Chapter 2
Fertility Rates Around the World: A Cluster Analysis of Time Series Data from 1960 to 2013

Carlo Drago and Giuseppina Talamo

Abstract The entry of women into the labor market with an active and permanent presence is, today, a subject of a heated debate among scholars and policy makers that sees, on the one hand, diversity in gender relations and women's employment and on the other hand the economic importance of women and increasing economic efficiency. At international level, greater economic and political role of women is recognized as a sign of economic vitality of the country. The increase in female education rates, the economic and cultural globalization, public policies favorable to families, and recent legislative impositions have enlivened this debate highlighting two crucial aspects: a greater integration of women meeting the equitable principles of equal opportunities and a greater integration of women responding to greater efficiency and economic growth. The main limitations and difficulties in the participation of women in the labor market are numerous and complex and often interconnected: direct discrimination, occupational segregation, stereotypes, conciliation of life and work, the service coverage rates, etc.

In this paper we use World Bank data on fertility rates around the world from 1960 to 2013, and we analyze the different time series related to fertility rates of different countries in order to detect different clusters. The classification of different countries considered in different clusters is performed by considering an appropriate clustering methodology and the dynamic time warping distance. At this point we interpret the different clusters in order to considering also the different labor markets and policies as a relevant determinant of the dynamic of the fertility rate over time and a relevant statistical reason of the formation of the cluster. The aim of this paper is to provide how and if greater attention to women considerations could lead

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to a greater understanding of the obstacles that prevent the full participation of women in the economy and in particular in the labor market. This recognition allows the creation of more targeted assistance programs to address these obstacles thus creating an environment for even better response from policy makers. This paper is organized as follows. In the first section, we present a recent review of the main literature on women in the labor market. The second section presents data. The third section presents the methodology used and the fourth all different statistical results. In the fifth section, we discuss all results obtained. Finally, we conclude.

Keywords Economics of gender • Econometrics • Labor market • Public policy • Welfare economics

2.1 Introduction

The entry of women into the labor market with an active and permanent presence is, today, a subject of a heated debate that sees, in the one hand, diversity in gender relations and women's employment and on the other hand economic importance of women and increasing economic efficiency as source of heated debate among scholars and policy makers. At international level, greater economic and political role of women is recognized as a sign of economic vitality of a country. The World Economic Forum (2015) estimates that the global gender gap—the time it will take for women to achieve parity in the workforce—would take 118 years for economic parity to be achieved. The increase in female education rates, the economic and cultural globalization, public policies favorable to families, and recent legislative impositions have enlivened this debate highlighting two crucial aspects: a greater integration of women meeting the equitable principles of equal opportunities and a greater integration of women responding to greater efficiency and economic growth. The main limitations and difficulties in the participation of women in the labor market are numerous and complex and often interconnected: direct discrimination, occupational segregation, stereotypes, conciliation of life and work, the service coverage rates, etc. Following this approach, a study by Goldman Sachs (Matsui, 2005) has introduced the term global *womenomics*, stressing that women's work is an important engine of world development. Several studies (The Economist, 2006; Wittemberg-Cox and Maitlan 2009) have shown that the phenomenon of *womenomics* is a tool to promote economic growth, a higher birth rate, of household wealth, and better business performance. Recently, more attentions are given, for example, to the effects of the recent economic and financial crisis on women's participation in the workforce. In this regard, recent studies (EU Report, 2012; UNAIDS, 2012) have shown that women have been more exposed to the global crisis for the following reasons: low levels of social protection, lower wages, less control of resources and property, and increased presence in precarious jobs. Nevertheless, the crisis was seen by many scholars as a chance to rethink and reform the principles and the

leadership and governance mechanisms present in most financial institutions and beyond.

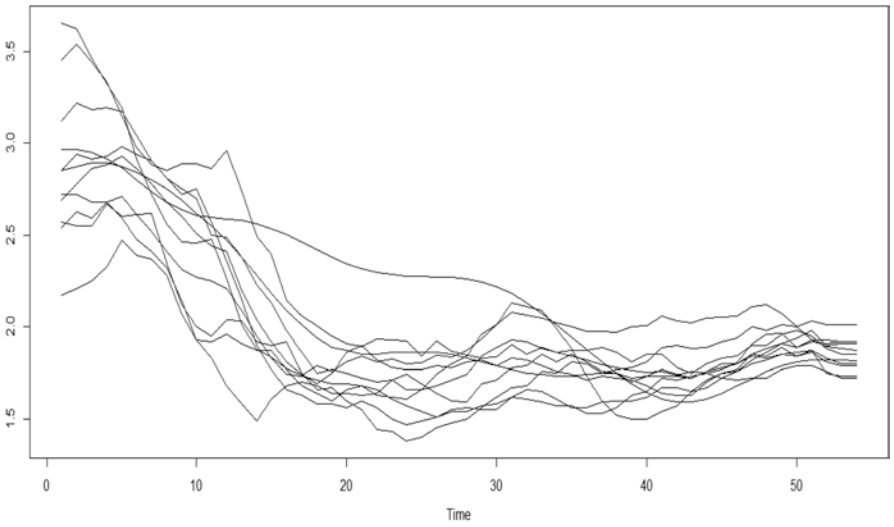
The fact that womens face large difficulties in getting established in labor market, delay of the time when they move to independent living, and to postpone the first motherhood may have serious consequences in terms of fertility. Recent studies (World Bank, 2016; OECD, 2005) show that fertility rates have declined in most countries to the levels that are well below those needed to secure generation replacement. Many of these countries have total fertility rates below 1.5, and some have recorded below-replacement fertility rates for decades. During the recent crisis, at European level, for example, in 2008 there were no falls in fertility rates compared to the 2007. By 2011 fertility rates have declined in 24 countries (Eurostat, 2013).

The effects of fertility declines are not limited to society as a whole but extend to the well-being of individuals, for example, all difficulties in getting established in labor markets, the delay to move to independent living, and the increasing number of women to postpone their first motherhood. All of these require and imply an active role of policy makers in designing possible measures to reverse the ongoing decline in fertility rates. Recent data (OECD, 2003, 2005), however, confirm that few countries have adopted policies that stimulate increasing fertility. In particular, policies that aim to influence fertility should consider different determinants such as social benefits, conditions in labor and housing markets, level of education, and health services. Social scientists and demographers have engaged a lively debate on the causes of low fertility rates. Many empirical studies have focused on the link between women's childbearing decisions and their participation in the paid labor market, as well as on the relation between fertility rates and other demographic or societal development at macro- and microlevels. Recent studies, however, have examined the relation between fertility rates and institutions and policies affecting families with children (OECD, 2003, 2005). Several governments have introduced specific measures aimed at countering it, designing policies that also allow women to combine opportunities in the labor market and responsibilities within the family (OECD, 2005; World Bank, 2016).

Objective of this work is to analyze, in the light of the existing literature, the effect of the variation in fertility rates in two groups of countries due to the interaction of female participation in the labor market. In particular, this analysis considers time series of fertility rates and through a classification process (clustering) of the same series identifies the clusters or groups of similar series with each other. These clusters would then be attributed to groups with similar social and economic structures (which in fact lead to similar fertility rates over time). The results show different fertility patterns over time and across countries. Through this analysis we show that greater attention to women considerations and policies oriented to the decline in fertility rates could lead to a greater understanding of the obstacles and structural factors that have contributed to the decline in fertility rates. This paper is organized as follows. In Sect. 2.1, we present a recent review of the main literature on women in the labor market. The Sect. 2.2 presents data. The Sect. 2.3 presents the methodology used and the Sect. 2.4 all different statistical results. In Sect. 2.5, we discuss all results obtained. Finally, we conclude.

2.2 Literature Review

The gradual but rapid decrease in fertility rates occurred in all industrialized countries, and it is one of the contemporary phenomena at the center of debate among scholars and policy makers because of the multiplicity of implications for both society and the economy. Over the past few years, female participation rates in the labor market have increased, and fertility rates have declined in most developed countries. This negative relationship between fertility and female participation in the labor market is increasingly object for concern and attention at global level. According to the World Bank Report (2016), total fertility is now 2.5 children per woman globally. This global average masks wide regional differences.



Source: World Bank data.

In recent decades, the participation in the labor market by women has increased, while the fertility rate decreased in most advanced countries. This model is consistent with the traditional microeconomic forecasts: economic models of fertility rate provide that an increase in education levels and women's wages led to an increase in their labor supply and a reduction in fertility. The existence of an inverse relationship between fertility and the participation was documented by Becker and Lewis (1973a, 1973b) and Willis (1973a, 1973b) and empirically analyzed by Butz and Ward (1979a, 1979b). In Becker (1960) and Leibenstein (1957), the demand for children is a function of their costs and individuals' preferences, for a given income. Thus, children are a special type of capital good (OECD, 2005). Recent analysis (Del Boca, 2002) showed that in the 1980s, female participation in the labor market has grown in all countries, while fertility rates have declined in some countries, while in others they grew. Countries that, for example, have lower fertility levels (Spain, Italy, and Greece) are those with relatively low levels of female participation in the labor market, while countries with higher fertility rates (Denmark, France) have relatively high

female participation rates in the labor market. Several authors (Ahn & Mira, 2001) have analyzed the correlation between the total fertility rate and the rate of female participation in the labor market. All results confirm the strategic role of political decisions and the actuations of social norms in favor of women-working mothers: parental leave, child care, flexibility. Other studies have, however, shown different results: there is a correlation between the two phenomena, but there was a change of sign from negative to positive. In particular, these studies focus on the Mediterranean area and showed a negative correlation between female employment and fertility rates (Engelhardt, Kogel, & Prskawetz, 2001a, 2001b). Other studies have focused the attention on the role of income in the decision to have a child. The results showed the existence of a negative correlation between income and fertility, and in particular it has been observed that middle-income families are the ones who have fewer children. Theoretical models proposed in the literature (Devaney, 1983; Heckman and Walker, 1990) show that, on the one hand, a pure income effect implies a positive relationship between income and fertility and, on the other hand, a combined income effect with a substitution effect leads to less net results. The income is also related to the position of women in the labor markets, and women who may aspire to higher occupations can find too costly to give up work to have a child. In these cases, therefore, the substitution effect can counterbalance the income effect. The interesting fact is that in countries with the highest degree of fertility, the degree of female employment is also high.

Recent data (Eurostat, 2016) show that in many European countries, fertility levels are below the threshold of substitution. The declining birth rate, in fact, not only has a direct impact on the immediate and age structure and the dependency ratio between generations but, by changing the proportion of young and old, can affect even indirectly on the balance and vitality of the labor market as well as on levels of innovation and economic development of the whole society. Studies conducted in all European countries show that not only in many cases a significant gap between the number of children they want and realized fecundity exists, but also as in recent years it is witnessing a realignment between intentions and actual fertility in a sort of downward spiral described by some authors as “low fertility trap” (Lutz, Skirbkk, & Testa, 2005).

Finally, in light of recent studies on gender equality, comparative analysis between European countries has shown that minor gender imbalances in wages and employment are associated with a higher birth rate and economic growth (Ferrera, 2008; Country Report, 2010). Recent studies (Klasen, 1999) found a positive correlation between gender equality in education measures and growth rates. A recent report (McKinsey Report, 2015) states that the global weakening of the gender gap could double the contribution of women to the growth of global GDP by 2025. According to ILO (2014) shows that the effect of increased gender gap is negatively associated with the process of growth, particularly in developing countries, and lower income. The World Bank (2015) confirms that gender inequality in areas such as education, health and employment, and political participation has a negative impact on growth processes. In Europe, for example, all countries now devote a significant proportion of their resources to the implementation of measures designed to support families in order to support the achievement of desired fertility.

Next to the concept of fertility, it is necessary to associate the level of protection and social assistance to help working women in some countries to be mothers. Several studies provide mixed conclusions on the effect of various policies on fertility.

2.3 Introduction to the Statistical Problem and Methodology

Starting analysis perspective, we will focus on fertility rates as a key element in the analysis of each country. In particular, therefore, we will consider specifically the time series of fertility index. The analysis in time series ended up being important in many scientific contexts. In particular, the usefulness in time series is in the possibility, offered by the method, to analyze dynamic phenomena in time. The classification procedures of time series in this way make it possible to identify common trends over time so that they can be adequately characterized.

In this work we make use of their own time series as just we are particularly interested in analyzing and comparing the dynamic behavior of the time series. The historical analysis allows to study the dynamic and temporal behavior of a phenomenon. In particular, in this context, precisely considering the fertility, the identification of increasing trends over time or even decreasing that instead represent the decline of a certain phenomenon is especially of interest.

In the same way, it is useful to study the trends of time series groups (e.g., convergence) and even possible structural changes that may exists in one or more time series. Structural changes, in fact, may be due to economic or social and political phenomena is very important to identify such phenomena in turn can determine them.

The aim of this scientific work is to analyze the one hand the trend of historical information, the fertility, the fertility rates of countries worldwide, and as of this purely exploratory approach, study the trend of that time series over time. In addition, we will study the trends of the time series to groups making use of appropriate classification procedures (also called cluster analysis). The relevance of such analysis is that one wants to identify the existence of models of development and economic growth between the various countries that can be traced to the economics and prototypes, thus be identified in this way.

Various approaches have been proposed for the classification of time series, including two large families: methods that classify from time series parameters and methods that classify from raw time series data itself (Liao, 2005). From these methods it is possible, using its own remote, to classify the historical series.

We can define clustering or automatic classification that statistic procedure may be considered useful in the classification of objects or even statistical units in groups of objects that can be defined as similar to each other (Liao, 2005). The similarities, therefore, can be defined as a similarity between observations and statistical "intragroup units" where it is instead the maximum distance between the various groups. If so, the classification of time series is a statistical procedure aimed at the identification of classes or groups of time series maximally similar between them;

the same classification is usually based on a reference distance. In this sense the algorithm identify the groups of time series maximally similar to each other and different considering other groups. The distance used is appropriate in these contexts and is the distance DTW (dynamic time warping). The procedure of using the DTW distance identifies the time series that possess the optimal alignment (Zhao & Cen, 2013). The classification method instead uses the single bond (Ghererghi & Andlauro, 2004).

The validation of clustering procedures is important in order to identify a number of groups defined consistent. In particular in the literature, we have proposed very different approaches in the validation and in the choice of an appropriate number of clusters. A classification procedure must be validated as it is theoretically possible to obtain a different number of clusters within the same set of time series. In this sense need the number of clusters identified by the procedure need to be validated. In this work in particular, we will use the index of Dunn (1974). The validation procedure departs from the hierarchical classification algorithm and then identify the number of groups by the Dunn index. We consider several cuts of the dendrogram and we compare the Dunn index. Then we choose the cut of the dendrogram and the associated clusters, which maximizes the Dunn index.

The data refer to all the nations of the world considering the time interval defined. The figures relate to the annual series of the fertility rate. The data source is the World Bank. Where such comments were found to be missing the time series, it is not considered. Eventually we consider the different time series taking into account the reference period. In particular, we use all available information.

2.4 Results and Discussion

This section presents all results and comments on our clustering analysis divided into two groups of countries: Group 1, which includes Italy, Germany, Greece, Russia, Romania, Bulgaria, and Japan, and Group 2, which includes Anglo-Saxon countries, Scandinavia, France, Belgium, and the Netherlands. Using World Bank data (1960–2013), we analyze the pattern of fertility rates across these two groups. In particular, it is interesting to analyze the similarity between different time series of countries related to fertility rates. From the dendrogram it is possible to compute the different Dunn index associated with the different cuts and the clusters obtained. At this point the different indices of Dunn calculated are compared. At the end of the procedure, we obtain a number of 30 clusters or groups which represent the final result of our analysis. We can now describe the different results of different classification groups maximally similar to each other. These time series groups can be referred to different models and represent as the dynamics of fertility which can be acted in time from these development models.

Starting our analysis by Fig. 2.1, it is possible to see a significant difference between different dynamics of both countries.

This dynamic appears to be opposed to our second analysis related to Fig. 2.2 where we have analyzed countries of Group 2.

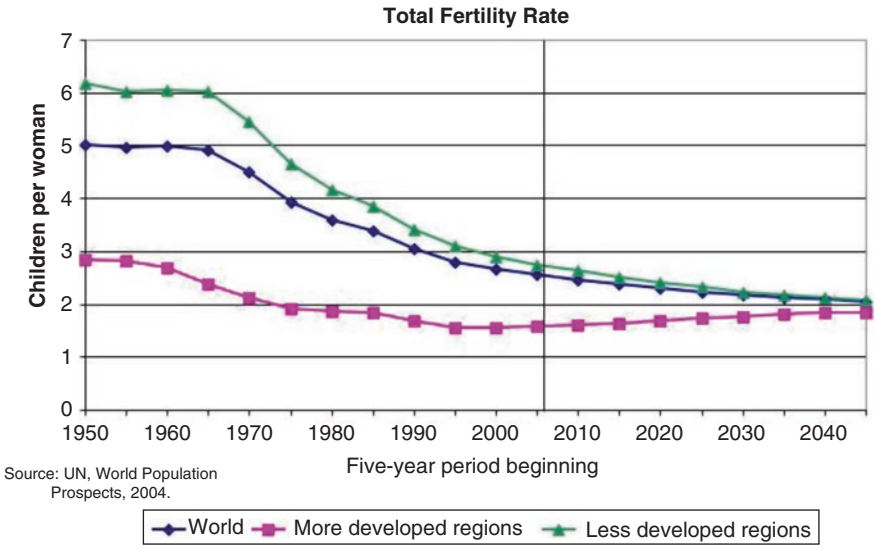


Fig. 2.1 Development of the cluster time series. Group 1: Italy, Germany, Greece, Russia, Romania, Bulgaria, and Japan. Fertility rate years from 1960 to 2013. Source: World Bank data

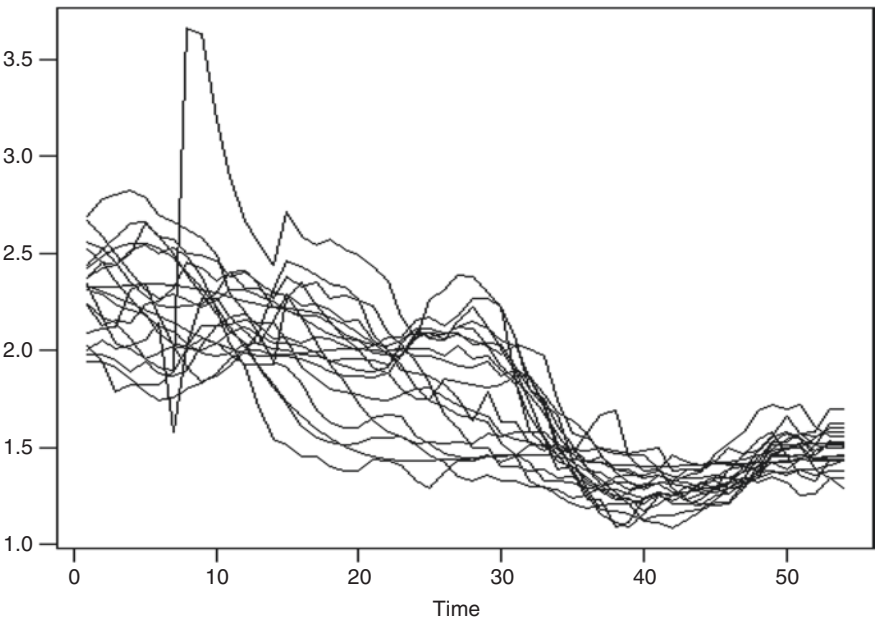


Fig. 2.2 Performance of Group cluster time series 2. Group 2: Anglo-Saxon countries, Scandinavia, France, Belgium, and Holland. Fertility rates in 1960–2013. Source: World Bank data

The dynamics of both time series groups can usefully be considered and compared. All descriptions related to the main variables are in the appendix.

Analyzing Fig. 2.1, it is interesting to note that in the 1960s we have a level of about 2.4 with regard to the type of European countries. Variability tends to vary over the next decade being reduced gradually, by aiming well to shrink the central value. In the same way, it can be seen that the value of fertility continues to decline over time in the decade having some recovery in the 1980s that is reconfirmed in the 1990s. Finally we can see a collapse precisely in the 1990s but also in a certain way a certain convergence of all of the group's cluster time series toward the end of the period. Finally, after 2000, we can see a slight recovery in a scenario in which the time series of fertility tend to be still converging.

One first conclusion is that fertility rate has been growing in some stages and declining in other phases. This pattern confirms that the countries of this first group, in different phases, have adopted both policies that have strongly influenced fertility rates and have followed the micro approach related to income effect. Despite different economic and social history, these countries present a significant and variable trend in term of fertility rates. For example, considering the years of the economic boom, we can see a high fertility rate, which in turn may imply an affordable and quality child care, tax advantage provided to family, and statutory maternity leave (OECD, 2005).

Additionally, a comparison between some of the countries of Group 1 is instructive. Before the 1940s, low fertility rates were not sustained by policies, and this low rate was the result of the two wars. On the contrary, birth rates increased during the baby boom of the 1940s, 1950s, and 1960s and assuaged previous fears of population decline. By the 1970s, most of Western Europe experienced the emergence of "low–low" fertility rates. By the late 1980s and early 1990s, countries such as Germany, Spain, and Italy reported fertility rates well below replacement level (<1.5), refueling concerns about very low levels of fertility (Morgan & Taylor, 2006). At this point it is also possible to consider Fig. 2.2. In this second group, countries' fertility rates decrease more sharply in the first decade and then increase in the following period. Finally, all countries tend to have a recovery in recent years. Analyzing Fig. 2.2, we can conclude that the economic policy choices of this group of countries and their economic situations have a great influence on the value of the fertility rate. For example, France initiated birth policies immediately after the Second World War and is a clear proof that birth support policies by governments show their results in the long term and also significantly affect women's participation in the labor market (Livi, 2017). Thus, the interpretation of the temporal variation in the relationship between participation and the fertility rate confirms the importance of policy choices and the implementation of social norms for women-mothers: parental leave, child care, and greater flexibility.

In contrast, in countries such as Italy, for example, the lack of fiscal policies that encourage women's work, the lack of long-term policies for births, and the lack of family income security have strongly influenced the low and limited participation of women in the labor market, total fertility has dropped to 1.34 children per woman, and the Italian propensity to have children at maturity is confirmed (ISTAT, 2017).

Comparing some countries of the two groups, we can see how the concerns facing Greece, Italy, and Spain are very different from those facing France, for example. For the latter one country, moderate levels of immigration could offset sub-replacement fertility, producing population stability. For Greece, Italy, and Spain, only massive immigration could offset their very low fertility. (Morgan & Taylor, 2006).

Comparing both figures we can conclude that despite the diversity in the choice of economic policies of each country, we can confirm that since the 1980, female participation in the labor market has grown in all countries, while fertility rates have declined in some countries, while in others they are grown. Countries that, for example, have lower levels of fertility (first group: Spain, Italy, and Greece) are those with relatively low levels of female participation in the labor market, while countries with higher levels of fertility (second group: see, e.g., France) have relatively high levels of female participation rates in the labor market. Additionally, a comparison between Italy and Scandinavian countries (Group 1 and Group 2) is instructive. Until the 1970s, Scandinavian fertility rate was lower than the Italian rate. Now we can see the opposite: new generations of Scandinavian women have more children compared to Italian women.

These results confirm recent analysis (Del Boca, 2002) showed that in the 1980s, female participation in the labor market has grown in all countries, while fertility rates have declined in some countries, while in others they grew. Countries that, for example, have lower fertility levels (Spain, Italy, and Greece) are those with relatively low levels of female participation in the labor market, while countries with higher fertility rates (Denmark, France) have relatively high female participation rates in the labor market.

These results confirm the main theories on fertility rates: for many years the elasticity of fertility with respect to incomes was positive, and in recent years it is zero or even negative (Guinnane, 2011).

2.5 Conclusions

The United Nations (2010) in relation to fertility rates in different countries agrees with the idea of a future convergence around the replacement level or an attenuation of the differences between countries. This approach would allow policy makers to have an agenda of more accurate and reliable policy particularly in the short to medium term as the basis for critique and design interventions on the social systems. In this paper we proposed an analysis of historical data relating to fertility indexes on World Bank data. The present analysis confirms very low fertility trends that may increase in the light of improving the sustainability of socioeconomic system itself. The results of the two different groups confirm and reinforce what is analyzed at the micro and macro: in recent years, female participation rates in the labor market have increased, and fertility rates have declined in most developed countries. In recent decades, as confirmed by the data, participation in the labor

market by women has increased, while the fertility rate decreased in most advanced countries. This model is consistent with the traditional microeconomic forecasts: economic models of fertility rate of conduct provide that an increase in education levels and the ports of women's wages led to an increase in their labor supply and a reduction in fertility. The existence of an inverse relationship between fertility and the participation was by Becker and Lewis (1973a, 1973b) and Willis (1973a, 1973b) and empirically documented by Butz and Ward (1979a, 1979b). Recent studies have shown that especially for policy makers and institutions, it is necessary to understand the potential effects of fertility trends on the various economic and social dimensions in order to arrange an agenda of policy suited to respond or to provide correctives to the needs that new sociopolitical arrangements require.

All results presented in this paper show that the phenomenon of the fall in the average rate of fertility lasts too long and also in all countries. Although in some of them there will be a recovery in the last decade, no nation is really at the level of sufficient fertility rates to ensure the replacement of generations.

Finally, according to the main literature (Guinnane, 2011), the historical fertility transition played a central role in the making of modern economies, and in considering this it is necessary to consider several different economic explanations for the historical fertility transition: an exogenous decline in infant and child mortality, innovations in the technology of contraception or more widespread availability of contraceptive devices, increases in the direct cost of childbearing, changes in the opportunity costs of childbearing, and net increase in returns to child quality; children were an important way to ensure against risk and to provide for old age, and the rise of state social insurance as well as private insurance and savings vehicles led households to substitute out of children. In conclusion, in light of this observation, the role of the flows of international migration to industrialized countries should be followed carefully. In fact, we can consider the so-called third transition that can affect the population structure in terms of ethnic composition as well as on the age (Coleman, 2006).

Appendix

Nations Considered

1. Afghanistan
2. Albania
3. Algeria
4. Angola
5. Antigua and Barbuda
6. Argentine
7. Armenia
8. Aruba

9. Australia
10. Austria
11. Azerbaijan
12. Bahamas, The
13. Bahrain
14. Bangladesh
15. Barbados
16. Belarus
17. Belgium
18. Belize
19. Benin
20. Bhutan
21. Bolivia
22. Bosnia and Herzegovina
23. Botswana
24. Brazil
25. Brunei Darussalam
26. Bulgaria
27. Burkina Faso
28. Burundi
29. Cabo Verde
30. Cambodia
31. Cameroon
32. Canada
33. Central African Republic
34. Chad
35. Channel Islands
36. Chile
37. Cinchona
38. Colombia
39. Comoros
40. Congo, Dem. Rep.
41. Congo, Rep.
42. Costa Rica
43. Cote d'Ivoire
44. Croatia
45. Cuba
46. Cyprus
47. Czech Republic
48. Denmark
49. Djibouti
50. Dominican Republic
51. Ecuador
52. Egypt, Arab Rep.
53. El Salvador

54. Equatorial Guinea
55. Eritrea
56. Estonia
57. Ethiopia
58. Fiji
59. Finland
60. France
61. French Polynesia
62. Gabon
63. Gambia, The
64. Georgia
65. Germany
66. Ghana
67. Greece
68. Grenada
69. Guam
70. Guatemala
71. Guinea
72. Guinea-Bissau
73. Guyana
74. Haiti
75. Honduras
76. Hong Kong SAR, China
77. Hungary
78. Iceland
79. India
80. Indonesia
81. Iran, Islamic Rep.
82. Iraq
83. Ireland
84. Israel
85. Italy
86. Jamaica
87. Japan
88. Jordan
89. Kazakhstan
90. Kenya
91. Kiribati
92. Korea, Dem. Rep.
93. Korea, Rep.
94. Kuwait
95. Kyrgyz Republic
96. Lao PDR
97. Latvia
98. Lebanon

99. Lesotho
100. Liberia
101. Libya
102. Lithuania
103. Macao SAR, China
104. Macedonia, FYR
105. Madagascar
106. Malawi
107. Malaysia
108. Maldives
109. Mali
110. Malta
111. Mauritania
112. Mauritius
113. Mexico
114. Micronesia, Fed. Sts.
115. Moldova
116. Mongolia
117. Montenegro
118. Morocco
119. Mozambique
120. Myanmar
121. Namibia
122. Nepal
123. Netherlands
124. New Caledonia
125. New Zealand
126. Nicaragua
127. Niger
128. Nigeria
129. Norway
130. Oman
131. Pakistan
132. Panama
133. Papua New Guinea
134. Paraguay
135. Peru
136. Philippines
137. Poland
138. Portugal
139. Puerto Rico
140. Qatar
141. Romania
142. Russian Federation
143. Rwanda

144. Samoa
145. Sao Tome and Principe
146. Saudi Arabia
147. Senegal
148. Sierra Leone
149. Slovak Republic
150. Slovenia
151. Solomon Islands
152. Somalia
153. South Africa
154. South Sudan
155. Spain
156. Sri Lanka
157. St. Lucia
158. St. Vincent and the Grenadines
159. Sudan
160. Suriname
161. Swaziland
162. Sweden
163. Switzerland
164. Syrian Arab Republic
165. Tajikistan
166. Tanzania
167. Thailand
168. Timor-Leste
169. Togo
170. Tonga
171. Trinidad and Tobago
172. Tunisia
173. Turkey
174. Turkmenistan
175. Uganda
176. Ukraine
177. United Arab Emirates
178. United Kingdom
179. United States
180. Uruguay
181. Uzbekistan
182. Vanuatu
183. Venezuela, RB
184. Vietnam
185. Virgin Islands (U.S.)
186. Yemen, Rep.
187. Zambia
188. Zimbabwe

Group 1 European countries, Italy, Germany, Greece; Eastern European countries, Russia, Romania, Bulgaria; Japan.

Group 2 Anglo-Saxon countries, Scandinavia, France, Belgium, Netherlands.

References

Ahn, N., & Mira, P. (2001). Job bust baby bust? Evidence from Spain. *Journal of Population Economics, 14*(3), 505–522.

Becker, G., & Lewis, H. G. (1973a). Interaction between quantity and quality of children. In *Economics of the family: Marriage, children, and human capital*. Chicago, IL: Univeristy of Chicago Press.

Becker, G., & Lewis, H. G. (1973b). On the interaction between the quantity and quality of children. *Journal of Political Economy, 82*, S279–S288.

Becker, G. S. (1960). An economic analysis of fertility. In *Demographic and economic change in developed countries*. New York City, NY: Columbia University Press. isbn: 0-87014-302-6.

Butz, W. P., & Ward, M. P. (1979a). The emergence of countercyclical U.S. fertility. *The American Economic Review, 69*(3), 318–328.

Butz, W. P., & Ward, M. P. (1979b). The emergence of countercyclical US fertility *American Economic Review, 69*(3), 318–328.

Coleman D. (2006). Immigration and Ethnic Change in Low-Fertility Countries: A Third Demographic Transition. *Population and Development Review*. Vol. 32, No. 3 (Sep., 2006), pp. 401–446.

Del Boca, D. (2002). The effect of child care and part time opportunities on participation and fertility decision in Italy. *Journal of Population Economics, 15*, 549–573.

Devaney (1983B). An analysis of variation in U.S. fertility and female labor force participation trends. *Demography, 20*, 147–161.

Dunn, J. (1974). Well separated clusters and optimal fuzzy partitions. *Journal of Cybernetics, 4*, 95–104.

Engelhardt, H., Kogel, T., & Prskawetz A. (2001a). Fertility and Female Employment reconsidered. *MPIDR Working Paper WP 2001-021 Max Planck Institute for Demographic Research*.

Engelhardt, H., Kogel, T., & Prskawetz, A. (2001b). Fertility and female employment reconsidered: A macro-level time series analysis. *MPIDR Working Paper WP 2001-021*, Rostock: Max Planck Institute for Demographic Research. Devaney, 1983; Heckman and Walker, 1990.

EU Report. (2012). The impact of economic crisis on the situation of women and men and on gender equality policies. In *Synthesis report*. isbn: 978-92-79-28680-3. Brussels: European Commission.

Eurostat (2016). *Fertility statisitics*. http://ec.europa.eu/eurostat/statistics-explained/index.phptitle=Fertility_statistics&oldid=282365

Eurostat (2013). Fertility statistics in relation to economy, parity, education and migration". ISSN:2314-9647

Ferrera, M. (2008). Dal welfare state al welfare regions: la riconfigurazione spaziale della protezione sociale in Europa. In *Rivista delle politiche sociali.*

Ghererghi, M., & Andlauro, C. (2004). *Appunti di analisi dei dati multidimensionali: Metodologia ed esempi*. RCE edizioni.

Guinnane T. W. (2011). The Historical Fertility Transition: A Guide for Economists. *Journal of Economic Literature*. Vol. 49, No. 3, September 2011. (pp. 589–614).

Heckman J., Walker J. (1990). The relationship between wages and income and timing and spacing of births: evidence from Swedish longitudinal data. *Econometrics, 58*, 1411–1441.

ILO. (2014). The motherhood pay gap: A review of the issues, theory and international evidence. In *Conditions of work and employment series no. 57*. Geneva: ILO.
Klasen, S. (1999). Does gender inequality reduce growth and development? Evidence from cross-country regressions. *Policy research report on gender and development working paper series, No. 7*.
Leibenstein, H. (1957). Economic Backwardness and Economic Growth, New York: Wiley.
Liao, T. W. (2005). Clustering of time series data—A survey. *Pattern Recognition, 38*(11), 1857–1874.
Livi, B. M. (2017). Dobbiamo anticipare l'età dell'autonomia per i nostri giovani. In *Corriere della Sera*.
Lutz, W., Skirbkk, V., & Testa, M. (2005). The Low Fertility trap hypothesis: Forces that may lead to further postponement and fewer births in Europe. In *European Demographic Research Papers.*
Matsui, K. (2005). Womenonomics: Japan' s hidden asset. In *Goldms Sachs Japanese Portfolio Strategies.*
McKinsey Report (2015). *The outlook for global growth in 2015*.
Morgan, S. P., & Taylor, M. G. (2006). Low fertility at the turn of the twenty-first century. *Annual Review of Sociology, 32*, 375–399. doi:10.1146/annurev.soc.31.041304.122220.
OECD (2005). Women and Men in OECD countries.
The Economist. (2006). A guide to womeconomics. *The future of the world economy lies increasingly in female hands.*
UNAIDS. (2012). *Impact of the global economic crisis on women, girls and gender equality*. isbn: 978-92-9173-989-9.
United Nations (2010). Human Development Report 2010 20th Anniversary Edition. The Real Wealth of Nations: Pathways to Human Development.
Willis, R. (1973a). A new approach to the economic theory of fertility behavior. *Journal of Political Economy, 81*(2), S14–S64.
Willis, R. J. (1973b). A new approach to the economic theory of fertility behavior. *Journal of Political Economy, 81*(2), 3–18.
Wittemberg-Cox, C. A., & Maitlan, A. (2009). *Rivoluzione Womenomics. Perchè le donne sono il motore dell'economia*, Gruppo 24ore.
World Bank (2015). *World Development Report: Mind*, Society, and behavior
World Bank (2016) World Development Indicators. http://data.worldbank.org/data-catalog/world-developmentindicators
World Economic Forum (2015). The Global Gender Gap Report
Zhao, Y., & Cen, Y. (Eds.). (2013). *Data mining applications with R*. Cambridge, MA: Academic Press, Elsevier. isbn: 978-0-12-411511-8.