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Economic development, female wages and missing female births in Spain, 1900-1930

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Abstract

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ABSTRACT

Focusing on the years between 1900 and 1930, a period characterised by significant structural transformations and rapid economic growth. this article shows that Spain exhibited abnormally-high sex ratios at birth (SRB) at least until the 1920s. Apart from ruling out the possibility that female under-registration and different mortality environments solely explain the results reported here, the analysis of regional information indicates that SRB were higher in those provinces whose economic structure was dominated by agriculture and manufacturing (relative to the service sector). In addition, during the First World War period, which arguably subjected the Spanish economy to an exogenous demand shock, increased wages resulted in decreases in SRB in those province-years that reported male and female wages. Importantly, the protective role of female wages was twice as large as that of males. Likewise, in those provinces that published male but not female wages, increases in male wages had the opposite effect and increased the SRB, thus further supporting the link between relative labour returns and female neglect around birth. As expected, the relationship between wages and SRB vanished during the 20s along with the bias in SRB. These results stress that gender discrimination around birth does not necessarily vanishes with economic growth unless this process is not accompanied by expanding labour opportunities for women.

Key words: Sex ratio at birth, Gender discrimination, Gender wage gap, Industrialisation

JEL: I14, I15, J13, J16, N33

1.- Introduction

Sex-selective abortions, female infanticide and other types of female neglect around birth constitute a well-known phenomenon in low-income countries with strong son preference (Hesketh and Xing 2005, Echavarri and Ezcurra 2010). Chao et al. (2019) identify 12 countries which exhibited unbalanced sex ratios at birth between 1970 and 2017, resulting in around 25 million female births across the world[1]. Although accentuated due to fertility decline and the availability of prenatal sex determination technologies, these gender-discriminatory practices tended to be rooted in the past and the traditional status that girls and women had suffered in those societies (Bhaskar and Gupta 2007; Drixler 2013; Gupta 2014).

The strong son preference is linked to economic, social and cultural considerations affecting the perceived value of girls (Das Gupta et al. 2003; Jayachandran 2015; Guilmoto 2018). In rural areas, boys are considered as a crucial labour force for the family farm and the lack of female employment opportunities undermines girls' relative status (Rosenzweig and Schultz 1982). Cultural practices reinforce the economic implications of having a daughter and not a son. Patrilocality and strict dowry systems constitute a drain on household resources and a waste investment because daughters end up living with their in-laws (Dyson and Moore 1983; Bhalotra et al. 2020)[2]. These preferences are accentuated under adverse conditions due to the need to allocate limited household resources (Das Gupta and Shuzhuo 1999). Additionally, women are disadvantaged in societies where sons are responsible for worshipping their ancestors and where lineage is solely traced though males (Abrevaya 2009; Almond et al. 2013). Interestingly, son preference and the subsequent sex-selective abortions does not necessarily disappear with economic growth or the widespread of education, at least during the first stages of economic development as the Indian experience illustrate (Echavarri and Ezcurra 2010).

Despite that previous literature have stressed that cultural and religious values, as well as household formation patterns, prevented female infanticide in historical Europe (Derosas and Tsuya 2010; Lynch 2011), recent research argues that female infanticide was more pervasive than traditionally thought, especially in Southern Europe. Baptismal records, for instance, suggest that this practice could have been in place in Modern France and Italy (16-18th centuries), especially under adverse circumstances (Hanlon 2016). Some evidence suggests that female infanticide may have persisted in France throughout the 19th century (Bechtold 2001). Quantitative and qualitative evidence indicates that Modern Greece suffered female neglect around birth at least until the 1920s (Beltrán Tapia and Raftakis 2021).

Female neglect around birth is also visible in 19th century rural Spain, especially at higher parities and among landless and semi-landless families which were subject to harsher economic conditions and therefore more likely to resort to extreme decisions (Beltrán Tapia and Marco-Gracia 2021)[3]. Not only the practice was known in Spain, prompting specific regulation, but infanticide was also subject to a mild punishment if it was oriented to safeguard the honour of the mother (of a decent family) and was carried out in the first days after birth[4]. It is possible that this permissive legal context, and the underlying social norms towards death in the first days after birth would have facilitated the prevalence of a moral construct that allowed female infanticide by action or omission (fatal neglect). Likewise, studying the development of the textile industry in the city of Alcoy between 1860 and 1914, Beneito

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[1] This figure is of course subject to a lively debate. See, for instance, Sen (1990), Klasen and Wink (2002) and Anderson and Ray (2010; 2017).

[2] In patrilocal systems, the responsibility for old-age support also falls to sons. Kinship systems that isolate women from their original families also tend to be deleterious to female status.

[3] These authors also suggest that the dowry system may have also acted against girls (Beltrán Tapia and Marco-Gracia 2021, 5).

[4] As a punishment for this practice, the 1822 Spanish Penal Code established the expulsion from the village within a radius of 50 km for 25 years (Ministerio de Gracia y Justicia, 1822, art. 612). In 1848, expulsion was substituted by correctional/minor imprisonment (Ministerio de Gracia y Justicia, 1848, art. 327), persisting this regulation in the 1870 (art. 424) and 1932 (art. 416) Penal Codes (Ministerio de Gracia y Justicia, 1870, Ministerio de Justicia, 1932).

and García-Gómez (2021) find that the growing contribution of female wages to household incomes reduced the relative mortality rates of female infants and girls. Neonatal discrimination against girls resurfaced again during the early 1940s due to the extremely difficult economic conditions brought about by the Spanish Civil War and the subsequent autarchic period (Echavarri 2022). The evidence available so far, therefore, seems to stress that discriminatory practices arising from son preference in the Spanish context in the 20th century resulted mostly from poverty and the limited female waged-labour opportunities.

Analysing the Spanish experience between 1900 and 1930, this article contributes to the literature by focusing on the economic dimensions that might be behind female neglect around birth. On the one hand, it shows that Spain exhibited abnormally-high sex ratios at birth (SRB) at least until the 1920s, a period characterised by significant structural transformations and rapid economic growth. The national average however conceals important regional differences, so this article analyses how province SRB evolved throughout this period. Apart from ruling out the possibility that female under-registration and different mortality environments solely explain these regional patterns, our exercise explores how the changes associated with economic development interacted with female neglect around birth. In this regard, our results indicate that SRB were higher in those provinces whose economic structure was dominated by agriculture and manufacturing (relative to the service sector). In addition, to further analyse the protective role that waged labour opportunities may have played in addressing sex-based discrimination at birth, we created a province-level panel data that, for the first time, includes information on agricultural waged labour opportunities separately for men and women. The data analysis shows how, in the First World War period, increased wages resulted in decreases in SRB in those province-years that reported male and female wages. Importantly, the protective role of female wages was twice as large as this of males. A one-unit increase in women's average non-harvesting season wages decreases the predicted SRB by 12 male births (per 100 female births). In addition, in those provinces that published male but not female wages, increases in male wages increased the predicted SRB thus further supporting that the effect identified here is arising from the relative wages that men and women earned in these provinces. As expected, the relationship between wages and SRB vanished during the 20s along with the bias in SRB. Given that the First World War subjected the Spanish economy to an unexpected demand shock, part of the variation we are exploiting is arguably exogenous. This allows us to argue that the observed link between labour returns and SRB, when examining the WWI period, is causal. These results stress that female neglect around birth does not necessarily vanishes with economic growth unless this process is not accompanied by expanding labour opportunities for women.

2.- Data and Historical background
2.1 Sex ratios at birth, a long-term perspective

The Spanish government only started to systematically compile vital statistics in 1858 when state officials gathered the number of baptisms from parish records (Livi Bacci 1968, 95). Prior to that date, baptismal information was not centralised and was managed locally by the parish and archbishopric themselves. This effort was however short-lived, and no further reports were published for the years between 1871 and 1899[5]. During this time, Spain created the civil registration office (1870) in order to have a public record of all births, marriages and births. Although the new system experienced many problems during the first years, it seems that, by the end of the 19th century, the quality of this information was relatively high (Brel 1999). Although civil registration was deemed compulsory, it is true however that the number of births may suffer from some omissions even during the first decades of the 20th century[6].

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[5] Although more birth statistics were published for the years 1886-1892, they do not distinguish between male and female births (Instituto Geográfico y Estadístico 1895).

[6] Particular regions probably suffered registrations issues until the first decades of the 20th century (Martínez Carrión 1983; Gonzalvez Pérez 2003; Duran Herrera 2014).

Civil registration data, gathered in the yearbooks of the Natural Movement of the Population, allows us to compute the male-to-female sex ratio at birth (SRB: the number of male births divided by the number of female births). For illustrative purposes, the SRB is multiplied by one hundred in the figures and descriptive statistics tables. Figure 1 compares the evolution of the SRB in Spain and other European countries between 1750 and 2017[7]. The first three decades of the 20th century, exhibiting sex ratios at birth around 110 males per hundred females, stand in mark contrast to what happened before and after that period.

Figure 1. Sex ratio at birth in Spain and Europe, 1750-2016
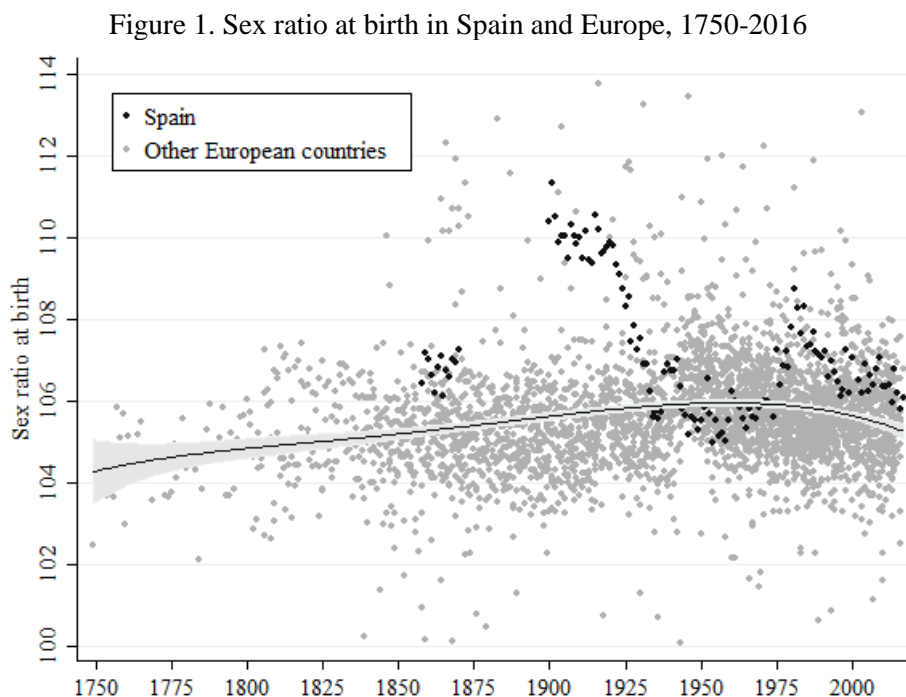
Source: Spanish vital statistics and Human Mortality Database. The fitting line is the result of estimating a fractional polynomial to the data, along with the subsequent confidence interval.

It should be noted nonetheless that the Spanish data depicted here was produced under three different birth registration systems. The data for the period 1858-1870 are based on baptismal registers and, therefore, do not include those born alive but who died before being baptized. Many infants in fact died before being registered and this issue especially boys affect due to their vulnerability (Waldron 1998; Zarulli et al. 2018). The result is that SRBs for that period were probably higher than what it is observed[8]. From 1870 onwards (and up to 2011), the definition changed and, for civil purposes, a child was counted as born alive if it survived 24 hours separated from the mother (Brel 1999, 97; Echavarri, 2021)[9]. Therefore, the observed sex ratios can be again considered a lower bound because more males than females would have died during the first day of life. The potential bias however is probably lower than in the previous period based on baptismal data and it declines over time as perinatal survival improved throughout the 20th century. From 2011, it is considered that a child is born alive as soon as it is separated from the mother's womb (Civil Registry Law 2011, third

[7] If under-registration of births was higher for girls in the past, this figure would be even lower because the sex ratios observed in the 18th and 19th centuries would be biased upwards.

[8] Records of the period indicate that death before baptism of born alive could be as high as 5% of births and that the sex ratio of such deaths may be about 140-150 so that the SRB could be at least 1 point higher than what is indicated in the graphs. It is true however that the statistics from the period 1858-1870 suffered from under-registration issues (Carreras and Tafunell 2005, 107).

[9] The law also specified that the baby should have a human figure. The personal and familiar information gathered at the time of the childbirth increased over the period, especially at the beginning of the 80s.

provision). This recent change hardly had any effect on reported sex ratios at birth because, by that time, neonatal mortality was already extremely low.

2.2.- Fatal neglect around birth, infanticides, or under-registration of female births, 1900-1930

The extreme patterns detected in the first third of the 20th century in Spain deserve further attention as the SRB remained abnormally high throughout the period. Following the accepted procedure in the literature, the incidence of missing female births is inferred by comparing the SRBs with the biologically expected benchmark in absence of neonatal discrimination. In a recent study, Chao et al. (2019) report that the median SRB revolves around 105.8 in contemporary societies where it is assumed that sex-selective abortion and/or female infanticide does not exist. Although we follow the literature in using the 105-106 benchmark as a measure of the biological SRB, there are very little evidence of how sex ratios at birth should look like in the past and very few studies adopt a long-term perspective (Visaria 1967; Chahnazarian 1988; Chao et al. 2019). There are reasons however to hypothesise that the historical figure in absence of human manipulation might be slightly lower, thus making the Spanish figures even more striking. Due to the female biological advantage, not only more male foetuses tend to die before birth (Di Renzo et al. 2007; Dipietro and Voegtline 2017)[10], but several studies have indeed found that less boys are born under adverse circumstances (Schacht et al. 2021; Morse and Luke 2021). The probability of miscarriages was indeed higher in the harsher circumstances that characterised the European past (Woods 2009), what would push the "natural" SRB down. Figure 1 indeed suggests that sex ratios at birth were, on average, closer to 104 in the late-18th and part of the 19th century[11]. This number could be even lower because it is estimated using the observed births and therefore includes data from countries where, as this article suggests, female infants were potentially being neglected (Beltrán Tapia and Marco-Gracia 2021, 8)[12].
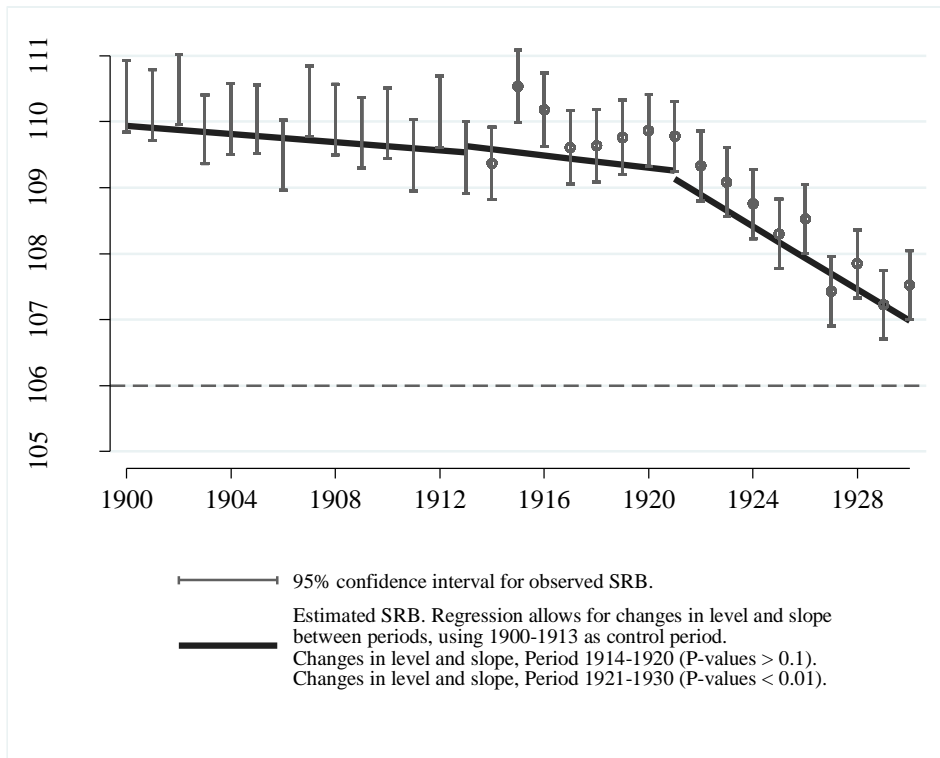
Figure 2 shows that none of the 95% confidence intervals for the province average SRBs for the period 1900-1930 included the biological expected value of 106 male births for each 100 male births. This figure also shows how the decrease in the SRB over the period seems to have been smooth before 1920, becoming sharper between 1921 and 1931. The statistically significant change in pace before and after 1920 (p<0.01) does not seem to have occurred in response to a one-time exogenous shock (such as the end of WWI). We find no evidence of a random discontinuity in levels in 1920. The break observed around 1920 is statistically significant only for time windows longer than 4 years (see table A1 in the Appendix).

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[10] The mechanisms behind the higher vulnerability of male foetuses are still largely unknown (Dipietro and Voegtline 2017). As well as in perinatal and neonatal mortality, the female biological advantage continues through infancy and childhood (Waldron 1998; Drevenstedt et al. 2008; United Nations 2011; Peacock et al. 2012; Peelen et al. 2017; Zarulli et al. 2018).

[11] It is true however that the available information for the earliest period is restricted to a very few countries.

[12] In this regard, sex ratios at birth in Mediterranean countries tend to be relatively high, especially in earlier periods. Unfortunately, the series for Eastern European countries do not usually allow looking at the period before 1950.

Figure 2. Sex ratio at birth. Spain, 1900-1930

95% confidence interval for observed SRB.

Estimated SRB. Regression allows for changes in level and slope between periods, using 1900-1913 as control period.
Changes in level and slope, Period 1914-1920 (P-values > 0.1).
Changes in level and slope, Period 1921-1930 (P-values < 0.01).

Investigating the drivers of the evolution of SRB in the first third of the 20th century would clarify the role played by human decisions on missing female births, if any. Certainly, although the quality of birth data in this period is relatively high (Gómez Redondo 1992), it is still possible that under-registration issues may contaminate some of the figures employed here (Martínez Carrión 1983, 34-38; Gonzalvez Pérez 2003). Female sub-registry is yet routinely assumed as the main explanation for the unbalanced sex ratios at birth observed during this period (Carreras and Tafunell 2005, 107; Duran Herrera 2014, 104). Nevertheless, there is hardly any evidence that under-registration especially affected girls. According to Gómez Redondo (1992, 8-14), the main source of inaccuracies in the vital statistics of the first decades of the 20th century is the inconsistencies derived from the very definition of "live birth". Not only the civil code indicated that those babies dying during birth and within the first day of life were should not be counted as such, but this rule induced confusion among the authorities in charge of registering these events. This issue, however, should not affect males and females differently. If anything, given the higher male vulnerability, more boys should be subject to these uncertainties. While the reports attached to birth statistics are very aware that the reported figures are not perfect, they indeed do not mention the possibility that potential under-registration varied by sex (Junta General de Estadística 1863; Instituto Geográfico y Estadístico 1877, 1895; 1901; 1903). One of these reports also include a recompilation of all the legislation referring to birth registration since 1813 and these legislative texts do not explicitly mention the possibility that girls were more subject to registration problems (Junta General de Estadística 1863). In fact, contemporary reports suggest that, if anything, sex-selective under-registration may have targeted boys in order to avoid military recruitment later on (INE, Censo de 1920; Brel 1999, 93).

The regional variation in the relative number of male and female births is remarkable. Most provinces have SRB values ranging from above 100 to 110 male births per 100 female births. However, in provinces such as Albacete, Almeria or Murcia, among others, the SRB range is between over 110

and around 130 male births per 100 female births (see figure A1 in the Appendix)[13]. Part of the temporal and geographical variation in SRB could be explained by differences in the mortality environment. More males are likely to die in utero in those provinces and/or years suffering especially harsh conditions, thus lowering sex ratios at birth. Given that no direct information of conditions in utero exist for this early period, we use infant mortality rates as a proxy for the overall health environment. As for the case of birth statistics, we collect the number of infant deaths at province level from the yearbooks of the Natural Movement of the Population. Linking infant mortality rates and sex ratios at birth yields, however, the opposite pattern than what we would expect (see figure A2 in the Appendix). If anything, harsher conditions are associated with a larger number of male births, thus suggesting that something else is going on.

The published statistics distinguish between male and female deaths, thus allowing exploring the link between discrimination at birth, measured by SRB, and discrimination in infancy, measured by the ratio between male and female infant mortality. Son preference has the potential to affect the selection of children who will survive to birth and those who will survive to infancy. In this regard, son preference can result in a lower ratio of male-to-female mortality arising from either lower male mortality rates (protection) or higher female mortality rates (neglect). During the first third of the twentieth century in Spain, high SRBs were associated with more girls (or less boys) dying during infancy (figure 4, panel a). This pattern is extremely telling for two main reasons. On the one hand, it suggests that some sort of gender discrimination was happening both at birth and during infancy. On the other hand, it mitigates the possibility that our results are driven by registration issues. In this regard, if female under-registration increased SRB, female under-registration of deaths would increase the male to female infant mortality ratio[14]. What we observe (figure 3, panel a) however is exactly the opposite: The male to female mortality ratio is lower when the SRB is higher. Figure 3, panel a, cannot discriminate between the possibility that families provided extra protection to sons and the possibility that they neglected daughters. Plotting SRB against male and female infant mortality rates suggests that gender discrimination mostly worked through female neglect: While SRB and male IMR are almost independent, high SRB are associated with higher female IMR (figure 3, panel b).

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[13] Studying infant mortality rates during the early 1930s, Gómez Redondo (1992, 214) also noticed discriminatory practices against girls in Murcia.

[14] As well as with birth, under-registration of deaths was more problematic during the first days of life (Brel 1999, 96, 107-110). Stillbirths were also especially problematic since it was unclear whether they should be registered as births and/or deaths (Gonzalvez Pérez 2003; Duran Herrera 2014). In this regard, Blanes (2007, 60-63) estimates that the under-registration of female births was higher during the first decades of the 20th century but his exercise assumes that there is no under-registration of infant deaths (as well as negligible children migratory flows).

Figure 3. Gender mortality gap and sex ratios at birth, 1900-1930

(a) Gender mortality gap	(b) Male and female mortality
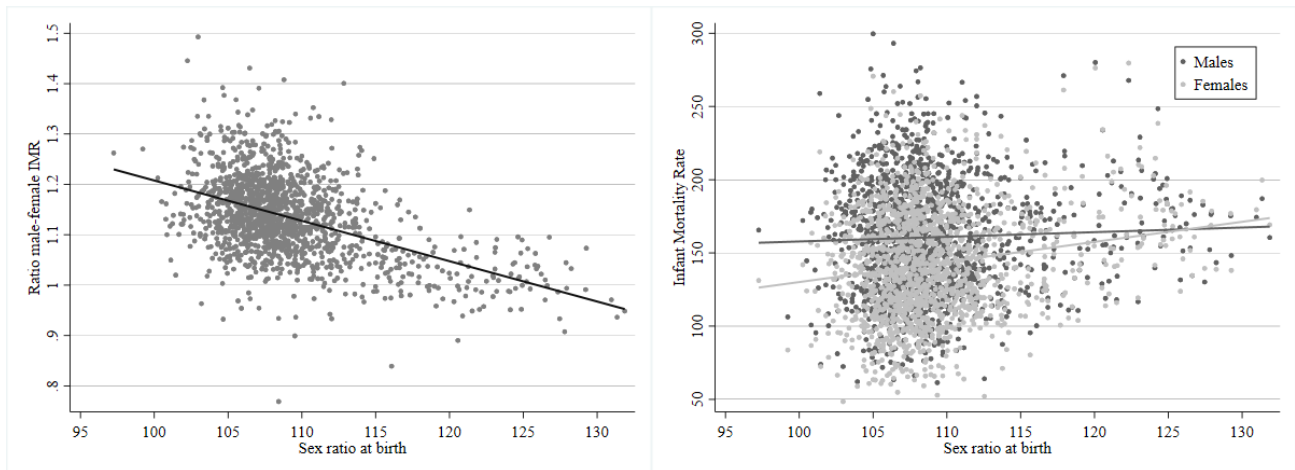
Moreover, we can assume that, even if under-registration was an important issue here, its importance would vary across provinces and decrease over time. Regressing annual SRB between 1900 and 1930 on the whole set of province and year dummies leaves 27 per cent of the variation in the data unexplained. In order to mitigate concerns about the possibility that our results mostly reflect the quality of the registration, this article will solely focus on this unexplained variation. This is a purportedly conservative research strategy because province and year dummies may not only capture potential female under-registration, but also other discriminatory practices that increased female mortality around birth.

2.3.- Urbanisation, economic opportunities, and missing female births, 1900-1930
The evolution towards a modern society may have influenced SRB. Although the first modernisation steps were taking during the 19th century, industrialisation and economic growth in Spain accelerated after 1900 and particularly so during the 1920s (see table 1). Increasing migratory flows fuelled the concentration of population in urban areas and this economic dynamism not only brought about growing living standards and profound social changes, but it also meant disruptions and growing inequalities. Previous literature acknowledge that female waged-labour opportunities had expanded with the expansion of the manufacturing and service sectors, increasing exposure to women in socially valued roles and facilitating women's collective action (Evans 2019). That said, it is possible that the first waves of rural-urban migration may have benefited from women's expanded opportunities to a limited extent, as families may have experienced added adaptation pressures. They may have had to adapt their skills and learning acquired through the accumulation of knowledge over generations to a new context in which their apprenticeship may not have been the most appropriate (for example, moving from mining or agriculture to industrial work), and it is also possible that initially women lost employment opportunities. Women who were active in rural areas may not have achieved the same employment status in urban areas from the outset.

Though women's status had not improved with urbanisation, economic growth alone could have helped female survival at birth. That is, son preference, as part of the well-rooted cultural background, may have remained largely unaffected over the study period. However, the potential increase in families' wealth and living standards may have alleviated their pressure to select which offspring would survive. In this regard, the impact of economic growth on women's status and, subsequently, on the importance of missing female births would be likely to be dependent on the type of employment that was being generated and the likelihood that women were indeed benefiting from the new economic opportunities. While the textile sectors, for instance, tend to heavily employ women, the same is not true of other economic activities. As well as the existence of female labour

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opportunities, the relative wage levels might also be an important consideration. If women are poorly remunerated, their bargaining power within households is also limited and may therefore sustain the male breadwinner ideology. But no change would be observed in SRB with economic growth if the pressure to select among offspring had persisted as result of facing increased pressures on fertility reduction. It is therefore an empirical, yet unexplored question whether the early social changes towards modernity reduced or deepened the different opportunities for men and women to survive childbirth.

Table 1. Economic growth and structural change, 1900-1930

	1900	1910	1920	1930
GDP per capita (in thousands, GEKS $2011)	3,184	3,359	3,859	4,668
Agriculture and fishing (% of the active population)	66,3	66	57,2	45,5
Urbanization (%)	32.2	34.8	38.4	42.6

Source: Prados de la Escosura (2017), Carreras and Tafunell (2005, 150) and Rosés et al. (2010). Urbanization refers to the percentage of the population living in locations larger than 10,000 inhabitants.

Interestingly, the first third of the 20th century includes a period in which the Spanish economy suffered exogenous demand shocks resulting from the outbreak of the WWI (Rosés and Sánchez-Alonso 2004; Gómez-Tello et al. 2019; Galofré-Vilà and Harris 2021). Rosés and Sánchez-Alonso (2004) show how the outbreak of the WWI interrupted the convergence of real wages across regions and occupations that was ongoing until then in Spain. The authors provide evidence to support that the convergence process would have resumed after the end of the WWI (i.e., in the 1920s). At the same time, Gómez-Tello et al. (2019) find evidence that the WWI created a price increase in Spain that would have affected some provinces more than others would. In other words, the conflict created a temporal scenario, with geographic variation, in which the degree of exogeneity of wages with respect to the pre-existing perceived value of women in the province increased, enabling the identification of the short-term effect of women's waged-labour opportunities on the missing female births. Furthermore, attention to changes in real wages also allows us to examine wealth effects that come through men or women's opportunities, separately.

We do not have information on women's wages in industry during the first third of the 20th century, but we do have them for paid agricultural labour (*braceros*). Daily average wages, disaggregated by sex, for paid agricultural labour were published annually between 1914 and 1931 (Spanish Statistical Yearbooks)[15]. The evolution of women's status tends to be slower in rural than in urban settings, as shocks to the agricultural environment are often the result of migration, because excess of labour supply, rather than because radical transformations in society more likely to produce changes in the household decision framework. However, agricultural wages may also have responded to the exogenous shocks of WWI, providing a unique scenario for investigating the potential role of wages on the SRB. At the same time, in assessing the prevalence of discrimination, changes affecting rural settings are critical. The economic transformation was not homogeneous across the territory and agriculture remained the main economic activity in most provinces.

Unfortunately, women' wages are not always available: Out of 49 provinces in our study, five did not publish any data on women's wages, while six published them for each of the periods. On average, each province published female wages during half of the years analysed here. Specifically, information for male and female wages is available for 393 out of the 882 plausible observations (see figure A3 in the appendix). The data are sufficiently rich, nonetheless, to reflect the evolution of wages in Spain between WWI and the post-war period. To discard sample selection bias related to the

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[15] No statistical yearbooks were published for the years 1917 and 1925.

perceived value of women in the society, table 2 presents a balance analysis across wage-reporting groups: The group of province-years for which both female and male wages were published (our main group); the group of province-years for which no wages were published (neither male nor female); the group of province-years for which male, but not female wages were published, and the group combining *the two* groups that do not report female wages. Column (1) shows the average characteristics for the group of province-years that released female and male wages. Columns (2)-(4) present the average difference between column (1) and the alternative wage reporting groups. Interestingly, there is no evidence of selection into wage-reporting *vs* no reporting group based on two key measures of the perceived value of women in the province: whether this is a stem vs a nuclear province (Tur-Prats 2019, Echavarri, 2021) and the average SRB. That is, there is no statistically significant differences in the proportion of stem provinces or in SRB between our main group and the group that did not report any wages (column (2)). Neither there are statistically significant differences in these variables between the group that reported female wages and the one which did not report female wages, whether they reported male wages or not (column (4)). However, province-years for which male wages, but no female wages, were released are less likely to include stem provinces and have greater SRB than our main group (column (3)). That is, if any, gender-based sample selection affects the subsample of provinces that released male, but no female wage information. While table 2 supports the idea that the perceived value of women in society did not lead to select our main group of province years, allowing us to investigate the relationship between wages and sex-based discrimination at birth, this table also shows how our wage-reporting group had lower infant mortality than in the counterpart wage-reporting groups.

Table 2. Balance between wage-reporting groups

	Means	Differences between wage-reporting groups		
	Male & female wages	No male or female wages	Only male wages	No female wages
	(1)	(2)	(3)	(4)
1914-1931				
Stem	0.267	-0.011	-0.054*	-0.040
	[0.443]	(0.041)	(0.032)	(0.029)
SRB	1.083	0.001	0.006*	0.004
	[0.040]	(0.004)	(0.003)	(0.003)
Under 1 mort, all	0.135	0.008*	0.013***	0.011***
	[0.036]	(0.003)	(0.003)	(0.002)
Under 1 mort, male	0.143	0.008*	0.013***	0.011***
	[0.040]	(0.003)	(0.003)	(0.003)
Under 1 mort, fem	0.126	0.008*	0.013***	0.011***
	[0.035]	(0.003)	(0.003)	(0.002)
GDP	0.232	-0.004*	0.000	-0.002
	[0.024]	(0.002)	(0.002)	(0.002)
Observations	389	160	333	493

Notes: Column (1) reports the average characteristics for the group of province-years for which information on female and male wages were released. Standard deviations are in brackets. Columns (2)-(4) show the average difference between column (1) and the group of province-years without wage reports, the group province-years for which male, but no female wages were released, and the group of province-years for which female wages were not released. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Figure 4 displays the evolution of agricultural real wages (ppp adjusted) between 1914 and 1931, separately for the upper (harvest season) and lower bounds (rest of the year), for females and males' wages. The upper bound includes the summer season, which involves longer working days, while the

lower limit includes the average daily wages of the winter season[16]. Daily average real wages of agricultural workers seem to have slightly decreased during the first years of the WWI, starting an upward trend in the late war and early post-war years, and remaining stable in the 1920s. This evolution of real wages is consistent with that documented for industrial workers in the same period in Barcelona by Galofré-Vilà and Harris (2021)[17].

Figure 4. Agricultural paid labour. Spain, 1914-1931.
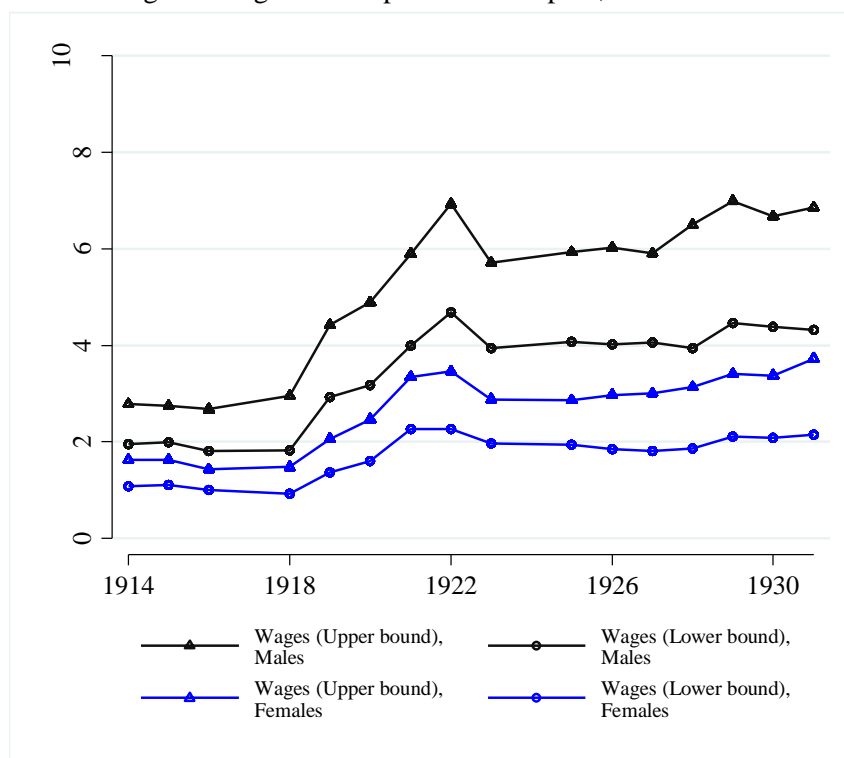
Using province-level panel data, the following sections explore: (1) to what extent structural change and economic modernisation is associated with missing female births (section 3), and (2) whether increases in men's and women's real wages were a protective mechanism against missing female births (section 4).

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[16] The Spanish Statistical Yearbooks release nominal wages. To avoid wages capturing potential non-real monetary effects and the effects of regional differences in purchasing power on discrimination, we convert nominal wages into real wages adjusted for purchasing power parity (ppp). To do so, we compute a deflator, D, that combines time varying changes in the consumer price index (CPI) and spatial variation in ppp. Specifically, D=CPI*(PPP/100), where CPI is the time annual percentage change in prices at national level, which was compiled by De Zwart (2015), and using 1914 as base year; PPP is Gómez-Tello's et al. (2019) index of ppp spatial variation for Spanish provinces with Barcelona as base province. Specifically, Gómez-Tello's et al. (2015) estimates of the interprovincial variation in purchasing power are based on data for the period 1910-1920. Our strategy of applying this estimated spatial variation to the entire period assumes that regional differences during the 10s remained constant during the 20s. These computations, however, do not affect the results reported here since they remain virtually identical even if we use the un-deflated raw wages.

[17] Table A2 in the Appendix supplements this information by showing how the wage increase between the 10s and the 20s was statistically significant for both men and women. The difference in means between the two periods is computed by providing OLS estimates of stage on each main variable. The wage increase appears to be larger for men's wages than for women's wages at the upper bound, resulting in a statistically significant increase in the gender wage gap. The gender wage gap, measured at the lower bound, remained unchanged throughout the period. The same pattern emerges for the sub-sample of province-years in which female wages are reported.

3. Structural change and missing female births

This section examines whether missing female births (proxied by SRB bias) declined along with economic modernisation. To measure the economic structure of the Spanish provinces between 1900 and 1930, we employ the information in four population censuses that were published every 10 years. The census makes it possible to compute the percentage of the population living in cities larger than 10,000 inhabitants as a proxy for urbanisation, and to estimate the province GDP per capita in each province year (Rosés et al. 2010). The calculation of GDP involves aggregating income from a wide variety of sources. This could hide significant regional diversity in terms of the underlying economic structure and, therefore, economic modernization. We therefore supplement the analysis by considering the relevance of each sector in each province and year. To do so, we calculated the percentage of the province's population that worked in agriculture and manufacturing industry, leaving services (the sector with the highest potential to facilitate women's entry into paid work, relative to those opportunities of men) as the reference category[18]. Summary statistics of the variables employed here can be found in table A3 in the Appendix.

The first third of the 20th century was a particularly dynamic period and, in addition, Spain was undergoing an important transformation in non-economic dimensions. Therefore, the econometric specification to examine the correlation between SRB and economic modernisation includes controls for fertility (measured by the average number of children in households), male literacy and the predominant family type (proxied by the percentage of adult women in the household, following Tur-Prats, 2019). To capture the underlying mortality environment, the specification also accounts for male infant mortality rates[19]. In addition, province fixed-effects control for other social and time-invariant cultural differences between provinces that may affect SRB, and time fixed-effects account for unobserved temporal heterogeneity that may have affected the relative number of male and female births in the four census-years[20].

Table 3 presents the fixed effects estimates of the relationship between SRB and economic modernisation, suggesting that the economic structure might play an important role in explaining the level of neonatal discrimination in a region. In this regard, although the GDP per capita show the expected negative coefficient, the relationship fails to be statistically significant. Interestingly, considering the relevance of economic sectors (columns 4 and 5), instead of the aggregated income level, provides crucial insights. The greater the weight of sectors with greater waged-labour opportunities for males relative to females (agriculture and manufacturing) in the province-year, the higher the SRB. Specifically, a one-standard deviation increase in agriculture (16.4 percentile points) and manufacturing (9.1 p.p.) is associated with 3.1 and 2.8 more male births per hundred female births, respectively (calculations based on the estimates in table 3, column 5). Using services as the reference category, the larger the weight of agriculture in the economy, the greater the discrimination against women at birth, which could result from the larger difference between the value of female and male paid work in this sector compared to this difference in the service sector. This same mechanism could

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[18] The service sector, as well as some manufacturing industries, would have facilitated women's entry into paid work in the early 20th century in countries such as the United States (Costa 2000). It is possible that Spain would have followed a similar pattern of women's entry into paid work.

[19] We rely on male infant mortality because, in our context, girls' infant mortality might be affected by deviations in neglect of care resulting from gender discrimination (Beltrán Tapia and Gallego-Martínez, 2017, Marco-Gracia and Beltrán Tapia 2021; Echavarri, 2021). Male infant mortality is thus a better proxy of the external environment that influenced family's ability to ensure the survival of its offspring. Contrary to the population censuses which were published every ten years, vital statistics (births and deaths) were published annually. To mitigate the role of random noise arising from unexplained year-to-year variation, SRB and infant mortality rates are computed here using a three-year average around each census year. In any case, the results do not change if the figures are calculated only using the information from the census year but become noisier (or if we employ average infant mortality instead of male infant mortality).

[20] Social and cultural dimensions, such as different dowry, inheritance and family-type systems, would be therefore captured by the province dummies.

explain why the greater the weight of the manufacturing sector in the economy (relative to the weight of services), the greater the discrimination against female births.

Although the manufacturing sector may also include industries as feminised as the service sector (e.g., the textile industry), early industrialisation may have been very demanding for families, especially in the early stages, and this demand may have been greater for women. The reason is that, in the first third of the 20th century, factory work may have posed difficulties in accommodating female labour from agricultural work. Unlike their previous occupations and the labour into the service sector, the nature of factory work may have involved further incompatibilities between paid work and maintaining large families. These difficulties may have forced many of them to select among offspring, resorting to sex-selective infanticide at birth. Interestingly, the estimates in table 2 show that the mortality environment was not driving the variation observed in the SRBs in the first third of the 20th century. Due to the male vulnerability in utero and around birth, harsher mortality environments are expected to reduce the SRB. The fact that this is not observed in our data provides further evidence that some unobserved behaviour was keeping SRB abnormally high, even after controlling for province and year fixed-effects.

Table 3. Sex ratio at birth. Spain, 1900, 1910, 1920 and 1930.

	(1)	(2)	(3)	(4)	(5)
Urbanisation (%)		-0.011	-0.006	-0.001	0.009
		[0.105]	[0.107]	[0.106]	[0.109]
GDP per capita		-0.754	-0.950		
		[1.468]	[1.835]		
Agriculture (%)				0.189**	0.192**
				[0.089]	[0.090]
Manufacturing (%)				0.317**	0.304**
				[0.142]	[0.136]
Inf. Mort., M	-0.001	-0.000	-0.008	-0.005	-0.011
	[0.017]	[0.017]	[0.016]	[0.016]	[0.015]
Constant	1.101***	1.107***	1.168***	0.932***	0.976***
	[0.033]	[0.049]	[0.129]	[0.107]	[0.155]
Controls	NO	NO	YES	NO	YES
Province FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	192	192	192	192	192
R-squared	0.784	0.784	0.790	0.794	0.799
Within R-squared	0.297	0.298	0.318	0.330	0.347

Clustered standard errors at province level in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Dependent variable is the male to female sex ratio at birth, 3-year average. GDP per cap. is measured in one hundred million monetary units, and Inf. Mort, M is the proportion of male children who died before their first birthday, 3-year average. The set of controls include fertility (children per household), male literacy and family type (number of adult women per household). R-squared includes the variation explained by time-invariant elements.

SRB was quite high and stable before 1920, and that year marked the beginning of a strong downward trend (see figure 2). It is quite possible, therefore, that the potential relationship between the economic structure and the missing female births phenomenon followed a non-linear relationship thorough the period. Table 4 presents estimates for this relationship, allowing for the interaction between the agriculture and manufacturing variables and the time dummy variables. The specification also allows for the non-linear effect of urbanisation. While the relationship between urbanisation and the SRB seems to have remained invariant over time, this does not seem to have been the pattern of

economic structure. The difference between the SRB in the provinces with the greatest weight of the most masculinised sectors (agriculture and manufacturing) was greater in 1900 than in the subsequent decades. The results therefore suggest the presence of threshold effects, which might be related to the level of development and the potential change in the role of women in the economy and the society. By the end of the 1920s, Spain had become a much more modernized country and SRB were no longer related to the structure of the economy (or at least to a much lesser extent than in the previous decades). In this regard, it is also plausible to argue that living standards were high enough by then and, even in the presence of son preference, families no longer resorted to extreme forms of female neglect.

Table 4. Sex ratio at birth. Spain, 1900, 1910, 1920 and 1930.

	(1)	(2)		Cont. (1)	Cont. (2)		Cont. (1)	Cont. (2)
Urban. (%)	0.012	0.020	Agric. (%)	0.333***	0.356***	Manuf. (%)	0.465**	0.507**
	[0.113]	[0.111]		[0.115]	[0.114]		[0.185]	[0.196]
x 1910	0.019	0.018	x 1910	-0.136	-0.153	x 1910	-0.217	-0.251
	[0.031]	[0.031]		[0.099]	[0.095]		[0.177]	[0.167]
x 1920	0.032	0.031	x 1920	-0.162**	-0.179**	x 1920	-0.243*	-0.277*
	[0.038]	[0.038]		[0.079]	[0.080]		[0.140]	[0.153]
x 1930	-0.053*	-0.056*	x 1930	-0.227***	-0.249***	x 1930	-0.230**	-0.271*
	[0.029]	[0.031]		[0.062]	[0.088]		[0.108]	[0.153]
Constant	0.805***	0.831***						
	[0.128]	[0.160]						
Controls	NO	YES						
Province FE	YES	YES						
Year FE	YES	YES						
Observations	192	192						
R-squared	0.821	0.822						
Within R-squared	0.417	0.420						

Clustered standard errors at province level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the male to female sex ratio at birth, 3-year average. The set of controls include male infant mortality (3-year average), fertility (children per household), male literacy and family type (number of adult women per household). Cont. (1) and Cont. (2) refers to the continuation of columns (1) and (2). R-squared includes the variation explained by time-invariant elements.

4. Waged-labour opportunities and missing female births

Analysing the relationship between missing female births and the modernisation of the economy, we find that the potential effect of modernisation on curving gender discrimination was smaller in province-years with a higher weight of male dominated sectors (manufacture and agriculture) than in the alternative setting. One possible mechanism to explain this finding is that women's labour participation and their labour rewards protected against gender discrimination at birth. To dig deeper into this issue and to assess how changes in the available households' resources, whether produced by men or women, may have affected short-term changes in the level of discrimination at birth, this section turns now to explore the impact of real wages on SRB. Specifically, we expect to find fewer missing female births in provinces and time periods in which women obtained greater labour rewards in formal markets.

Our previous results, i.e. the discontinuity of the pace in the evolution of SRBs around 1920 and the non-linear relationship between modernisation and SRB, seem to respond to the existence of two distinct socioeconomic historical periods. Thus, a pooled-time analysis may conceal the potential effect of wages on protection against sex discrimination at birth. This is the case when the data generation processes vary across historical moments. While the wages might play a protective role in historical periods of high discrimination, they might play a marginal or no protective role in periods

of low discrimination. Therefore, to assess the nature of the relationship between real wages and missing female births, we divide the analysis into two periods: one characterised by the persistence of high average SRB and the existence of exogenous aggregated demand shocks from the WWI (1914-1920) and the other by an accelerated decline of the SRB and the end of the WWI (1920-1931)[21].

Table 5 presents fixed effect estimates for the impact of lower and upper bounds of daily average wages on SRB, using the sample of province-years for which sex-specific wages were reported during the period 1914-1920. The specification includes controls for the effect of variables that change over time but are constant across regions and for variables that change across regions but are constant over time. This specification is also enriched by controlling for temporal and geographic variation in survival conditions of children by including the male infant mortality in the province-year. Since there is a potential collinearity bias between wages and child survival chances, we estimate the reduced-form SRB equation by controlling for and omitting male infant mortality. The results are robust to excluding (uneven columns) and controlling for (even columns) male children's infant mortality rate. The results in panel A suggest that increases in the lower-bound daily average wages protected against sex-based neonatal discrimination, regardless of whether wages were male or female. The protective role of female wages was however twice that of male wages: A one-unit increase in female wages leads to a decrease in the predicted SRB of 12 male births (per 100 female births). However, this decrease would be of six male births in the case of a one-unit increase in male wages. The results show no evidence of change in the predicted value of SRB with changes in the gender wage gap. The protective role of wages seems to work on the lower bound of daily average wages, since when we focus on the upper bound (panel B of Table 5), there is no evidence of correlation between wages and SRB.

It is interesting to emphasize that the results displayed in table 5 show further evidence of sex-based discrimination at birth during the 1910s in Spain. High-mortality environments, proxied by male infant mortality, had an independent and positive effect on SRB. This result goes against the idea that the biological male vulnerability would result in lower SRB in adverse circumstances (Di Renzo et al 2007; Dipietro and Voegtline 2017) and therefore suggest that harsh conditions triggered discrimination against female births.

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[21] Table A2 in the appendix presents the mean of the main variables separately for the first (1914-1920) and the second (1931-1931) study periods. The table also presents the difference in means between the two periods (OLS estimates of stage on each main variable). Wages experienced statistically significant growth for both male and female wages, and for both the upper and lower bounds. Although the wage gap increased at the upper bound, there was no statistically significant difference at the lower bound (the gender wage gap is defined as the difference between male and female average daily wages, and this difference is divided by male average daily wages). The mean SRB decreased from the first to the second period, being this difference statistically significant.

Table 5. Sex ratio at birth and Average daily real wages. Province-years that reported sex specific wages, Spain, 1914-1920

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Lower bound estimates						
Wages, M	-0.007**	-0.006*				
	[0.003]	[0.004]				
Wages, F			-0.013*	-0.012*		
			[0.006]	[0.007]		
WG					0.017	0.013
					[0.024]	[0.026]
Inf. Mort, M		0.500**		0.489**		0.505**
		[0.207]		[0.207]		[0.209]
Constant	1.100***	1.026***	1.100***	1.027***	1.079***	1.006***
	[0.006]	[0.033]	[0.006]	[0.031]	[0.013]	[0.038]
Prov. FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Size	152	152	152	152	152	152
R-squared	0.791	0.805	0.793	0.807	0.786	0.801
Within R-squared	0.073	0.138	0.083	0.144	0.054	0.119
Panel B: Upper bound estimates						
Wages, M	-0.004	-0.003				
	[0.002]	[0.002]				
Wages, F			-0.007	-0.007		
			[0.005]	[0.005]		
WG					0.005	0.014
					[0.016]	[0.016]
Inf. Mort, M		0.446**		0.467**		0.483**
		[0.207]		[0.221]		[0.226]
Constant	1.097***	1.029***	1.098***	1.029***	1.085***	1.009***
	[0.006]	[0.032]	[0.008]	[0.032]	[0.008]	[0.039]
Prov. FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
Observations	154	154	154	154	154	154
R-squared	0.787	0.799	0.787	0.800	0.784	0.798
Within R-squared	0.057	0.111	0.057	0.116	0.044	0.106

Notes: Clustered standard error at province level in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01. Dependent variable is the male to female sex ratio at birth. Wages, M is the upper bound of the average daily real wages of male braceros. Wages, F is the same wage measure, but for female braceros. WG refers to the gender wage gap, which we measure by computing the difference between male and female wages and dividing this difference by male wages. Inf. Mort, M is the proportion of male children who died before their first birthday. R-squared includes the variation explained by time-invariant elements.

Turning to examine the protective role of wages during the 20s, table 6 shows how the protective role of lower bound daily average wages disappeared during that decade. This goes in line with the findings from the previous section showing that the effect of structural change on SRB was significantly reduced during the 1920s. The idea that discriminatory practices during this latter period were probably negligible is also supported by the fact that the positive link between the mortality environment and SRB is no longer visible, thus suggesting that the relative number of male and female births was mainly influenced by random variability or at least from variation unrelated to economic considerations.

Table 6. Sex ratio at birth and Average Wages. Province-years reporting sex specific wages, Spain, 1921-1931

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Lower bound estimates						
Wages, M	0.002	0.002				
	[0.002]	[0.002]				
Wages, F			0.001	0.001		
			[0.004]	[0.004]		
WG					0.004	0.004
					[0.012]	[0.012]
Inf. Mort, M		0.042		0.039		0.046
		[0.130]		[0.137]		[0.132]
Constant	1.086***	1.083***	1.093***	1.087***	1.092***	1.085***
	[0.010]	[0.022]	[0.008]	[0.018]	[0.008]	[0.023]
Prov. FE	yes	yes	yes	yes	yes	Yes
Year FE	yes	yes	yes	yes	yes	Yes
Size	237	237	237	237	237	237
R-squared	0.702	0.702	0.701	0.701	0.701	0.702
Within R-squared	0.138	0.138	0.136	0.136	0.136	0.136
Panel B: Upper bound estimates						
Wages, M	0.000	0.000				
	[0.001]	[0.001]				
Wages, F			-0.000	-0.000		
			[0.002]	[0.002]		
WG					-0.004	-0.004
					[0.011]	[0.011]
Inf. Mort, M		0.031		0.035		0.033
		[0.131]		[0.131]		[0.130]
Constant	1.092***	1.088***	1.094***	1.089***	1.096***	1.091***
	[0.009]	[0.020]	[0.006]	[0.018]	[0.007]	[0.021]
Prov. FE	yes	yes	yes	yes	yes	Yes
Year FE	yes	yes	yes	yes	yes	Yes
Observations	239	239	239	239	239	239
R-squared	0.699	0.699	0.699	0.699	0.699	0.699
Within R-squared	0.135	0.135	0.135	0.135	0.135	0.135

Notes: Clustered standard error at province level in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01. Dependent variable is the male to female sex ratio at birth. Wages, M is the upper bound of the average daily real wages of male braceros. Wages, F is the same wage measure, but for female braceros. WG refers to the gender wage gap, which we measure by computing the difference between male and female wages and dividing this difference by male wages. Inf. Mort, M is the proportion of male children who died before their first birthday. R-squared includes the variation explained by time-invariant elements.

Finally, it is worth examining whether wages have the same protective role regardless of the perceived value of women and girls in society. To do so, we replicate the previous estimates, but using the group of province-years that reported male, but no female wages[22]. Table 7 shows that increases in male wages (in both the lower and the upper bounds) did not help but harmed the survival of females to birth relative to that survival of males. A unit increase in the lower bound of the average daily male wages implied an increase in the predicted SRB of 6 male births for each 100 female births, and 4 male births in the case of a unit increase in the upper bound of the male wages during the 10s. It can be argued that those provinces who did not report female wages did so because women were considered of lesser importance but also because female waged labour was negligible. The latter implies that increases in male wages significantly widened the gender wage gap, thus further reinforcing the lower

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[22] Comparing the effect of wages on SRB between stem and nuclear provinces, which would be the direct exercise (Tur-Prats, 2019, 2021; Echavarri, 2021), does not reflect a statistically significant difference in behaviour probably due to the increase in partitions in a relatively small sample.

status of women and potential discriminatory practices. As expected, this wage effects vanished during the 20s.

Table 7: Sex ratio at birth and average daily real wages (Sub-sample that reported male, but no female wages). Spain, 1914-1931.

	1914-1920		1920-1930	
	Lower bound	Upper bound	Lower bound	Upper bound
	(1)	(2)	(3)	(4)
Wages, M	0.006***	0.004***	0.007	0.001
	[0.002]	[0.001]	[0.005]	[0.001]
Inf. Mort, M	0.024	0.094	0.141	0.084
	[0.203]	[0.185]	[0.208]	[0.245]
Constant	1.080***	1.067***	1.064***	1.049***
	[0.034]	[0.032]	[0.034]	[0.039]
Prov. FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	125	127	209	206
R-squared	0.888	0.887	0.716	0.724
Within R-squared	0.113	0.103	0.087	0.113

Notes: Clustered standard error at province level in brackets. * $p < 0,1$, ** $p < 0,05$, *** $p < 0,01$. R-squared includes the variation explained by time-invariant elements.

5.- Concluding remarks

This article sheds light on how structural transformations affected long-standing gender-discriminatory practices around birth in Spain. Our findings confirm previous evidence showing that son preference was stronger in rural areas due to the lower perceived relative value of girls in those contexts (Beltrán Tapia and Marco-Gracia 2021). The role of industrialisation appears however to have been mediated by how it affected female labour opportunities. In this regard, more industrial provinces exhibited higher SRB, probably because many of these industries were mostly employing men. We should also bear in mind that industrial cities grew thanks to the inflow of rural migrants who, as well as their labour force, brought their cultural values with them. Likewise, the disruptions caused by industrialisation, especially during the first stages, may have also played a role since increasing inequality and marginalisation can fuel the need to get rid of unwanted babies in the most precarious segments of the population[23]. Although the lack of sectoral information prevents us from providing a more fine-grained assessment of the impact of industrialisation[24], the results derived from the analysis of male and female agricultural wages suggest that gender discriminatory practices are linked to their relative returns in labour market, which thus shapes the perceived relative value of sons and daughters. Previous research on a growing town specialised in textiles indeed shows the positive effect that female wages had on the survival chances of female infants and children (Beneito and García Gómez 2021).

SRB decreased markedly during the 1920s and, by 1930, they were practically indistinguishable from those of other countries. The link between the economic structure and the relative number of male and female births also disappeared during this period. This is probably explained by the existence of threshold effects. On the one hand, living standards had probably increased enough so that families no longer need to resort to neglect female babies, even in the presence of son preference. On the other hand, female labour opportunities had also become much more widespread, which may have altered

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[23] It is also argued that factory work was not compatible with child rearing, which may have forced many families to resort to abortions and infanticide in order to continue working.

[24] The variable "manufacturing" does not distinguish between the type of industries that were thriving in each province, so this coefficient is conflating the impact of textiles, metallurgy, etc.

the perception of the relative value of sons and daughters. This mechanism was probably reinforced by the possibility of migration. Not only migratory flows had become much larger, but women were increasingly joining these flows (Beltrán Tapia and Miguel Salanova 2017; Santiago Caballero 2021, 552). Even parents living in rural areas where female labour opportunities were limited could see that their daughters could have a future in the growing cities. These improvements were, however, interrupted by the Spanish Civil War (1936) and the harsh economic conditions that characterised the 1940s (Echavarri 2021). Female neglect, both around birth and during infancy and early childhood resurfaced again during this dark period in Spanish history.

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Appendix:

Tables

Table A1 Sex ratio at birth. Inference for sharp design at 1920. Province-year data, Spain.

	Average SRB Left of 1920	Average SRB Right of 1920	Diff. in means	Window observations
Window [1917, 1923]	1.093	1.091	-0.002	343
Window [1916, 1924]	1.094	1.089	-0.005	441
Window [1915, 1925]	1.096	1.088	-0.008*	539
Window [1914, 1926]	1.095	1.087	-0.008**	637

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. P-values correspond to randomization-based test of Neyman (Large sample). Standard deviation of the mean SRB in brackets. The cutting point is 1920.

Table A2. Wage differentials in agriculture (braceros) in Spain between the 10s and 20s of the 20th century.

Wages	Mean (1914-1920)	Mean Diff.
	(1)	(2)
Average daily real wages		
Male. Upper bound	3.956 [2.240]	2.912*** (0.146)
Male, Lower bound	2.632 [1.466]	1.903*** (0.088)
Female, Upper bound	2.074 [0.850]	1.424*** (0.088)
Female, Lower bound	1.367 [0.607]	0.843*** (0.064)
Gender wage gap		
Upper bound	0.462 [0.153]	0.030* (0.015)
Lower bound	0.483 [0.150]	0.017 (0.017)

Notes: Column (1) reports the average daily real wages and gaps. Standard deviations are in brackets. Columns (2) shows the average difference between the first (1914-1920) and the second (1921-1931) study periods. Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3. Summary statistics. Spain, 1900-1930.

	Obs.	Mean	St. Dev.	Min	Max
	(1)	(2)	(3)	(4)	(5)
Sex ratio at birth	196	108.9	4.2	103.6	128.2
Male infant mortality	196	158.7	41.4	71.9	286.1
Urbanisation (%)	196	29.2	21.3	0	83.4
GDP per capita (000000)	196	0.555	0.223	0.216	1.593
Agriculture (%)	196	64.7	16.4	9.0	92.8
Manufacturing (%)	196	16.7	9.1	2.4	58.6
Literacy, male (%)	196	68.0	19.5	30.7	104.9
Family size: children per household	196	1.00	0.14	0.67	1.48
Family type: adult women (aged 26-70) per household	196	0.92	0.09	0.80	1.17

Note: The period under analysis included information from the census years: 1900, 1910, 1920 and 1930.

Figures:

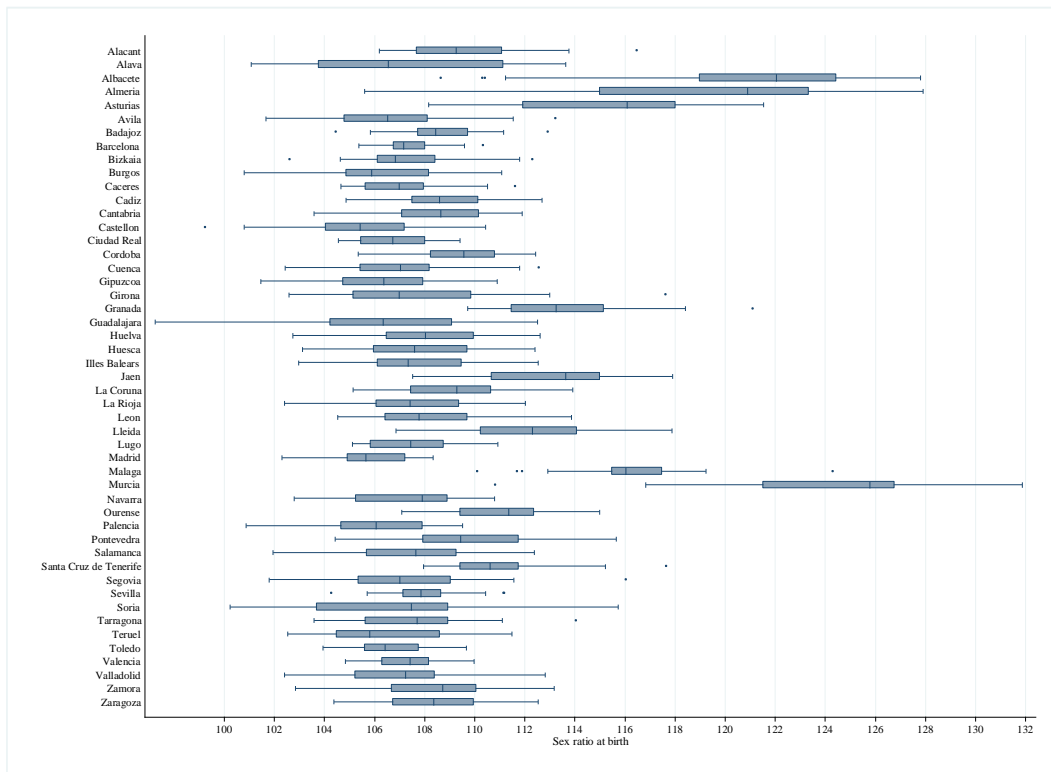Figure A1 Sex ratio at birth, Province variation, 1900-1930
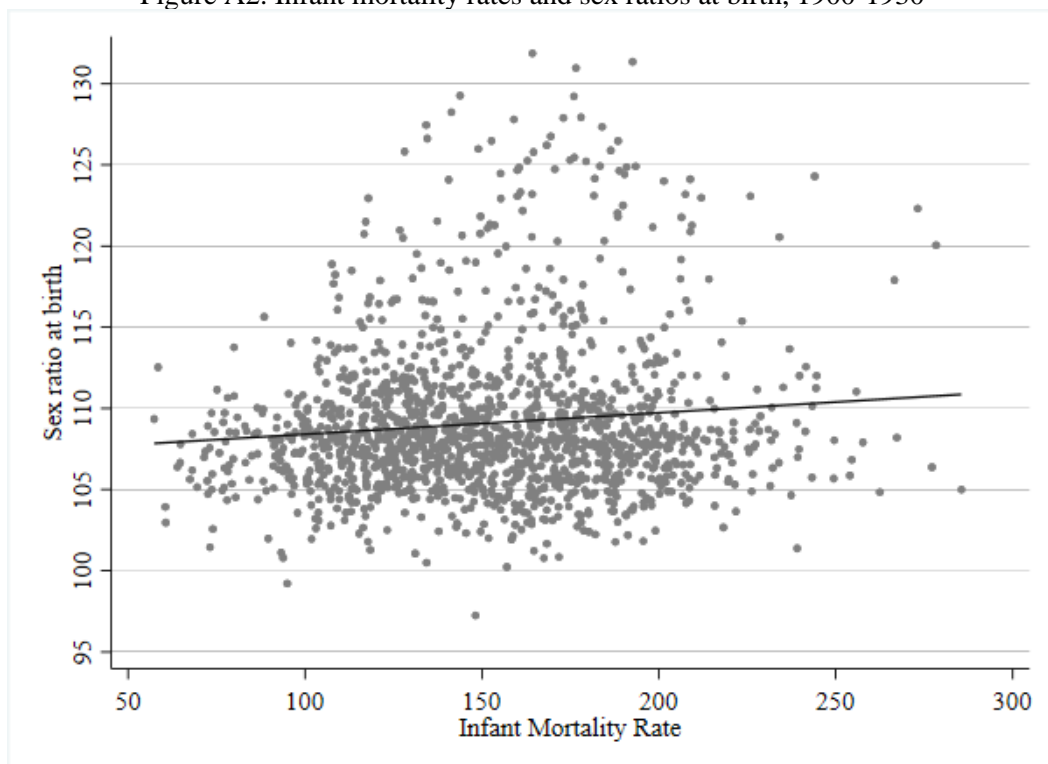

Figure A2. Infant mortality rates and sex ratios at birth, 1900-1930

Figure A3. Report of female wages

Reporting Female Wages

- Report more than three fourts of the times.
- Report between one half and three fourths of the times,
- Report between one fourth and half of the times,
- Report less than one fourth of the times,