

“Green Note” or “Black Note”: What weighs most in the decision to have children?

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Abstract: The decline in fertility rates and the number of children per woman is a demographic problem that faces several countries and is present on their political agenda. This dissertation aims to evaluate, through the application of econometric models, the effect of pronatalist policies and different variables on fertility rates, to assess if at the time of having children people value the economic issues "Black Note" or issues related to the sustainability and quality of life offered by the municipalities "Green Note". Various factors influence fertility, namely, the increased education level, the opportunity cost associated with raising children, and economic and employment instability. Indeed, the interaction between the quantity and quality of children may also explain the decline in fertility, since families have chosen to invest more in each child and higher quality in each child, implies less quantity. So, increasingly people voluntarily choose childlessness. The results obtained through the application of two-way fixed effects models, where the time from 2011 to 2019 was controlled, demonstrated that there is an evident cause-effect relationship between the attribution of direct incentives to fertility and fertility rates. On the other hand, a greater bet to the environment, sport, and culture by the municipalities did not demonstrate, through the variables incorporated in the models, empirical evidence to the fertility rates.

Keywords: fertility rates, public policy, municipal incentive regulation for natality, panel data, two-way fixed effect regression model

1. Introduction

1.1 Motivation and contextualization

The decline in fertility rates is a problem transversal to society that affects and has an impact on the country both in demographic and social terms, as well as in economic and financial terms. A country without children is unsustainable and Portugal must invest in a path that promotes fertility intentions. The aging of the Portuguese population is currently a problem the country is facing, and low fertility rates are one of the biggest contributors to this phenomenon. The births that have taken place have not been enough to offset the negative natural balance that Portugal has had since 2009, after which there has been a greater number of deaths, compared to the number of births, which may, in the future, contribute to a rapid decline in population (Instituto Nacional de Estatística 2020a)

What variables influence the fertility rates? Are the Portuguese autarchies contributing with pro-natalist measures to the birth problem? What are the most family-friendly Portuguese autarchies? Are direct birth incentives the solution? Or is the Portuguese population more concerned with the quality of life that each municipality offers?

This study aims to answer these questions by making a broad and differentiating analysis for an emerging theme in society, giving an original contribution to the literature and research in the area under study.

1.2 Objective

This study aims to assess not only the contribution of economic programs to directly encourage births but also the impact that other explanatory variables have on fertility rates. In this way, by aggregating information on variables that can, directly and indirectly, influence the birth rate problem, it will be possible to conclude whether the approach to be followed by our government officials should directly address the birth problem with the attribution of direct incentives to those who want to have children, or a greater commitment to improving the quality of life that each municipality offers its residents.

2. Problem definition

2.1 Birth rate, fertility rate and mother's age

The crude birth rate is defined as the number of births that occur (live births) over a year, divided by the population of that year, and this value is normally expressed per 1000 inhabitants¹. In 2020, the crude birth rate in Portugal was 8.2‰ that is there were 8.2 births per 1000 inhabitants in that year. In 1960, the year in which there was a drop in birth rates throughout Europe, 24.1 births per 1000 inhabitants were born (24,1‰)². Thus, after six decades the number of births in Portugal has dropped substantially to less than half. Portugal is not only below the European average but is also the fourth country with the lowest birth rate in the European Union.

Another important indicator, commonly used to describe fertility trends, is the total fertility rate (TRF), which represents the average number of children per woman of

¹ <https://smi.ine.pt/Conceito/Detalhes/1717>, consulted on October 21, 2020

² <https://www.pordata.pt/Europa/Taxa+bruta+de+natalidade-1605>, consulted August 15, 2021

childbearing age, considering the fertility rates in the period in question³. In Portugal, in 2020, a woman of childbearing age had an average of 1.40 children⁴. It is noteworthy that the values that the European Union has presented in recent years are well below 2.1 children, which is considered the minimum value that guarantees the renewal of generations, given relatively low mortality rates (Instituto Nacional de Estatística 2020a). Since 1982, the average number of children per woman has fallen below the generational replacement threshold, 2.1. Although no country in the European Union has ensured the replacement of generations, Portugal is part of the group of countries in the 28 Member States of the European Union with lower TRF values, being one of the countries with the lowest levels of fertility in Europe and the world. For countries that have values below the level necessary to ensure generational replacement, a future of population aging is expected, which may also be accompanied by a decrease in the size of the total population, which has led to an increased concern about the social consequences associated with this phenomenon (Gomes et al. 2016; B. J. Bongaarts 1999). In this field, it should also be noted that the TRF values do not correspond to the expectations that families have regarding the ideal family size. In general, families aspire to have more children than they actually have, mainly due to economic factors, namely the direct and opportunity costs associated with raising children, as well as due to youth unemployment that brings economic uncertainty and creates difficulties for the constitution of a family (J. Bongaarts 2008).

Over the years, and following the decline in the fertility rates, there has also been a significant increase in the average age of the mother at the birth of her first child. Therefore, the postponement of motherhood that has been observed brings the moment when mothers have their first child closer to their biological fertility limit, which consequently contributes to reducing the probability of having many children. In 2020 this average age was 30.7 years in Portugal, while in 1960 it was only 25 years. The data indicate that fertility is concentrated around a certain age and that Portuguese women are remaining with only one child, a situation quite different from what happened a few years ago (Ferreira Cabral 2019). This phenomenon is largely due to the higher level of education and employment rates that have been intensifying over the years among younger female generations. It is noteworthy that, over the years, the financial autonomy of women has increased, with a change in values regarding the traditional family role that women once played (Addio Mira 2005).

2.2 Portuguese territory distribution and impact of public policies in this country

According to the data present in the Territorial Portrait of Portugal and the preliminary results of the 2021 Census, the population in Portugal has decreased by around 2.0% in the last decade. Both reports are consistent with the pattern of littoralization and population concentration near the capital. The preliminary results of the 2021 censuses show that about 50% of the Portuguese population is concentrated in just 31 municipalities, located mostly in the Metropolitan Areas of Lisbon and Porto. Of the 308 Portuguese municipalities, 257

registered a decrease in population, a number higher than the results of the previous decade. The municipalities that over the last decade have shown a population growth, are located mostly along the coast, predominantly around the Portuguese capital and the Algarve region (Instituto Nacional de Estatística 2021). Similarly, the projections are not favorable either and point to an even more aged Portugal in the future, being in agreement with the preliminary results of the censuses and pointing to an increase in the population residing in the Lisbon Metropolitan Area and Algarve (Instituto Nacional de Estatística 2020b).

2.2 Impact of public policies in Portugal

Concerning the application of measures to encourage births in Portugal, Rodrigues Velez (2020) highlight the importance that these policies have in combating low birth rates, and which when applied must take into account the articulation from different perspectives and efforts. Recently, the researcher Fernandes de Matos also highlighted the emergence of the birth problem in Portugal and the importance and influence that those public policies which encourage births can have in combating it, especially in rarefied municipalities⁵. The researcher also argues that birth support policies should be designed for the medium/long term, and not just as a "quick band-aid".

It is also important to highlight that according to data obtained from the most recent Fertility Survey conducted by INE in 2019, the vast majority of respondents considered that there should be birth incentives (Instituto Nacional de Estatística 2020).

2.3 Importance of the environment, sport, and culture in quality of life and social well-being

The environment, sport, and culture are highlighted themes in today's society, so this first phase will study the impact that these themes have on the quality of life, in order to be able to infer later, in an inductive and exploratory way, its indirect relationship with the problem of the decline in fertility rates.

Green spaces are essential elements for the habitability and sustainability of cities, so as the population, density, and size of cities increase, green spaces, therefore, assume greater importance (Bush 2020). Access to green spaces by the green population promotes the practice of physical activity, contributing to psychological well-being and reducing stress, and increasing the quality of life of urban residents (Lee and Maheswaran 2011; Wolch, Byrne, and Newell 2014). In Portugal and Europe, green investment has been growing and the concept of the green city has assumed special relevance. Lisbon, the largest urban area in Portugal, was elected the European green capital of 2020. The prize awarded to Lisbon recognizes that it has been outlining an effective strategy for environmental sustainability, intending to improve people's quality of life⁶.

Has the investment that Portugal and Portuguese municipalities have been developing in the environmental area have a return and a direct relationship with fertility intentions?

³ <https://smi.ine.pt/Conceito/Detalhes?id=5310&lang=PT>, consulted on October 21, 2020

⁴ <https://www.pordata.pt/Europa/%c3%8dndice+sint%c3%a9tico+de+fecundidade-1251>, consulted on October 21, 2020

⁵ <https://www.dn.pt/sociedade/investigador-propoe-subsidio-mensal-por-cada-filho-para-aumentar-natalidade--14011594.html>, consulted on August 11, 2021

⁶ <https://www.lisboa.pt/capital-verde-2020>, consulted on September 13, 2021

Sports also positively affect the population's well-being, contributing to the reduction of anxiety and the occurrence of depressive symptoms. Thus, the practice of physical activity has been shown to be an efficient way to improve the quality of life, as it improves personal self-esteem, mood, sleep and also contributes to reducing stress and anxiety (Fox 1999; Crone-Grant Grant 2000; Downward Rasciute 2011). Similarly, artistic activities and culture, in general, allow for better emotional regulation, reduction of stress, and social isolation, contributing to increased quality of life and individual well-being (Daisy Fancourt Saoirse Finn 2019) (Iwasaki 2006).

So, will the municipalities that invest more in sport and culture be more attractive for families to live and want to have children?

3. Literature Review

3.1 Contribute of Gary Becker

Gary Becker reintroduced in the 20th century the economic study about fertility, proposing a revision to the Malthusian theory. The model proposed by Thomas Malthus assumes that income and population growth are directly correlated so that as income increases, fertility also increases. This theory was quite relevant and influenced the forecasts of economists until the 19th century, however from the 20th century was proven to be quite limited, as it was unable to explain the decline in fertility rates observed in Western countries and other developed countries when there was a significant increase in family income (Becker 1993).

According to Gary Becker, the interaction between the quantity and quality of children is the only interaction capable of explaining why the number of children changes very quickly over time. For Becker, families not only decide how many children they want, n , but also how much they are willing to invest in them, q , which encompasses issues about the provision of daycare centers and private schools, private dance and music lessons, among others (Becker 1960; Becker 1993). Similarly, Doepke 2004) supports this premise, arguing that even though schools are free, educating a child is expensive, and the opportunity cost associated with education is significant, so a sharp decline in birth rates is expected soon after major educational reforms.

Thus, Becker (1993) assumes that all children in the same family have the same quality and that this is produced by the family itself and by market goods.

$$U = U(n, q, z) \quad (3.1.1)$$

He argues that each family maximizes a utility function of the number of children, n , the expenses with each child regarding their quality, q , and the quantities related to other commodities, that is, to other goods, z (Becker 1993).

The budget constraint is given by:

$$I = p_c q n + \pi_z z \quad (3.1.2)$$

Where I represents the total income, q the total quality inherent to each child, p_c the constant cost associated with one more unit of quality, and $p_c q n$ represents the expenses associated with the children. (Becker 1993). Consequently, for Becker, parents started to choose to invest

more in each child, which implies a higher “quality” and a lower “quantity”. According to him, when increasing the number of children, there must be compensation concerning quality so that for parents the utility remains the same (Becker 1993).

3.2 Factors that influence the natality.

Between the late 50s and 70s of the 20th century witnessed the first major global decline in birth rates, where it fell by between 40 and 60 percent in most regions of the world and by 40 percent in the world as a whole (Weeks 2015). At the same time, in recent years, it has been on the rise in Europe and it has been increasingly common to come across childlessness behavior, that is, of those who voluntarily choose not to have children (Park 2005; Tanturri Mencarini 2008).

When deciding whether or not to have children, several factors are balanced, especially with regard to the couple's financial and employment conditions. These factors seem to have a huge contribution in the decision of wanting or not to have children and include issues such as the investment that is necessary for the education of children, the direct and indirect costs that children's individual behavior also entails, the impact they have in career development and the difficulties in reconciling them with professional life. Even so, at the time of this decision, many non-financial costs are also balanced, such as the loss of lifestyle options, and the quality of the marital relationship is also another factor that indicates weight in this decision, as less happy couples are less likely than others to have children (Robyn Parker 2004).

The opportunity cost associated with children, the increase in consumerism, and the increase in competitiveness at various levels associated with globalization are factors commonly associated with the decline in fertility rates. These factors underlie the view that children are seen as an extra job, so people prefer to invest in themselves and dedicate their free time to leisure activities that provide them with greater satisfaction and well-being (Lutz et al. 2006). Note that opportunity costs have increased over time, as levels of education and female employment have also increased (Bongaarts 2008). Especially in women, due to the association that mothers would be the primary caregivers of their children, which would imply a greater sacrifice of time on their part, the opportunity cost appears to be even more prevalent. The decision of not wanting to have children by women arises as a result of the definition of other priorities and the fear they have about the involvement that motherhood can entail, not only with their professional career but also with leisure activities, for who are unwilling to accept the sacrifices associated with pregnancy (Tanturri Mencarini 2008; Park 2005). Studies have shown that there is a negative association between an increase in female participation in the labor market and fertility decisions, with the increase in the opportunity cost of children due to the increase in female participation in the labor market, pointed out as one of the main causes that led to the decline in the birth rate (Thévenon Gauthier 2011). There is also an association between women with higher levels of education and childlessness behavior, since for them the opportunity cost of motherhood is higher, so as there is an increase in the level of education of women, voluntary absence from having children may also increase (Tanturri Mencarini 2008; Park 2005).

The dissemination and improvement of contraceptive methods are also pointed out as one of the causes that contributed to the decline in fertility rates, given the fact that many births result from unplanned pregnancies (Lutz et al. 2006; Westoff et al. 1987).

Finally, economic factors are also a major obstacle to the creation of families, preventing them from reaching the ideal size they aspire to, due to the high cost that children present (J. Bongaarts 2008).

3.4 Impact of birth support policies

Public policies can play a crucial role in minimizing and mitigating some of the obstacles that families present in the creation of a family. In this field, Becker (1992) argues that the cost of having children is affected by public policies and that these can contribute to increasing fertility intentions. Similarly, Luci-Greulich Thévenon (2013) also argue that family policies make it possible to reduce the monetary cost and opportunity cost commonly associated with raising children. The success seen in some countries of the Organization for Economic Cooperation and Development (OECD), such as the United States, France, and several Nordic countries, which have a synthetic fertility rate close to that which is necessary to guarantee the stability of their population, is due to the presence of policies and agreements that allow families to reduce the direct and indirect costs associated with raising children (D’Addio Mira d’Ercole 2006).

Previous studies have shown that financial benefits granted to families, namely in the form of allowances, have a positive effect in particular on the total fertility rate (Thévenon Gauthier 2011; Gauthier Hatzius 1997). The impact of this type of incentives appears to accelerate the moment when births occur, thus limiting the postponement of family formation. This happens as families are encouraged to accelerate the birth of children and especially a first child, in order to be able to respond to and access current policies and, in this way, benefit from assistance. Therefore, the impact of this type of incentives can be quite limited, since the fact that they contribute to anticipating fertility intentions does not assume that the size of the household is larger, or in other words, that the number of children increases (Thévenon Gauthier 2011).

At the same time, policies aimed at facilitating the balance between work and family also appear to have a strong influence on the decision to have children. This genesis of policies, which includes, parental leave after the birth of a child, daycare services, flexible working hours, among others, significantly reduce, or even eliminate, the opportunity cost of children. It should be noted that the impact of this type of policy appears to be most decisive at the time after the birth of a first child (Thévenon Gauthier 2011). It should also be noted, for example, that concerning the group of countries that make up the OECD, the countries that have a higher total fertility rate are those that, at the same time, have greater availability of daycare centers, lower direct costs associated with children, higher availability of part-time work and longer leaves (Addio Mira 2005).

4. Methodology

4.1 Data collection

This study incorporates in its analysis a set of data gathered at the municipality level for the period between 2011 and 2019. Given the lack of a database that includes all the intended variables of interest, it was built from scratch, a database for this study that incorporates not only information provided by the municipalities regarding direct birth incentive policies, but also a set of variables of interest that were provided by INE and by the Quadros de Pessoal. Thus, a process of direct

contact was established with all Portuguese municipalities in mainland Portugal, via email and telephone, to obtain information about the existence and period of validity of the direct birth incentive policies in force in each municipality. A total of 278 of the 308 Portuguese municipalities were contacted. With the aim of facilitating the distinction of clearly pro-natalist policies from family social action policies, it was considered that only municipalities that have a municipal regulation to support and encourage birth over the period under study have incentive policies for the current birth rate. Thus, from the set of 278 Portuguese municipalities contacted, a total of 72 municipalities were found that have, or had at some point in the period of analysis, active policies of direct birth incentive, duly governed by a municipal regulation to support and encourage births. Therefore, these municipalities will be part of the treatment group, which represents the municipalities that are covered by the direct birth incentive policies. Municipalities that do not have a municipal regulation to directly encourage births are not covered by these measures and will therefore be part of the control group.

4.2 Variables

The dependent variables to be considered will be the birth rate and the total fertility rate, two indicators commonly used by researchers in the field to describe the evolution of the birth rate over the years.

**Table 1 - Dependent variables under study
Information from INE**

| Variables | Description |
|-----------------------------|---|
| Crude Birth Rate | Number of live births that are born annually per thousand inhabitants (%) |
| Total Fertility Rate | Average number of children per woman over a given year. |

The independent variables to be analyzed concern characteristics that are believed to explain the birth problem. Together, variables related to the green, cultural, and sports investment by the municipalities will also be analyzed. With that information, it is possible to infer, in an inductive and exploratory way, if the fact that the municipalities bet more on the environment and culture has an impact on the quality of life of the citizens and, consequently, albeit indirectly, on the birth rate.

**Table 2 - Independent variables under study
Information from INE and from Quadros de Pessoal**

| Variables | Description |
|---|--|
| Birth Incentives | Binary variable that takes the value of 1 or 0 and informs about the existence of a municipal birth incentive regulation in the municipality; 1 - there is regulation; 0 - there is no regulation; |
| Unemployed | Unemployed registered at employment and vocational training centers in the total resident population aged 15 to 64 (%); |
| General monthly remuneration | Average monthly earnings of employees (€); |
| Women's monthly remuneration | Average monthly earnings of female employees (€); |
| Men's monthly remuneration | Average monthly earnings of male employees (€); |
| Secondary School Completion Rate | Students enrolled in secondary education in public or private educational establishments who successfully completed this cycle of studies (%); |

| Variables | Description |
|---|---|
| Completion rate in the 3rd cycle of basic education | Students enrolled in the 3rd cycle of basic education in public or private educational establishments who successfully completed this cycle of studies (%); |
| Gross divorce rate | Observed number of divorces during a calendar year, reporting where there are more and fewer divorces per 1,000 residents (%); Where the highest and lowest |
| Live births outside marriage - total | percentage of babies of unmarried parents are born, whether the parents live together or not (%); |
| Live births outside marriage - with parents cohabiting | Where are the highest and lowest percentage of babies born to unmarried parents who live together (%); |
| Live births outside marriage - no parental cohabitation | Where the highest and lowest percentage of babies born to unmarried parents who do not live together (%); |
| Municipalities' expenditure on the environment as a % of total expenditure | Information on which municipalities spend more and less on environmental management and protection, such as air and climate, wastewater, waste, soil and water, noise and vibrations or biodiversity and landscape (%); |
| Municipalities' expenditure on culture and sport as a % of total expenditure | Information on which municipalities spend a greater or lesser percentage of expenditure on culture and sport (%); |

4.3 Difference-in-differences estimation and two-way fixed effects regression model

The difference-in-differences estimator is currently one of the most popular and widely used tools by researchers to assess the causal effects resulting from the application of public policies (Wooldridge 2018). However, as in the case under study, the application of birth support incentives does not occur at the same time, it will not be possible to apply the difference-in-differences methodology in its canonical form. This happens since this methodology only allows to ascertain the effect of policies implemented at the same time, exclusively admitting the presence of two groups and two distinct temporal moments, where in the first temporal moment no individual undergoes treatment, and in the second temporal moment some individuals undergo treatment (treatment group) and others do not (control group).

An equivalent approach to the application of the differences-in-differences methodology is the bidirectional fixed effects model, which allows the assessment of the impact of measures applied at different times in the analysis period (Wooldridge 2021; Imai Kim 2021). A fixed-effects model allows capturing the differences that do not vary over time, assuming homogeneity in the slope and heterogeneity in the constant part. Thus, the estimation of a fixed-effects model is made assuming that the heterogeneity of individuals is captured in the autonomous component of the α_i model, constant over time, differing from individual to individual and thus allowing to capture the differences between individuals that they are invariant over time, as is the case of culture, environment, traditions, geographical position of the different municipalities, etc. On the other hand, it is worth noting that the fixed effects model does not allow the inclusion of constant variables over time (Wooldridge 2018). Furthermore, for the birth problem under study, it is entirely interesting and useful to control the effect of time, to estimate the specific effects of

each period. This is achieved through the two-way fixed effects regression model application.

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 X_{it} + \dots + \varepsilon_{it} \quad (4.3.1)$$

It is also important to mention that the methodology used in this study is based on the organization of panel data where it is possible to study the variations of the variables under study over time and between different individuals. Therefore, in the case under analysis, the municipalities are repeated and are the object of study over the time of the analysis, being organized chronologically and having all municipalities the same number of temporal information (Wooldridge 2018).

5. Results and Discussion

For the present study, two distinct econometric analyzes will be developed. The first econometric analysis presents a greater degree of reliability, as the information regarding the control municipalities present in the variable "birth incentives" is more precise and accurate, as it results from direct contact established with the municipalities. This analysis is more restrictive, as it does not include all municipalities belonging to the region of mainland Portugal. Thus, in order to avoid problems related to the selection and bias of the sample under study, a second global econometric analysis will be carried out, covering all Portuguese municipalities in the region of Mainland Portugal, including municipalities that were not responsive to the contact attempt effected.

For the two econometric analyses, seven models were carried out, where the variable "birth incentives" is present in all the models carried out, to assess its interaction with the other variables under study. Consequently, the first model analyzes a set of variables that come from structural changes in society and the economy in general, such as wages, unemployment, and education. The second model represents a set of variables intrinsic to the environment and family structure, analyzing the variables that relate to changes within the family, such as the increase in divorces and the fact that births outside marriage are verified with or without cohabitation of parents. Models three and four separately assess expenditure related to the environment and expenditure related to culture and sport, as these two variables inform a percentage of the total expenditure of the municipality, hence competing with each other, which reinforces the importance of analyzing them separately. Model five incorporates all the variables except for the variables inserted in the "Green Note", to isolate the contribution of this effect. Models six and seven have the objective of evaluating all the variables under study, the difference between them being that model seven does not include the variables referring to education, since for these variables we do not have information for all municipalities, so model six is unbalanced and model seven balanced.

Table 3 – Crude Birth Rate analysis (1)

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Birth Incentives | 0.234** (0.102) | 0.394*** (0.114) | 0.398*** (0.114) | 0.395*** (0.115) | 0.228** (0.101) | 0.230** (0.100) | 0.416*** (0.113) |
| General monthly remuneration | -0.013* (0.008) | | | | -0.015* (0.008) | -0.016** (0.008) | -0.013* (0.008) |
| Men's monthly remuneration | 0.008 (0.005) | | | | 0.009* (0.005) | 0.010** (0.005) | 0.008 (0.005) |
| Women's monthly remuneration | 0.010** (0.005) | | | | 0.011** (0.005) | 0.011** (0.004) | 0.009** (0.004) |
| Unemployed | -0.067* (0.039) | | | | -0.070* (0.038) | -0.071* (0.039) | -0.079** (0.040) |
| Secondary School completion rate | -0.005 (0.008) | | | | -0.005 (0.008) | -0.005 (0.008) | |
| 3 rd cycle completion rate | -0.007 (0.008) | | | | -0.009 (0.009) | -0.008 (0.009) | |
| Live births outside marriage | | -0.625 (0.432) | | | -0.485 (0.413) | -0.461 (0.416) | -0.707 (0.429) |
| Live births outside marriage – with parents cohabiting | | 0.615 (0.431) | | | 0.469 (0.413) | 0.446 (0.416) | 0.696 (0.429) |
| Live births outside marriage – no parental cohabitation | | 0.624 (0.431) | | | 0.476 (0.412) | 0.452 (0.415) | 0.707 (0.428) |
| Gross divorce rate | | 0.010 (0.074) | | | 0.043 (0.076) | 0.046 (0.077) | 0.005 (0.074) |
| Environment expenditure | | | -0.009 (0.014) | | | -0.018 (0.014) | -0.010 (0.013) |
| Culture and Sport expenditure | | | | 0.006 (0.010) | | 0.010 (0.009) | 0.005 (0.009) |
| Constant | 5.273*** (1.789) | 7.551*** (0.296) | 7.317*** (0.118) | 7.200*** (0.119) | 5.922*** (1.772) | 5.891*** (1.704) | 5.325*** (1.604) |
| N | 975 | 1,053 | 1,053 | 1,053 | 975 | 975 | 1,053 |
| R-square | 0.155 | 0.132 | 0.127 | 0.127 | 0.168 | 0.172 | 0.148 |
| Number of municipalities | 113 | 117 | 117 | 117 | 113 | 113 | 117 |

Note: All models contain controls for the year. The standard error is shown below each coefficient in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4 - Total Fertility Rate analysis (1)

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| Birth Incentives | 0.021 (0.021) | 0.056** (0.024) | 0.056** (0.024) | 0.055** (0.024) | 0.021 (0.021) | 0.021 (0.021) | 0.063*** (0.023) |
| General monthly remuneration | -0.002 (0.002) | | | | -0.002 (0.002) | -0.003* (0.001) | -0.002 (0.002) |
| Men's monthly remuneration | 0.001 (0.001) | | | | 0.001 (0.001) | 0.002* (0.001) | 0.001 (0.001) |
| Women's monthly remuneration | 0.002* (0.001) | | | | 0.002* (0.001) | 0.002* (0.001) | 0.002* (0.001) |
| Unemployed | -0.021*** (0.008) | | | | -0.022*** (0.008) | -0.022*** (0.008) | -0.024*** (0.009) |
| Secondary School completion rate | -0.001 (0.001) | | | | -0.001 (0.001) | -0.001 (0.001) | |
| 3 rd cycle completion rate | -0.002 (0.002) | | | | -0.002 (0.002) | -0.002 (0.002) | |
| Live births outside marriage | | -0.057 (0.090) | | | -0.030 (0.085) | -0.025 (0.085) | -0.072 (0.090) |
| Live births outside marriage – with parents cohabiting | | 0.055 (0.090) | | | 0.027 (0.085) | 0.021 (0.085) | 0.070 (0.090) |
| Live births outside marriage – no parental cohabitation | | 0.057 (0.090) | | | 0.028 (0.084) | 0.023 (0.085) | 0.072 (0.089) |
| Gross divorce rate | | -0.012 (0.015) | | | -0.003 (0.014) | -0.002 (0.014) | -0.012 (0.015) |
| Environment expenditure | | | -0.004 (0.003) | | | -0.005 (0.003) | -0.004 (0.003) |
| Culture and Sport expenditure | | | | 0.001 (0.002) | | 0.001 (0.002) | 0.001 (0.002) |
| Constant | 0.966** (0.401) | 1.277*** (0.062) | 1.217*** (0.023) | 1.184*** (0.023) | 1.128*** (0.397) | 1.120*** (0.385) | 1.040*** (0.354) |
| N | 975 | 1,053 | 1,053 | 1,053 | 975 | 975 | 1,053 |
| R-square | 0.149 | 0.122 | 0.119 | 0.117 | 0.164 | 0.170 | 0.144 |
| Number of municipalities | 113 | 117 | 117 | 117 | 113 | 113 | 117 |

Note: All models contain controls for the year. The standard error is shown below each coefficient in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5 – Crude Birth Rate analysis (2)

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Birth Incentives | 0.277*** (0.087) | 0.398*** (0.099) | 0.404*** (0.099) | 0.399*** (0.099) | 0.272*** (0.087) | 0.276*** (0.087) | 0.422*** (0.100) |
| General monthly remuneration | -0.004 (0.005) | | | | -0.005 (0.005) | -0.005 (0.005) | -0.002 (0.005) |
| Men's monthly remuneration | 0.002 (0.003) | | | | 0.002 (0.003) | 0.002 (0.003) | 0.001 (0.003) |
| Women's monthly remuneration | 0.003 (0.003) | | | | 0.003 (0.003) | 0.004 (0.003) | 0.002 (0.003) |
| Unemployed | -0.042 (0.026) | | | | -0.043 (0.026) | -0.043 (0.026) | -0.031 (0.025) |
| Secondary School completion rate | -0.002 (0.005) | | | | -0.002 (0.005) | -0.002 (0.005) | |
| 3 rd cycle completion rate | 0.000 (0.006) | | | | 0.000 (0.006) | 0.000 (0.006) | |
| Live births outside marriage | | -0.143 (0.322) | | | -0.200 (0.319) | -0.177 (0.319) | -0.135 (0.324) |
| Live births outside marriage – with parents cohabiting | | 0.137 (0.322) | | | 0.192 (0.319) | 0.169 (0.319) | 0.129 (0.324) |
| Live births outside marriage – no parental cohabitation | | 0.141 (0.322) | | | 0.191 (0.318) | 0.169 (0.319) | 0.134 (0.324) |
| Gross divorce rate | | 0.076 (0.054) | | | 0.090 (0.058) | 0.093 (0.058) | 0.080 (0.054) |
| Environment expenditure | | | -0.013* (0.007) | | | -0.014* (0.008) | -0.012 (0.008) |
| Culture and Sport expenditure | | | | 0.006 (0.006) | | 0.007 (0.005) | 0.007 (0.005) |
| Constant | 7.317*** (1.421) | 7.590*** (0.194) | 7.654*** (0.071) | 7.512*** (0.075) | 7.525*** (1.439) | 7.560*** (1.426) | 7.382*** (1.144) |
| N | 2,295 | 2,502 | 2,502 | 2,502 | 2,295 | 2,295 | 2,502 |
| R-square | 0.162 | 0.137 | 0.135 | 0.135 | 0.167 | 0.169 | 0.141 |
| Number of municipalities | 261 | 278 | 278 | 278 | 261 | 261 | 278 |

Note: All models contain controls for the year. The standard error is shown below each coefficient in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6 – Total Fertility Rate analysis (2)

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| Birth Incentives | 0.028* (0.016) | 0.056*** (0.019) | 0.057*** (0.019) | 0.056*** (0.019) | 0.028* (0.016) | 0.029* (0.016) | 0.062*** (0.019) |
| General monthly remuneration | -0.000 (0.001) | | | | -0.000 (0.001) | -0.000 (0.001) | 0.000 (0.001) |
| Men's monthly remuneration | -0.000 (0.001) | | | | 0.000 (0.001) | 0.000 (0.001) | -0.000 (0.001) |
| Women's monthly remuneration | 0.000 (0.001) | | | | 0.000 (0.001) | 0.000 (0.001) | 0.000 (0.001) |
| Unemployed | -0.019*** (0.006) | | | | -0.019*** (0.005) | -0.019*** (0.006) | -0.017*** (0.005) |
| Secondary School completion rate | -0.000 (0.001) | | | | -0.000 (0.001) | -0.000 (0.001) | |
| 3 rd cycle completion rate | -0.000 (0.001) | | | | -0.000 (0.001) | -0.000 (0.001) | |
| Live births outside marriage | | -0.013 (0.063) | | | -0.029 (0.062) | -0.024 (0.062) | -0.016 (0.064) |
| Live births outside marriage – with parents cohabiting | | 0.012 (0.063) | | | 0.027 (0.062) | 0.022 (0.062) | 0.015 (0.064) |
| Live births outside marriage – no parental cohabitation | | 0.013 (0.063) | | | 0.028 (0.062) | 0.023 (0.062) | 0.016 (0.064) |
| Gross divorce rate | | -0.002 (0.010) | | | 0.000 (0.011) | 0.001 (0.011) | 0.000 (0.010) |
| Environment expenditure | | | -0.003** (0.002) | | | -0.003** (0.002) | -0.003** (0.002) |
| Culture and Sport expenditure | | | | 0.002 (0.001) | | 0.001 (0.001) | 0.001 (0.001) |
| Constant | 1.313*** (0.275) | 1.272*** (0.039) | 1.248*** (0.013) | 1.212*** (0.014) | 1.385*** (0.275) | 1.393*** (0.272) | 1.313*** (0.232) |
| N | 2,295 | 2,502 | 2,502 | 2,502 | 2,295 | 2,295 | 2,502 |
| R-square | 0.129 | 0.104 | 0.104 | 0.103 | 0.134 | 0.137 | 0.116 |
| Number of municipalities | 261 | 278 | 278 | 278 | 261 | 261 | 278 |

According to the main results obtained, it is possible to state that the birth incentive variable has a significant impact and a notable contribution to the birth problem, significantly contributing to reversing the low birth values in Portugal. This variable was significant in all balanced models and practically in all models carried out, except for some models belonging to the more restrictive analysis, which, as it has a smaller sample, may have contributed to a bias in the results. Thus, it is clear that the existence of a birth incentive regulation contributes positively, not only to the increase in the number of babies per 1000 inhabitants but also appears to have a positive effect on the increase in the average number of children per woman.

On the other hand, the contribution of the variables that are part of the "Green Note" that this dissertation was willing to analyze was negligible, having in most cases a non-significant contribution and in cases where it was significant, it presented an unexpected and opposite effect to the intended, indicating that a greater commitment to the environment by the municipalities has an opposite and unwanted effect on birth rates. However, in this matter, the results obtained were not clear, as the significance and coefficients obtained were not very expressive, which does not allow us to draw robust conclusions about this analysis, which was intended to be inductive and exploratory.

As for the results obtained for the other variables included in the models, the contribution of the variable "unemployed" should be highlighted, which was significant for the vast majority of models carried out and in particular for the analysis of the synthetic fertility index. Thus, an increase in the percentage of unemployed people in the country may contribute to Portugal continuing to remain below the generational replacement threshold and, consequently, explain the phenomenon of the prevalence of an only child in Portuguese society, thus contributing negatively to the birth problem.

Conclusions

The decline in birth rates we are witnessing today is an unprecedented demographic problem that could have severe consequences for society. In Portugal, the population continues to decline, and projections point to an even more aged country in the future.

Over the past few years, the crude birth rate in Europe has been quite low, and the average number of children per woman has been insufficient to guarantee generational replacement. The average age of the mother at the birth of her first child is much higher today than in the past. The high opportunity cost associated with children, as well as the difficulty in reconciling work with family, financial and employment instability, and increased competitiveness at work, are factors that have contributed to the postponement of family formation. For Gary Becker, the contribution of the interaction between the quantity and quality of children is the main cause of the decline in birth rates. According to him, parents have chosen to bet more on each child, which implies a higher quality and, consequently, a lower quantity. Thus, birth barriers are increasing, and childlessness behavior has been on the rise in Europe. To reverse the current birth problem, public policies can play a role of great notoriety, making it possible to overcome some of the main obstacles that families present for the creation of a family.

The concept of birth is interlinked with that of happiness and social well-being on the part of developed societies and can also be seen as an ally for the recovery of low levels of

fertility. In this field, a greater commitment to the environment, sport, and culture can contribute to reducing stress and increasing people's quality of life, which may be preponderant for their individual choices, namely for their fertility intentions.

Thus, in order to constitute a broad and differentiating analysis, this dissertation had as its main objective to infer whether, when having children, people value more the economic issues "Black Note", or issues related to the sustainability and quality of life offered by "Green Note" municipalities. In relation to the models carried out, an approach equivalent to the use of the difference-in-differences estimator was applied, which allowed the evaluation of the impact of measures applied at different moments of the analysis period: the bidirectional fixed-effects model.

With regard to the results obtained, it is possible to affirm that there is in fact a cause-effect between the policies to support and encourage births and the increase in the crude birth rate and the average number of children per woman. On the other hand, the variables related to the environmental, cultural, and sports investment by the municipalities, included in the "Green Note" of this dissertation, did not demonstrate a significant and expressive impact on birth rates, indicating that when families decide to have children the "Black Note" economic issues outweigh the issues related to the sustainability and quality of life of the "Green Note" municipalities.

This is a topic of great importance for the future of Portugal, Europe, and the world. The birth theme is complex and difficult to interpret, as the existing literature in the area continues to lack further studies and research, so it is necessary to continue exploring this area, whether national or at European level. The study carried out recognizes the importance that the attribution of direct birth incentives has for current levels of birth, showing agreement and supporting this line of action as a measure to be followed to reverse the current phenomenon of declining birth rates.

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