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**Working Paper**

## All little girls, the bad luck!' Sex ratios and gender discrimination in 19th-century Greece

EHES Working Paper, No. 172

**Provided in Cooperation with:**

European Historical Economics Society (EHES)

*Suggested Citation:* Tapia, Francisco J. Beltrán; Raftakis, Michail (2019) : All little girls, the bad luck!' Sex ratios and gender discrimination in 19th-century Greece, EHES Working Paper, No. 172, European Historical Economics Society (EHES), s.l.

This Version is available at:

<https://hdl.handle.net/10419/247102>

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EHES Working Paper | No. 172 | November 2019

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discrimination in 19th-century Greece

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**Abstract**

Based on anecdotal evidence on girls’ inferior status and the analysis of sex ratios, this article argues that son preference resulted in gender discriminatory practices that unduly increased female mortality rates in infancy and childhood in Greece during the late-19th and early-20th century. The relative number of boys and girls was extremely high early in life and female under-registration alone is not likely to explain this result. Female infanticide and/or the mortal neglect of infant girls played therefore a more important role than previously acknowledged. Likewise, sex ratios increased as children grew older, thus suggesting that parents continued to treat boys and girls differently throughout childhood. Lastly, the analysis of province-level information shows that economic and social conditions influenced how the value of girls was perceived in different contexts, thus aggravating or mitigating female excess mortality.

JEL Codes: I14, I15, J13, J16, N33

Keywords: Sex ratios, Infant and child mortality, Gender discrimination, Health

\* We are grateful to Eftychia Kalaitzidou for invaluable research assistance. This research received financial support from the Research Council of Norway (project 249723) and the Spanish Ministry of Science and Education (projects HAR2015-64076-P and ECO2015-65582).

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## 1. Introduction

*May they not survive! May they go no further!¹*

Written by Alexandros Papadiamantis, one of the most influential Greek authors, *The Murderess* (1903) provides a bleak picture of the fate of women in Greece. Servants of her fathers, husbands, children and grandchildren, her miserable lives are spent toiling under harsh conditions and the prevailing patriarchal system<sup>2</sup>. In this short story, Hadoula, the central female character, is impelled to murder a series of infant girls, including her new-born niece. Reflecting on the futility, emptiness and hardness of her life, Hadoula realises that there is nothing worse than being born a woman and this thought leads her to kill young girls, almost as a mercy to save them from a gloomy future<sup>3</sup>. This idea is also quite explicit in her accustomed prayer for little girls quoted above.

Despite the dramatically explicit nature of Papadiamantis' story, the Greek historical literature has not considered the possibility of female infanticide and/or the mortal neglect of girls. Valaoras (1960, 121), for instance, considered that the unbalanced sex ratios reported in the 19<sup>th</sup>-century censuses were due to female under-registration. There are only a few studies that openly discuss male predominance in Greek historical censuses but these authors do not relate the lack of females to gender discriminatory practices resulting in female excess mortality (see Asdrahas 1978; Panagiotopoulos 1987; Caftantzoglou 1997; Komis 1999, 2004). This research also mostly refers to adulthood rather than infancy or childhood. Only Hionidou (1993, 51), Gavalas (2001, 232-234) and Komis (2004, 290) questioned previous assumptions and suggested that a relatively higher mortality of girls might have been responsible for the predominance of males. Although Papadiamantis' fiction can admittedly exaggerate the societal attitude towards girls in 19<sup>th</sup> century Greece, both anecdotal evidence on girls' inferior status and distorted sex ratios at birth, infancy and childhood imply that this issue merits further attention.

This article analyses the relative number of boys and girls found in the Greek censuses. Sex ratios early in life not only were extremely male-bias at least between 1879 and 1921, but also showed remarkable regional patterns, at least when studying the province-level information provided by the 1879 and 1881 censuses. Crucially, the analysis also evidences that female under-registration cannot explain these distorted figures. Likewise, sex ratios were not only extremely high at birth and infancy, but they increased as children got older. The available evidence therefore suggests that some sort of gender discrimination was unduly increasing female mortality rates early in life. The analysis of the regional variation shows that economic and social conditions (such as economic stress, marriage prospects, the availability of female labour opportunities and/or cultural and religious factors) influenced how the value

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<sup>1</sup> Papadiamantis (1983 1903, 14).

<sup>2</sup> Greek women were supposed to endure all hardships, including domestic violence, without complaining (Thanailaki 2018, 111). See also Blum and Blum (1965, 48-50) and Dimen (1986).

<sup>3</sup> See also Sant Cassia and Bade (1992, 188) and Thanailaki (2018, 108-109) on how Papadiamantis characterised women's life in late-19<sup>th</sup>-century Greece.

of girls was perceived in different contexts, thus aggravating or mitigating female excess mortality.

Although accurately assessing the relative importance of different practices is beyond the scope of this article, we argue that it is likely that female infanticide, mortal neglect and/or abandonment of infant girls contributed to high sex ratios at birth and in infancy. Gender discrimination in any case continued throughout childhood. Greek families treated boys and girls differently and, in a context of widespread poverty and high mortality rates, discrimination in terms of food, childcare and/or workload impaired girls' net nutritional status and increased female mortality rates due to the combined effect of malnutrition and diseases.

This article therefore challenges the view that there were no missing girls in historical Europe (Derosas and Tsuya 2010; Lynch 2011). Recent research has shown that this issue was probably much more important than previously thought, especially in Southern and Eastern Europe (Hanlon 2016; Beltrán Tapia and Gallego-Martínez 2018; Beltrán Tapia 2019). A related strand of the literature discusses whether an unequal allocation of resources within households negatively affected girls' heights and mortality rates in 19<sup>th</sup>-century Britain and continental Europe (Tabutin 1978; Johansson 1984; Pinnelli and Mancini 1997; Baten and Murray 2000; McNay et al. 2005; Harris 2009; Horrell and Oxley 2016).

This article also contributes to the existing literature by identifying the underlying factors behind gender discrimination. Women's position within the household and the society in general is influenced by cultural values that tend to respond to the incentives created by the economic and environmental context (Das Gupta et al. 2003). The dowry system, for instance, plays a crucial role on motivating son preference (Bhalotra et al. 2018). Access to employment opportunities, on the other hand, strengthens women's position (Qian 2008; van Zanden et al. 2019). Likewise, Evans (2019) argue that cities foster gender equality by raising the opportunity costs of the male breadwinner, increasing exposure to women in socially valued roles and facilitating women's collective action. Lastly, it is argued that gender equality is not only a potential outcome of economic development but that this link may also work the other way around (World Bank 2011; Cuberes and Teignier 2014; Dilli et al. 2015). Studying the Greek case is therefore crucial for understanding the complex relationship between gender discrimination and economic progress.

## **2. Gender roles, dowries and attitudes towards girls in Greece**

Women's agency in Greece was rather limited and restricted to traditional gender roles (Friedl 1967; Stott 1973; Hionidou 1995; Thanailaki 2018). Girls were supposed to stay home and help their mothers until they got married. The hierarchical status of the traditional patriarchal Greek family attributed sons a higher status than their older sisters or even their mothers (Valmas 1936). Most families were prejudiced against female schooling, so most girls remained illiterate<sup>4</sup>. Girls were not allowed to choose their future husbands and marriages were usually arranged by their parents. Being unmarried was not socially accepted and resulted in

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<sup>4</sup> In 1867, only 19.1 per cent of school students were girls (Thanailaki 2018, 13). Evidence from Hermoupolis and Mykonos shows that female schooling only significantly increased in the late-1920s (Hionidou 1993, 138; Raftakis 2019, 160). Although rural poverty constrained education in general, sons were prioritized until well into the 20<sup>th</sup> century (Friedl 1964, 18; Papathanassiou 2004, 336; Safilios 1972).

marginalization, so women had no other choice but to accept the arranged marriage<sup>5</sup>. The new bride often lived with her in-laws but this practice could vary by region (Couroucli 1987)<sup>6</sup>. Women's moral reputation was extremely important and strict codes regulated their behaviour (Stott 1973, 127)<sup>7</sup>. Strict customs also regulated widowhood and remarriage was not generally accepted. Although the status of women improved over the next decades, many of these practices were still visible in many rural areas up to the 1970s (Friedl 1964, 12)<sup>8</sup>.

Son preference was therefore an important element in the Greek society. While bearing a son was received with joy, giving birth to a girl was often seen as a cause for blame and lamentation (Du Bulay 1983, 244; Thanailaki 2018, 57, 100, 130). Males were considered more useful for the family economy, regardless of whether their labour contribution was actually larger than that of females. This was especially true if they were expected to provide agricultural labour (Campbell 1964; Friedl 1963). Tradition also marked that the family name was transmitted to future generations only through males (Gallant 1991, 493)<sup>9</sup>. In addition, sons were supposed to support their single sisters and parents, especially their mothers throughout their widowhood (Hionidou 2011, 220-221, 231)<sup>10</sup>. Likewise, the dowry system made girls a burden to their families since they drained away part of the family resources. The dowry was often an onerous obligation, especially for the poorest families (Stott 1973, 126-127; Michaleas and Sergeantanis 2019, 14)<sup>11</sup>. Marrying their daughters was a primary obligation for the families and this was connected to how generous her endowment was<sup>12</sup>. According to Blum and Blum (1965, 48), the anticipation of the dowry problem is one reason why baby girls were not welcomed. The view that girls are a liability also stems from the idea that they needed protection and that through them the family could be dishonoured, so they were a constant source of worry (Blum and Blum 1965, 50, 75; Du Bulay 1974, 124). The lack of men due to migration or the

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<sup>5</sup> Remaining unmarried was considered as one of the worst fates for a woman (Lambiri-Dimaki 1972, 75). The proportion of women ever married was extremely high (97.1 per cent in 1879) and continued to be so until the second half of the 20<sup>th</sup> century (it was still 95 per cent in 1951; Hionidou 1993, 55). The age gap between spouses was quite high in the 19<sup>th</sup> century: around 8 years, for instance, in Mykonos or Hermoupolis (Bafounis 1984, 217; Hionidou 1993, 54). The age gap declined in the late 19<sup>th</sup>-century and early 20<sup>th</sup> century, mostly due to the increasing female age at marriage (Hionidou 1993, 54). In 1907, this gap still ranged between 5-6 years (Gavalas 2008, 516).

<sup>6</sup> In the Cycladic Islands or Kythera, for instance, each couple would establish their own independent household upon marriage but usually near the groom's parental household (Hionidou 1995, 74-75; 1999, 417; 2011, 230; 2016, 56). The inheritance system was designed to keep the younger generation closely linked to their parents (Hionidou 2011, 221).

<sup>7</sup> Women were not supposed to go to wine shops, cafés or taverns and they could not visit friends alone in order to safeguard women's honour (Stott 1973, 127). Women bearing illegitimate children were forced to leave the village because having children outside marriage was considered a disgrace (Thanailaki 2018, 94).

<sup>8</sup> For detailed anthropological and ethnographical accounts, see Campbell (1964), Blum and Blum (1965) and Du Bulay (1974).

<sup>9</sup> In the Cyclades, however, while the eldest son would continue the male line, the eldest daughter was expected to continue the female line (Kasdagli 2004, 268).

<sup>10</sup> Hionidou (2011, 231) stresses that the absence of male descendants left widows, widowers and single daughters in a rather vulnerable position.

<sup>11</sup> On the Greek dowry system, see Lambiri-Dimaki (1972), Du Boulay (1983), Franghiadis (1998), Papataxiarchis and Petmezas (1998), Kasdagli (2005), Hionidou (2011), Michaleas and Sergeantanis (2019).

<sup>12</sup> Higher dowries were paid if the marriage meant climbing up the social ladder (Michaleas and Sergeantanis 2019). The exact amount was often subject to bargaining (Sanders 1962, 166). Ferriman (1910, 141) depicts marriage as a commercial transaction in which the dowry is the principal consideration.

fact that sailors were away from home for long periods made boys even more valuable and contributed to dowry inflation (Sant Cassia and Bade 1992, 192)<sup>13</sup>.

Equal partible inheritance between all children was the general rule regarding the transmission of property across generations in 19<sup>th</sup>-century Greece (Papataxiarchis and Petmezas 1998, 218; Hionidou 2011, 220). While sons received their share as inheritance, daughters obtained theirs at the time of marriage as dowry. Providing a dowry was a legally established obligation of the bride's father (Franghiadis 1998, 188). As well as furniture, clothes, homeware or cash, dowries could consist on livestock, one or more pieces of land and/or a house depending of the parents' wealth<sup>14</sup>. In some cases, however, daughters were excluded from inheriting estates<sup>15</sup>. Although direct evidence on dowries' values is limited, it amounted to a significant fraction of the familial wealth and it probably approximated to the corresponding share if the family property were divided equally among all children (Hionidou 1999, 418). Traditionally, in the absence of the father, male children were obliged to remain single until all their sisters got married in order to contribute to their dowries and ensure the reproduction of the complex peasant family economy (Franghiadis 1998, 189). The practice of the dowry, in any case, established a strong obligation to provide daughters with enough resources to secure them a good marriage, thus imposing a great burden on the parents, especially in families with many daughters (Stott 1973, 126-127)<sup>16</sup>.

Given the perceived value of women and the subsequent attitudes to girls, it is plausible to consider that female infanticide and the mortal neglect of young girls might have been present in Greece during the 19<sup>th</sup> and early-20<sup>th</sup> century. Direct evidence on this kind of behaviour, however, is lacking. Contemporary accounts, either by Greek intellectuals or foreign travellers, stress the inferior position of women but are mostly silent about female infanticide or the mortal neglect of young girls. However, the high levels of infant and child mortality in Greece at the time might have facilitated the concealment of certain practices (i.e. smothering, suffocation, irregular feeding, exposure to cold, etc.), as they could have easily been the result of "natural" deaths (Hrdy 1999; Derosas and Tsuya 2010). Parents deliberately killing new-borns could have also reported them as stillbirths (Hanlon 2016, 537). The story in *The Murderess* also makes this clear: "There had been no particular commotion about the little daughter of Delcharo Trachilaina, they buried her the same day. Even if she noticed certain black marks round the little child's throat, the baby's mother would never have dared to speak about them, nor would anyone have believed the charge against her own mother. Obviously, the child had died of

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<sup>13</sup> Mass-scale migration started in the late-19<sup>th</sup>-century due to the economic consequences of the currant crisis. Apart from significant internal migration to urban centers, around half a million Greeks migrated abroad (mostly young males going to the United States). It seems, however, that 40-50 per cent of them returned to Greece during the following decades (Kitroeff 2000, 125; Papathanassiou 2004, 327). The Greek Parliament attempted to intervene in the issue of the lack of men by creating a special tax for unmarried males in 1887 and 1928 but it was never approved (Sant Cassia and Bade 1992, 192).

<sup>14</sup> The increasing monetization of the economy also affected this institution and resulted in "the inflation of dowries" (Sant Cassia and Bade 1992, 234; Kasdagli 2005, 9). The delay of female marriage at the turn of the 20<sup>th</sup> century has been related to the increasing dowries demanded by the grooms (Psychogios 1987, 174-180).

<sup>15</sup> In the pastoral (sometimes mixed agricultural) economies of Central and Northern Greece, as well as in Kythera, the system prescribed that only sons were entitled to the equitable distribution of livestock, land and houses (Caftantzoglou 1994, 93; Papataxiarchis and Petmezas 1998, 219; Hionidou 2016, 57). See also Couroucli (1987).

<sup>16</sup> A bride was judged primarily on the basis of the size of her dowry (Lambiri-Dimaki 1972, 75). The absence of a dowry usually meant condemning the daughter to end up a spinster (Stott 1973, 126-127).

fever” (Papadiamantis 1983/1903, 49). Not only infant deaths could be easily reported as stillbirths, but those occurring within the first days of life probably could have also escaped registration (Hionidou 1993, 123, 129)<sup>17</sup>.

Sex ratios at birth in late-19<sup>th</sup>-century Greece were indeed extremely high: the vital statistics reported around 111 and 119 new-born boys per hundred girls in 1860 and 1884, respectively (Ministry of Interior 1861, 1885)<sup>18</sup>. The relative number of male and female births in the Ionian island of Lefkada between 1823 and 1863 was also exceptionally unbalanced (Ministry of Interior 1866; Tomara-Sideri and Sideris 1986, 30-32). Even accepting some degree of sub-registry of female births<sup>19</sup>, these figures are simply too high. Oral evidence from Lefkada suggests that many families suffocated their unwanted children, a practice that seem to have been more common for girls (Tomara-Sideri and Sideris 1986, 44). In interviews carried out in rural villages in 1962, old women (probably born in the late-19<sup>th</sup> century) could not recall how many of their children had died (Blum and Blum 1965, 73-74). Many of these women appeared reluctant or unable to recall abortions or miscarriages and they actually confused abortions, “abortions” at nine months term, stillbirths and infanticides, practices that appear to have been relatively common<sup>20</sup>. They also believed that infanticide could be justified under certain circumstances: not only unbaptised children were not treated as wholly human, but also some infants were considered to be demons. The devilish nature of some new-borns was often attributed to the infant’s origins, including whether he or she was wanted or not. In this regard, female infants were more likely candidates for “nine-month abortions” than males (Ibid. 75). Writing about her experience in a Greek village in the 1970s, Du Bulay (1983, 245) recounted two cases in the last 25 years that had resulted in the mortal neglect of two baby girls: while one was cast out into a ditch to die, the other was neglected and had subsequently died. Regardless the anecdotal nature of this evidence, these episodes stress how entrenched the underlying attitudes towards girls remained and how real the temptations to get rid of unwanted girls remained even well into the 20<sup>th</sup> century.

Likewise, 19<sup>th</sup>-century Greek families were abandoning much more girls than boys. Around 60 per cent of the children that entered the Athens Foundling Hospital between 1859 and 1884 were girls (Korasidou 1995, 112-113). Zinnis, the director of this institution, attributed this situation to the subordinate position of girls, especially the poor, in 19<sup>th</sup>-century Greece (Ibid.). More females were also being abandoned in other areas such as Hermoupolis and Kephallenia (Loukos 1994, 256; Gallant 1991, 492-493). Rather than illegitimacy, poverty and the kinship system were the main drivers of child abandonment and its selectivity in Kephallenia, where young girls were marginalised and placed in an extremely vulnerable position in the 19<sup>th</sup> century (Gallant 1991, 503). As in other countries at that time, child

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<sup>17</sup> Very little evidence is available regarding stillbirth registration in Greece. Oral evidence from Mykonos showed that stillbirths were routinely not reported either as births or as deaths and were buried informally by the parents (Hionidou 1997, 158). A recent study on Hermoupolis suggested that stillbirths only started to be registered from 1912 onwards (Raftakis 2019, 149).

<sup>18</sup> These high sex ratios at birth were noted by the Greek statistical authorities. See, for instance, the comments by Soutsos in the Statistical Movement of the Population in 1860 (Ministry of Interior, 1862,4).

<sup>19</sup> The quality of birth statistics is discussed at the beginning of Section 3.

<sup>20</sup> According to a local priest, around 20 percent of all infants were intentionally aborted or killed at birth (Blum and Blum 1965, 76).



abandonment can be considered a sort of “deferred infanticide” (Johansson 1984). Loukos (1994, 256), for instance, estimated that, in Hermoupolis, around 60 per cent of these foundlings died within the first year during the period 1873-1910<sup>21</sup>.

Instead of infanticide, abandonment or mortal neglect of girls, excess female mortality could arise from more indirect mechanisms. There is some evidence that parents treated their sons and daughters differently in 19<sup>th</sup>-century Britain and continental Europe (Johansson 1984; Baten and Murray 2000; McNay et al. 2005; Horrell and Oxley 2016). An unequal allocation of resources within the household (food, care and/or workload) translated into girls’ nutritional status and morbidity, thus affecting heights and mortality rates. Studying a mountainous village in central mainland Greece, Papathanassiou (2004, 332-333) indicated that food was distributed in ways that gave priority to men. In terms of workload, it also seems that girls tended to be overburdened more than the boys (Ibid., 333)<sup>22</sup>. Similarly, in Karpathos, younger female children not only were discriminated in terms of food and clothing but also carried out the hardest tasks (Vernier 1984, 38)<sup>23</sup>.

As described in the next section and contrary to what should be expected, child sex ratios increased as children grew older circa 1880, thus suggesting that discriminatory practices were unduly increasing female mortality rates during childhood. In this regard, and despite the biological female survival advantage, Komis (2004, 290) blames the high mortality rates of female children as a partial explanation of the predominance of male adults in Greek historical populations. Infant mortality rates in Mykonos were higher for girls than for boys in 1859-1878 and, consequently, female life expectancy was lower (Hionidou 1993, 129, 149). Interestingly, the gender gap in life expectancy was higher for the age-group 1-4 than for infants (aged 0-1), thus suggesting that excess female mortality was not only affecting the first year of life but continued throughout childhood. Hionidou (1993, 149) indeed stresses the rarity of this occurrence but does not dig deeper into this issue. Likewise, Despite the female advantage in Hermoupolis, Raftakis (2019, 307-309) also found higher levels of female mortality for the age-group 1-4 in Hermoupolis around 1879. Relying on the analysis of sex ratios at different ages, both over time and across Greek provinces, the remaining of the article evidences that female infanticide and the mortal neglect of young girls were much more prevalent in Greece than previously recognised.

### **3. Infant and child sex ratios in Greece**

This article relies on sex ratios computed from the 1879 and 1881 population counts instead of mortality rates extracted from vital statistics, which suffered from extensive under-registration up to the 1920s. While population censuses were carried out by appointed authorities who counted the number of people living in each household, parents had to pay a fee in order to register births and deaths. In societies privileging males, this alters the incentives and affect the

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<sup>21</sup> The increase in the number of foundlings in Greece parallels the decline in infanticides (Loukos 1994, 256).

<sup>22</sup> The census reporters indicated that females in general worked very hard and this was likely to have increased their mortality rates (Hionidou 1993, 150).

<sup>23</sup> Eldest daughters exploited their younger sisters due to an inheritance system that prioritised primogeniture and the reproduction of the social position of male and female lines. While many younger sons emigrated, most younger girls remained single and lived in the paternal house with their eldest sister and her husband (Vernier 1984, 32-33).

decision whether to register births and deaths, especially for poor families. Even though contemporaries considered that death registration was more complete than that of births because funerals could not be carried out without a death certificate (Stephanos, 1884, 450), the death of unbaptised infants often went unregistered. This is especially problematic because if parents deliberately killed or neglected female new-borns, their deaths would not appear in the vital statistics. Although under-registration might be still an issue in population censuses, it is surely less significant and, more importantly, not sex-specific as it is evidenced later on.

During the period 1879-1920, the child sex ratios reported in Greek censuses were extremely unbalanced, ranging from 106.7 to 109.5. As shown in Figure 1, these figures remained much higher than those of most European countries during that period<sup>24</sup>. A closer look at the information available around 1880 also confirms the exceptionality of the Greek infant and child sex ratios within Europe (Beltrán Tapia 2019). Map 1 shows that the relative number of boys and girls in Greece was not only higher than in north-western Europe, but also than other Mediterranean countries such as Italy or Spain. Only child sex ratios in Bulgaria in 1880 are in line with those in Greece. It was not until 1928 onwards when the Greek figures joined the general international pattern. It should be stressed, however, that the 1870 census yields a much lower figure (102.9; see black dot in the figure 1). Whether this rate reflects a real trend or is an artefact of the underlying quality of the 1870 census is however unclear.

Fig. 1. Child sex ratios in Greece, 1870-2001



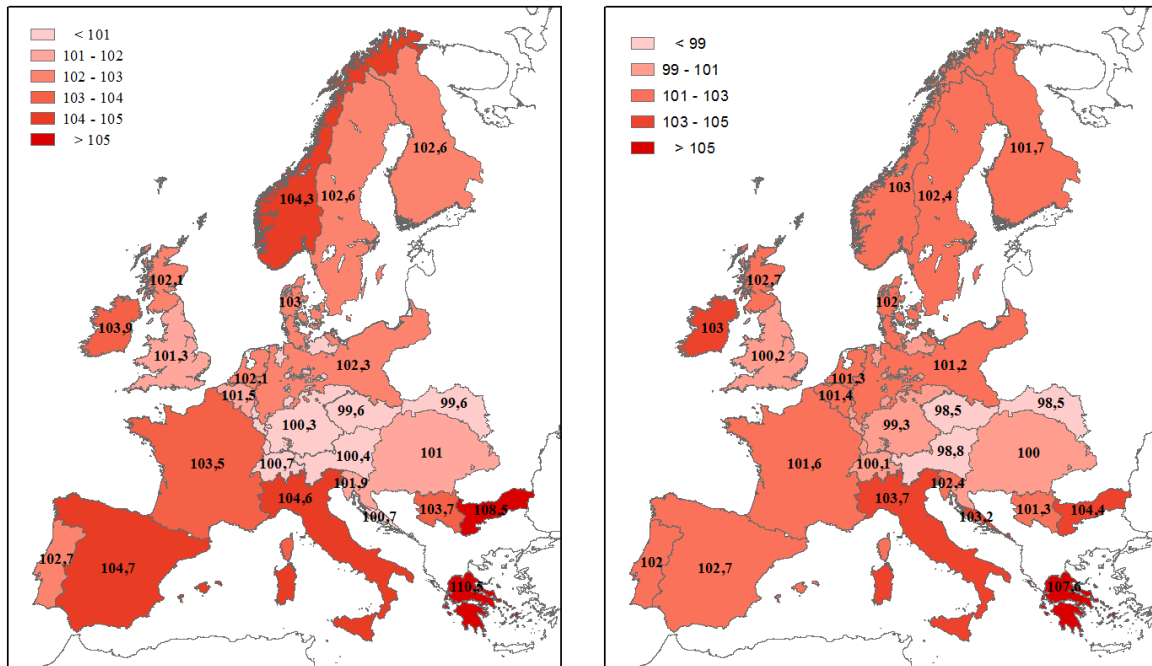
Source: Mitchell (2013).

<sup>24</sup> There is hardly any evidence on child sex ratios before 1861. The 1719 census in the town of Preveza (in north-western Greece) also presents an excess of boys (Komis 2004, 290). The source provides the number of children regardless of age: 64 per cent were male, which results in a sex ratio of 181.2.

Map 1. Infant and child sex ratios in Europe, 1880

Aged 0-1

Aged 0-4



Source: Population censuses (see Beltrán Tapia 2019).

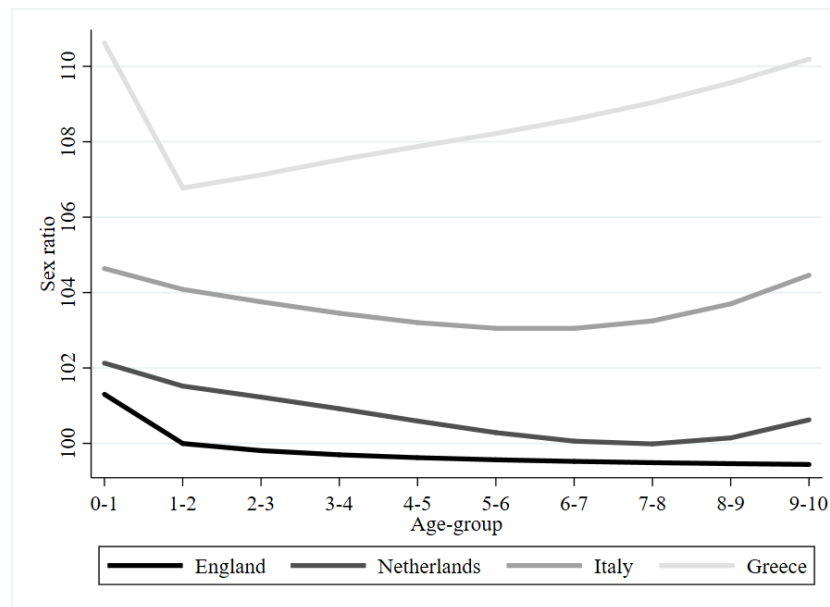
In addition, we should keep in mind that child sex ratios in the past are not comparable with contemporary ones (Beltrán Tapia and Gallego-Martínez 2017; Beltrán Tapia 2019). In this regard, mortality levels during infancy and childhood have a direct influence on sex ratios at these age-groups. Due to the female survival advantage, harsher environments are especially deleterious to boys, thus relatively increasing their mortality rates and resulting in lower sex ratios. Recent estimates indicate that infant mortality rates around 220 deaths per 1,000 live births should yield child sex ratios around parity (100 boys per hundred girls). Greek infant mortality rates during the second half of the 19<sup>th</sup> century were slightly below 200<sup>25</sup>. According to the estimates mentioned above, Greek mortality rates would be compatible with child sex ratios around 101 boys per hundred girls. The child sex ratio reported in the Greek censuses was much higher, at least up to 1920, thus evidencing that other factors were at play.

Moreover, the child sex ratio in Greece c.1880 was not only markedly different in levels but also exhibited a different trend as children got older (Fig. 2). This evolution starkly contrasts with that of other countries where gender discrimination was not an issue, such as England or the Netherlands. As explained above, the biological female advantage results in more boys than girls dying, especially during the first years of life when mortality rates are higher. Subsequently, sex ratios are expected to decline or remain flat as infants grew older. The atypical trend observed in the Greek data arguably suggests that gender discrimination was

<sup>25</sup> The infant mortality rate was 198.2 in 1860-64, 193.7 in 1875-79 and 177.4 in 1895-99 (Valaoras 1964, 132). The national average obviously hides important regional differences, as well as an urban penalty (Hionidou, 1997, 160; Raftakis, 2019, 131). It should also be mentioned that, following the Mediterranean pattern, early-childhood mortality (0-4 years) in Mykonos and Hermoupolis was very high, even higher than that of infants in the 1870s and 1880s (Hionidou, 1993, 192-193; Raftakis, 2019, 96).

unduly increasing female mortality rates at birth, in infancy and throughout childhood<sup>26</sup>. Even the Italian case, which admittedly shares some of the economic and social features present in Greece, exhibits a very different pattern.

Fig. 2. Sex ratios in infancy and childhood, by age-group, 1879



Source: Population Censuses (see Beltrán Tapia 2019).

As Komis (2004, 290) has pointed out, the predominance of boys in Greek sources can be explained by other factors apart from excess female mortality arising from gender discrimination. On the one hand, Valaoras (1960, 117-121) warned about the quality of the historical censuses, by arguing that the infant population was under-enumerated and that the omission of females was larger than that of males at nearly all ages<sup>27</sup>. His assumptions are, however, questionable and Hionidou (1993, 51) has suggested that a relatively higher female mortality might be behind the predominance of males (see Asdrahas 1978; Panagiotopoulos 1987; Caftantzoglou 1997; Komis 1999, 2004). Although under-registration of girls is theoretically plausible, neither contemporary sources nor secondary literature provide evidence why this might have been the case. Although registering vital statistics (births, marriages and deaths) entailed paying a fee, which may have dis-incentivised reporting those events<sup>28</sup>, the population census was not subject to any charge. The census was conducted by a local committee that visited each household and collected information on each person living there (Hionidou 1993, 32). There is no reason to believe that they tended to sub-register girls. In this regard, although under-registration of births was important, especially during the 19<sup>th</sup> century, it was not sex-specific (Hionidou 1993, 123; Raftakis 2019, 90).

<sup>26</sup> The sharp decline in the Greek sex ratios between the 0-1 and 1-2 age-groups clearly reflects the biological female advantage during the most critical period in terms of survival. The fact that the 1879 census mis-reported the age of a significant number of infants and thus classified them into the 1-2 age-group could also affect sex ratios in those two age-groups (Hionidou 1993, 144; Gavalas 2001, 82-83).

<sup>27</sup> See also Siampos and Valaoras (1969), Hionidou (1993) and Gavalas (2001).

<sup>28</sup> This fee, however, incentivised priests to register vital events (Hionidou 1993, 22-23).

On the other hand, the fact that populations listings had often military or tax purposes is likely to have led to deliberate misleading figures. The 1881 census indeed noticed the excess of males and warned that the enumeration was carried out under difficult circumstances. It indicated, however, that they were expecting boys, not girls, to be under-reported due to the military purpose of the census (Ministry of Interior 1884, ζ)<sup>29</sup>.

In any case, Valoras (1960, 138) tried to correct the under-registration of females by estimating the male and female population at each age-group using survival ratios obtained from model populations. Even under his questionable assumptions (see the criticism in Hionidou 1993, 55-56), these population estimates yield child sex ratios slightly below 105 boys per hundred girls during the period 1860-1915. These numbers, which are an absolute minimum, are still extremely high given the mortality conditions explained above.

Moreover, under-registration primarily affected infants (Hionidou 1993, 57). Although some infants may have escaped enumeration, this issue was due to age-misreporting (Hionidou 1993, 144; Gavalas 2001, 82-83). Many infants were reported as being one-year-old, so they were registered in the 1-2 age-group<sup>30</sup>. However, even in the case that female infants were more subject to under-enumeration, they should be visible in the censuses as they grow up. Older age-groups should then be less prone to this concern, thus reducing sex ratios. Figure 3 depicts the evolution of sex ratios at different age-groups over time and confirms that female under-reporting alone is not behind the high sex ratios observed in Greece in the late 19<sup>th</sup> and the early 20<sup>th</sup> century. Not only the evolution of sex ratios at age 5-9 mimics that of those at age 0-4, but sex ratios were also generally higher at older ages. This evidence suggests again that gender discrimination resulted in excess female mortality and reduced the number of girls both early in life and throughout childhood.

Migration might also be an issue if either boys or girls were more likely to move away. An important safety valve to balance population pressures, Greeks often resorted to migration, either seasonally or permanently, to regulate the size of the local population (Hionidou 2002). Migration mainly affected young single male adults<sup>31</sup>, so it is unlikely that it can explain away our results. Due to a strict moral code to prevent pre-marital sexual relations, working outside the household was not desirable for women, especially for young single women whose chances of getting married could be jeopardised (Stott 1973, 125, 127; Hionidou 1995, 78, 92; 1999, 418). Although single girls could be sent into domestic service to alleviate household poverty or contribute to setting up their own dowries (Sant Cassia and Bade 1992, 191; Hionidou 2005), this phenomenon hardly involved girls younger than 10 years old.

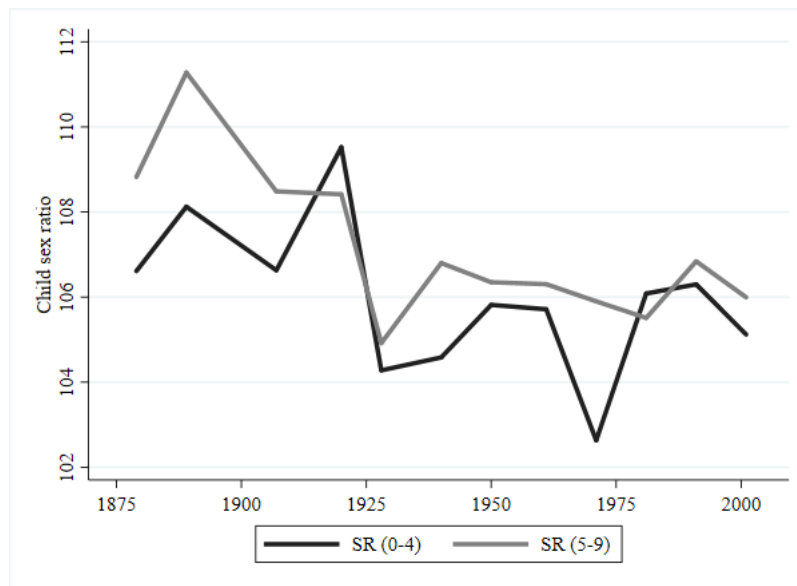
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<sup>29</sup> In this regard, the early Greek censuses suffered under-registration of males in the 18-24 age-group because they were eligible for military service at this age (Siampos, 1973, 55; Hionidou, 1993, 144). This issue became less important from 1878 onwards due to changes in the law, which imposed that all men aged 24 to 40 were also eligible for military service, thus reducing male under-registration at these age-groups (Hionidou, 1993, 20).

<sup>30</sup> The low number of infants aged 0-1 is especially visible in the 1861 and 1879 censuses in Mykonos (Hionidou 1993, 144).

<sup>31</sup> In Kythera in 1844, while around 35-40 per cent of men aged 20-35 were absent from the island, only 6-9 per cent of women had migrated (Hionidou 2016, 55).

Fig. 3. Child sex ratios (aged 0-4 and 5-9) in Greece, 1879-2001



Source: Mitchell (2013).

It is possible however that children participated in migratory flows accompanying their parents. Given that most migrants were male, it is very unlikely that they took their female children with them. Although there is very little information on sex-specific migration at early ages, it seems that, if anything, it was boys who were more likely to be absent. For instance, in Kythera in 1844, the percentage of children aged 0-4 who were registered as absent was extremely low and remarkably similar for boys and girls (Hionidou 2016, 54). For the 5-9 age group, migration was also small and biased towards boys. In this regard, it seems that, up to 1907 when the US migration regulations on acceptance of under-aged became more restrictive, a large number of under-age boys were sent abroad (Hionidou 1993, 57)<sup>32</sup>. If boys were actually the ones emigrating (either abroad or within Greece), child sex ratios should decrease as children got older. Figures 2 and 3 show actually the opposite, thus evidencing that higher sex ratios at older ages were the result of discriminatory practices against girls.

Lastly, a crucial reason why female under-registration is not likely to be the main factor behind the high child sex ratios observed in late-19<sup>th</sup>-century Greece is the fact that the relative number of boys and girls born in the US from Greek migrants is also quite unbalanced. Relying on the full-count 1880 and 1900 US Censuses (Ruggles et al. 2019), we have computed the sex ratios of children born from Greek parents. In order to avoid capturing migratory choices or the effect of the presence of other cultures in mix couples, we have only counted those children (up to 10 years old) born in the US whose parents are both Greek. The child sex ratio was 107.7 (27 children) and 110.2 (269 children) in 1880 and 1900, respectively. Although the number of children underlaying these sex ratios are admittedly small, these figures closely resemble those found in the Greek censuses at the time, thus suggesting that the specific sub-registry of girls is not likely to have played a major role.

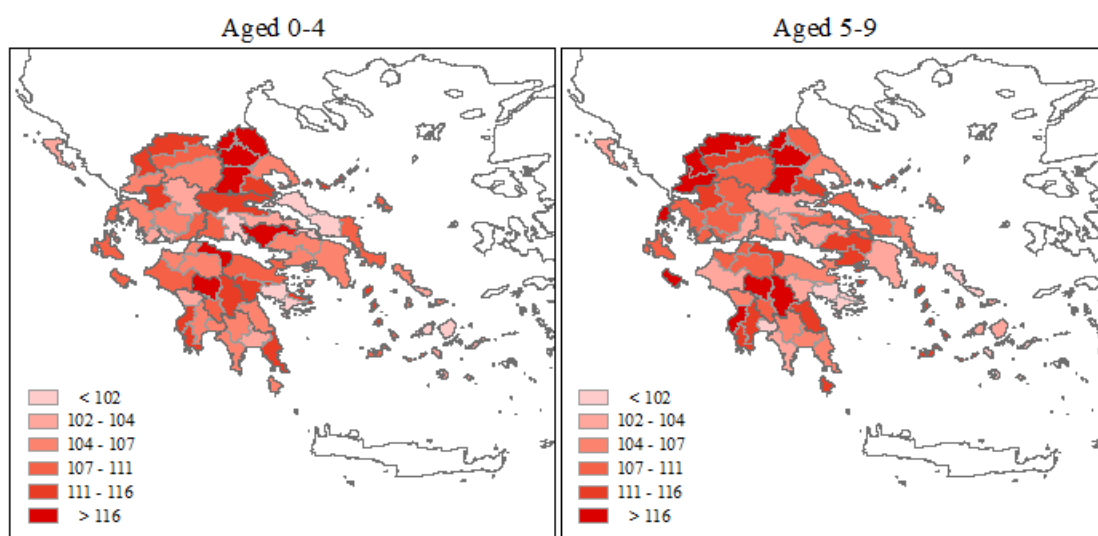
<sup>32</sup> A Parliamentary report in 1902 estimated that the proportion of children under 15 migrating was around 10 per cent (mentioned in Hionidou 1993, 57).

Summing up, under-reporting and sex-specific migration cannot therefore account for the distorted child sex ratios reported here. Next sections rely on the variation in child sex ratios across Greek provinces circa 1880 to provide further evidence that female under-registration is not the main issue behind the Greek sex ratios. Moreover, this regional analysis suggests that certain economic and social features promoted or mitigated female excess mortality early in life.

#### 4. Regional variation in child sex ratios, 1879-1881

The 1879 census was the third enumeration carried out according to international standards by the Modern Greek State (Gavalas 2001, 33-38)<sup>33</sup>. For the first time, this census classified population by age and sex in single years up to the age of 30 (and then in five-year age-groups) for each province<sup>34</sup>. In 1881, the census was expanded in order to cover the newly liberated areas of Thessaly and Arta. In total, we have information on 66 provinces<sup>35</sup>. As displayed in Map 1, average sex ratios early in life were extremely high. Interestingly, child sex ratios varied widely across provinces. Map 2 now depicts sex ratios at age 0-4 and 5-9 and evidences that some provinces exhibited extremely unbalanced figures, especially in central and northern Greece (central Peloponnese, Thessaly and Epirus). In total, 21 provinces reported child sex ratios above 110.

Map 2. Child sex ratios in Greece, 1879-1881



Source: Ministry of Interior (1881; 1884). Provincial boundaries based on a Map of the Kingdom of Greece published in 1903 by Dodd, Mead & Co (unknown author).

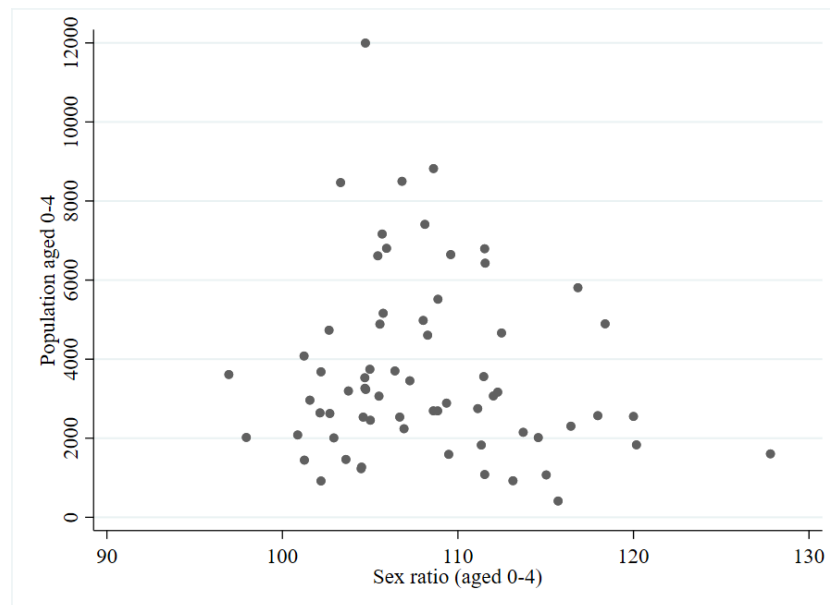
<sup>33</sup> The first modern census was carried out in 1861 and followed by the 1870 census. Twelve basic enumerations were conducted between 1828 and 1856 but their reliability is highly questioned (Siampas 1973, 44).

<sup>34</sup> Although censuses were conducted in 1889 and 1896, full returns were never published due to different reasons (Hionidou 1993, 19-21). Demographic information was resumed in the 1907 and 1920 censuses.

<sup>35</sup> Given their small size, the provinces of Kranea, Palli and Sami, on the one hand, and Oros and Mesi, on the other, have been aggregated into Kephallenia and Kerkyra, respectively.

Admittedly, part of this variation is random. Sex ratios at birth are the result of a random process and this random component is more visible in small populations. Although the average population from which child sex ratios are computed is relatively large (5,071 children), some provinces are rather small and can thus exhibit distorted sex ratios just by chance. Figure 4 below plots child sex ratios (aged 0-4) and the number of children in that age-group. As discussed above, the levels of infant mortality rates existing in Greece around 1880 would be compatible with child sex ratios around 101. Even in the smallest provinces, the probability of obtaining such sex ratios (as those, for instance, above 110) by chance alone is extremely low (see table A1 in the Appendix which lists the provinces with the highest sex ratios and reports the probability of observing such figures given the expected sex ratio in absence of discrimination)<sup>36</sup>.

Fig. 4. Child sex ratios and population size in Greece, 1879-1881



The previous section argued that female under-registration is not likely to account for the lack of girls in the censuses. Comparing province sex ratios at different age-groups also supports this conclusion. Even in the case that female miss-reporting was an issue early in life, it is less likely that older girls went unreported, so they should show up in the census as they grew up and, then, sex ratios at different ages should not correlated well. By contrast, the correlation between sex ratios at the 0-4 and 5-9 age-groups is 0.45 (see Figure 5). This figure is actually quite high considering that some provinces are relatively small and random variation thus plays an important role. The correlation coefficient jumps up to 0.70 if we only consider those provinces with more than 5,000 children aged 0-4<sup>37</sup>. These coefficients are in line with what is shown in other countries that are less suspect in terms of census quality around that

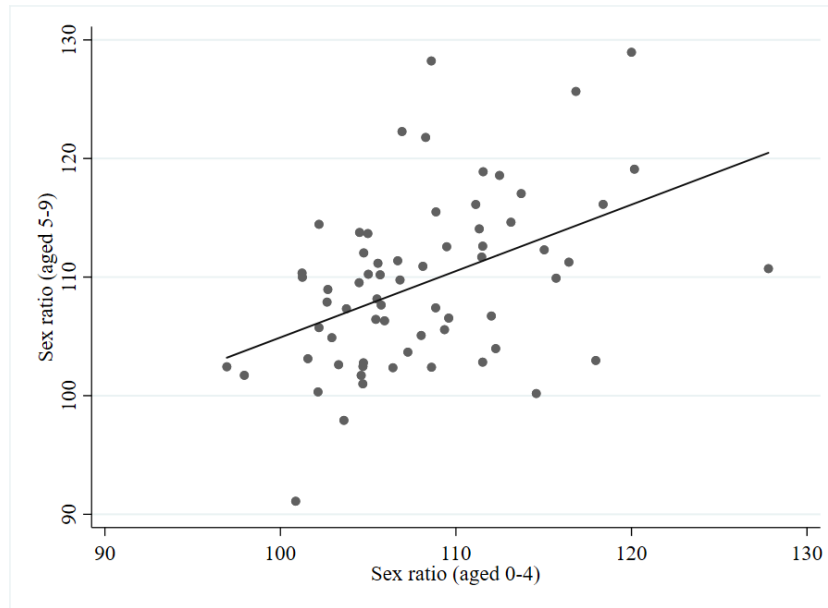
<sup>36</sup> As seen in Table A1 in the Appendix, this conclusion does not change even if considering a gender-neutral child sex ratio of 102 (compatible with infant mortality rates around 150 deaths per 1000 live births). See Beltrán Tapia (2019) for more details on the relationship between infant mortality rates and child sex ratios.

<sup>37</sup> Similarly, the correlation coefficient equals 0.61 if the 66 provinces are aggregated into their corresponding departments (16 in total).



date: the correlation between these two measures using French and Italian provinces, which are significantly larger than the Greek regions, is 0.64 and 0.63, respectively (Beltrán Tapia 2019, 12). Another method to assess whether under-registration of infants and/or children is affecting our results is to analyse the population structure (United Nations 1955; 1967). If this problem is sex-specific, regions where enumerated children comprise a smaller fraction of the population due to poor registration should also present more distorted child sex ratios. This is actually not the case in the 1879-81 census: there is virtually no correlation between child sex ratios and the percentage of children aged 0-10 over the total population ( $r=0.01$ )

Fig. 5. Child sex ratios at different age-groups (0-4 and 5-9) in Greece, 1879-1881



## 5. What is behind abnormal child sex ratios in late-19<sup>th</sup>-century Greece?

As shown above, although average Greek child sex ratios were high, there was a significant variation between regions. Interestingly, the 1879-81 census contains detailed information on the social and economic characteristics of the Greek provinces, so it is possible to dig further and assess which factors are behind the observed variation in sex ratios. We have therefore regressed province sex ratios on a set of variables that account for the economic and social features of the local communities according to the following model:

$$Sex\ Ratio_i = \alpha + \beta X_i + \varepsilon_i \quad (1)$$

The dependent variable is the child sex ratio (aged 0-1, 0-4 and 5-9) in each province measured as a proportion. In order to expand the set of results and test their robustness, we have also collected information on births in 1884 from the Greek vital statistics (Ministry of Interior, 1888), so the sex ratio at birth is also employed as dependent variable.

Although, the choice of explanatory variables is based on the literature on gender discrimination in infancy and childhood (McNay et al. 2005; Beltrán Tapia and Gallego-Martínez 2019; Beltrán Tapia 2019), this exercise is obviously constrained by the information

available in the 1879-81 census. The local economic structure is measured using the relative importance of different occupations (shepherds, sailors, servants, liberal professions and industry owners), as well as urbanisation, population density and active population. The presence of waged-labour opportunities for women is considered by computing the percentage of the female population (aged 16-40) who was registered as performing paid jobs (labourers, servants, schoolteachers and midwives). Economic conditions are further captured relying on the prevalence of farm labourers as a measure of land access inequality. The general economic conditions are also influenced by demographic pressures and the prevalent settlement pattern, so these factors have also been included in the model using the child-women ratio (the number of children aged 0-10 per woman aged 16-40) and the number of settlements per 100 kilometres.

Social and cultural factors are also expected to have a crucial role on the perception of women's value and therefore on discriminatory practices against girls. On the one hand, different religions co-existed, so we have created two dummy variables to distinguish Orthodox Christians from other Christians and other religions (mostly Jews and Muslims). On the other hand, the complex interaction between family types, inheritance rules and dowry systems in Greece is likely to have played a fundamental role. The geography of the different systems of family organisation existing in Greece at the time can be found in Couroucli (1987), Sant Cassia and Bada (1992); Caftanzoglou (1994), Papataxiarchis and Petmezas (1998), Hionidou (1995; 1999; 2011) and Kaser (2009). In the agricultural and pastoralist communities of mountainous and inland Greece, married couples resided with or near the husband's parents and extended families were relatively common in order to support a complex division of labour based on large households<sup>38</sup>. In this regard, Kaser (2009) distinguishes two areas depending on whether these arrangements responded to "lifecycle" or "household cycle" complexity. The islands and the coastal areas, on the other hand, also relied on fishing and seafaring and the dominant household structure was the nuclear household (Hionidou, 1999; 2011, 232)<sup>39</sup>. The value attached to women as important economic and social agents seems to have been higher in the maritime and agricultural communities of the Aegean (Papataxiarchis and Petmezas 1998, 224). Contrary to the general pattern elsewhere in Greece, some islands had long practised matrilocality and women there seem to have enjoyed a comparatively freer status (Sant Cassia and Bada 1992, 33). In addition, dowries in these areas tended to be more generous and daughters were often endowed with houses at marriage (Couroucli 1987, 329). Following Kaser's classification on household type (2009, 270) and Hionidou's contribution to this topic (2011)<sup>40</sup>, we have classified the different provinces into three groups depending on the most prevalent family type.

Lastly, the variation in sex ratios can arise from other unobserved factors. A different disease environment, for instance, may affect boys and girls differently (Anderson and Ray 2010). Also, although we have included many features in the model, it is possible that omitted

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<sup>38</sup> Co-residence with the husband's parents was though temporary and ended as soon as the son achieved economic autonomy and his family grew in size (Papataxiarchis and Petmezas 1998, 223).

<sup>39</sup> Complex households did exist in these areas but their relative importance was small (never exceeding ten per cent of the total households) and mostly the result of temporary arrangements.

<sup>40</sup> Although we followed Kaser's classification (2009), some adjustments were made for various areas, in particular for the islands of Kerkyra and Kythera where existing studies have shown that most common family type was the nuclear household (Couroucli, 1987; Hionidou, 2011).

variables might be biasing the results. A set of regional dummies have been therefore considered in order to account for regional fixed-effects (the population census groups the provinces into 16 departments). Summary statistics of the dependent and explanatory variables included in this model are reported in table A2 in the Appendix.

Given that some provinces are relatively small, the role of random variability in determining sex ratios is not uniform. In order to mitigate this concern, equation 1 is estimated relying on maximum-likelihood methods that assume a binominal distribution and use a logit function. As explained in Beltrán Tapia and Gallego-Martínez (2019), this approach takes into account the sample size underlying each sex ratio and therefore control for the varying role that chance plays in determining sex ratios in the different provinces<sup>41</sup>. Considering all these factors simultaneously allows identifying the specific relationship between the variables at play. It should be stressed though that this model does not seek to estimate causal effects but simply to reveal general patterns behind the data.

The results of regressing sex ratios at different ages (at birth and at ages 0-1, 0-4 and 5-9) on the set of variables explained above are reported in table 1. While the first column in each specification presents the baseline specification, the second column extends the model to include regional fixed-effects. Crucially, these results hardly change regardless of the specification employed, thus evidencing that the observed relationships are highly robust. The fact that these results are similar for all age groups also confirms that female under-registration is not likely to play an important role here.

This analysis generally confirms previous studies (Johansson 1984; McNay et al. 2005; Beltrán Tapia and Gallego-Martínez 2019; Beltrán Tapia 2019). Firstly, urban areas are clearly associated with lower sex ratios. Although this effect may suggest that cities reduced gender discrimination through other mechanisms apart from female employment (Evans 2019)<sup>42</sup>, we should consider that the urban penalty is likely to have taken a higher toll on boys due to the female survival advantage<sup>43</sup>. Both effects are likely to be playing a role but disentangling their relative importance is not possible with this data. Other features of the economic context, such as a higher active population and the presence of sailors and servants, are also related to higher sex ratios. Although the effect of the active population is more difficult to explain (and also weaker as it will become apparent later), an economic structure dominated by servants and/or sailors seems to have strongly shaped the attitudes towards girls. The importance of servants, on the one hand, can be thought as a proxy for inequality since more families need to resort to unskilled paid work outside the household. A sea-faring community, on the other hand, is likely to have fostered son preference in different ways. Not only were men the ones becoming sailors but also, these jobs implied that many men stayed away for long periods of time and were also subject to higher mortality rates than women. This reduced the pool of potential husbands, thus making girls even less valuable in the marriage market and affecting their status within the

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<sup>41</sup> Another advantage of this method is that it deals with the bounded nature of sex ratios. For more details, see Wilson and Hardy (2002).

<sup>42</sup> According to Evans (2019), urban environments also foster gender equality by raising the opportunity costs of the male breadwinner, increasing exposure to women in socially valued roles and facilitating women's collective action.

<sup>43</sup> Infant mortality rates were higher in cities than in the countryside at least until the late 1930s (Hionidou 1993, 52-53; Raftakis, 2019, 131).

household (Erllich 1966). Remarkably, the existence of waged labour opportunities for women is clearly associated with lower sex ratios early in life. By enhancing women's economic and social status, the possibility of working outside the household improved the value of girls and alleviated gender discrimination. These suggestive results confirm what has been found in the literature focusing on other European populations including Sweden, England or Spain (Johansson 1984; MacNay et al. 2005; Beltrán Tapia and Gallego-Martínez 2019).

Table 1. Correlates of sex ratios (at birth, 0-1, 0-4 and 5-9) in Greece, 1879-81

	Dependent variable: Sex ratio (proportion)							
	At birth		Aged 0-1		Aged 0-4		Aged 5-9	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Population density	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Urbanisation (%)	-0.02*** (0.00)	-0.02*** (0.01)	-0.02*** (0.01)	-0.02** (0.01)	-0.01*** (0.00)	-0.01** (0.01)	-0.02*** (0.00)	-0.01** (0.01)
Settlement pattern	0.20 (0.18)	0.21 (0.17)	0.37 (0.24)	0.43* (0.25)	0.11 (0.18)	0.20 (0.15)	0.08 (0.16)	0.17 (0.15)
Active Population (%)	0.14** (0.06)	0.14** (0.06)	0.06 (0.07)	0.13 (0.09)	0.13** (0.06)	0.13* (0.07)	0.14** (0.06)	0.12* (0.07)
Child-women ratio	0.48 (0.80)	-0.71 (1.14)	-0.25 (1.13)	0.47 (1.84)	0.97 (0.88)	-0.43 (1.38)	1.09 (0.89)	-0.39 (1.29)
Farm labourers (%)	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)
Shepherds (%)	0.01 (0.02)	0.01 (0.02)	0.03 (0.03)	0.03 (0.03)	0.01 (0.02)	0.01 (0.03)	0.01 (0.02)	0.01 (0.02)
Sailors (%)	0.06*** (0.02)	0.06*** (0.02)	0.08*** (0.02)	0.09*** (0.02)	0.06*** (0.02)	0.06*** (0.02)	0.05*** (0.02)	0.05*** (0.02)
Servants (%)	0.08* (0.04)	0.21*** (0.05)	0.20*** (0.06)	0.22*** (0.07)	0.11** (0.05)	0.19*** (0.06)	0.12** (0.05)	0.20*** (0.06)
Women waged labour	-0.05* (0.03)	-0.16*** (0.04)	-0.13*** (0.04)	-0.17*** (0.06)	-0.08** (0.04)	-0.17*** (0.04)	-0.09** (0.04)	-0.17*** (0.04)
Family type (Ref. Cat.: Nuclear hous.)								
Patrilocal: life-cycle complexity	-0.23 (0.17)	0.15 (0.18)	-0.47** (0.22)	-0.04 (0.48)	-0.30* (0.17)	0.09 (0.28)	-0.26 (0.18)	0.13 (0.26)
Patrilocal: household-cycle complex.	-0.69*** (0.24)	-0.29 (0.27)	-0.60* (0.31)	-0.42 (0.55)	-0.52** (0.23)	-0.16 (0.35)	-0.47** (0.22)	-0.10 (0.33)
Non-orthodox christians (%)	0.04*** (0.01)	0.03*** (0.01)	0.02** (0.01)	0.01 (0.01)	0.02*** (0.01)	0.01** (0.01)	0.02*** (0.01)	0.01* (0.01)
Other religions (%)	0.01 (0.01)	-0.00 (0.02)	-0.02 (0.01)	-0.00 (0.02)	0.00 (0.01)	-0.00 (0.02)	0.01 (0.01)	0.00 (0.02)
Region Fixed-Effects (16 Départements)	NO	YES	NO	YES	NO	YES	NO	YES
Observations	66	66	66	66	66	66	66	66
Deviance	6.396	4.095	10.18	7.676	6.664	4.769	6.572	4.603

Robuts standard errors between brackets; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Contrary to our expectations, nuclear households do not seem to be correlated with lower sex ratios. It is actually the opposite: regions where other family types are more prevalent, especially those in category 3 (Patrilocal - household-cycle complexity), are associated with lower sex ratios. These results become statistically insignificant when we control for regional fixed-effects. This might be due to the lack of variation in family types when regional dummies are included or to the presence of other variables that may be behind lower sex ratios (such as worse economic conditions) that are effectively controlled for when including the regional fixed-effects<sup>44</sup>. It is also possible that our proxies do not capture well the regional variation in Greek family types. It is nonetheless interesting to note that the prevalence of nuclear families should not disguise the strong economic links between the paternal household and those of his sons (Hionidou 2011, 232). Cooperation between kinship living in independent households was indeed an extended practice in most Greek regions (Papataxiarchis and Petmezas 1998, 224), so perhaps the different family types were not that different after all, at least in terms of their attitudes towards girls.

The effect of religion turns up to be statistically significant in our models. Relative to Orthodox, the importance of other Christian creeds is positively related with sex ratios, suggesting that girls' status was lower in those communities. This result is basically driven by the sizable number of Catholics in Syros and Tinos (12.4 and 31.6 per cent of the population respectively), so it could be affected for other unobserved characteristics of those areas. The estimated coefficient for "other religions" is however not different from zero. Given that this variable mixed up different religions (mostly Jews and Muslims), this may reflect the existence of countervailing effects (more on this later). The other variables included in the model do not seem to have a clear impact relationship with sex ratios. The fact that the variable reflecting land access inequality shows no significant result might be due to a landowning structure where large estates were almost absent. The fact that there is no visible effect of the child-women ratio is in itself interesting. Larger families are supposed to put more pressure on the existing resources and bad economic conditions tend to penalise boys due to the male disadvantage. Although sex ratios are therefore expected to be lower, that is not the case, suggesting that gender discrimination may have offset that effect.

Given that the 1881 Addendum to the Census that covered the northern provinces that had been recently annexed in Thessaly and Arta was carried out under difficult conditions that is likely to have affected its accuracy (Ministry of Interior, 1909, 1β), we have repeated the exercise focusing only on the information provided in the 1879 Census for the remaining provinces. This analysis not only serves as a robustness test of the previous results, but it also allows incorporating the information on literacy that was provided only for those provinces. Given that education helps countervailing traditional norms, literacy rates, both as a measure of the overall educational level and the gender literacy gap, may have also influenced the prevailing attitudes towards girls.

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<sup>44</sup> Islands and coastal areas seem to have enjoyed better standards of living, thus decreasing infant and child mortality (Hionidou 1997; Gavalas 2001). As explained in Section 2, sex ratios early in life should thus be relatively higher there due to the lesser death toll that boys suffered there during infancy and childhood. Recent evidence shows that infant mortality rates in the urban centre of Hermoupolis on the island of Syros were even higher than the national Greek average, so this argument should be considered cautiously (Raftakis 2019).

This analysis confirms the results reported before (see table A3 in the Appendix). In addition, our data does not show any effect of literacy levels on child sex ratios, which suggest that attitudes towards girls were highly ingrained, at least during the period of study. Another difference from table 1 is that the importance of other religions is now clearly associated with lower sex ratios. Given that the Muslim population was especially important in the Northern provinces that have been excluded from this exercise, this effect is likely to reflect the influence of other religions. Lastly, as mentioned before, the link between the population structure, measured as the rate of the active population, is hardly statistically significant now, thus questioning the role of this dimension on sex ratios.

Nonetheless, it is interesting to note that, even after controlling for the effect of all these explanatory variables, other unobserved features were shaping the observed sex ratios (see table A4 in the Appendix). The estimated effect of the regional fixed-effects show that there was something else driving sex ratios up in the Cyclades islands, Arta, and the island of Zakynthos. When the analysis is carried out excluding the territories annexed in 1881 (Thessaly and Arta), it is the departments of Akarnania and Aitolia, Attika and Boiotia, Kephallenia, Cyclades, and Zakynthos the ones showing unexplained higher sex ratios. Further work is needed to identify which conditions were especially deleterious for girls' health in these regions.

Before concluding, we would like to have a closer look at the children born in the US whose parents were both Greek. The 1900 US Census reports 260 children aged 0-10 fulfilling those conditions with a sex ratio equalling 110.2 (141 boys and 128 girls). Although this is a small sample, regression analysis at the individual level shows that the probability of being male is significantly higher for those kids with a larger number of siblings (see table A5 in the Appendix). This result is robust to controlling for age, urban and farm status, the father's socio-economic status and mother's age. It is also interesting to note that the probability of being male does not seem to decrease with age (as expected due to the female biological advantage). Gender discrimination therefore offset male excess mortality early in life, an effect that was especially acute in large families. Despite living in a totally different environment from their motherland, these results strongly suggest that those Greek families that migrated to the US did not leave their cultural values behind, especially their strong son preference and their attitudes towards girls.

## 6. Conclusion

Son preference was a crucial feature of late-19<sup>th</sup>-century and early-20<sup>th</sup>-century Greek society. The analysis carried out here strongly suggests that, in a context of generalised poverty, gender discrimination resulted in excess female mortality during infancy and childhood. Sex ratios early in life remained extremely unbalanced at least between 1879 and 1921, showed remarkable regional patterns and, as discussed above, are not likely to be explained by female under-registration alone.

Identifying however which practices are behind these figures is challenging. It is likely that, at least circa 1880, female infanticide, mortal neglect and/or abandonment of infant girls contributed to the extremely high sex ratios at birth (118.7) and in the 0-1 age-group (110.3).

Although the under-reporting of girls might be an issue here, especially of births, the sex ratio in the 1-2 age-group is still extremely high (107) and keeps growing steadily throughout childhood (over 110 in the 9-10 age-group)<sup>45</sup>. We argue that this arises from families prioritising boys in terms of the distribution of resources. In a society close to subsistence levels and high mortality rates, differences in the way that parents treated boys and girls in terms of food, child-care or workload is likely to have contributed to higher female mortality rates due to malnutrition and illness. As described in section 2, there is indeed considerable qualitative, mostly anthropological, evidence from twentieth-century Greece suggesting that families privileged sons in different ways. This was probably even more acute in large families, especially in those with several daughters.

Beyond the role of the kinship system and the dowry as an underlying force behind the attitudes towards women suggested by high sex ratios, the regional patterns found here point to the importance of other dimensions that lessened or aggravated gender discrimination in response to how the value of girls and women was perceived in different contexts. Economic conditions, marriage prospects and the availability of female labour opportunities, as well as cultural and religious factors, all contributed to shaping women's and girls' relative status in society. More research is clearly needed however to determine the distinct effect of family types, inheritance rules and dowry systems on sex ratios. This article is only a first step towards re-evaluating the importance of the lethal consequences of gender discriminatory practices in modern Greek society, an issue that has long been neglected despite all the hints that pointed in that direction.

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<sup>45</sup> Moreover, the decline in sex ratios from birth to the 1-2 age-group can also be explained by the biological survival male disadvantage that makes boys more vulnerable during this crucial stage (especially in a high-mortality environment).

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## APPENDIX

Table A1. Probability that the observed child sex ratios are obtained by chance.  
Provinces with child sex ratios above 110.

Province	Population aged 0-4			Child Sex Ratio	One-tailed test (p-value)	
	Total	Boys	Girls		CSR=101	CSR=102
Agia	1606	901	705	127.8	0.0000***	0.0000***
Aigialia	2305	1240	1065	116.4	0.0003***	0.0008***
Almyros	1083	571	512	111.5	0.0550*	0.0754*
Argos	3167	1675	1492	112.3	0.0016***	0.0037***
Domokos and Farsala	2552	1392	1160	120.0	0.0000***	0.0000***
Epidavros Limira	3070	1622	1448	112.0	0.0022***	0.0050***
Phthiotis	6794	3582	3212	111.5	0.0000***	0.0001***
Gortinia	5809	3130	2679	116.8	0.0000***	0.0000***
Kalabaka	2751	1448	1303	111.1	0.0065***	0.0130**
Kea	1073	574	499	115.0	0.0180**	0.0265**
Larisa	4894	2653	2241	118.4	0.0000***	0.0000***
Levadia	2572	1392	1180	118.0	0.0000***	0.0001***
Mantinia	6429	3390	3039	111.6	0.0000***	0.0002***
Paxi	412	221	191	115.7	0.0921*	0.1097
Pilia	3559	1876	1683	111.5	0.0017***	0.0043***
Skopelos	925	491	434	113.1	0.0455**	0.0617*
Tyrnavos	1834	1001	833	120.2	0.0001***	0.0003***
Trifylia	4664	2469	2195	112.5	0.0001***	0.0004***
Tzoumerka	2150	1144	1006	113.7	0.0032***	0.0063***
Valtos	1828	963	865	111.3	0.0199**	0.0325**
Ydra and Troezen	2017	1077	940	114.6	0.0025***	0.0049***

Note: The last two columns report the probability of obtaining the observed sex ratio assuming that the expected child sex ratio is either 101 or 102. The reasons why the hypothetical gender-neutral sex ratios should be around 101 (or 102 is we take a more conservative figure) are given in the text. These results are computed employing a binomial distribution where the sample proportion is defined by:  $E[x]=p$ ;  $\sigma^2 = [p \cdot (1-p)]/n$ . \*\*\*, \*\*, \* indicates that the observed child sex ratios are very unlikely to have been observed by chance (according to conventional significance levels: 1, 5 and 100 per cent levels respectively).

Table A2. Summary statistics. Greek provinces, 1879-1881

	Obs	Mean	St. Dev.	Min	Max.
Dependent variables:					
Sex ratio at birth	66	121. 0	17.6	98.0	196. 5
Infant sex ratio (0-1)	66	110. 0	21.7	63.0	200. 0
Child sex ratio (0-4)	66	108. 2	5.8	97.0	127. 8
Child sex ratio (0-9)	66	109. 5	7.2	91.1	129. 0
Explanatory variables:					
Population density	66	39.6	32.75	9.9	187. 4
Settlement pattern	66	0.9	0.9	0.2	6.4
Urbanisation	66	9.8	20.3	0	77.7
Fam. type 1: Nuclear household	66	0.65	0.48	0	1
Fam. type 2: Patrivirilocal: life-cycle complexity	66	0.11	0.31	0	1
Fam. type 3: Patrivirilocal: household-cycle complex.	66	0.24	0.43	0	1
Inequality	66	18.4	14.4	0.8	59.7
Active Population (%)	66	61.4	2.5	56.0	70.2
Child-women ratio	66	1.27	0.15	0.84	1.6
Shepherds (%)	66	4.7	3.8	0.03	18.8
Sailors (%)	66	2.0	3.8	0	18.2
Servants (%)	66	3.7	2.6	0.6	14.8
Women waged labour (%)	66	3.5	3.6	0.3	21.5
Non-orthodox Christians	66	0.8	4.2	0	31.6
Other religions	66	1.8	6.1	0	30.1

Table A3. Correlates of sex ratios (at birth, 0-1, 0-4 and 5-9) in Greece, 1879

	Dependent variable: Sex ratio (proportion)							
	At birth		Aged 0-1		Aged 0-4		Aged 5-9	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Population density	-0.00 (0.00)	-0.01 (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.01)
Urbanisation	-0.01** (0.01)	-0.01* (0.01)	-0.02** (0.01)	-0.01 (0.01)	-0.01* (0.01)	-0.01 (0.01)	-0.01* (0.01)	-0.01 (0.01)
Settlement pattern	0.14 (0.10)	0.10 (0.11)	0.16 (0.14)	0.23 (0.16)	0.08 (0.12)	0.12 (0.12)	0.06 (0.11)	0.10 (0.11)
Active Population (%)	0.11** (0.06)	0.12* (0.06)	0.09 (0.06)	0.14* (0.08)	0.11* (0.06)	0.13* (0.07)	0.11* (0.06)	0.12* (0.07)
Child-women ratio	0.39 (0.74)	-0.30 (1.00)	0.75 (1.30)	1.42 (1.42)	0.56 (0.77)	0.09 (1.25)	0.55 (0.74)	-0.15 (1.22)
Farm labourers (%)	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Shepherds (%)	-0.00 (0.02)	-0.02 (0.02)	-0.01 (0.04)	-0.02 (0.04)	-0.01 (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.02 (0.02)
Sailors (%)	0.05*** (0.02)	0.06*** (0.02)	0.08*** (0.02)	0.10*** (0.03)	0.05*** (0.02)	0.06*** (0.02)	0.04** (0.02)	0.06** (0.02)
Servants (%)	0.08** (0.04)	0.23*** (0.06)	0.17** (0.07)	0.23* (0.13)	0.15*** (0.05)	0.23*** (0.08)	0.15*** (0.05)	0.24*** (0.07)
Women waged labour (%)	-0.07*** (0.03)	-0.17*** (0.04)	-0.11** (0.05)	-0.17** (0.07)	-0.13*** (0.04)	-0.20*** (0.05)	-0.13*** (0.04)	-0.21*** (0.04)
Family type (Ref. Cat. Nuclear house)								
Patrilocal: life-cycle complexity	-0.34* (0.19)	0.18 (0.23)	-0.33 (0.25)	0.22 (0.62)	-0.37* (0.21)	0.12 (0.31)	-0.33 (0.21)	0.16 (0.28)
Patrilocal: household-cycle comple	-0.80*** (0.27)	-0.11 (0.28)	-0.57* (0.33)	0.03 (0.65)	-0.60** (0.25)	0.01 (0.34)	-0.56** (0.24)	0.05 (0.32)
Male literacy	0.01 (0.01)	-0.01 (0.01)	-0.03 (0.02)	-0.04** (0.02)	-0.00 (0.02)	-0.01 (0.02)	0.00 (0.02)	-0.01 (0.01)
Gender literacy gap	-0.00 (0.01)	0.01 (0.01)	0.04** (0.02)	0.05*** (0.02)	-0.00 (0.02)	0.01 (0.02)	-0.00 (0.02)	0.01 (0.01)
Non-orthodox christians	0.03** (0.01)	0.04*** (0.01)	0.04** (0.02)	0.03** (0.01)	0.02 (0.01)	0.02 (0.01)	0.01 (0.02)	0.01 (0.01)
Other religions	-0.37*** (0.06)	-0.40*** (0.05)	-0.40*** (0.08)	-0.39*** (0.07)	-0.30*** (0.06)	-0.23*** (0.06)	-0.30*** (0.05)	-0.23*** (0.06)
Region Fixed-Effects (16 Départements)	NO	YES	NO	YES	NO	YES	NO	YES
Observations	55	55	55	55	55	55	55	55
Deviance	4.009	2.358	6.666	4.851	4.499	3.204	4.449	3.123

Robust standard errors between brackets; \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table A4. Regional fixed-effects on sex ratios at birth, 0-1, 0-4 and 5-9 in Greece, 1879-1881  
(after controlling for all explanatory variables)

	Dependent variable: Sex ratio (proportion)							
	All territories (Table 1)				Excluding Thessaly and Arta (Table A3)			
	At birth	Aged 0-1	Aged 0-4	Aged 5-9	At birth	Aged 0-1	Aged 0-4	Aged 5-9
	(2)	(4)	(6)	(8)	(2)	(4)	(6)	(8)
Reference Cat.: Achaia and Ilida								
Akarnania and Aitolia	0.25 (0.31)	0.28 (0.44)	0.30 (0.33)	0.30 (0.32)	0.60* (0.31)	0.76* (0.46)	0.70** (0.34)	0.67** (0.33)
Argolis and Korinthia	-0.14 (0.37)	-0.31 (0.58)	-0.03 (0.41)	-0.06 (0.40)	0.12 (0.30)	0.21 (0.49)	0.22 (0.34)	0.16 (0.33)
Arkadia	-0.53** (0.24)	-0.07 (0.41)	-0.20 (0.27)	-0.24 (0.27)	-0.36* (0.20)	0.11 (0.43)	-0.04 (0.26)	-0.08 (0.25)
Attika and Boiotia	0.13 (0.32)	-0.10 (0.40)	0.41 (0.35)	0.34 (0.36)	0.35 (0.24)	0.26 (0.35)	0.65** (0.28)	0.58** (0.28)
Euboia	0.16 (0.39)	-0.11 (0.58)	0.39 (0.45)	0.27 (0.44)	0.46 (0.30)	0.33 (0.50)	0.64 (0.39)	0.51 (0.37)
Phthiotis and Phocis	-0.24 (0.31)	-0.29 (0.47)	-0.17 (0.34)	-0.24 (0.34)	0.12 (0.27)	0.22 (0.45)	0.21 (0.32)	0.10 (0.33)
Arta	1.11*** (0.35)	0.22 (0.53)	1.19*** (0.40)	1.20*** (0.41)				
Kephalenia	1.13** (0.44)	0.36 (0.89)	0.37 (0.54)	0.47 (0.50)	1.58*** (0.41)	1.20 (0.77)	0.90* (0.49)	0.98** (0.47)
Kerkyra	0.42 (0.66)	-0.02 (0.88)	-0.02 (0.46)	0.10 (0.44)	1.27*** (0.33)	1.05 (0.77)	0.44 (0.38)	0.57* (0.34)
Cyclades	0.94*** (0.36)	0.89 (0.61)	1.08** (0.43)	1.06*** (0.41)	1.10*** (0.35)	1.42** (0.70)	1.31*** (0.40)	1.28*** (0.37)
Laconia	0.27 (0.33)	0.64 (0.45)	0.18 (0.36)	0.11 (0.36)	0.42 (0.33)	0.78* (0.47)	0.34 (0.38)	0.25 (0.38)
Messinia	0.36 (0.26)	0.14 (0.41)	0.24 (0.31)	0.20 (0.30)	0.43* (0.22)	0.26 (0.38)	0.32 (0.28)	0.29 (0.26)
Thessaly	0.20 (0.51)	-0.48 (0.70)	0.37 (0.57)	0.25 (0.55)				
Trikala	0.35 (0.39)	-0.30 (0.55)	0.49 (0.44)	0.40 (0.44)				
Zakynthos	1.01** (0.50)	0.71 (0.74)	0.75 (0.46)	0.84* (0.44)	1.23*** (0.35)	1.16 (0.81)	0.90** (0.38)	0.97*** (0.35)
Observations	66	66	66	66	55	55	55	55

This table reports the coefficients of the regional fixed-effects controlling for all the explanatory variables estimated in tables 1 and A3. See columns (2), (4), (6) and (8) there for more details.



Table A5. Gender discrimination in Greek families in the US, 1900

	Dependent variable: Probability of being male		
	Aged 0-10	Aged 0-4	Aged 5-10
	(1)	(2)	(3)
Number of siblings	0.316*** (0.120)	0.289* (0.149)	0.429* (0.223)
Urban status	-0.045 (0.450)	-0.121 (0.532)	-0.267 (1.034)
Farm status	0.402 (1.333)		-1.185 (1.817)
Mother's age (at birth)	-0.069** (0.030)	-0.119*** (0.039)	0.032 (0.054)
Father's occupational score	-0.005 (0.009)	-0.009 (0.011)	0.002 (0.015)
Age (ref. cat.: 0-1)			
Aged 1-2	0.458 (0.458)	0.335 (0.466)	
Aged 2-3	-0.402 (0.532)	-0.508 (0.545)	
Aged 3-4	-0.780 (0.547)	-0.839 (0.561)	
Aged 4-5	-0.046 (0.613)	-0.261 (0.644)	
Aged 5-6	-0.329 (0.638)		
Aged 6-7	-0.408 (0.620)		0.400 (0.776)
Aged 7-8	-0.117 (0.704)		0.514 (0.862)
Aged 8-9	-0.263 (0.762)		0.516 (0.907)
Aged 9-10	-0.140 (0.696)		0.378 (0.836)
Aged 10-11	0.605 (1.211)		1.148 (1.278)
Pseudo R-squared	0.057	0.081	0.103
Observations	223	147	75

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. For simplicity, the intercept is not reported.

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