Family Budget Survey 2008.
**Multivariate Results:**

This section estimates three empirical models in order to assess the impact of each of the previously discussed factors on fertility among U.A.E. households. The first model includes parents’ age, years of education, income, labor market status and nationality of the mother, in addition to the number of domestic workers working in the household, the number of bedrooms in the house, and household children expenditures. The second regression adds a proxy for the age at first birth of the spouse, and the third regression adds a proxy for the birth interval among the children in the family.

In the econometric model estimation, we further restrict our sample to female spouses aged between 15 and 49 years and living in households where polygamy does not exist in order to obtain independent and identically distributed data. Therefore, we attain a sample size of 2735 observations. Table 11 shows the distribution of households according to the number of children. Around 50% of the U.A.E. citizen families have 5 or more children and the most frequent number of children per spouse is 3, 4, and 5.

**Table 11** Distribution of the Sample Household According to the Number of Children

<table>
<thead>
<tr>
<th># of Kids ever born to a spouse</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>&gt;10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>101</td>
<td>173</td>
<td>309</td>
<td>398</td>
<td>408</td>
<td>383</td>
<td>308</td>
<td>232</td>
<td>179</td>
<td>96</td>
<td>67</td>
<td>81</td>
<td>2735</td>
</tr>
<tr>
<td>Percent</td>
<td>3.7</td>
<td>6.3</td>
<td>11.3</td>
<td>14.6</td>
<td>14.9</td>
<td>14</td>
<td>11.3</td>
<td>8.5</td>
<td>6.5</td>
<td>3.5</td>
<td>2.5</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Cumulative</td>
<td>3.7</td>
<td>10.0</td>
<td>21.3</td>
<td>35.9</td>
<td>50.8</td>
<td>65.0</td>
<td>76.1</td>
<td>84.5</td>
<td>91.1</td>
<td>94.6</td>
<td>97.0</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 12 depicts the summary statistics of the variables used in the empirical analysis. The sample shows that the average number of children per married females is 4.73 and that the average age for the female at first birth is around 21 years. The sample also shows that, in
general, families wait on average two years between the births of each kid. As for the income and expenses variables, the difference between the average annual gross income between the husband and the wife is striking. Wives’ average gross annual income is estimated at around 39,500 AED (10,763 USD), which is almost one-tenth of the average husbands’ annual income (384,847 AED or 104,863 USD). Husbands are the primary breadwinners of the family and their income defines the economic well being of the family. This observation is supported by the large percentage of working husbands relative to working wives (76% to 22%). Average annual expenditure per child is around 4,066 AED ($1,108) which is very small relative to the average incomes in the families.

The sample also shows that average number of education years is around 11.2 for the wife and 11.9 for the husband. The families on average have one domestic worker and large houses (between 4 to 5 bedrooms on average). Finally, 96% of the wives in the used sample are U.A.E. citizens.

Table 13 presents the results of the three Poisson models. It depicts the coefficients, odds ratios, and the semi-standardized odds coefficients. The odds ratios could be used as the odds ratios for a unit increase or decrease in the explanatory variable. The semi-standardized odds coefficients express the odds ratios in terms of standard deviation units and therefore allow us to rank the influence each variable has on fertility.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th># of Observations</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Kids ever born to a spouse</td>
<td>Number of Kids per female</td>
<td>2735</td>
<td>4.73</td>
<td>2.712</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Age at first birth</td>
<td>Age when the wife had her first child</td>
<td>2633</td>
<td>20.90</td>
<td>4.330</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>Age of Wife</td>
<td>Age of the Wife</td>
<td>2735</td>
<td>36.16</td>
<td>7.243</td>
<td>19</td>
<td>49</td>
</tr>
<tr>
<td>Birth Interval</td>
<td>Proxy for Birth interval between kids</td>
<td>2461</td>
<td>2.04</td>
<td>.8410</td>
<td>0</td>
<td>10.5</td>
</tr>
<tr>
<td>Wife’s Gross Income</td>
<td>Annual Gross Income (AED)</td>
<td>2735</td>
<td>39499.5</td>
<td>96587.2</td>
<td>0</td>
<td>1720000</td>
</tr>
<tr>
<td>Husband’s Gross Income</td>
<td>Annual Gross Income (AED)</td>
<td>2735</td>
<td>384847.2</td>
<td>649586.8</td>
<td>0</td>
<td>2.85e+07</td>
</tr>
<tr>
<td>Expenditures per child</td>
<td>Annual Children Expenditures per one child</td>
<td>2735</td>
<td>4065.6</td>
<td>6631.8</td>
<td>0</td>
<td>180804</td>
</tr>
<tr>
<td>Abu Dhabi</td>
<td>Dummy=1 if Abu Dhabi</td>
<td>2735</td>
<td>0.36</td>
<td>0.480</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Dubai</td>
<td>Dummy=1 if Dubai</td>
<td>2735</td>
<td>0.27</td>
<td>0.444</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sharjah</td>
<td>Dummy=1 if Sharjah</td>
<td>2735</td>
<td>0.19</td>
<td>0.390</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other Emirates</td>
<td>Dummy=1 if Other Emirates</td>
<td>2735</td>
<td>0.18</td>
<td>0.387</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Wife is working</td>
<td>Dummy=1 if Wife is working</td>
<td>2735</td>
<td>0.22</td>
<td>0.413</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Wife is not working</td>
<td>Dummy=1 if Wife is not working</td>
<td>2735</td>
<td>0.78</td>
<td>0.417</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Wife is a student</td>
<td>Dummy=1 if Wife is a student</td>
<td>2735</td>
<td>0.005</td>
<td>0.069</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Husband is working</td>
<td>Dummy=1 if Husband is working</td>
<td>2735</td>
<td>0.76</td>
<td>0.426</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Husband is not working</td>
<td>Dummy=1 if Husband is not working</td>
<td>2735</td>
<td>0.24</td>
<td>0.426</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Education of the wife</td>
<td>Years of Education</td>
<td>2735</td>
<td>11.24</td>
<td>5.887</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Education of the husband</td>
<td>Years of Education</td>
<td>2735</td>
<td>11.85</td>
<td>5.613</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td># of Domestic workers</td>
<td>Number of Domestic workers</td>
<td>2735</td>
<td>1.09</td>
<td>0.877</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td># of bedrooms</td>
<td># of bedrooms in the house</td>
<td>2735</td>
<td>4.50</td>
<td>1.939</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Nationality of the wife</td>
<td>Dummy=1 if wife is a U.A.E. national</td>
<td>2735</td>
<td>0.96</td>
<td>0.195</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

The difference between the three models is the addition of the marriage at first birth variable to the second model and the birth interval variable to the third model. This restricts the equations to wives that have at least one child in model 2 and wives that have at least two children in model.
3. We perform a goodness-of-fit test to the three models. The test turns out to be insignificant for all models indicating that that the Poisson model is the appropriate one. The overall goodness-of-fit of the model could also be seen via the Pseudo R2 and the log pseudo likelihood ratio.

All variables are significant in the first model except for the status of the wife as a student which does not make a difference to fertility. In the second and the third models, the wife’s gross income, the husband and wife’s status as unemployed, the wife’s status as a student and the education of the husband are not significant at the 5% level. Moreover, in the second and the third models, only the emirate of Dubai is different from the reference emirate (Abu Dhabi) in terms of fertility while other emirates are not different. In Dubai, women seem to have 7.1% less kids than Abu Dubai and other emirates. This result is consistent with the previous finding in table 9.

The empirical results show that fertility is a quadratic function of females’ age as both age and age-squared are significant at the 1% level. Fertility increases with age at decreasing rates and peaks at age group 45-49 years.

The husband’s gross income variable, is statistically significant and positively related to fertility, however, the magnitude of the coefficient in absolute terms is almost zero. Moreover, the value of the coefficient of children expenditure on fertility is also nil, although statistically significant and negatively related to fertility. Those results together with the descriptive results depicted in table 8, which point to the lack of association between fertility and parents’ gross income, allow us to conclude that our findings do not support the quality-quantity theory of Becker. Therefore, it seems that economic constraints are not important in the couples’ decision to have children among U.A.E. citizens.
The education of the wife, in contrast to the education of the husband, is significant, and as expected, is negatively related to fertility. Over the past few decades, female enrollment in education, especially in higher education, has been increasing and is expected to continue rising in the future. This implies a further decrease in fertility due to the higher educational attainment of females. Total fertility rate is estimated at around 4.8 for females with primary education or less and it drops to 1.6 or lower for females that have completed more than 7 years of education (see table 3 above).

Contrary to education, women’s labor market status is significant in model 1 only. The number of children ever born to a wife who is not working is 12.7% higher than that for a wife who is working. However, the variable becomes insignificant in model 2 and 3, perhaps because females’ labor market decisions matter mainly when deciding whether to have the first child or not. Once a female conceives her first child this variable becomes less important. Furthermore, and in relation to females’ labor market status, we have seen that the effect of the wife’s gross income on fertility is negligible in the U.A.E. Therefore, the opportunity cost of raising children, which can be measures by the extra income a woman forgoes by increasing the time she can spend at home with her children, is not important in the U.A.E. This might be explained further by the wide use of domestic helpers, which can mitigate the opportunity cost of having children and eliminate the tradeoff between participating in the labor force and maintaining families at the same time. Our results suggest that having more domestic workers seems to increase the incentive to have more children, although the descriptive results show only a slight increase in fertility rates when comparing households with domestic workers to those without domestic workers.

The age at first birth variable included in models 2, and 3, that also proxies to some degree the age at first marriage, is significant at the 1% level and is negatively related to fertility. The descriptive results show that marital fertility rates decline sharply with the age of marriage, which
is increasing over the years within the U.A.E. society. It can be estimated from the data that the average age of marriage has increased by 3.5 years in two decades; from around 20 years in 1988 to 23.5 years in 2008. Furthermore, the birth interval is significant and inversely related to fertility as expected. However, we have seen from table [9] that birth intervals of 2 or less years are not important in reducing fertility in the U.A.E. Nevertheless, it could be that birth intervals are widened further after a desired number have been reached in the household.

The nationality of the wife is significant and positively related to fertility. The results show that a U.A.E. nationality wife is expected to have on average 47.4% more children than a foreign wife in a U.A.E. household. Therefore, fertility is expected to decline as the incidents of marriages between U.A.E. males and foreign females increase. Finally, the number of bedrooms is positively related to fertility and highly significant. The living space available for the family acts as a constraint to have more kids. It is less likely to be interpreted as a wealth variable because U.A.E. nationals are entitled to government housing assistance if their income is below a certain level. Moreover, an sizable number of U.A.E. families still live in traditional houses which are relatively cheap but very large in size. Therefore, we may expect a decrease in fertility to some degree as U.A.E. couples move to smaller houses over the years.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Model (1)</th>
<th></th>
<th>Model (2)</th>
<th></th>
<th>Model (3)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Odds Ratio</td>
<td>Semi Standardized Odds Ratio</td>
<td>Coefficient</td>
<td>Odds Ratio</td>
<td>Semi Standardized Odds Ratio</td>
</tr>
<tr>
<td>Age of Wife</td>
<td>0.2919***</td>
<td>1.3390</td>
<td>8.2849</td>
<td>0.2341***</td>
<td>1.2638</td>
<td>5.2652</td>
</tr>
<tr>
<td></td>
<td>(0.0139)</td>
<td></td>
<td></td>
<td>(0.0110)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Squared of Wife</td>
<td>-0.0036***</td>
<td>0.9964</td>
<td>0.1523</td>
<td>-0.0028***</td>
<td>0.9972</td>
<td>0.2415</td>
</tr>
<tr>
<td></td>
<td>(0.0002)</td>
<td></td>
<td></td>
<td>(0.0002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wife’s Gross Income</td>
<td>-3.2e-07**</td>
<td>1.0000</td>
<td>0.9693</td>
<td>-1.7e-07**</td>
<td>1.0000</td>
<td>0.9833</td>
</tr>
<tr>
<td></td>
<td>(1.3e-07)</td>
<td></td>
<td></td>
<td>(1.1e-07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband’s Gross Income</td>
<td>1.3e-08***</td>
<td>1.0000</td>
<td>1.0086</td>
<td>1.6e-08***</td>
<td>1.0000</td>
<td>1.0107</td>
</tr>
<tr>
<td></td>
<td>(5.2e-09)</td>
<td></td>
<td></td>
<td>(5.2e-09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dubai</td>
<td>-0.0731***</td>
<td>0.9295</td>
<td>0.9681</td>
<td>-0.0894***</td>
<td>0.9145</td>
<td>0.9610</td>
</tr>
<tr>
<td></td>
<td>(0.0214)</td>
<td></td>
<td></td>
<td>(0.0186)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharjah</td>
<td>0.0610**</td>
<td>1.0629</td>
<td>1.0241</td>
<td>0.0320**</td>
<td>1.0336</td>
<td>1.0129</td>
</tr>
<tr>
<td></td>
<td>(0.0260)</td>
<td></td>
<td></td>
<td>(0.0218)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Emirates</td>
<td>0.0608**</td>
<td>1.0627</td>
<td>1.0238</td>
<td>0.0341**</td>
<td>1.0346</td>
<td>1.0133</td>
</tr>
<tr>
<td></td>
<td>(0.0245)</td>
<td></td>
<td></td>
<td>(0.0210)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wife is not working</td>
<td>0.1194***</td>
<td>1.1268</td>
<td>1.0510</td>
<td>0.0290**</td>
<td>1.0294</td>
<td>1.0120</td>
</tr>
<tr>
<td></td>
<td>(0.0317)</td>
<td></td>
<td></td>
<td>(0.0253)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wife is a Student</td>
<td>-0.0015**</td>
<td>0.9985</td>
<td>0.9999</td>
<td>-0.1554**</td>
<td>0.8561</td>
<td>0.9896</td>
</tr>
<tr>
<td></td>
<td>(0.0183)</td>
<td></td>
<td></td>
<td>(0.1008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband is not working</td>
<td>0.0529**</td>
<td>1.0543</td>
<td>1.0228</td>
<td>0.0226**</td>
<td>1.0229</td>
<td>1.0097</td>
</tr>
<tr>
<td></td>
<td>(0.0227)</td>
<td></td>
<td></td>
<td>(0.0195)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education of the Wife</td>
<td>-0.0186***</td>
<td>0.9815</td>
<td>0.8961</td>
<td>-0.0079***</td>
<td>0.9921</td>
<td>0.9544</td>
</tr>
<tr>
<td></td>
<td>(0.0020)</td>
<td></td>
<td></td>
<td>(0.0018)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education of the Husband</td>
<td>-0.0016**</td>
<td>0.9984</td>
<td>0.9911</td>
<td>-0.0002**</td>
<td>0.9998</td>
<td>0.9986</td>
</tr>
<tr>
<td></td>
<td>(0.0019)</td>
<td></td>
<td></td>
<td>(0.0017)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Domestic workers</td>
<td>0.0419***</td>
<td>1.0428</td>
<td>1.0375</td>
<td>0.0207***</td>
<td>1.0209</td>
<td>1.0183</td>
</tr>
<tr>
<td></td>
<td>(0.0104)</td>
<td></td>
<td></td>
<td>(0.0090)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenditures per child</td>
<td>-0.00001***</td>
<td>1.0000</td>
<td>0.9331</td>
<td>-9.1e-06**</td>
<td>1.0000</td>
<td>0.9409</td>
</tr>
<tr>
<td></td>
<td>(1.89e-06)</td>
<td></td>
<td></td>
<td>(1.5e-06)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of bedrooms</td>
<td>0.0419***</td>
<td>1.0428</td>
<td>1.0847</td>
<td>0.0198***</td>
<td>1.0200</td>
<td>1.0392</td>
</tr>
<tr>
<td></td>
<td>(0.0051)</td>
<td></td>
<td></td>
<td>(0.0045)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nationality of Wife</td>
<td>0.3878***</td>
<td>1.4737</td>
<td>1.0785</td>
<td>0.2238***</td>
<td>1.2508</td>
<td>1.0426</td>
</tr>
<tr>
<td></td>
<td>(0.0661)</td>
<td></td>
<td></td>
<td>(0.0489)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at first birth</td>
<td>-0.0499***</td>
<td>0.9512</td>
<td>0.8054</td>
<td>-0.0550***</td>
<td>0.9465</td>
<td>0.7947</td>
</tr>
<tr>
<td>Birth Interval</td>
<td>(0.0020)</td>
<td>(0.0020)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0.1586***</td>
<td>-0.8533</td>
<td>0.8751</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constant</th>
<th>(0.0110)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.6058***</td>
<td>-2.3776***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># of Observations</th>
<th>2735</th>
<th>2633</th>
<th>2460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wald chi2 (df)</td>
<td>2095.7 (16)</td>
<td>3461.67 (17)</td>
<td>3512.88 (18)</td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.1476</td>
<td>0.1664</td>
<td>0.1476</td>
</tr>
<tr>
<td>Log Pseudo likelihood</td>
<td>-5673.6071</td>
<td>-5140.8681</td>
<td>-4750.6667</td>
</tr>
</tbody>
</table>

*, **, and *** denote significance at the 10%, 5%, and the 1% levels, respectively.
Conclusion and Policy Implications

Fertility levels in the G.C.C. have been declining rapidly at a time when the majority of the population is made up of foreigners in most of the countries. This decline could change the age structure of the population and decrease the population growth of nationals escalating their minority status within the country.

In this paper, we analyze the determinants of fertility in the U.A.E. using the Household Expenditure Survey (HES) 2008 dataset. To the best of our knowledge, the HES data has never been used to study fertility in the G.C.C. region or the U.A.E. specifically. We estimate a Poisson count model and conclude that income factors do not impact fertility in the U.A.E. This could be due to the presence of sizeable government social insurance programs U.A.E.at easing the cost of living of U.A.E. national households. The results show that Becker’s theory does not apply to the U.A.E. because present fertility rates are not driven by the costs of children and the benefits that families derive from their children. According to our results, policies that provide financial incentives to conceive children such as the marriage fund, the generous housing allowances and the salary benefits associated with the number of children a national employee has are not effective in increasing fertility in the U.A.E.

We also conclude in the paper that the extensive use of domestic workers within U.A.E. households reduce to some extent the impact of female labor force participation on fertility in that they lessen the allocation of time females must devote to their children’s needs. Therefore, contrary to many other countries, the employment status of females is not very important in the determination of fertility. On the other hand the age at which a female marries or her age at first birth, along with higher female educational attainment, are shown to be the most important factors in causes of declines in fertility. The increase in the incidence of marriages to foreign females, the increase in birth intervals between kids and the
decrease in the size of the residence for U.A.E. families have also contributed to the recent drops in fertility.

Effective policies aimed at increasing fertility should be directed at encouraging marriages among U.A.E. nationals and reducing the obstacles that affect working women from having children. Encouraging earlier marriages among females and males citizens can be very successful in raising fertility by increasing the number of years available to conceive children. However, early marriages may obstruct young citizens from pursuing their higher education. Promoting marriages among U.A.E. nationals in contrast to mixed marriages with foreigners may also help at increasing fertility levels, as U.A.E. females tend to have more kids than foreign females.

Policies that encourage female labor force participation should also be implemented as a female’s employment status is not a very important determinant of fertility in the U.A.E.. On the contrary, it might offset in part the reduction in the labor force that results from the reduction in fertility among U.A.E. nationals. These policies could be directed towards increasing the maternity benefits, offering part time jobs in both the private and public sector, and providing suitable nursing facilities in large working centers.

Future work entails examining the economic and demographic implications of a reduction in fertility in the G.C.C. countries.
References


