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ESSAYS ON ECONOMIC DEVELOPMENT AND GENDER

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To my family

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Preface

In this Ph.D. dissertation, I investigate how economic development and gender relate to each other. In doing so, I place women at the centre of the discussion and analyse several aspects involving them: the rise of gender equality, its long-run consequences on state capacity, and a novel mechanism that explains maternal employment in sub-Saharan Africa through economic prosperity. As it is evident, my Ph.D. thesis touches upon a varied range of topics and therefore contributes to several strands of the economic literature. In general, however, my Ph.D. dissertation elaborates on the importance of gender at critical historical junctures, and it abounds on the topic of gender equality, either as cause or consequence.

Starting in the early 2000s, the Millennium Development Goals aspire to reduce the gender gap. Policy-makers have embraced the ideal, and legislation and initiatives strive to diminish the gender-wage gap, break the glass ceiling, and reduce intimate-partner violence. However, the economic literature indicates that many cultural traits are persistent, and efforts directed to correct gender biases may be doomed since their conception if they fail at identifying the root causes. Moreover, gender inequality may stifle female's human capital accumulation if its productivity is artificially limited by the existence of glass ceilings. Similar concerns apply to on-the-job training, too. In that sense, partial restrictions to human capital accumulation for half of the population may delay economic growth. My Ph.D. thesis indirectly speaks to this political agenda, in particular, suggesting unexplored channels like encouraging female associations that guarantee young women a decent standard of living as a mean to improve gender equality in the long run. It also unveils that gender equality can have unexpected consequences on domains apparently unrelated to it.

Starting with Becker (1991), the economic literature has studied the family, the forms it takes and how it organises. Recently, the literature related to the family has been interested in the role of gender, for instance, to explain differences in the treatment sons and daughters receive or the variations in female employment. Related, some scholars strive to explain the origins of gender roles. In this particular strand of the literature, there is consensus in pointing to differentiated physiological endowments to explain the origin of gender roles. Galor and Weil (1996a) pioneer it, proposing a theoretical model whereby gender-biased technological change and physiological differences favours female labour-force participation. This seminal model has been later empirically validated by Alesina et al. (2013a), who creatively show that descendants of plough users display lower levels of female employment, and Hansen et al. (2015a) who documents that a long tradition of agriculture depressed feminine work. Other theories depart from the idea of physiological differences and suggest that women's status is related to their contribution to household finances, see Qian (2008a) and Xue (2014a). However, an underlying assumption common to these contributions is that culture is *somehow* transmitted. The seminal paper of Bisin and Verdier (2001a) provides the theoretical foundations to claim how culture is transmitted between generations.

Needless to say, scholars have embarked on providing evidence of cultural transmission, finding that it is persistent and shapes, among others, gender norms and preferences for child's gender.¹ In that sense, Fernández and Fogli (2009a) and Alesina et al. (2013a) show that the cultural background from our ancestors determines fertility and employment. However, Galor and Moav (2002) advance that genetic transmission of preferences can widely spread, within a society, traits associated with higher reproductive success, even if initially only a minority displayed them. This mechanism complements Bisin and Verdier (2001a).

In parallel to this literature, a second strand discusses the effects of gender equality on economic development. In that spirit, De Moor and van Zanden (2010), advance that gender-egalitarianism in the Northern Sea region aligned family's fertility with women's preferences to sire fewer offspring, freeing resources that parents directed to human capital formation. Finally, in the theoretical front, Lagerlöf (2003a) and Hiller (2014) relate gender equality to economic growth through human capital accumulation.

I organise my Ph.D. dissertation in three independent chapters that have gender as common, underlying thread. In particular, Chapter 1 —co-authored with Annalisa Frigo— delves into the long-forgotten origins of gender equality, showing that a temporary female empowerment can have enduring effects on gender equality once women's improved outcomes morph into culture. This chapter complements several advances that document the origins of gender equality, or more broadly, of gender roles. The channel I advance in this chapter is novel in the relevant literature and emphasises female's bargaining power and access to better outside options, triggered by the establishment of *beguine* communities in the Belgian context.

In Chapter 2 I document that gender equality may have lingering consequences on economic prosperity through nation-building during its early stages. Building on a theoretical model, I find that granting women equal access to inherit hastens state-building in the short run, but delays it in the long run. This result is important because the literature, in the context of my model, has typically portrayed only a negative relationship between variables. My result refines the previous findings and indicates that, at critical junctures, gender equality may be growth-enhancing. Finally, in Chapter 3 I analyse how economic growth and maternal employment coeval in developing societies, where mother's work can jeopardise children's safety. The mechanism I propose is anchored by the medical literature but has never been investigated in economics. Moreover, this chapter clearly indicates the importance of economic growth in determining maternal job-taking. From a methodological standpoint, my Ph.D. thesis combines empirical research and economic modelling. It intertwines classical regression analysis, the cliometric methodology and creative empirical methods.

In the paragraphs that follow, I describe in greater detail the scope of each of the three chapters. Although I strive for brevity, I present a comprehensive summary of each, summarising the main findings and my contributions to the literature. It is my hope that the reader will find what follows illuminating, that it contributes to the accumulation of scientific knowledge, and that it may serve one day to guide future research.

The first chapter studies the roots of gender equality, specifically in the Belgian context. It follows the trail initiated by Alesina et al. (2013a) which documents that cultural traits are strikingly persistent. However, we advance an enduring, local breakaway from traditional roles for women in Belgium. It originated with the establishment of *beguine communities* during the 13th century in that country. Beguinages were female-only, self-supporting groups of women of all social strata that conducted their lives combining religious devotion with worldly occupations. Beguines participated in the local economy working in textile-related industries, as bakers,

¹Other, unsuspected, outcomes that reveal striking persistence are antisemitism and trust, see Voigtlander and Voth (2012) and Lowes et al. (2017).

teachers, nurses and even long-distance traders. The chapter argues that the presence of beguines modified townsfolk perceptions regarding the value of women and its equality with respect to men as beguines offered a living example of women successfully thriving without male intervention. We show that, during the mid-19th century —several centuries after the foundation of beguinages and after these communities ceased functioning—, Belgian towns that once hosted a beguinage exhibit higher levels of gender equality. We propose that beguinages offered women an additional option besides marriage or monastic life, improving their bargaining power. Female outcomes become akin to those of men, and the inter-temporal transmission of the idea that men and women are equal generates its long-lasting persistence. We find some supporting evidence for this mechanism, and we build a theoretical model that rationalises it. Our most conservative results indicate that beguinages decreased the literacy gap between women and men by 0.04. This corresponds to 5.3% of the average value for that ratio. Similarly, the fraction that literate women represented among the entire literate population rose by 1.2 percentage points and the ratio of female-to-male literacy rates increased by 4.1 percentage points.

The second chapter of the thesis is theoretical. It is concerned with the process of state capacity building at its early stages. More capable states can coax compliant behaviour from the individuals more easily, and state capacity has been associated with economic performance in the literature. Our model incorporates a neglected institutional factor governing its evolution: the degree of gender-egalitarianism embedded in inheritance rules. We compare the consequences for the evolution of state capacity of following a gender-biased ruled —male-cognatic primogeniture, a rule that grants men preferential access to inheritance— against a gender-egalitarian rule —absolute primogeniture—. We complement the theoretical analysis incorporating the idea of dynastic continuity. It was of utmost importance to European elites during the middle ages and consisted in pursuing an enduring identification between landholdings and family names. Gender-biased inheritance rules favouring men incentivise state-building because, historically, men continued dynasties and it was valued. Besides a taste for dynastic continuation, our model accommodates inter-state marriages between land-inheriting heirs. Marriages accumulate land, thereby generating a wealth effect. We weigh the direct effect of dynastic continuation against the indirect effect of more land-merging marriages under gender-egalitarian rules. The paper shows the importance of gender equality. In particular, it advances that state capacity accumulates faster under gender-egalitarian norms in the short run. This result nuances the literature because it generally indicates a more expedited evolution when the probability of continued rule is higher, and this is the case under gender-biased rules. Nonetheless, in the long run, results are reversed. Although our model is silent about economic growth, it indirectly relates economic prosperity to gender-equality through the effect the latter has on state capacity building.

The final chapter is concerned with the determinants of maternal employment in developing countries. It proposes and tests a new mechanism that relates economic prosperity to maternal employment through child mortality differentials between working and non-working mothers. Using DHS data for a sample of sub-Saharan countries, we corroborate that children born to working mothers are at a higher risk of dying. However, this mortality gradient decreases with female's accumulated level of human capital. The core of the chapter relates this mortality gradient to maternal employment. In particular, it shows maternal work does not change with the mortality gradient in deprived families wherein husband's income is low. Women's work is essential to those families to meet ends, and therefore cannot optimally trade off maternal employment against the risk it poses to children. In short, mothers in poor families are constrained to work, despite its detrimental effects. On the contrary, well-off households reduce maternal employment when it is less compatible with childcare and endangers infants more. Overall reductions in mothers' job-taking are sizeable and reach 5.6 percentage points among affluent families in more developed areas. These results document the importance of economic prosperity for unstrained maternal work. Finally, we evince the mechanism is not operative in families whose children are above the age of five. A simple, theoretical model rationalizes our findings. It

relates the child mortality gradient to economic prosperity and generates a U-shaped relationship between development and female labour force participation. This model improves upon the previous literature explaining both the decreasing and increasing parts of this curve.

Chapter 1

Roots of Gender Equality: The Persistent Effect of Beguinages on Attitudes Toward Women

by Annalisa FRIGO
and Èric ROCA FERNÁNDEZ

Abstract: This paper is concerned with the historical determinants of gender equality. In the specific context of Belgium, it relates higher levels of gender equality during the 19th century to the presence of medieval, female-only, Belgian communities called *beguinages*. Combining a novel, hand-collected data-set on beguinage location with 19th-century Belgian census data, we document that in municipalities where beguine communities settled the literacy gap reduced. Schooling was not compulsory and literacy differentials reflect parental tenets on gender equality. Using changes in the political organisation through which some villages became more attractive to beguines, we establish that the variation in gender literacy is indeed related to the presence of beguinages. Our results are in line with the extensive empirical evidence documenting the persistence of gender norms and culture. Finally, we propose a novel class of mechanisms, based on improvements in girls' bargaining power, to rationalise our findings.

1.1 Introduction

This paper is concerned with the historical determinants of gender equality. In the specific context of Belgium, it traces back the reduction of the literacy gap during the mid-19th century to the presence of medieval, female-only, Belgian communities called *beguinages*. We explain the lingering effect of beguine communities on attitudes toward women combining the female empowerment beguinages represented in terms of girls' bargaining power with the intergenerational transmission of a gender-egalitarian culture.

The beguine movement started in the 13th century and consisted of female-only communities that offered women of all socio-economic strata the opportunity to remain single, amidst a society encouraging marriage or monastic enclosure. Beguines, in emulation

of Jesus’ disciples, supported themselves by means of work. Although religiosity was important, beguines differed from nuns because they never took formal vows, could retain and accumulate wealth and could leave the beguinage. Moreover, beguine communities were not subject to men.¹ Finally, these communities were actively involved and well integrated into everyday social life as beguines self-supported themselves by means of that put them in contact with the secular society.

This paper is the first to systematically explore the relationship between pre-industrial, female-only urban associations and gender equality. Combining a novel, hand-collected data-set on beguinage location with Belgian census data, we show that municipalities where beguine communities settled reached higher levels of gender equality by the mid-19th century. Our most conservative results indicate that the presence of beguinage in a municipality decreased the literacy gap between women and men by 0.04. This corresponds to 5.3% of the average value for that ratio.

It may be argued, however, that beguines located in municipalities that were already more gender-egalitarian, and thus more favourable to the beguines’ lifestyle. In order to deal with this potential endogeneity issue, we rely on a specific instrument, related to changes in the political framework that decentralised power in some municipalities, encoded in *municipal charters*. Municipal charters conveyed privileges including the possibility to set up markets, guilds and mints, as well as a municipal judicial system. These advantages attracted beguines because they specialized in market activities. Our IV approach corroborates the previous association. In any case, even if municipal charters were not completely exogenous, our research highlights that beguine communities had a role in building-up gender-egalitarian norms and maintaining those for over 600 years.

To rationalise these results, we postulate one possible mechanism whereby beguinages improved nubile girls’ bargaining power. Indeed, access to a beguinage represented a viable alternative to nubile girls besides marriage or monastic life. Consequently, female’s outcomes became similar to their male counterparts, eventually translating into a more gender-egalitarian culture perpetuated through its intergenerational transmission in the spirit of Bisin and Verdier (2001b). In that sense, children in towns with beguine communities were exposed, first, to beguines, and second, to peers who were already

¹For this characteristic the beguine movement is considered the “first feminist movement”, see Panciera (2016).

more favourable toward the idea of gender equality. Our data suggests this may be a valid explanation. A simple theoretical model rationalises our conjecture and posits that cultural intergenerational transmission generated the persistence.

The rest of the paper is organized as follows: Section 1.2 reviews the relevant literature on the origins of gender roles and introduces the historical background of the beguinal movement. Sections 1.3 and 1.4 describe the different data sources and the empirical strategy. The latter is supplemented by robustness tests, including an IV approach. A theoretical model in Section 3.2 rationalises our findings. Section 1.6 concludes.

1.2 Related Literature and Historical Background

Related literature. Economic research has documented the long-lasting nature of gender norms and argued that many arose from gender-based specialisation predating industrialisation and going as far back as the Neolithic revolution several millennia ago.² In particular, gender roles and gender equality are strikingly persistent and determine present-day attitudes toward women.

Alesina et al. (2013b) study the origins of cultural norms about gender roles and labour division. They find contemporary rates of female employment, entrepreneurial and political activities to be significantly lower for the descendants of societies that traditionally practised plough agriculture. Different physical endowments explain the result since men had a comparative advantage at manoeuvring the plough. Analysing female employment rates of second-generation migrants in the USA, the authors also identify the key role of cultural transmission. Along the same line, Hansen et al. (2015b) show that women work less in societies that transitioned earlier to agriculture. The authors argue that agriculturalists could reach higher fertility, diverting women's time from market work to childcare. Also, a cereal-based diet requires more time to prepare food, an activity in which women specialised. Galor and Weil (1996b) provide a theoretical model rationalising these empirical findings, revolving around how differential physical endowments explain women's specialisation in child rearing and home activities rather than market work.

²In general, cultural beliefs are deeply rooted and tend to evolve slowly. Some recent studies document persistence for a wide range of characteristics, including antisemitism and trust. See for instance Voigtlander and Voth (2012), Becker et al. (2016) or Lowes et al. (2017). Giuliano and Nunn (2017) analyse under which conditions traits persist or change.

Departing from physiological determinants, some scholars have shown that certain cultural and economic aspects are associated with the gender bias. First, strong family ties are related to gender inequality, although probably both variables co-evolved. Alesina and Giuliano (2010) document lower female employment, higher fertility and, in general, more “traditional” roles for women in societies with strong family ties.³ Second, Grosjean and Khattar (2015) documents that the historical scarcity of women improved their contemporaneous position in Australia during the 17th and 18th centuries, in particular, women married more and worked less. Today, these traditional roles endure. Finally, Qian (2008b) and Xue (2014b) analyse how price changes in sectors where women had a comparative advantage increased female’s earnings in China. The authors associate women’s higher contribution to household finances with less female infanticide, reflecting girl’s higher value. Giuliano (2017) provides a recent literature review on the historical origins of gender roles.

Our paper complements the existing literature providing a new explanation for the origins of gender roles. Our explanation combines female empowerment through girls’ bargaining power with the intergenerational transmission of a gender-egalitarian culture, effectively departing from the literature. Complementing the previous explanation, beguines also acted as role modellers and could have instilled the idea that men and women were equally capable of conducting their lives.

By focusing on semi-monastic communities, our paper is also linked to the strand of the literature analysing the enduring role of religious institutions in explaining economic performance. For instance, Valencia Caicedo (2015) assesses the positive effects of historic Jesuit Missions in Latin America on modern-day human capital and technological progress. Similarly, Andersen et al. (2017) associate the presence of the industrious Cistercian Order in England with faster productivity growth three centuries after the dissolution of monasteries. Finally, Akçomak et al. (2016) study how a Catholic sect that valued literacy to understand the Gospel —the Brethren of the Common Life— affected Dutch male literacy rates.

We believe this paper is the first to relate medieval semi-religious movements with gender norms. Our contribution singles out the importance of female associations —in

³Bertocchi and Bozzano (2016) corroborates the results using historical Italian data. Tur-Prats (2015) associates the stem family type to domestic, intimate-partner violence in Spain.

particular, beguinages— to improve gender equality, even long after such communities disappear. Moreover, we propose a novel class of mechanisms based on bargaining power, never explored in this literature, to explain the lingering association between beguine communities and gender equality.

Historical Background. The economic literature argues that the gender-egalitarian culture of the Northern Sea region was conducive to economic development.⁴ In particular, gender equality enabled human capital accumulation by aligning family’s fertility with women’s preferences for less offspring (Carmichael et al. (2016)), but traces of gender equality are also documented in historically high levels of female employment, see De Moor and Van Zanden (2010).

The beguinal movement started in the late 12th century in this region, fully flourishing in the next two centuries, and has left several beguinages across the Low Countries, France and Germany.⁵ It consisted of self-supporting, female-only communities that offered women of all social strata⁶ the opportunity to remain single in a society that discouraged that option, allowing them to study and work.⁷

Records of pre-beguine communities first appear around the city of Huy about 1181. Several analogous groups arose nearby in subsequent years, dotting the region comprising Aachen, Nivelles and Vilvoorde. Simultaneously, two beguinages flourished in Cambrai and Valenciennes—in present-day France—, see Simons (2010, Appendix I). Bowie’s (1990, p. 14) chronology is similar and also points to the same Belgian region as the cradle of the beguine movement.⁸

⁴In this paper, we do not attempt to explain why that region was more gender-egalitarian, to begin with. In particular, we are concerned with differences in gender equality *within* this area.

⁵In 1998, the UNESCO recognised them as World Heritage for their “outstanding example [... as] a religious movement characteristic of the middle ages, associating both secular and conventual values”.

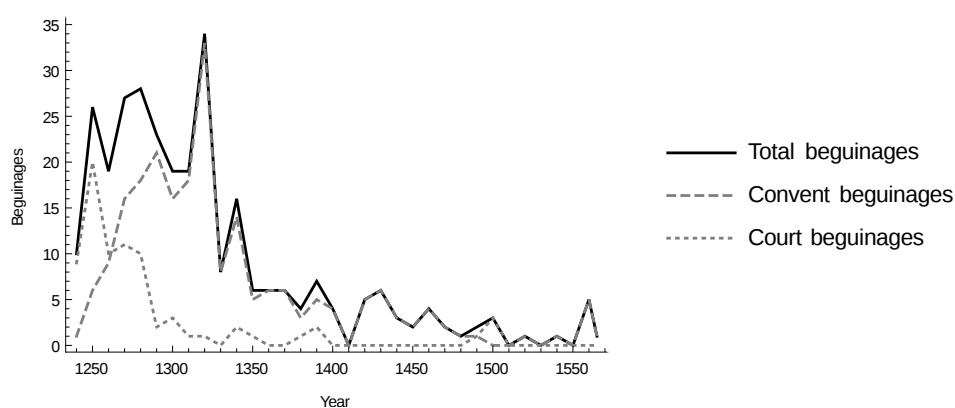
⁶Poor and well-off women alike joined beguinages. Some girls arrived almost empty-handed and few saw poverty as a Catholic ideal, see McDonnell (1954, p. 146) and Geybels (2004). Contrasting, daughters of wealthy citizens and noble-men joined the community, at times accompanied by their maids, see McDonnell (1954, p. 97-99) and Geybels (2004, p. 111).

⁷The Mistresses of the beguinages in Ghent indicate that “[...] young beguines received their education [...]” in the beguine, although the “fruit of their work” earned them a living, see Vander Schelden (1862, p. 2 and p. 12); own translation from French. Beguinages combined contemplative lifestyle and work (McDonnell (1954, p. 146-149)). Indeed, admittance to a beguine required the capacity of supporting oneself through work or personal finances (Geybels (2004, p. 114-118)) and their laboriousness put them “in competition with guilds and craftsmen” (*Ibid.* p. 63). Beguine occupations included “carding, spinning, weaving and bleaching [...] making of bobbin lace, sewing, embroidery, making rosaries and baking communion wafers” and “[...] labour was compatible with the ideals of the *vita apostolica* [...] because] the disciples in Jesus’s day also had to support themselves”. (*Ibid.* p. 115-116). Caretaking and teaching were also profitable sources of income.

⁸These initial arrangements differed from the concept of beguine that developed later. However, they featured several women who followed a spiritual life outside convents.

Tracing the history of beguinages, we can distinguish two different types: convent and court beguinages.⁹ In the first sort, the most common, beguines lived close to each other in the same neighbourhood and followed a common rule under the direction of a superior.¹⁰ Although court beguinages were rarer, this type developed earlier and with more intensity. Moreover, court beguinages were erected in open spaces with the unique purpose of accommodating the community, leaving a greater imprint on city life. These consisted of several dwellings, gardens, workshops and a chapel. In any case, the lack of unified rules brought about a wide spectrum of different hybrid arrangements.

Figure 1.1: Number of beguinages created by decade



Note: Data on beguinage foundations per decade from Simons (2010). Own elaboration.

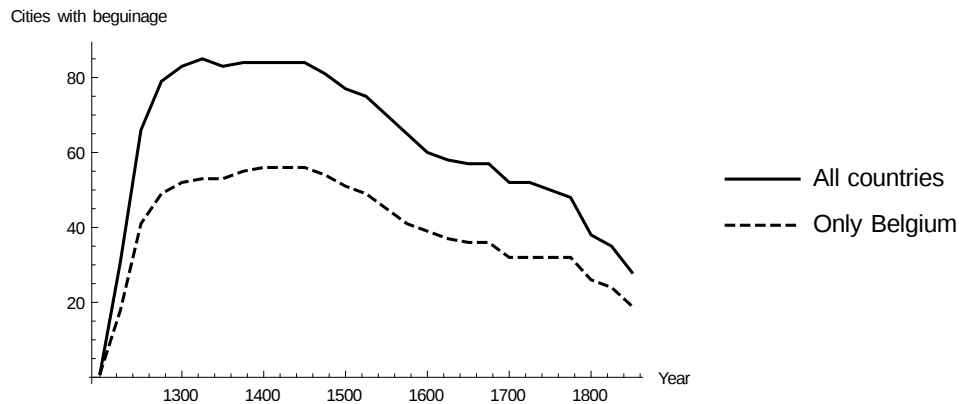
The expansion of beguinages in the middle ages was uneven. Across the Low Countries, after an initial surge, the creation of beguinages stagnated at 20 per decade and then steadily decreased. Figure 1.1 represents the number of beguinages created every decade between 1241 and 1565. Data follows Table 1 in Simons (2010, p. 49). Overall, 111 cities hosted a beguinage: 70 located in Belgium, 22 in France, 17 in the Netherlands, and two in Germany. Besides the total number of beguinages, another telling feature is the number of municipalities that had at least one beguinage at any point in time as this gives a sense of how long beguinages lasted. Figure 1.2 displays this information for every 25 years in Belgium and all countries. After an initial momentum in the creation of new beguinages, the movement reached its zenith between the 14th and the 16th centuries,

⁹Geybels (2004, p. 105-106) distinguishes between “town pattern” beguinages, “court beguinages” and what he calls “miscellaneous beguinages”.

¹⁰See, for instance, Geybels (2004, p. 50) and Mommaers and Dutton (2004, p. 21).

when the number of beguinages stabilized. Afterwards, their popularity declined.

Figure 1.2: Number of cities with at least one beguinage



Note: Data on beguinage foundations per decade from Simons (2010). Own elaboration.

Beguinages greatly differed in terms of the population they hosted. Simons (2010, Table 3, p. 56-59; Appendix II), McDonnell (1954, p. 64) and Geybels (2004, pp. 69, 136, 143, 145 and 147) provide estimates of the number of members in some beguinages over time. The authors document a decreasing trend between 1300 and 1900, approximately. Some beguinages reached large populations, such as Mechelen —up to 1900 beguines in 1500— or Nivelles —hosting 51 beguines in 1284, shortly after the movement began—. By the mid-19th century those beguinages still operative counted less than 10 inhabitants.¹¹

The beguine movement stands out from other religious and semi-religious communities especially because beguines never constituted an orthodox religious order.¹² Although religiosity and pious life guided the foundation and daily routine of beguinages, these communities radically differed from monastic convents. First, beguines did not take poverty vows, allowing them to retain property and accumulate wealth. Second, they could leave the beguinage at will to marry or to reintegrate secular society. Family ties were generally maintained.¹³ Third, these communities were actively involved in and well

¹¹Some pious men, known as *beghards*, emulated the lifestyle of beguines but never reached their reputation and size. Beghards were sorts of small guilds, as they were essentially craftsmen in the textile industry.

¹²Denisart notes that “beguines are pious women whose status is [...] between religious and secular.” Own translation from French, see Vander Schelden (1862, Document V, p. XXV-XXVI). Religiosity was important, and daily praying compulsory, see McDonnell (1954, p. 5) and Béthune (1883, p. 90).

¹³Warnkönig (1836, p. 350) defines them as “women [...] who wear a particular monastic clothing, live together in a space not forbidden to outsiders [...], to lead a chaste and pious life under a superior and following their own statutes. They are not obliged by vows to renounce the world forever”; own translation from French. Vander Schelden (1862, Document V, p. XXV-XXVI) confirms this characterisation adding that “beguines need not give up family relationships or friendships [...]” Bishop Malderus of Antwerp similarly characterises beguines, especially noting the lack of vows, see McDonnell (1954, p. 121-122). Mommaers and Dutton (2004, p. 20) portray

integrated into the everyday social life of medieval cities. Indeed, beguines pursued a life of prayer combined with active service in the urban environment, including various forms of occupation and charitable work.¹⁴ These activities distinguished beguinages from enclosed convents as the former often had their own vegetable garden, schools and hospitals, providing work opportunities. In fact, while they promised to lead a humble life, this did not prevent them from having real-world occupations.¹⁵

The movement further distinguished from Catholic orders because beguines lacked common rules and a central coordinating authority.¹⁶ Despite their non-adherence to traditional monastic standards, beguines were tolerated and even granted spaces by the secular society.¹⁷

This peculiar freedom of choice and self-determination of beguines rapidly propagated, and as soon as 1260 a literary work portrayed the beguines.¹⁸

Indeed, beguinages were the forerunners of women's associations, guaranteeing the necessary social and financial protection for single women who joined the community, in a society where staying single was stigmatised.¹⁹ Because of their independence from male authority, Bowie (1990, p. 13) considered the beguines "the first European women's movement".

In general, the Holy See and local bishops supported the beguine movement.²⁰ However, the Council of Vienna (1311-12) demonised beguines, and the persecution of heretic

a similar depiction.

¹⁴Beguines worked in embroidery and textile production or more in touch with the external society as nurses, small business owners and teachers, see footnote 7 Geybels (2004, p. 114-118), Vander Schelden (1862, p. 2) and McDonnell (1954, p. 5) underline their charitable work.

¹⁵McDonnell (1954, p. 131) provides an analogous characterisation based on the Béthune (1883, p. 74): "[t]he beguinage was a retreat, especially well adapted to an urban society, where women living in common could pursue chastity without a vow and earn a livelihood by suitable work". See also Bowie (1990, p. 25).

¹⁶According to Geybels (2004, p. 59), the beguine movement was "poorly organised [...] with each community possessing its own statutes". It always lacked common rules (McDonnell (1954, p. 134)) and ecclesiastical opposition was partly founded on this Frédéricq (1889, p. 168-169, par. 172).

¹⁷French and Belgian beguines enjoyed powerful patronage and were granted privileges, including donations of land, see Vander Schelden (1862) and McDonnell (1954, p. 6, Ch. X and Ch. XI). Clerical tolerance is also emphasized, and beguines were praised and their lifestyle recommended by prelates and the Roman Curia. They received assistance when threatened by ecclesiastic opposition, see Geybels (2004, p. 50).

¹⁸The poem "*Ci encoumence li diz des Beguines*" written by the Parisian *trouvère* Rutebeuf around 1260 caricatures beguines "If a beguine marries, that is her vocation, because her vows or profession are not for life. Last year she wept, now she prays, next year she'll take a husband. Now she is Martha, then she is Mary; now she is chaste, then she gets a husband.". In particular, This literary work reveals their flexibility and ostensible freedom on how to conduct their lives.

¹⁹The cartulary of the beguinage in Ghent supports this perspective, see Geybels (2004, p. 47).

²⁰Simons (2010, p. 124-125) indicates that clergymen accepted beguines as "a sign of diversity" within the Church, and others simply saw beguines women who "contributed to purify the faith". See also footnote 17. However, some initial opposition is recorded because they preached and "interpreted the mysteries of Scripture".

movements harassed them particularly in the Rhineland region, despite the beguine movement never been considered as such.²¹ Accusations did not last long, though, and the Pope Clement VI completely exonerated the movement from previous charges in 1328.

Finally, De Moor (2014) reviews and dismisses the traditional explanations for the rise and success of the beguine movement. In particular, the view that beguines sheltered urban girls unable to marry because of skewed urban sex ratios is dubious because most beguines came from the countryside. Similarly, beguinages were not a substitute of monasteries, because each community located geographically separated and attracted different women. The author evinces that —besides devotional reasons— a beguines were often motivated by professional opportunities. In that sense, joining a beguinage was a deliberate choice to stay single and do remunerated work, independently of a male breadwinner.

1.3 Data and Empirical Strategy

We combine several data sets to establish an empirical relationship between medieval beguine communities and female agency. Our baseline econometric specification is the following OLS model, where the unit of observation is a Belgian municipality existing in 1866:

$$outcome_{i,j} = \alpha beguinage_{i,j} + X_{i,j}\beta + \gamma_j + \epsilon_{i,j}. \quad (1.1)$$

$outcome_{i,j}$ measures gender equality and is observed for municipality i belonging to canton j , $beguinage_{i,j}$ a variable attesting the presence of a beguinage, $X_{i,j}$ is a set of covariates, γ_j are fixed-effects at the canton level, and $\epsilon_{i,j}$ denotes the error term.²² We proxy gender equality using mid-19th-century literacy differentials between genders derived from census data. We detail below how these are computed as well as how we attest the presence of beguine communities.

Analysing 19th-century census data mitigates the influence of the labour market and welfare state measures implemented in the following century, especially compulsory

²¹See , p. 72-73 Frédéricq (1889, p. 168-169, par. 172) and Geybels (2004, p. 56-65).

²²Cantons are the administrative level immediately above municipalities. Belgium counted 193 cantons in 1886 and each contained between one and 40 municipalities.

education. Moreover, it allows to control for migratory patterns and reduces concerns related to the involvement of women in the early industrialization of Belgium. Finally, historic data alleviates the fact that variation in gender norms tends to be confounded over time by historical events and institutional shocks.

1.3.1 Historical Presence of Beguines

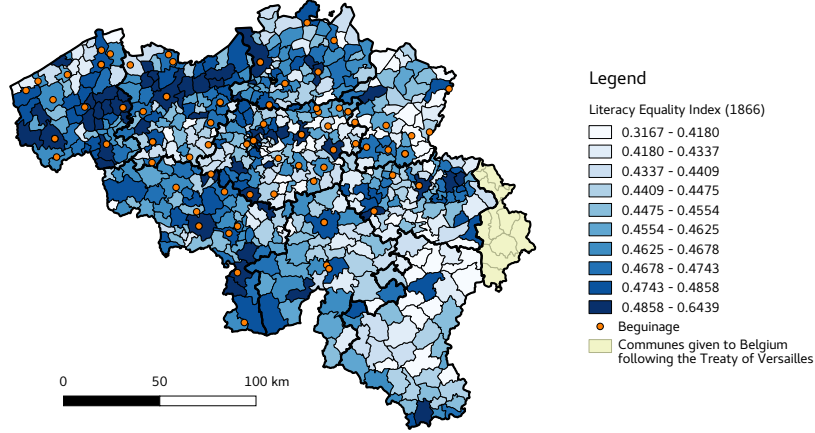
Beguinaige location, foundation and dissolution dates are reported by Simons (2010). The author combines a wide variety of sources to overcome the lack of historical records and the fact that beguinages were rarely established through a formal act of foundation. He documents 143 sites that can be positively defined as beguinages, although few records group several small beguinages in a town. Using this information, we compile a new data set that features the exact location of each beguinage, and relate it to Belgian municipalities existing in 1866. We restrict our attention to beguinages located within the borders of modern Belgium, where 70 municipalities hosted a community. Figure 1.3 depicts their location.

Ideally, one would like to have information on the number of beguines living in each municipality, but such information is scarce and only available for selected beguinages. We circumvent this limitation by creating three proxy variables that convey information in that sense. The first one is a binary indicator that takes value one when a municipality had, at any point in time and for any duration, at least one beguinage:

$$Beguinaige_i = \begin{cases} 0 & \text{if } municipality_i \text{ never had a beguinage,} \\ 1 & \text{if } municipality_i \text{ had, at least, one beguinage.} \end{cases} \quad (1.2)$$

The information contained in this indicator is not finely grained, and we expand it considering more than the mere presence of a community. The second measure consists of a continuous variable that accounts for different durations (t) of beguinages (j) in municipalities (i). Since it is possible that a municipality hosted more than one beguinage, we aggregate the impact of different beguine communities coexisting or succeeding in the

Figure 1.3: Distribution of beguinages and literacy equality index



Note: This map depicts present-day Belgian municipalities. Literacy equality index is computed for each historical municipality during 1866 and aggregated using population-weighted averages. Provincial boundaries follow historical limits. Due to the skewness of the data, the map displays it by deciles.

same town in the variable *exposure*:

$$Exposure_i = \sum_{j \in i} t_{i,j}. \quad (1.3)$$

Our last variable consists in a five-level index called *intensity* that combines features of the previous two indicators. It is formally defined as follows:

$$Intensity_i = \begin{cases} 0 & \text{if no beguinage has even been recorded,} \\ 1 & \text{if 1 beguinage has been present and } exposure_i < 200, \\ 2 & \text{if 1 beguinage has been present and } exposure_i \geq 200, \\ 3 & \text{if more than 1 beguinage has been present and } exposure_i \geq 200, \\ 4 & \text{if more than 3 beguinages have been present and } exposure_i \geq 200. \end{cases} \quad (1.4)$$

1.3.2 Census Data

Following Bertocchi and Bozzano (2016), we use census data to assess gender equality comparing female-to-male literacy rates.²³ In the first half of the 19th century, education

²³In our context, a literate individual is someone able to read and write.

was not compulsory for children and traditional roles preferentially educated men over women. Therefore, comparing female-to-male literacy rates is meaningful as it reflects how women were perceived with respect to men because the schooling of children was an expensive investment.²⁴ Hence, locations valuing comparatively more women and equating them to men are expected to educate both genders in similar manners. Data to proxy gender equality with literacy ratios are only available at the municipal level starting from the 1866 census.²⁵ This data source offers widespread coverage and consistent measurement across regions.

We proxy gender equality using three different variables that measure gender differences in literacy levels. These are, for each municipality i :

$$\text{literacy equality index}_i = \frac{\text{Number of literate women}_i}{\text{Number of literate men}_i} \quad (1.5)$$

which relates the number of literate women with the number of literate men,

$$\text{female literacy share}_i = \frac{\text{Number of literate women}_i}{\text{Number of literate women}_i + \text{Number of literate men}_i}, \quad (1.6)$$

recording the share of literate women among the literate population and

$$\text{female literacy index}_i = \frac{\text{Share of literate women}_i}{\text{Share of literate men}_i} \quad (1.7)$$

comparing female and male literacy rates. Higher values for these indexes correspond to more favourable attitudes toward women. In all our indicators, the inclusion of men in the denominator is meaningful since plain literacy rates may vary across regions for diverse reasons. Its inclusion smooths out part of this underlying, idiosyncratic characteristics.

Other variables derived from the census comprise population, nuptiality and the share of international and domestic migrants by gender; the sex ratio and an indicator variable for the 10% most populous municipalities. The final sample comprises 2553 municipalities.²⁶

²⁴Clearly, the parental decision on whether to educate a daughter or a son is influenced by other factors we should control for in the regressions. See Section 1.3.3 for a more comprehensive description of them.

²⁵Census data from 1846 onward has been recently digitised by the HISSTAT/LOKSTAT project of the University of Ghent. Older national censuses from the years 1800-1830 are scattered and stored in manuscript in different archives in Belgium, France and the Netherlands.

²⁶There are 158 municipalities for which information on population is not available for the year 1866.

1.3.3 Other Data

Education Providers. Regressions consider the presence of two education providers that promoted literacy and hence affect the outcome of interest. First, elementary education prior to and during the 19th century was traditionally offered almost exclusively by church-related institutions. According to Ruyskensvelde (2016, p. 28), it became compulsory at the end of the 19th century, and previous efforts —notably the *Nothomb law* of 1842— failed.²⁷ Our data set documents the presence of monasteries at the municipal level, as they historically provided education and could have fostered human capital in the area.^{28,29} Information includes monasteries’ foundation and dissolution dates, the order to which they belonged and whether the community was masculine or feminine. We limit our observations to monasteries founded before 1800. Although both beguines and traditional nuns were devoted to the study of the scriptures, the latter were more inclined to cloistered, contemplative life, and therefore lacked integration with the secular society.

Secondly, we introduce the distance to Leuven, which hosted the unique university in Belgium from its constitution in 1425 until 1817 when Liège and Ghent universities were created. Being close to the unique university might have raised awareness on the benefits of education or it may have intensified the supply of books, teachers and professors in the area.³⁰

Other Controls. In a pre-modern society, the degree of economic development is likely to exert an influence on literacy levels and gender roles. To take into account the extent of industrialisation, we introduce the number of steam engines per individual at the municipal level using data from Neck (1979, p.468-476). We incorporate additional variables obtained using GIS solutions: latitude, longitude, distance to the closest river³¹

²⁷Financial problems and opposition from the Church doomed the success of the 1842 education bill. Although the reform contributed to increasing literacy rates, by 1880 39% of the population was still illiterate while this figure was as high as 51% in 1843.

²⁸Information on monasteries has been derived from Cottineau (1939), Berlière (1955), Michel (1923) and Department of History, The Ohio State University (2016). Monasteries were assigned to the relevant municipality existing in 1866. For instance, the priory of Oignies is located in the town of Aiseau although its name suggests it was in Oignes. Most religious institutions were suppressed, and their properties auctioned after the Napoleonic invasion.

²⁹Unfortunately, contemporaneous information on schools is only available at the provincial level.

³⁰The presence of this university should not directly encourage women to pursue higher education because they were not admitted until 1880, first at *Université Libre de Bruxelles*. Therefore, we expect distance to Leuven to have a negative impact on our measures of compared literacy, if any.

³¹We use shape-files from European Environment Agency (2017) tracing all major European rivers.

and to the closest large city.³² The proximity to waterways and urban areas captures industrialisation, and we argue that the presence of close-by factories may affect incentives on whether to educate children.

During the 19th century, agriculture was an important activity, and we introduce measures to capture its extents. In particular, we include agricultural caloric yields, soil types and crop-specific yield for staple crops: barley, buckwheat, rye, wheat and white potatoes. The economic literature indicates that historical agricultural productivity, measured by its caloric yield, have enduringly shaped gender roles due to economic specialisation. Contemporaneous yield levels affect the marginal productivity of labour, and hence the returns to education. For these reasons, the variable takes on different values before and after 1550 (see Galor and Özak (2016)).

Carranza (2014) documents that soil types determine female employment in agriculture, and a long tradition of female participation in agriculture can generate persistence. Following her, we compute the share of clayey, silty or sandy soil in a 10 km-radius area around each municipality. Similarly, crop-specific yields account for the possibility that women had a comparative advantage in given crops.³³

Table 3.1 provides the summary statistics for the main variables.

1.4 Regression Analysis

This section presents the results obtained estimating Equation 1.1 by OLS, and establishes that the presence of beguinages at the municipal level correlates with increased gender equality. We argue that beguinages offered young, nubile girls an additional option besides marriage or monastic life. Access to a broader choice-set improves the bargaining position of women, and the ensuing outcome should be closer to the male counterpart, raising the status of women among the population. Complementing the previous, beguines acted as role modellers by successfully conducting their own life without the intervention of men, which signalled the equality between genders.³⁴ Be it as it may, we postulate that

³²The 50 most populated cities are those classified as large municipalities.

³³Crop yield data is provided by FAO/IIASA (2011). These provide measures of production capacity for several crops based on geographic and climatic characteristics. In our setting, it is measured assuming both a low-input and rain-fed, mimicking medieval characteristics; and imputing an intermediate level of inputs and the use of irrigation to better account for 19th-century agricultural techniques.

³⁴Beguines independence was sustained by means of work—including high-level, prestigious positions as teachers— instead of pious donations, which underlined, even more, the value of women. Also, beguine occupations

Table 1.1: Summary Statistics

	<i>Mean</i>	<i>Std.Dev.</i>	<i>Min.</i>	<i>Max.</i>
<i>Beguinage presence</i>				
Beguinage (0/1)	0.026	0.159	0	1
Intensity: No Beguinage	0.974	0.159	0	1
Intensity: 1 Beg., < 200 years	0.007	0.086	0	1
Intensity: 1 Beg., > 200 years	0.012	0.108	0	1
Intensity: > 1 Beg., > 200 years	0.003	0.054	0	1
Intensity: > 3 Beg., > 200 years	0.004	0.061	0	1
Exposure (centuries)	0.134	1.065	0.000	22.440
<i>Outcomes</i>				
Literacy equality index, 1866	0.822	0.137	0.236	1.808
Female literacy share, 1866	0.448	0.042	0.191	0.644
Female literacy index, 1866	0.856	0.122	0.256	1.601
<i>Controls</i>				
Total men, 1866 (thousands)	0.949	2.622	0.009	74.169
Total women, 1866 (thousands)	0.944	2.909	0.009	83.736
Nuptiality men, 1866	0.360	0.036	0.181	0.669
Nuptiality women, 1866	0.398	0.037	0.202	0.626
Fem. monastery	0.030	0.184	0	2
Masc. monastery	0.024	0.170	0	3
Other monastery	0.072	0.259	0	1
Distance to river (km)	9.082	8.757	0.002	52.396
Distance to Leuven (km)	69.560	33.467	0.000	167.249
Distance to beguinage (km)	16.265	18.164	0.000	122.010
Distance to large city (km)	18.577	19.988	0.000	114.328
Steam engines per 1000 people	0.071	0.689	0.000	12.493
Potential caloric yield before 1550	2142.122	72.760	1908.810	2305.816
Potential caloric yield after 1550	8894.732	310.662	8292.416	9780.832
Potatoes, yield; pre-1800	3595.284	228.123	2726.000	3933.000
Potatoes yield; post-1800	7206.351	450.825	5698.000	7724.000
Wheat yield; pre-1800	2507.358	73.550	2328.000	2687.000
Wheat yield; post-1800	5992.998	239.711	5163.000	6353.000
Barley yield; pre-1800	2507.358	73.550	2328.000	2687.000
Barley yield; post-1800	5992.998	239.711	5163.000	6353.000
Rye yield; pre-1800	1545.315	57.366	1337.000	1735.000
Rye yield; post-1800	3368.416	96.500	2972.000	3637.000
Buckwheat yield; pre-1800	1032.003	38.934	911.000	1122.000
Buckwheat yield; post-1800	1597.474	55.684	1486.000	1734.000
Observations	2553			

the ensuing more gender-egalitarian view of the society is transmitted horizontally across generations (as in Bisin and Verdier (2001b)), fossilising in a local culture of higher equality between genders. In that sense, children in towns with a beguinage were exposed, first, to beguines; and second, to peers who were already more favourable toward women.

Table 1.2 presents the results of OLS regressions when the dependent variable is *literacy equality index_i*. Since results are consistent across specifications, outcomes where gender equality is traced with the variables *female literacy share_i*, and *female literacy index_i* are relegated to the Appendix in Tables 1.B.1 and 1.B.2, respectively. Table 1.2 reports the results of increasingly demanding specifications. Columns 1) to 3) present the raw correlation between the presence of beguinages and *literacy equality index_i*. Columns 4) to 6) introduce canton fixed-effects as an additional regressor, tackling regional variation in attitudes towards women. In Columns 7) to 9), exogenous variables related with geography are incorporated, namely, latitude, longitude, distance to Leuven, to the sea and the closest river, caloric yield, soil types, crop-specific productivity and the presence of monasteries. Finally, Columns 10) to 12) incorporate contemporaneous variables measured in 1866, including the number of men and women, their marriage rates, the sex ratio, the percentage of internal and external migrants for each gender and an indicator variable for the 10% most populous municipalities.³⁵

Results show that municipalities where medieval beguine communities established displayed higher levels of gender equality in 1866 when the institution already decayed and hosted only a few women if any. The association remains valid across all specifications and regardless of how the presence of beguinages is measured. In the most comprehensive specification, the presence of a beguine community increases the variable *literacy equality index_i* by 4.4 percentage points, that is, 5% of its average value. This effect is sizable. In particular, increasing the presence of beguinages by one standard deviation raises gender equality approximately as much as moving one standard deviation away from the city of Leuven, which hosted a university promoting literacy only for men. These results are based on the regression reported in Column 10) of Table 1.2 where some controls are potentially outcome variables. This seems to be the case because the coefficients of interest drop in Columns 10) to 12) while before they were relatively stable.

kept them in touch with the townspeople.

³⁵Note that these variables may depend on the presence of beguinages.

Table 1.2: Beguinages and Literacy equality, 1

	Dep. variable: Lit. equality index, 1866											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Beguinage (0/1)	0.144*** (0.019)			0.153*** (0.019)			0.125*** (0.019)			0.043*** (0.013)		
<i>Intensity</i>												
No Beg.		Ref.			Ref.			Ref.				
1 Beg., < 200 years		0.062*** (0.024)			0.085*** (0.025)			0.073*** (0.024)			0.038** (0.015)	
1 Beg., > 200 years		0.153*** (0.033)			0.160*** (0.034)			0.150*** (0.032)			0.047** (0.019)	
> 1 Beg., > 200 years		0.233*** (0.034)			0.269*** (0.044)			0.213*** (0.054)			0.088** (0.036)	
> 3 Beg., > 200 years		0.208*** (0.015)			0.183*** (0.009)			0.092*** (0.025)			−0.041 (0.036)	
Exposure (centuries)			0.021*** (0.003)			0.022*** (0.003)			0.017*** (0.003)			0.006** (0.003)
Fixed-effects	No	No	No	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549
R^2	0.030	0.035	0.029	0.203	0.207	0.200	0.218	0.220	0.213	0.432	0.433	0.431

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality proxied by the variable *literacy equality index_i*, see main text for a description. Column 1) to 3) include only the presence of beguinages as a regressor. Column 4) to 6) add fixed-effects at the canton level. In Column 7) to 9) exogenous variables are incorporated, namely, the presence of monasteries, latitude, longitude, distance to Leuven, to the sea and the closest river, caloric yield, soil types and crop productivity. Finally, Column 10) to 12) incorporate contemporaneous variables measured in 1866, including, number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In that case, the effect of the presence of beguinages would be greater, meaningfully raising *literacy equality index_i* by 12.5 percentage points, that is, 15% of its average value. According to the results in Column 2), 5) 8) and 11), the effect of beguine communities is larger for intermediate levels of beguinage presence. In any case, a longer presence of beguines is always related to increased female agency.

We argue that the presence of a beguinage in a town increased the girls' bargaining power by improving their outside options. We test this mechanism exploiting the presence of feminine monasteries because these also enlarged women's choice-set for women. However, we stress that entering a traditional convent conveyed less freedom and benefits than joining a beguinage. In particular, Table 1.3 assesses whether gender equality was larger in towns with a monastery for women, for the sub-sample of towns without a beguinage. Panel A) considers feminine monasteries altogether while Panel B) distinguishes between open and cloistered ones according to the Catholic order they belonged to.³⁶ Regressions exclude municipalities that hosted a beguinage.

Based on the results, the presence of feminine monasteries increased gender equality, more so for religious orders that interacted with the population. Arguably, open monasteries offered girls an alternative option beside marriage while cloistered, secluded life indicate a sheer vocation. Thus, the availability of a non-stigmatised environment for young nubile girls —either religious or semi-religious— improved the female status in the local society.³⁷ The non-significant coefficient associated with masculine monasteries reinforces this interpretation, ruling out increased female literacy as an explanation because masculine monasteries promoted literacy as well. Further controlling for beguinage presence does not change the results.

1.4.1 Robustness

Beguinage location may be itself explained by town-specific attitudes toward women, in particular, a local culture accepting beguines' lifestyle. In that sense, previous correlations would only indicate the perpetuation of these characteristics, and the mechanism we

³⁶Cloistered orders include the Annoncides, Carthusian, Colettine, Dominicans and Trappists.

³⁷Nowadays, similar networks of women leaving their families to find mutual protection and support in other women are present in a few developing societies. These groups are described in Appendix 1.A. From an empirical historical lens, our paper suggests that encouraging women to be independent in a safe community might be conducive to a widespread culture of gender equality.

Table 1.3: Literacy and gender equality, monasteries

	Lit. eq. index, 1866	Fem. lit. share, 1866	Fem. lit. index, 1866
	(1)	(2)	(3)
Panel A: Monasteries			
Fem. monastery	0.047** (0.019)	0.014*** (0.005)	0.049** (0.019)
Masc. monastery	-0.010 (0.013)	-0.003 (0.004)	-0.011 (0.013)
Other monastery	0.012 (0.019)	0.005 (0.006)	0.014 (0.020)
Observations	2479	2479	2479
R^2	0.407	0.392	0.232
Panel B: Monasteries by type			
<i>Fem. monastery</i>			
No mon.	Ref.	Ref.	Ref.
1 open	0.047** (0.024)	0.015** (0.007)	0.050** (0.024)
2 open	0.306*** (0.008)	0.080*** (0.002)	0.312*** (0.008)
1 open, 1 unknown			
2 open, 1 unknown			
1 closed	0.039 (0.059)	0.016 (0.016)	0.053 (0.062)
1 closed, 1 unknown			
1 unknown	0.011 (0.029)	0.004 (0.009)	0.011 (0.030)
Masc. monastery	-0.008 (0.013)	-0.003 (0.004)	-0.009 (0.013)
Other monastery	0.013 (0.019)	0.005 (0.006)	0.015 (0.020)
Observations	2479	2479	2479
R^2	0.408	0.393	0.234
Fixed-effects	Canton	Canton	Canton
Geography	Yes	Yes	Yes
Demography	Yes	Yes	Yes

Note: This table documents the increased opportunities for women mechanism presenting the results of OLS regressions relating the presence of monasteries to increased gender equality. See the main text for a discussion of the mechanisms. Panel A) introduces the number of monasteries for each gender while Panel B) distinguishes among feminine monasteries those that belonged to open or enclosed Catholic orders. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Regressions include canton fixed-effects. Municipalities that hosted a beguine community are excluded from the sample. Standard errors clustered at the canton level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

ascribe to beguinages becomes suspect. We conduct a series of robustness checks to alleviate this concern, before turning to an IV approach later. Nonetheless, these more demanding specifications reinforce the previous findings, lending additional credence to our hypothesis. In the interest of readability, we report only the results of regressions including the largest set of regressors (i.e. specifications control for geographical and agricultural characteristics, demographic and development indicators as well as canton fixed-effects).³⁸

First, Table 1.4 restricts the sample to municipalities with a similar culture and attitudes toward women by selecting only towns located at close distance from a beguinage: 5 km, 10 km and 20 km, in Panels A), B) and C), respectively. The underlying hypothesis is that those municipalities near the ones chosen by beguines did not hold different views with respect to women. In that sense, municipalities sufficiently close can be considered substitutes in terms of gender culture and female agency. Overall, results indicate a positive and significant effect of beguine communities on gender equality. Moreover, the estimated coefficients are stable. Further adding beguinage fixed-effects and clustering the standard errors at that level does not change the results.³⁹

In addition, since few municipalities had an operating beguinage in 1886, Panel A) of Table 1.5 disentangles its effects from the cultural legacy lingering from dismantled communities. We do so by excluding from regressions municipalities that had an operating beguinage in 1866. This removes 17 municipalities from the baseline sample.⁴⁰ Results indicate that the cultural imprint left by beguine communities shaped the perception of women. In general, these results are indistinguishable from the main specification. Panel B) introduces male literacy rate as regressor, evidencing that our findings are not caused by women catching up in literacy.⁴¹ Male literacy is always significantly positive. However, the historical presence of beguinages continues to appear as an important predictor of female agency, although its magnitude decreases and becomes non-significant for the variable $exposure_i$.⁴² Finally, in Panel C), municipal charters, the instrument used in

³⁸As before, removing variables that are potential outcomes from regressors delivers larger estimates for the presence of beguinages. Hence, our baseline coefficients can be seen as lower bounds of the estimation of interest.

³⁹These results are available from the authors upon request.

⁴⁰The municipalities that had an ongoing beguinage in 1866 are, with the closing year between brackets: Aalst (1953), Kortrijk (2001), Diksmuide (1914), Hasselt (1886), Herenthals (2001), Momalle (1899), Hoogstraten (1972), Liège (1869), Lier (1970), Nieuwpoort (1914) and Turnhout (1994).

⁴¹Notice that this may be an outcome variable of historical beguinal presence.

⁴²The negative coefficient associated with municipalities that had more than three beguine communities lasting

Table 1.4: Beguinages and Literacy equality, Robustness 1

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Beguinage < 5 km									
Beguinage (0/1)	0.040** (0.020)			0.012** (0.006)			0.041** (0.020)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.039* (0.021)			0.014** (0.006)			0.041* (0.021)	
1 Beg., > 200 years		0.037 (0.027)			0.009 (0.008)			0.035 (0.027)	
> 1 Beg, > 200 years		0.093* (0.050)			0.028** (0.013)			0.096** (0.047)	
> 3 Beg., > 200 years		−0.006 (0.041)			0.002 (0.011)			0.005 (0.039)	
Exposure (centuries)			0.007* (0.004)			0.002** (0.001)			0.007* (0.003)
Observations	371	371	371	371	371	371	371	371	371
R^2	0.661	0.664	0.660	0.620	0.623	0.619	0.478	0.482	0.477
Panel B: Beguinage < 10 km									
Beguinage (0/1)	0.042*** (0.015)			0.012*** (0.004)			0.040*** (0.015)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.033** (0.016)			0.012** (0.005)			0.034** (0.017)	
1 Beg., > 200 years		0.047** (0.021)			0.012** (0.006)			0.043** (0.020)	
> 1 Beg, > 200 years		0.099** (0.041)			0.029** (0.011)			0.097** (0.040)	
> 3 Beg., > 200 years		−0.036 (0.040)			−0.008 (0.011)			−0.034 (0.039)	

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Table 1.4 – *Continued from previous page*

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exposure (centuries)			0.007** (0.003)			0.002** (0.001)			0.007** (0.003)
Observations	1114	1114	1114	1114	1114	1114	1114	1114	1114
R^2	0.516	0.518	0.515	0.488	0.490	0.488	0.317	0.319	0.316
Panel C: Beguinage < 20 km									
Beguinage (0/1)	0.045*** (0.014)			0.012*** (0.004)			0.043*** (0.013)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.042*** (0.016)			0.014*** (0.005)			0.042** (0.016)	
1 Beg., > 200 years		0.048** (0.020)			0.011** (0.005)			0.043** (0.018)	
> 1 Beg., > 200 years		0.090** (0.039)			0.025** (0.010)			0.086** (0.037)	
> 3 Beg., > 200 years		−0.033 (0.039)			−0.007 (0.010)			−0.030 (0.037)	
Exposure (centuries)			0.006** (0.003)			0.002** (0.001)			0.006** (0.003)
Observations	2060	2060	2060	2060	2060	2060	2060	2060	2060
R^2	0.435	0.436	0.433	0.419	0.420	0.418	0.243	0.245	0.242
Fixed-effects	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality. Panel A) considers only municipalities located less than 5 km from a beguinage, Panel B) increases the distance up to 10 km and Panel C) further expands it to 20 km. Geography: latitude, longitude, distance to Leuven, the sea and rivers, caloric yield, soil type and crop productivity. Demography: population, nuptiality and % internal and external migrants by gender, sex ratio and a dummy for the 10% most populous towns. Regressions include canton fixed-effects. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

IV regressions later, are included as an additional covariate. Municipal charters granted towns the possibility of establishing a market and guilds and conveyed other benefits. Moreover, these indicated relatively prosperous towns. Results evidence that beguine communities boosted gender equality beyond any possible effect introduced by changes in the local administration.

Finally, we conduct a series of additional robustness checks that further validate the uncovered correlation. These consist in alternative specifications to account for the presence of beguines and to control for spillover effects. Appendix 1.B details these supplementary specifications and displays the results. Supplementing these, placebo beguinages are generated to dismiss concerns arising from the low number of beguinages present in the sample. For this purpose, the sample is divided, using total population, in quantiles and the expected number of beguinage is calculated for each. A municipality in each quantile receives a placebo beguinage with probability equal to the quantile-specific expected number of beguinages. Based on 100 repetitions, we find that in less than 15% of the cases placebo beguinages are significant.

1.4.2 Instrumental Variable Approach

Here, we employ an IV approach to better address the potential endogeneity of beguinage location. Our approach exploits exogenous changes in the local organisation of power that occurred before the advent of beguinages. Considering that beguines self-sustained themselves working in several crafts, teaching and trading, locations facilitating market access should have attracted more these communities. The privilege to set-up markets and guilds, among others, were granted in municipal charters, documents conveying additional rights to selected municipalities.

Municipal Charters. In the medieval European context, some towns were awarded a semi-independent status through the acquisition of new privileges encoded in charters. A municipality receiving a charter was granted partial exemption from wars for its citizens, often allowing the opportunity to wall the town, trade, mint currency, set up a municipal judicial system, and establish guilds. Municipal charters, in fact, decentralised decision-making.⁴³

more than two centuries vanishes after controlling for provincial capitals.

⁴³The majority of these documents simply transposed privileges already bestowed to other municipalities,

Table 1.5: Beguinages and Literacy equality, Robustness 2

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: No open beguinage									
Beguinage (0/1)	0.046*** (0.014)			0.012*** (0.004)			0.042*** (0.014)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.039** (0.015)			0.012*** (0.005)			0.038** (0.016)	
1 Beg., > 200 years		0.056** (0.025)			0.013** (0.006)			0.049** (0.022)	
> 1 Beg., > 200 years		0.088** (0.036)			0.023** (0.010)			0.082** (0.035)	
> 3 Beg., > 200 years		−0.041 (0.037)			−0.011 (0.010)			−0.040 (0.036)	
Exposure (centuries)			0.007** (0.003)			0.002** (0.001)			0.006** (0.003)
Observations	2539	2539	2539	2539	2539	2539	2539	2539	2539
R^2	0.428	0.429	0.427	0.407	0.407	0.406	0.231	0.232	0.230
Panel B: Male litreacy rate									
Beguinage (0/1)	0.031** (0.012)			0.007** (0.003)			0.027** (0.011)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.034** (0.014)			0.011*** (0.004)			0.033** (0.014)	
1 Beg., > 200 years		0.032* (0.019)			0.005 (0.005)			0.025 (0.017)	
> 1 Beg., > 200 years		0.060 (0.037)			0.014 (0.010)			0.054 (0.035)	
> 3 Beg., > 200 years		−0.060* (0.033)			−0.017* (0.009)			−0.059* (0.032)	
Exposure (centuries)			0.004 (0.003)			0.001 (0.001)			0.003 (0.002)

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Table 1.5 – Continued from previous page

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Male lit. rate, 1866	0.268*** (0.027)	0.268*** (0.027)	0.269*** (0.027)	0.093*** (0.009)	0.093*** (0.009)	0.093*** (0.009)	0.281*** (0.028)	0.281*** (0.028)	0.282*** (0.028)
Observations	2549	2549	2549	2549	2549	2549	2549	2549	2549
R^2	0.469	0.470	0.468	0.456	0.456	0.455	0.284	0.285	0.283
Panel C: Municipal charter									
Beguinage (0/1)	0.037** (0.016)			0.009** (0.005)			0.033** (0.016)		
<i>Intensity</i>		Ref.			Ref.			Ref.	
No Beg.									
1 Beg., < 200 years		0.037** (0.017)			0.012** (0.005)			0.036** (0.017)	
1 Beg., > 200 years		0.044* (0.024)			0.009 (0.006)			0.036* (0.022)	
> 1 Beg., >200 years		0.084** (0.037)			0.021** (0.010)			0.076** (0.036)	
> 3 Beg., > 200 years		−0.042 (0.036)			−0.010 (0.009)			−0.040 (0.034)	
Exposure (centuries)			0.004 (0.003)			0.001 (0.001)			0.004 (0.003)
Municipal charter	0.016 (0.020)	0.007 (0.021)	0.025 (0.017)	0.005 (0.006)	0.004 (0.006)	0.008 (0.005)	0.019 (0.020)	0.011 (0.021)	0.027 (0.018)
Observations	2549	2549	2549	2549	2549	2549	2549	2549	2549
R^2	0.432	0.433	0.431	0.409	0.410	0.409	0.233	0.234	0.232
Fixed-effects	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality. Panel A) excludes ongoing beguinages. Panel B) and C) control for male literacy and municipal charters. Geography: latitude, longitude, distance to Leuven, the sea and rivers, caloric yield, soil types and crop productivity. Demography: population, nuptiality and % internal and external migrants by gender, sex ratio and a dummy for the 10% most populous towns. Regressions include canton fixed-effects. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

This change in the local powers and structures could be achieved for various motives. Some lords founded villages and immediately endowed them with a municipal charter.⁴⁴ Other towns benefited from their strategic position and obtained a municipal charter in exchange for defence.⁴⁵ A few other sought increasing trade and urban development and granted charters to this end.⁴⁶ Finally, some towns gained this privileged status by siding with a Lord at times of conflict.⁴⁷ or because of specific local circumstances.⁴⁸ In any case, though, granting a municipal charter was a prerogative of the ruler: not all cities that ever requested this special status obtained it.

In light of the economic benefits conveyed by municipal charters in terms of trade and economic activity in general, and considering beguines' occupations, beguine communities were more likely to establish in towns already enjoying a municipal charter. Moreover, beguines received terrain to build communities, often as donations, from wealthy and affluent donors that were more plausible to reside in developed municipalities. In view of these characteristics, municipal charters are employed as an instrument to trace locations that beguines chose to establish communities. In order to have a clear identification strategy, we consider only municipal charters that were granted *before* the 13th century, as beguinages were only founded after this time. Hence, imposing the mentioned restriction assures that beguinages did not exert any influence in obtaining a municipal charter. Additionally, the choice of pre-13th-century municipal charters rules out towns seeking a charter with the goal of attracting beguines. In total, 42 Belgian municipalities were granted a municipal charter before the 13th century.⁴⁹ Among the 70 towns with a

effectively copying them. In most cases, Belgian municipalities celebrated their independence erecting a *belfry*: a monumental, fortified building that served as a court, prison, archive and treasure chamber and doubled as watching and bell tower. Eastern cities under the control of the Prince-Bishop of Liège constructed, instead, small, decorated columns named *perron*. Interestingly, when the city of Liège capitulated in 1467 its *perron* was dismantled and moved to Bruges for ten years. The peace treaty remarked that “the Duke wanted nothing left standing from the ancient Liège constitution, nor from public liberties, the legacy of a long pass”.

⁴⁴This is the case of Herentals and Hoogstraten and Landen.

⁴⁵Ath, Geraardsbergen, Maaseik, Vilvoorde, Stokkem and Zoutleeuw received charters for being border posts against powerful regional rivals.

⁴⁶Joan and Margaret II, Countesses of Flanders, Henry I, Duke of Brabant, and Philip I, Count of Flanders, were among the group of nobles who promoted these reforms. Their reformation spirit benefited the cities of Antwerp, Damme, Eeklo, Landen, Oostende and Roeselare.

⁴⁷Bruges and Kortrijk benefited from a local conflict confronting Thierry of Alsace and William Clito. The Lord of Ghent delegated, issuing a charter, internal turmoil resolution to the citizens. Phillip II of France bought off Tournai's inhabitants offering them a municipal charter.

⁴⁸The Prince-Bishop of Liège granted Huy the first Belgian charter to reward the city for its involvement in the reconstruction of the cathedral. Abbot Léonius implored Thierry, count of Flanders and a friend of him; to grant a municipal charter to his vassals of Poperinge.

⁴⁹These are: Aalst, Aarschot, Antwerp, Ath, Beringen, Borgloon, Brugge, Bruxelles, Damme, Deinze, Dendermonde, Diest, Diksmuide, Eeklo, Ghent, Geraardsbergen, Gistel, Halen, Halle, Harelbeke, Hasselt, Herentals,

beguinage, 32 held a charter before beguines settled.

Since trade and increased economic activity, in general, can lead to population growth and increase the return to human capital, municipal charters may promote literacy rates beyond operating exclusively through the presence of beguine communities. In order to strengthen our exclusion restriction, we emphasize that the outcome of interest is not literacy but gender equality. In this regard, we see female-to-male literacy measures as indicators of female agency. Moreover, even if municipal charters boosted demand for schooling, this assumed higher education would bias results against us, as men were traditionally favoured over women in education investments. We can also dismiss that municipalities that hosted a beguinage grew faster.⁵⁰ Lastly, in Table 1.6, among those municipalities that hosted a beguinage, we distinguish those that were also granted a municipal charter from those that did not enjoy one. Focusing on municipalities hosting a beguinage provides a comparable sample in terms of female freedom acceptance. If, indeed, municipal charters directly promoted female literacy, municipalities that received a charter should score higher in female-to-male literacy measures on this sample. Results in Panel A) do not support this theory. We repeat the same procedure focusing on municipalities that never hosted a beguinage in Panel B), obtaining similar conclusions. Additionally, Panel C) in Table 1.5 confirmed that municipal charters did not contribute to gender equality.

IV Results. Table 1.7 presents the findings of the IV approach when beguinage location is instrumented using municipal charters. In Columns 1) to 3), the dependent variable is *literacyequalityindex_i*, Columns 4) to 6) focus on *femaleliteracyshare_i* and the remaining use *femaleliteracyindex_i*. In general, F-statistics are well above 10, indicating that regressions are not biased due to the inclusion of weak instruments.⁵¹ IV estimations follow Wooldridge (2010) procedure 21.1 that correctly accounts for the non-linearity of the first-stage when the independent variable of interest is *beguinage_i* or

Hoogstraten, Huy, Kortrijk, Landen, Leuven, Lier, Maaseik, Ninove, Oostende, Oudenaarde, Poperinge, Roeselare, Sint-Truiden, Soignies, Stokkem, Thurnhout, Tournai, Vilvoorde, Ypres and Zoutleeuw.

⁵⁰We use data from Cuvelier (1912) on municipal size during 1438 and compute population growth rate between this date and 1886. Unfortunately, the geographical coverage is limited to the historical province of the Brabant.

⁵¹Column 1) presents the F-stat corresponding to the classical two-step least square procedure. Under Column 2) the F-stat is small. Unfortunately, Stock and Yogo (2002) tabulate critical F-values for up to three endogenous regressors while our case involves five. Critical values are decreasing with the number of endogenous variables. For the case of three endogenous regressors and five instruments, the tabulated value equals 4.30, hence, the F-value we obtain is plausibly large enough.

Table 1.6: Municipal charters and gender equality

	Lit. eq. index, 1866	Fem. lit. share, 1866	Fem. lit. index, 1866
	(1)	(2)	(3)
Panel A: Municipalities with beguinage			
Municipal charter	-0.027 (0.044)	-0.002 (0.014)	-0.012 (0.046)
Fixed-effects	Arrond.	Arrond.	Arrond.
Geography	Yes	Yes	Yes
Demography	Yes	Yes	Yes
Observations	70	70	70
R^2	0.974	0.959	0.916
Panel B: Municipalities without beguinage			
Municipal charter	0.037 (0.034)	0.010 (0.011)	0.038 (0.037)
Fixed-effects	Canton	Canton	Canton
Geography	Yes	Yes	Yes
Demography	Yes	Yes	Yes
Observations	2479	2479	2479
R^2	0.406	0.391	0.231

Note: This table relates municipal charters with gender equality using OLS regressions. Gender equality is proxied by the variable *literacy equality index_i*, *female literacy share_i* and *female literacy index_i* in Column 1), 2) and 3), respectively. See the main text for a description. Panel A) includes all municipalities that hosted a beguine community at any moment in time while Panel B) considers those that never hosted one. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, their marriage rates, the sex ratio, the percentage of internal and external migrants for each gender and an indicator variable taking value one for municipalities above the 10th percentile in terms of population. Arrondissement and canton fixed-effects in Panel A) and B), respectively since it was not possible to estimate a model in Panel A) with canton fixed-effects. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

intensity_i.⁵² This method differs from classical 2SLS by introducing the estimated value of the endogenous variable as an instrument. The IV procedure for *exposure_i* follows the conventional two-step estimator.

Overall, results from the instrumented specification indicate that beguinages had a positive, significant and enduring effect on gender equality. Moreover, even if our approach cannot assuage all the possible endogeneity concerns, this exercise is useful insofar it highlights that beguine communities were instrumental in maintaining a higher regard for women for over 600 years. However, a clearer identification strategy limiting the IV approach only to cases where obtaining a municipal charter was arguably more exogenous

⁵²In the former case, the first-stage follows a probit model, in the latter an ordered logit.

Table 1.7: Beguinages and Literacy equality, IV

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Beguinage (0/1)	0.075*** (0.019)			0.019*** (0.006)			0.070*** (0.019)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.061 (0.050)			0.022 (0.014)			0.068 (0.049)	
1 Beg., > 200 years		0.071*** (0.024)			0.016*** (0.006)			0.061*** (0.021)	
> 1 Beg., > 200 years		0.127** (0.052)			0.034** (0.014)			0.122** (0.049)	
> 3 Beg., > 200 years		−0.067 (0.057)			−0.015 (0.015)			−0.058 (0.054)	
Exposure (centuries)			0.013** (0.005)			0.004** (0.002)			0.013** (0.005)
Fixed-effects	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1st-st. F-val.	54.5	3.8	28.4	54.5	3.8	28.4	54.5	3.8	28.4
Observations	973	2549	2549	973	2549	2549	973	2549	2549
R^2	0.472	0.433	0.431	0.449	0.411	0.409	0.266	0.235	0.231

Note: This table presents the results of IV regressions relating the presence of beguinages to increased gender equality where the presence of beguinal communities is instrumented using municipal charters. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

delivers similar results.⁵³

We also provide multiple robustness tests of the IV specification. These are the same, when applicable, to those performed for the OLS analysis. These additional results further confirm the long-lasting relationship between beguine communities and female agency. In particular, Table 1.8 restricts the sample to municipalities closely located around towns with a beguinage at distances 5 km, 10 km and 20 km, while Table 1.9 replicates Panels A) and B) of Table 1.5. Appendix 1.B details alternative robustness checks that further confirm the previous findings and generally strengthen the results.

⁵³Reasons considered include charters bestowed upon newly founded cities, conflict, and miscellaneous cases. The result of this more demanding specification validates our previous results. However, the estimated coefficient becomes less precise because the instrument is able to predict fewer beguine communities. These results are not reported but are available from the authors upon request.

Table 1.8: Beguinages and Literacy equality, IV, Robustness 1

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Beguinage < 5 km									
Beguinage (0/1)	0.053*** (0.018)			0.016*** (0.005)			0.055*** (0.018)		
Exposure (centuries)			0.009* (0.005)			0.003** (0.001)			0.011** (0.005)
Observations	301		371	301		371	301		371
R^2	0.633		0.659	0.593		0.618	0.415		0.475
1st-stage F-val.	213.1		24.4	213.1		24.4	213.1		24.4
Panel B: Beguinage < 10 km									
Beguinage (0/1)	0.090*** (0.025)			0.023*** (0.007)			0.085*** (0.025)		
<i>Intensity</i>									
1 Beg., < 200 years		0.079 (0.052)			0.031** (0.016)			0.091* (0.053)	
1 Beg., > 200 years		0.073*** (0.026)			0.018*** (0.007)			0.065*** (0.023)	
> 1 Beg., > 200 years		0.117** (0.048)			0.033*** (0.013)			0.113** (0.045)	
> 3 Beg., > 200 years		-0.041 (0.048)			-0.006 (0.012)			-0.031 (0.046)	
Exposure (centuries)			0.008* (0.004)			0.003** (0.001)			0.008* (0.004)
Observations	723	1114	1114	723	1114	1114	723	1114	1114
R^2	0.516	0.516	0.515	0.486	0.487	0.488	0.305	0.316	0.316
1st-stage F-val.	147.4	3.7	32.7	147.4	3.7	32.7	147.4	3.7	32.7
Panel C: Beguinage < 20 km									
Beguinage (0/1)	0.097*** (0.024)			0.024*** (0.007)			0.090*** (0.023)		

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Table 1.8 – *Continued from previous page*

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.078 (0.058)			0.030* (0.017)			0.089 (0.058)	
1 Beg., > 200 years		0.076*** (0.025)			0.017*** (0.006)			0.066*** (0.021)	
> 1 Beg., > 200 years		0.139*** (0.052)			0.038*** (0.014)			0.133*** (0.049)	
> 3 Beg., > 200 years		−0.061 (0.060)			−0.012 (0.015)			−0.049 (0.056)	
Exposure (centuries)			0.013** (0.006)			0.004** (0.002)			0.013** (0.006)
Observations	955	2060	2060	955	2060	2060	955	2060	2060
R^2	0.464	0.434	0.432	0.442	0.418	0.416	0.255	0.243	0.240
1st-stage F-val.	153.7	3.8	26.9	153.7	3.8	26.9	153.7	3.8	26.9
Fixed-effects	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of IV regressions where the presence of beguine communities is instrumented using municipal charters. Panel A) considers only municipalities located less than 5 km from a beguinage, Panel B) increases the distance up to 10 km and Panel C) further expands it to 20 km. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.9: Beguinages and Literacy equality, IV, Robustness 2

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: No open beguinage									
Beguinage (0/1)	0.096*** (0.021)			0.025*** (0.006)			0.089*** (0.021)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		1.362*** (0.397)			1.362*** (0.397)			1.362*** (0.397)	
1 Beg., > 200 years		0.191 (0.141)			0.191 (0.141)			0.191 (0.141)	
> 1 Beg, > 200 years		0.637 (0.393)			0.637 (0.393)			0.637 (0.393)	
> 3 Beg., > 200 years		−0.039 (0.489)			−0.039 (0.489)			−0.039 (0.489)	
Exposure (centuries)			0.019** (0.008)			0.006** (0.002)			0.019** (0.008)
Observations	831	2539	2539	831	2539	2539	831	2539	2539
R^2	0.463	0.411	0.424	0.440	0.411	0.403	0.245	0.411	0.226
1st-stage F-val.	163.0	5.0	14.3	163.0	5.0	14.3	163.0	5.0	14.3
Panel B: Male litreacy rate									
Beguinage (0/1)	0.057*** (0.017)			0.012** (0.005)			0.050*** (0.017)		
<i>Intensity</i>									
No Beg.		Ref.			Ref.			Ref.	
1 Beg., < 200 years		0.038 (0.052)			0.015 (0.015)			0.044 (0.052)	
1 Beg., > 200 years		0.054** (0.023)			0.009 (0.006)			0.042** (0.020)	
> 1 Beg, > 200 years		0.080* (0.046)			0.021* (0.012)			0.077* (0.044)	

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Table 1.9 – *Continued from previous page*

	Lit. eq. index, 1866			Fem. lit. share, 1866			Fem. lit. index, 1866		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
> 3 Beg., > 200 years		−0.071 (0.052)			−0.021 (0.014)			−0.069 (0.049)	
Exposure (centuries)			0.008* (0.005)			0.002 (0.001)			0.008 (0.005)
Male lit. rate, 1866	0.205*** (0.035)	0.266*** (0.026)	0.268*** (0.026)	0.069*** (0.011)	0.093*** (0.009)	0.093*** (0.009)	0.213*** (0.037)	0.280*** (0.027)	0.280*** (0.027)
Observations	973	2549	2549	973	2549	2549	973	2549	2549
R^2	0.494	0.469	0.468	0.475	0.456	0.455	0.296	0.284	0.283
1st-stage F-val.	197.4	3.7	30.5	197.4	3.7	30.5	197.4	3.7	30.5
Fixed-effects	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demography	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of IV regressions relating the presence of beguinages to increased gender equality where the presence of beguine communities is instrumented using municipal charters. Panel A) removes ongoing beguinages from the sample. Panel B) includes male literacy rates as additional control. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

1.5 A Model of Cultural Transmission

This Section proposes a theoretical model to rationalize our empirical findings. It particularly emphasises girls' bargaining power as the relevant mechanism, and illustrates how begunages triggered a shift in values that could spread beyond the begunal population itself, influencing gender outcomes for centuries. We believe this captures the essence of what begunages offered to young girls, but other potential mechanisms are left unexplored.

In this framework, cultural change in gender roles operates through the marriage market. We consider a population of men and women in equal number who randomly meet in the local marriage market. Before getting married, couples familiarize with the partner's background and prefigure the arrangements characterising their potential lifestyle as a married couple and their respective roles in the family. In economic terms, this means that they bargain non-cooperatively over the share of the constant marital surplus generated by a union, denoted by y .⁵⁴ Let $s_t^{m,f} \in (0, 1)$ be the share men appropriate and $t = 1, 2, \dots$ denote the time period. Agents will agree to the wedding if they enjoy their share of marital surplus more than their life as singles.

Individuals are characterised by their outside option in case they do not marry. Women f are assumed to be homogeneous in their outside option $u_f \in (0, y)$ and we posit that heterogeneous men m follow a Type I Pareto distribution with scale parameter x_t and shape parameter $\alpha = 2$ such that $u_{m,t} \sim \text{Pareto}_I(x_t, 2)$.⁵⁵ The initial average type of men is: $\mu_0 = \frac{\alpha x_0}{\alpha - 1}$.

Potential couples' negotiation problem follows Nash bargaining:

$$\max_{s_t^{m,f}} \left(y - u_{m,t} \right)^\beta \left(\left(1 - s_t^{m,f} \right) y - u_f \right)^{1-\beta}, \quad (1.8)$$

where $\beta \in (0, 1)$ denotes men's bargaining power. For the moment, we assume it to be constant.

At the optimum, men who marry appropriate a share $s_t^{m,f^*} = \frac{u_{m,t}(1-\beta) + \beta(y - u_f)}{y}$. Matched individuals for which $u_{m,t} + u_f > y$ cannot agree on a sharing rule. Consequently, men at the right tail of the distribution will stay single. Notice that, in fact,

⁵⁴Many aspects are typically encompassed in the notion of marital surplus: children and other household public goods, but also other psychological and sociological amenities, as self-realization and social recognition.

⁵⁵A Type I Pareto distribution with value 2 for the shape parameter allows obtaining closed-form solutions.

both very demanding men and the women matched with them are better off if they do not marry.

Each *married* couple has one daughter and one son. To obtain a tractable model, daughters inherit the constant type u_f of their mothers while sons are horizontally socialized. In particular, sons' type follows a Type I Pareto distribution with $\alpha = 2$ and the type of the average son equals the average amount married men obtain in the bargaining process. In other words, following Bisin and Verdier (2001b), a son randomly observes married couples to infer the amount he should demand, at least, in a bargaining process. This average equals:

$$\mu_{t+1} = E\left(s_t^{m,f^*} y\right) = y \frac{\int_0^{y-u_f} s_t^{m,f^*} f(u_{m,t}) du_{m,t}}{\int_0^{y-u_f} f(u_{m,t}) du_{m,t}} = \beta(y - u_f) + (1 - \beta) \frac{2x_t(y - u_f)}{x_t - u_f + y}$$

Since the average of a Type I Pareto distribution is given by $\frac{\alpha x}{1-\alpha}$ we can recast the previous expression in terms of μ_t ⁵⁶:

$$\mu_{t+1} = (y - u_f) \left(\beta + \frac{2(\beta - 1)\mu_t}{-\mu_t + 2u_f - 2y} \right). \quad (1.9)$$

Equation 1.9 describes the dynamic evolution of μ over generations. For sufficiently large values of the initial μ_0 , $\mu_{t+1} < \mu_t \forall t$.⁵⁷

In order to study the long-term evolution of gender norms, we focus on the change of men's values over generations, as captured by μ . Although it is possible to obtain a closed-form solution for the difference equation, we analyse the steady-state level of μ_t given by⁵⁸:

$$\lim_{t \rightarrow \infty} \mu_t = \mu^* = \frac{1}{2} (y - u_f) \sqrt{\beta} \left(\sqrt{8 + \beta} - \sqrt{\beta} \right). \quad (1.10)$$

Starting from this model, we discuss how the presence of a beguine in the municipality may have influenced the attitudes towards women. More in detail, we maintain that becoming a beguine was a viable alternative to marry while enjoying a decent standard of

⁵⁶We assume $\alpha = 2$ and $\mu_0 < 2 * (y - u_f)$. The latter is a technical condition to have a non-zero denominator for the expected average of the truncated distribution.

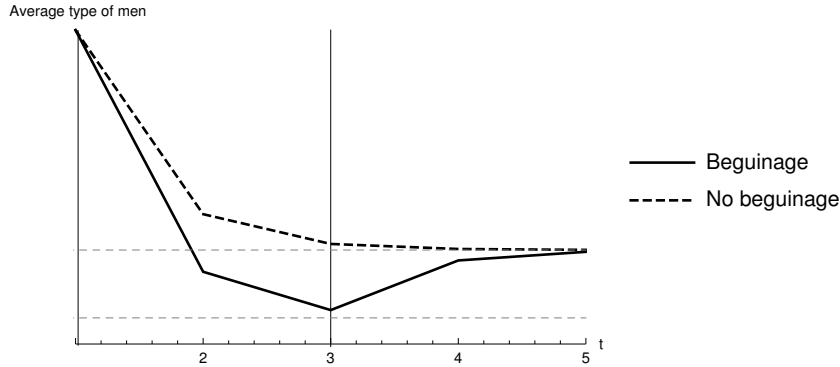
⁵⁷More in detail, the condition on μ_0 reads $\mu_0 > \frac{1}{2}(u_f - y)(\beta - \sqrt{\beta(8 + \beta)})$. This is not particularly restrictive considering medieval gender norms according to which husbands were in charge of household administration and were considered the legal guardians of their wives.

⁵⁸This unique steady-state is asymptotically stable.

living. This was in part due to a reduced stigma against single women and in part directly related to the possibility of working for pay in town. Therefore, women in municipalities with a beguinage enjoyed an increased outside option $u_f^{beguinage} > u_f$ and could bargain a better status within the couple if married. In this scenario, a larger share of selfish men will remain single, leading to a selection of values in the married population and to a lower steady-state level in the long run. It can be shown that $\mu_{beguinage}^* < \mu^*$. A possible extension could consider men's bargaining power β to be decreasing with female's outside option. This could produce a set of different steady-state values and the exact value of each would depend on beguinage's operative length, assuming it closes at some period of time.

Finally, Figure 1.4 illustrates how the average attitudes of men evolves over time in two different scenarios: a no-beguinage case represented by the dashed line and a case where the a beguinage is initially operative in a municipality and is dissolved after some time, represented by the solid line.⁵⁹ After the closure of the beguinage, women face the baseline outside option u_f .

Figure 1.4: Evolution over Time



The presence of a beguinage, even for a limited period of time, results in less male-egoistic values in the society. While the beguinage operates, the values converge to a different, lower steady-state and only after it ceases functioning they slowly switching to a different path. Such evolution is in line with our empirical observation of more gender-equal values in municipalities that enjoyed a beguinal institution for some time.

⁵⁹The illustration assumes $\beta = 0.65$ and $x = 5$ for both cases and $u_f^{beguinage} = 1.2 > u_f = 1$. The beguinage is operative for three periods only.

1.6 Conclusion

This paper provides new evidence of the historical determinants of differences in social attitudes toward women, focusing on the long-lasting effects of semi-religious, female-only communities in Belgium. The unique characteristics of medieval beguine communities, as clusters of single women living together, leading a religious life while earning a living as important actors of municipal economies, granted them the “first feminist movement” title (Panciera (2016)). These communities thrived amid a society that disapproved of women not marrying or entering a monastic, spiritual life.

We find that Belgian municipalities where medieval beguine communities settled between 1207 and 1500 were characterised by higher gender equality in 1866. These results are consistent with the self-same cultural attitudes of the beguine movement, suggesting that those gender norms attached to the role of the beguines successfully spread from within the walled beguinages to the society in general. Our findings are robust to the inclusion of several covariates. Moreover, alternative estimation methods based on matching samples and instrumental variables validate the results. We rationalise the findings combining an increase in girls’ bargaining power brought about by beguinages with the intertemporal transmission of a more gender-neutral culture. We find some support for this hypothesis. Complementing this mechanism, beguines could have shaped local attitudes through role modeling. In conclusion, this paper suggests that, even in contemporary small communities, female associations might be an effective channel to lessen gender inequalities and promote the diffusion of gender-egalitarian norms.

Appendix

1.A Analogous Institutions

Nowadays, there exist other female-only institutions resembling beguinal social customs: they are collective arrangements formed by groups of women in order to overcome certain common problems by setting rules regarding membership, use of the resources and services the group owns collectively, and management of these assets. For example, in one of these institutions, women seek the solidarity and protection of other women to escape misogynistic marriages. This is the case of a community in Tanzania that has embraced an age-old tradition of heterosexual women marrying women. In fact, in the Kurya community in Tarime District of the Mara region in northern Tanzania, the so-called *Nyumba Nthobu* tribal law is used by women who are not able to inherit property due to patriarchal cultural constraints.⁶⁰ Marriage between the two women is justified by the bride price paid before marriage, since there is no intimate relationship between the two women. In some cases, *Nyumba Nthobu* can be a polygamous marriage, as the older woman marries two younger women. This custom enables them to claim the children born by the other woman⁶¹ as their own and is a way of providing security for their old age. The culture is also being used as an escape for child marriage, female genital mutilation, and domestic violence.

Another example is the one of Zishunu, an ancient custom that originated from

⁶⁰Barren women or old women who do not have sons to inherit their property and whose daughters have moved away to their husbands' villages cannot take over property in the line of succession.

⁶¹A man is typically selected from the clan of the old woman for reproduction purposes with the young woman.

indigenous groups in southwestern China and consists of a group of women called *Sworn Spinsters*. Zishunu literally means self-combed women and depicts the local customs of girls forming sisterhoods who ritually pinned up their hair, and openly took elaborate vows not to marry and to remain childless. Evidence of such practices can be found in local publications and prospered well into the end of the 19th century, when almost all of them worked in silk reeling factories and, from the 1930s, as domestic servants in Hong Kong and Singapore. Their vow of celibacy, beyond apparent religious concerns, represents a commitment device of high-intensity labour supply and therefore made their employers invest more in their human capital match them to more important working positions.

1.B Additional Results

This section reports additional results corroborating our main findings. These include findings relying on OLS estimation as well as our instrumented specification. Furthermore, we provide estimates based on propensity score matching.

OLS results. Table 1.B.1 and 1.B.2 follow the same structure of Table 1.2 but gender equality is measured using *female literacy share* and *female literacy index*, respectively. Considered together, these results indicate a strong correlation between the presence of beguinages and gender equality.

Finally, Table 1.B.3 presents several additional robustness checks briefly introduced in Section 1.4.1. In Panel A), the main regressor is the distance between each municipality and the closest beguinage, considering only beguine communities located in Belgium. The idea is to depart from indicators displaying numerous zeros such as *beguinage_i*. Indeed, only about 3% of the municipalities ever had a beguinage and, consequently, for the remaining municipalities *beguinage_i*, *exposure_i* and *intensity_i* equal zero. Distance to the closest beguinage, measured in log-km, solves this issue as it continuously varies. The results of that exercise are in line with our previous findings: being further away from a beguinage reduces gender equality. Panel B) assumes that all municipalities less than 5 km away from a beguine community had one. Municipalities with real beguinages are excluded from the sample. Results evidence that municipalities close to a beguinage did not collectively benefit from increased gender equality since the coefficient for these fictitious

Table 1.B.1: Beguinages and Literacy equality, 2

	Dep. variable: Female lit. share, 1866											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Beguinage (0/1)	0.041*** (0.004)			0.043*** (0.005)			0.035*** (0.005)			0.011*** (0.004)		
<i>Intensity</i>												
No Beg.		Ref.			Ref.			Ref.				
1 Beg., < 200 years		0.020*** (0.007)			0.026*** (0.007)			0.023*** (0.007)			0.012*** (0.004)	
1 Beg., > 200 years		0.042*** (0.007)			0.044*** (0.008)			0.041*** (0.007)			0.010** (0.005)	
> 1 Beg., > 200 years		0.064*** (0.008)			0.075*** (0.011)			0.060*** (0.014)			0.023** (0.010)	
> 3 Beg., > 200 years		0.059*** (0.004)			0.051*** (0.002)			0.026*** (0.007)			−0.010 (0.010)	
Exposure (centuries)			0.006*** (0.001)			0.006*** (0.001)			0.005*** (0.001)			0.002** (0.001)
Fixed-effects	No	No	No	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549
R^2	0.025	0.028	0.024	0.204	0.206	0.201	0.216	0.218	0.212	0.409	0.410	0.409

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality proxied by the variable *female literacy share_i*; see main text for a description. Column 1) to 3) include only the presence of beguinages as a regressor. Column 4) to 6) add fixed-effects at the canton level. In Column 7) to 9) exogenous variables are incorporated, namely, the presence of monasteries, latitude, longitude, distance to Leuven, to the sea and the closest river, caloric yield, soil types and crop productivity. Finally, Column 10) to 12) incorporate contemporaneous variables measured in 1866, including, number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.B.2: Beguinages and Literacy equality, 3

	Dep. variable: Female lit. index, 1866											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Beguinage (0/1)	0.055*** (0.011)			0.061*** (0.012)			0.052*** (0.012)			0.040*** (0.013)		
<i>Intensity</i>												
No Beg.		Ref.			Ref.			Ref.				
1 Beg., < 200 years		0.028* (0.016)			0.050*** (0.016)			0.044*** (0.015)			0.038** (0.016)	
1 Beg., > 200 years		0.063*** (0.018)			0.062*** (0.019)			0.061*** (0.018)			0.041** (0.018)	
> 1 Beg., > 200 years		0.101*** (0.020)			0.131*** (0.031)			0.106*** (0.037)			0.082** (0.035)	
> 3 Beg., > 200 years		0.048*** (0.015)			0.027 (0.018)			−0.013 (0.025)			−0.039 (0.035)	
Exposure (centuries)			0.008*** (0.002)			0.007*** (0.002)			0.006** (0.002)			0.006** (0.003)
Fixed-effects	No	No	No	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton	Canton
Geography	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Demography	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549	2549
R^2	0.005	0.006	0.005	0.205	0.206	0.203	0.217	0.219	0.215	0.233	0.234	0.232

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality proxied by the variable *female literacy index_i*, see main text for a description. Column 1) to 3) include only the presence of beguinages as a regressor. Column 4) to 6) add fixed-effects at the canton level. In Column 7) to 9) exogenous variables are incorporated, namely, the presence of monasteries, latitude, longitude, distance to Leuven, to the sea and the closest river, caloric yield, soil types and crop productivity. Finally, Column 10) to 12) incorporate contemporaneous variables measured in 1866, including, number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

beguinages is never significant. Panel C) follows the same logic of Panel B) but includes in regressions municipalities that hosted a beguine community. In that case, the coefficient associated with real beguinages is significant and positive while the corresponding one for fictitious beguinages is never significant, even though the introduction of the latter naturally reduces the magnitude of the estimated parameter for $beguinage_i$. Finally, Panel D) incorporates as a regressor a modified version of the variable $exposure_i$. This alternative specification considers the total number of years during which any beguine community was present in a municipality, but does not aggregate the values for those overlapping in time. As the results evidence, this change does not affect the association between the presence of medieval beguine communities and gender equality during the mid-19th century.

IV results. Table 1.B.4 presents the results for the IV approach. In Panel A) the main regressor is the logarithm of the distance from each municipality to the closest beguinage, instrumented by municipal charters. Panel B) introduces the alternative definition for $exposure_{i,j}$, detailed in the main text, as main regressor.

Propensity score matching. Finally, we relate the presence of beguine communities and gender equal outcomes using propensity score matching. Ideally, municipalities would be matched using some pre-beguine characteristics on attitudes towards women at the municipal level. Unfortunately, this information is not available. Instead, municipalities are first matched on exogenous covariates thus mitigating concerns on the threat to identification posed by unobservables. These are latitude and longitude, distance to the sea and to rivers and cereals productivity. In a second matching exercise, predictors include the distance to Leuven and the presence of monasteries and castles at the municipal level to consider the regional organisation of power and wealth concentration.

Table 1.5 displays the positive relationship between the historical presence of beguine communities and gender equality obtained with this matching approach. It establishes that beguine presence at the local level left a great imprint on gender equality, still measurable during the 19th century. In general, coefficients lie between those presented in Column 1) and Column 10) of Table 1.2, 1.B.1 and 1.B.2, except for the variable $female\ literacy\ index_i$ for which we do not detect increases in gender equality following

from the presence of beguine communities. Nonetheless, results are in line with our previous findings and provide evidence in favour of our hypothesis: the presence of beguines in the urban environment instigated changes in the cultural values of local populations, which influenced gender equality in human capital in the long term.

Table 1.B.3: Beguinages and Literacy equality, Robustness 3

	Lit. eq. index, 1866	Fem. lit. share, 1866	Fem. lit. index, 1866
	(1)	(2)	(3)
Panel A: Distance to beguinage as regressor			
Dist. beg. (log-km)	−0.014*** (0.005)	−0.004*** (0.001)	−0.013*** (0.005)
Observations	2549	2549	2549
R^2	0.431	0.409	0.233
Panel B: Placebo beguinages			
Plac. beg. (< 5 km)	0.009 (0.010)	0.003 (0.003)	0.011 (0.011)
Observations	2479	2479	2479
R^2	0.406	0.391	0.231
Panel C: Placebo and real beguinages			
Beg. (0/1)	0.037*** (0.014)	0.009** (0.004)	0.033** (0.014)
Plac. beg. (< 5 km)	0.009 (0.010)	0.003 (0.003)	0.011 (0.011)
Observations	2549	2549	2549
R^2	0.432	0.410	0.233
Panel D: Alternative definition of exposure			
Alt. exposure (centuries)	0.008*** (0.003)	0.002** (0.001)	0.008*** (0.003)
Observations	2549	2549	2549
R^2	0.431	0.409	0.232
Fixed-effects	Canton	Canton	Canton
Geography	Yes	Yes	Yes
Demography	Yes	Yes	Yes

Note: This table presents the results of OLS regressions relating the presence of beguinages to increased gender equality. Panel A) introduces as the main independent variable the distance, in log-km, to the closest beguine community. See main text for a discussion regarding the benefits of a continuous variable. Panel B) assumes that municipalities less than 5 km from a beguinage had one, and ignores contemporary beguinages. Panel C) follows the same approach but reintroduces contemporary beguinages. Finally, Panel D) employs a modified version of the variable $exposure_i$. See main text for a description. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Regressions include canton fixed-effects. Standard errors clustered at the canton level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.B.4: Beguinages and Literacy equality, IV, Robustness 3

	Lit. eq. index, 1866	Fem. lit. share, 1866	Fem. lit. index, 1866
	(1)	(2)	(3)
Panel A: Distance to beguinage as regressor			
Dist. beg. (log-km)	−0.038** (0.016)	−0.011** (0.005)	−0.038** (0.016)
Observations	2549	2549	2549
R^2	0.426	0.405	0.226
1st-stage F-val.	34.7	34.7	34.7
Panel B: Alternative definition of exposure			
Alt. exposure (centuries)	0.013** (0.005)	0.004** (0.002)	0.013** (0.005)
Observations	2549	2549	2549
R^2	0.431	0.409	0.232
1st-stage F-val.	35.547	35.547	35.547
Fixed-effects	Canton	Canton	Canton
Geography	Yes	Yes	Yes
Demography	Yes	Yes	Yes

Note: This table presents the results of IV regressions relating the presence of beguinages to increased gender equality where the presence of beguine communities is instrumented using municipal charters. Panel A) features as the main independent variable the distance, in log-km, to the closest beguinal community. See main text for a discussion regarding the benefits of a continuous variable. Panel B) employs a modified version of the variable $exposure_i$. See main text for a description. Geography: latitude, longitude, distance to Leuven, to the sea and rivers, caloric yield, soil types and crop productivity. Demography: number of men and women, nuptiality, sex ratio, the share of internal and external migrants and a dummy for the 10% most populous municipalities. Standard errors clustered at the canton level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.5: Propensity score matching

	Lit. eq. index, 1866		Fem. lit. share, 1866		Fem. lit. index, 1866	
	(1)	(2)	(3)	(4)	(5)	(6)
Stratified matching	0.078*** (0.030)	0.050* (0.029)	0.022** (0.009)	0.014* (0.008)	0.018 (0.019)	0.013 (0.016)
Observations	2711	2711	2711	2711	2711	2711
Treated	70	70	70	70	70	70
Controls	1542	1497	1542	1497	1542	1497
Matching	Basic	Expanded	Basic	Expanded	Basic	Expanded
Kernel matching	0.080*** (0.026)	0.067** (0.027)	0.022*** (0.008)	0.019*** (0.007)	0.018 (0.018)	0.019 (0.016)
Observations	2711	2711	2711	2711	2711	2711
Treated	70	70	70	70	70	70
Controls	2641	2641	2641	2641	2641	2641
Matching	Basic	Expanded	Basic	Expanded	Basic	Expanded
Nearest neig. matching	0.097*** (0.029)	0.072** (0.032)	0.027*** (0.009)	0.019** (0.009)	0.038* (0.020)	0.017 (0.022)
Observations	2711	2711	2711	2711	2711	2711
Treated	70	70	70	70	70	70
Controls	44	44	44	44	44	44
Matching	Basic	Expanded	Basic	Expanded	Basic	Expanded

Note: This table presents the results of propensity score matching relating the presence of beguinages to increased gender equality. Matches are performed using latitude, longitude, distance to rivers and to the sea and crop-specific productivity in Column 1), 3) and 5). The remaining columns additionally employ the presence of monasteries, castles and the distance to Leuven to match municipalities. Matches are identified using stratified, kernel and nearest neighbour matching, respectively. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In the Name of the Father: Inheritance Systems and the Dynamics of State Capacity

by Èric ROCA FERNÁNDEZ

Abstract: We analyse an overlooked determinant of state capacity at its early stages. Based on a theoretical model, this paper advances that the degree of gender-egalitarianism embedded in inheritance rules affects state capacity. The model combines two forces that drive state capacity building as it permits to raise taxes and overcome rivals. It accommodates dynasties in its simplest form and introduces inter-state marriages of landed heirs. On the one hand, the idea of dynastic continuity, of utmost importance to European medieval rulers, directly encourages state building. On the other hand, a wealth effect that gains significance through marriages indirectly promotes it. Gender-biased inheritance rules favouring men incentivise state-building because, historically, men continued dynasties and it was valued. We weigh this effect against the indirect effect of more land-merging marriages under gender-egalitarian rules.

Our results suggest that gender-egalitarian rules promote state capacity in the short run. This new result nuances the idea that higher probability of continued rule boosts state capacity. We also corroborate the importance of continued rule: in the long run, gender-biased rules gender-neutral norms. This provides a rationale for the pervasive European tradition of preferring men over women as heirs.

2.1 Introduction

Well-functioning states are the result of centuries of continuous improvements in state capacity. The economic literature documents a clear relationship between state capacity and economic development as the former brings about property rights, judicial systems and market-supporting institutions —Bockstette et al. (2002), Besley and Persson (2011), Fukuyama (2012)—. For example, longer histories of state-level institutions are linked to

economic prosperity in Chanda and Putterman (2007), Dincecco and Katz (2014) and Borcan et al. (2017).

This theoretical paper is concerned with the process of state capacity building at its early stages. In the economic literature, state capacity usually advances to overcome rivals and control resources. We broaden that scope and focus on a neglected institutional factor: the degree of gender-egalitarianism embedded in inheritance rules. In particular, we analyse how state capacity evolves under two inheritance rules in the context of medieval Europe.¹ We compare male-cognatic primogeniture —a norm that grants men preferential access to inheritance— with absolute primogeniture —which treats genders alike—. In particular, under the former a woman can only inherit if she has no living brothers. In absolute primogeniture, the oldest sibling of whichever gender inherits.

In this framework, we introduce the concept of dynastic continuation. Dynastic continuity comprises the idea of relating landholdings to one's family name for generations. An enduring identification was actively pursued by elites in Europe during the middle ages, as we detail later. As fiefs descent through inheritance, an elite member expecting his dynasty's continuation devotes more resources to state capacity building because the benefits it brings about remain attached to his family name. Gender-biased inheritance rules favouring men incentivise state-building because, historically, men continued dynasties and it was valued. Besides a taste for dynastic continuation, our model accommodates inter-state marriages between land-inheriting heirs. Marriages accumulate land, thereby generating a wealth effect. We weigh the direct effect of dynastic continuation against the indirect effect of more land-merging marriages under gender-egalitarian rules. Our approach is apt at capturing the incentive to build state capacity for land-based countries. However, small and well organised states did not pursue territorial expansion. Considering that inter-state marriages merged wealth and political power as well broadens the scope of our model and encompasses such cases.

In this paper we show that state capacity accumulates faster under gender-egalitarian rules in the short run. This novel result nuances the literature and highlights that fast wealth accumulation can overcome a lower probability of continued rule. Nonetheless, in the long run results are reversed. The process is wealth accumulation through marriages

¹The choice of a particular rule is likely to be endogenous and related to how women are perceived in a society. However, this paper exogenously fixes norms to compare the outcome of each.

is delayed under gender-biased norms. However, the long-run dynamics generate a distribution of wealth that is similar for both regimes. After wealth differences vanished, the direct effect of higher probability of continued rule dominates. This corroborates the relevance of continued rule the economic literature highlights. Moreover, this result provides a rationale —beyond short-term considerations regarding dynastic continuity— for the pervasive prevalence of male-cognatic primogeniture in the European context.² Finally, although our model is concerned about the evolution of state capacity, our conclusions indicate that gender equality could have had important, indirect, consequences on economic development through state capacity building.

2.2 Related literature and historical context

State capacity and its determinants. The concept of *state capacity* refers to and measures how far-reaching and capable a state is at enforcing compliance of individuals. McAdam et al. (2001, p. 78) defines it as “the degree of control state agents exercise over persons, activities, and resources within their government’s territorial jurisdiction”. Ottervik’s (2013) definition is similar and enumerates indicators of state capacity.³ Among these tax collection stands out because “effective political system should be able to extract resources, aggregate them, and use them for national purposes” (Walder (1995, p. 90-91)).

In the economic literature, conflict promotes state capacity because it permits to collect taxes more efficiently, thereby increasing the chance of victory. This relationship is at the core of theoretical models on state-building which typically oppose two agents.⁴ For instance, state-building and tax collection respond to external threats in Besley and Persson (2008). In that sense, Besley and Persson (2009) confirm that a longer history of belligerency is correlated with state capacity. Dincecco and Katz (2014) empirically validate the conjecture that centralised states are more efficient at levying taxes than fragmented states. Our model retains the role of conflict as rulers wage war to control

²Contrary to our findings, increasing levels of gender equality, broadly understood, induce economic growth in a pre-modern set-up, see Lagerlöf (2003a). Insofar state capacity is conducive to economic prosperity, our model indicates that gender-discrimination, at least in some specific domains such as inheritance rules and for critical junctures, may be growth-enhancing.

³His definition reads “the ability of the state to [...] coax compliant behaviour from the individuals”.

⁴The role of state capacity as a lever to increase tax revenue to fund armies was early acknowledged by Bean (1973), Tilly et al. (1985) and Bonney (1999, p. 9).

resources.⁵ However, we arbitrarily expand the set of contenders.

The literature also emphasises that political stability —the probability of continued rule— fosters building state capacity. Typically, it introduces opposed groups that can alternate in power and make transfers to their people. Building state capacity increases tax collection efficiency, and therefore the potential transfers to the governing group in subsequent periods, see Besley and Persson (2008) and Persson and Besley (2009). Besley et al. (2013) find some empirical support for this hypothesis. We extend this concept by incorporating the idea of dynastic continuity and, consistent with the literature, it raises investments in state capacity.

Persson and Besley (2009) provide a theory highlighting other determinants of state capacity. These include the country's wealth, the demand for public goods and political representativeness.⁶ Johnson and Koyama (2014) further argue that greater homogeneity allowed England to switch away from cabal tax before France while Gennaioli and Voth (2015) model how regional cohesiveness facilitates centralisation. Finally, Johnson and Koyama (2017) review historical determinants of state capacity.

European medieval context. The collapse of the Roman Empire, once a powerful unified entity, brought about a plethora of regional polities seeking to militarily expand at the expense of others, as larger domains provided more income and accrued greater political influence and prestige.⁷ According to Smith (1776), power and greatness depended on estate size, and this explains the prevalence of primogeniture among elites because that system only allows one child to inherit all estates.⁸

Dynastic preservation through the identification of surnames to landholdings was of utmost importance, even to the extent of disregarding direct family members as heirs. Buck et al. (2004) notice that landowners used primogeniture to maintain family's relationship to the land contrary to common-law requirements.⁹ Documented accounts evidence that testators preferred to bequeath to an outsider or a distant relative rather than facing

⁵Fight for the control of scarce resources impacts other outcomes: fertility levels, with fatal consequences, in De la Croix and Dottori (2008) and education expenditures in Aghion et al. (2012). Economic development and industrialisation stifle war-making in Lagerlöf (2010) as the industry reduces the need of land to produce.

⁶Persson and Tabellini (2004) document that more representative parliamentary and proportional democracies achieve higher state capacity when measured by government spending.

⁷Girouard (1978) details additional advantages

⁸Kokkonen and Sundell (2014) find that countries that relied on primogeniture as inheritance system developed further both in the past and in the present compared to those that elected the ruler or applied agnatic seniority. Primogeniture avoided conflict because it clearly signalled a young heir, delivering stability.

⁹French Basques circumvented the law to stick to primogeniture, see Arrizabalaga (2018).

dynastic extinction. In such cases, wills made clear provisions for the continuation of the family name. For instance, Robert Marmyon specified his heir should “take the name Marmyon” to avoid “extinction [...] and to ensure that its estates would continue in the name of Marmyon”, see (Payling, 1992, p. 34).¹⁰ The concept of dynastic continuity we introduce follows this logic and illustrates the desire to preserve the identification of one’s family name to the land held. Surname transmission is crucial and, to continue a dynasty, heirship and surnames should descend through the same gender.

Our model distinguishes between inheritance rules based on the possibility of women to inherit. Male-cognatic primogeniture only allows a daughter to become heiress if she has no living brothers. On the contrary, absolute primogeniture selects the oldest sibling regardless of gender. In addition, the model also makes marriages between heirs possible.¹¹ Such marriages increased estate size because heiresses “brought lands to husband[s]” (Holt (1985)), although it meant halting the wife’s dynasty. In our model, larger polities invest more in state capacity due to a scale effect and the size of a polity result from a unification process through war and marriages.¹² This scale effect is in line with Lagerlöf (2014).

European regions systematically preferred men over women during medieval time, and the system of male-cognatic primogeniture was widely used (Drell (2013)).¹³

This rule maintained landholdings intact and preserved their identification with the dynasty because men were favoured.^{14,15} This was the case in England for all tenures since Henry I. Western France Capetians always designated one son as heir and Norman dukes traditionally applied primogeniture favouring sons, according to Patourel (1971)

¹⁰ Several other accounts support the *fear* of lineage extinction. Clay (1968) details the case of the Marquess of Halifax, who disinherited his daughter and demanded his heir adopted his family name. Payling (2001) describes a similar case within the Drayton family and notes that others married an heiress with a non-heir son while bequeathing to a male relative. Several wills clearly specify heirs should adopt testator’s family name and bear arms unchanged, see Cokayne (1887). Hicks (1998, p. 32) summarises the idea simply stating that “[the] preservation of the line and the family name really mattered”. Chu (1991) shows that primogeniture arises as the optimal inheritance rule that minimises the risk of lineage extinction. See also references therein.

¹¹ According to Habakkuk (1950), Clay (1968) and Girouard (1978), inter-state marriages were common during the middle ages.

¹² Our model is quite simple regarding regional dynamics and predicts unification. Alesina and Spolaore (1997, 2006) model the optimal number of countries its relation with state capacity and war.

¹³ The Visigoths allowed women to inherit if parents died intestate and Burgundian codes privileged sisters over brothers when nubile girls died, see Drell (2013, p. 10). Cecil (1895, p.26) notes that ancient Britons equally divided inheritances among all siblings.

¹⁴ di Renzo Villata (2018, p. 170) indicates that “preference for males was practically universal in feudal Europe reflecting the initial origin of fiefs”.

¹⁵ Inheritances transitioned from partitioned to intact. The model we develop does not consider the former case, but these were common in Britain before the Norman Conquest, in France under the Carolingians and temporarily in the Holy Roman Empire. Bertocchi (2006) models the joint evolution of political systems and economic development, focusing on the transition from primogeniture to partible inheritances.

and Jewell (1996, p. 122). Frankish Chamavian, Thuringian and Lombard codes also prevented women from inheriting land, see Nelson and Rio (2013). Similarly, Ros (2012) and Piniella del Valle (1986) indicate that Catalonia vigorously practised male-prefering primogeniture until very recent times. The Goth custom of “Geschlossene Güter” is similar to primogeniture and benefited men as well because “lands held by military service should descent to the eldest son”. Other tenures followed the same practice, see Cecil (1895).¹⁶ The more stringent Salic Law, completely forbidding women from inheriting, applied in Salian lands until softened by King Chilperic edict (Herlihy (1962)).¹⁷ Bertocchi (2006) indicates that the prevalence of primogeniture diminishes as nascent states assume the provision of defence whereas, previously, individual lords assured that expensive responsibility within their domains. Primogeniture provided the means to this end ensuring lords’ rents were high enough. Dunbar (2016) reasons similarly.¹⁸

The remaining of the paper is organised as follows: Section 2.3 introduces the static part of the theoretical model. Section 2.4 incorporates the marriage market for land-inheritors. This, together with war, generates the dynamics. We simulate the evolution of state capacity under both inheritance rules in Section 2.5. Section 2.6 concludes.

2.3 The Model

The model is based on an overlapping generations framework with discrete time. Consider a region $\mathcal{L}$ divided into smaller subregions at period $t = 0$. Each subregion is a *manor* indexed by $i = 1, 2, \dots, I_t$. The surface of manors $x_t^i > 0$ is normalized such that $\sum_{i \in \mathcal{L}_t} x_t^i = 1$. Each manor is ruled by a Lord who lives for two periods. Lords rule and make decisions only when adult. His preferences are given by:

$$\mathcal{U}_t^i = \ln(c_t^i) + \pi\eta \ln(x_{t'}^i), \quad (2.1)$$

¹⁶By 1242, German princes embraced estate division. The practice lasted until the Thirty Years War. This “reckless division” (Cecil (1895)) created more chances for a war to occur and also supposed a barrier to prosperity.

¹⁷Several other regions only allowed women to inherit if she had no living brothers, see Wemple (1985).

¹⁸In that sense, gender-biased inheritance rules in favour of men may reflect the military origins of fiefs and the need to organise its defence. War partaking is a prototypical male activity, and men are in general less risk-averse than women. This rationalises the extensive use of inheritance rules that preferentially select men. Related, to perpetuate dynastic continuity surnames need to descend through one gender. Moreover, it should coincide with the gender more likely to inherit the landholdings. We conjecture this delicate relationship may explain the joint prevalence of men being the depositor of the surname carrying capacity and being preferentially treated in inheritance rules.

where $c_t^i > 0$ represents consumption during adulthood and $x_{t'}^i \in (0, 1)$ the surface of the manor the heir will receive —after the war process but before marriages—. ¹⁹ Manor size is discounted by two factors: $\pi \in (0, 1)$, the psychological discount rate, and $\eta \in (0, 1)$, the probability of dynastic continuity. As we show later, inheritance rules determine the value of η . For the moment, with probability $1 - \eta$ dynastic continuity halts and the incumbent Lord derives no utility as his dynasty loses prestige and influence. ²⁰ Lords are powerless to avoid this, and strictly follow inheritance rules. To simplify the exposition, the model disregards partitioned inheritances. ²¹ Agency problems in managing large estates or marriage strategies may explain its existence. ²² Introducing such practices would slow down the dynamics of the model but would not alter the qualitative results.

Since total area is constant, the size of a manor can increase only at the expenses of some neighbour. Conflict continuously arises because Lords seek to enlarge their estates. We model conflict through a war process such that, at every period of time, Lords battle all-against-all. ²³ Lords hire soldiers to battle and their efficiency is increased by state capacity. ²⁴ The outcome of the war is a new distribution of land. Following Skaperdas (1996), post-war manor size follows:

$$x_{t'}^i = \frac{(1 + A_t^i + g_t^i) b_t^{i\phi}}{\sum_{i \in \mathcal{L}_t} (1 + A_t^i + g_t^i) b_t^{i\phi}}, \forall i \in \mathcal{L}_t, \quad (2.2)$$

where $b_t^i > 0$ represents the number of soldiers hired and $\phi > 0$ measures their relative importance in the war process. A_t^i represents state capacity during period t while g_t^i indicates the amount invested in state-building. ²⁵ We argue that more capable states

¹⁹Larger manors granted political influence and prestige, among others.

²⁰As discussed earlier, historical accounts reflect this idea and highlight the supreme importance of family names, see footnote 10. In this regard, the idea of dynastic continuation mattered more than assuring genetic continuation, although direct descendants were not left empty-handed. Notice that benefiting the progeny was only disregarded when dynastic continuation was threatened.

²¹Such inheritance rule consisted in the division of an estate between siblings. The practice was progressively abandoned in favour of undivided inheritances, in particular, primogeniture.

²²Additionally, some evidence indicates that children's equal value induced Lords to partition inheritances, see McNamara and Wemple (1973) and references therein.

²³To accommodate this battle process which does not consider the distance to the battlefield, think of $\mathcal{L}_t$ as a doughnut with manors on its surface and battles taking place in the central hole.

²⁴Diverting commoners from farming activities to partake in war does not qualitatively change the results.

²⁵State capacity building fosters economic development as it brings about market-supporting institutions, property rights and judicial systems. For simplicity, we forgo the model from capturing this aspect. However, the introduction of such mechanism would generate additional income for Lords that invest in state capacity, rewarding them. It would also provide clear results relating state capacity to economic development through gender equality. However, this paper indirectly relates both, although it misses the reinforcing effect that state capacity exerts through development.

are better at organising its military forces because these are more bureaucratised, have appointed more officials and are more internally coordinated.²⁶ To simplify the problem, we assume that Lords ignore the externality caused by a unilateral increase in the number of soldiers or in state capacity. This considerably simplifies the model and allows deriving analytical results at the expense of an inconsistent behaviour when there is only one manor.²⁷ However, the qualitative results would remain adopting a more complex approach. In particular, during the transition phases when the main results surface, more than one manor exists. Substituting Equation 2.2 into Equation 2.1 yields an equivalent expression for utility:

$$\mathcal{U}^i = \ln(c_t^i) + \gamma \ln\left((1 + A_t^i + g_t^i) b_t^{i\phi}\right), \forall i \in \mathcal{L}_t, \quad (2.3)$$

where $\gamma \in (0, 1) \equiv \pi\eta$.

A Lord's income depends on manor size and state capacity. In particular, a homogeneous final good is produced in each manor using only land.²⁸ Total production is shared between the Lord and the commoners under a crop-sharing agreement.²⁹ We impose constant shares over time and across manors: the Lord receives a constant share $\psi \in (0, 1)$ and the remaining $1 - \psi$ goes to commoners. Further, Lords can levy certain taxes on commoners' share. Keeping with the literature, the effective tax rate is given by $\tau_t^i = \frac{A_t^i + g_t^i}{1 + (A_t^i + g_t^i)}$ which increases in state capacity and investments. State capacity does not depreciate over time. A Lord's budget constraint is:

$$Z_t^i \equiv \psi Y_t^i + (1 - \psi) Y_t^i \frac{A_t^i + g_t^i}{1 + (A_t^i + g_t^i)} = c_t^i + p_b b_t^i + p_g g_t^i, \quad (2.4)$$

where $p_b > 0$ represents the costs associated with hiring a soldier and $p_g > 0$ stands for the cost of increasing state capacity.³⁰ Optimal number of soldiers and investment in state

²⁶Not introducing A_t^i in Equation 2.2 would not change the qualitative results of the model. Wealthier Lords would invest more in state capacity and outperform their rivals.

²⁷Clearly, if only one manor exists it faces no risk of losing any territory due to an attack and its optimal number of soldiers is zero. Notwithstanding, assuming the externality is ignored, all manors will inevitably hire a positive number of soldiers and, if they can afford it, they will also invest in state capacity.

²⁸Introducing commoners and assuming production is non-decreasing in factors and increasing in, at least, one of them delivers the same qualitative results. Further assuming that commoners detracted from labour to participate in war also produces similar results. In particular, under the linear specification $Y_t^i = n_t^i - b_t^i + x_t^i$, where n_t^i are commoners and b_t^i represents those partaking in war, results are qualitatively the same.

²⁹Lords historically used crop-sharing or leases to allocate production, see Slicher van Bath (1966). The burden supported by peasants varied between $\frac{1}{2}$ and $\frac{1}{3}$, depending on land fertility. Duby (1962) and Volokh (2009) find that share-cropping was more common in continental Europe and that leasing was preferred in England.

³⁰No payments are required to maintain a certain level of state capacity once it is reached. Nonetheless, if we assume officials receive a constant fraction of collected taxes results do not qualitatively change. In that case tax

capacity as well as comparative statics are given by the following Propositions.

Proposition 1. *Lords' optimal decision is given by the unique triplet (c_t^i, b_t^i, g_t^i) such that:*

$$\begin{aligned} b_t^i &= B(g_t^i) = \begin{cases} \frac{\gamma\phi(Y_t^i(A_t^i+g_t^i+\psi)-p_b g_t^i(A_t^i+g_t^i+1))}{p_b(A_t^i+g_t^i+1)(\gamma\phi+1)} & \text{if } g_t^i > 0 \\ \frac{\gamma Y_t^i \phi(A_t^i+\psi)}{(A_t^i+1)p_b(\gamma\phi+1)} & \text{if } g_t^i = 0 \end{cases} \\ g_t^i &= G(g_t^i) = \max\{0, g|G_1(g) = 0\}, \\ c_t^i &= C(b_t^i, g_t^i) = Z_t^i - p_b b_t^i - p_g g_t^i, \end{aligned} \quad (2.5)$$

where $G_1(g_t^i) = \frac{\gamma}{1+A_t^i+g_t^i} + \frac{(\gamma\phi+1)(p_g(A_t^i+g_t^i+1)^2-(1-\psi)Y_t^i)}{(A_t^i+g_t^i+1)(p_g g_t^i(A_t^i+g_t^i+1)-Y_t^i(A_t^i+g_t^i+\psi))}$.

Proposition 2. *At the optimum, $\frac{\partial b_t^i}{\partial Y_t^i} > 0$ and $\frac{\partial b_t^i}{\partial A_t^i} > 0$. Optimal investments in state capacity are such that $\frac{\partial g_t^i}{\partial Y_t^i} > 0$ and $\frac{\partial g_t^i}{\partial A_t^i} < 0$.*

Proposition 2 has an important consequence. Army size is increasing in Y_t^i and A_t^i .³¹ Moreover, g_t^i also increases with Y_t^i . However, despite the fact that optimal investment in state capacity decreases with its accumulated level, if $A_t^j > A_t^i$ then $A_t^j + g_t^j > A_t^i + g_t^i$. This implies that, *ceteris paribus*, a larger and more developed manor will capture more land from its opponents. Therefore, absent any counterbalancing force, such a manor will increase in size, creating an empire. We present some comparative statics in the following Proposition.

Proposition 3. *At the optimum, $\frac{\partial b_t^i}{\partial \gamma} \geq 0$, $\frac{\partial b_t^i}{\partial \phi} \geq 0$, $\frac{\partial b_t^i}{\partial \psi} \geq 0$ and $\frac{\partial b_t^i}{\partial p_b} < 0$. Also, at the optimum, $\frac{\partial g_t^i}{\partial \gamma} \geq 0$, $\frac{\partial g_t^i}{\partial \psi} \geq 0$, $\frac{\partial g_t^i}{\partial p_b} = 0$, $\frac{\partial g_t^i}{\partial p_g} < 0$, $\frac{\partial g_t^i}{\partial \phi} < 0$ and $\frac{\partial g_t^i}{\partial \psi} < 0$.*

Proposition 3 indicates that the optimal number of soldiers decreases with its price. Also, if γ increases —this is, if a Lord cares more about the size of the fiefdom to be transferred to his heir— he will optimally allocate more resources to increase it. This result is similar to Proposition 6 in Persson and Besley (2009), which establishes that investments in state capacity are higher the more likely an incumbent is to remain in power. On the other hand, if the relative importance of soldiers in the war process, measured by ϕ , increases, the optimal response is to deploy more to take advantage of the

income would be $(1-\psi)(1-\zeta)Y_t^i \frac{A_t^i+g_t^i}{1+(A_t^i+g_t^i)}$ where $\zeta \in (0, 1)$ represents the part of taxes officials keep as payment.

³¹This result is equivalent to Proposition 4 in Persson and Besley (2009) which establishes that state capacity increases with wealth.

additional value they provide in the battle process. Finally, a higher ψ means that Lords own more resources and depend less on taxation income. Since soldiers are a normal good, an increase in income raises their demand. We can reason similarly for g_t^i . The negative relationship with ϕ follows from the substitutability between soldiers and state capacity.

A crucial aspect of this model is the delicate relationship between gender and surname-carrying capacity. The surname-carrying gender —male— continues dynastic rule and institutions that favour male inheritance incentivise investments in state capacity because rulers care about dynasty continuation. This generates the relationship between γ and state capacity in the context of our model. In this regard, a gender-discriminating inheritance rule only promotes state capacity if heirship and surnames descend through the same gender.

At the other end, the number of men and women in the marriage market for land-inheriting heirs is balanced under a gender-neutral inheritance rule.³² Consequently, there are more marriages under such rule, landholdings are merged more often and become larger.³³ This provides an indirect lever that fosters state-building, as investments increase in Lord's income.

2.4 Dynamics

Until now we have restricted our attention to a static problem. This section describes the dynamic behaviour of our model which is significantly influenced by the outcome of the marriage market. Before turning to it we assume that tiny manors resulting from the war process are integrated into larger entities.³⁴ In fact, the functional form of Equation 2.2 coupled with the fact that all Lords hire soldiers implies that no manor would completely disappear due to conflict.³⁵ Instead, these become infinitesimally small. At any rate, such petty manors would be obliterated by more military capable rivals and removing them is a natural step.

An important aspect of inheritance rules is that heir's gender is only revealed at

³²Men and women are equally likely to inherit under a gender-egalitarian rule. Hence, the number of men and women who inherit land is the same. On the other hand, a gender-biased rule overrepresents one gender among the individuals who receive land. Consequently, fewer marriages between land-inheritors can be arranged.

³³Such marriages also combined wealth and political power which we do not incorporate in the model.

³⁴Removing small manors improves the numeric accuracy in our simulations.

³⁵Marriages cannot remove them either. Heirs at the end of the wealth distribution would be unlikely to marry under male-cognatic primogeniture or would marry likewise humble heiresses under absolute primogeniture.

testator's death. This implies that all decisions are made under uncertainty and we defer the realisation of the random event to the end of each period, when the offspring has reached adulthood.³⁶ We propose that events unfold in the following manner:³⁷

1. Lords' decide c_t^i , b_t^i and g_t^i under uncertainty.
2. War takes place between all manors.
3. Surviving children's gender is revealed and marriages are arranged.

2.4.1 Marriages

We consider a marriage market for land-inheriting heirs in which all participants have perfect information. Prospective spouses sort candidates according to their wealth, this is, their preferred match would be the richest individual of the opposite gender. As the number of men and women in this market need not agree, unmatched individuals are assumed to marry a non-heir child of a nobleman or a noble from the rest of the world. In medieval Europe, elite members followed some strategies when marrying children: usually, marriages were only arranged between spouses of similar rank.³⁸ We capture this aspect assuming that only potential spouses who are similar enough in terms of wealth can marry. In particular, the distance between them must be below a certain threshold δ_t for them to wed.³⁹

With these conditions, spouse selection follows a refined version of Gale and Shapley (1962). In our case, the outcome is intuitive. A Lord will marry his heir(ess) with the best possible candidate within his rank. This implies a swift process of land concentration on the upper echelons of the wealth distribution. Appendix 2.A formalises the marriage

³⁶Marrying an heir to an heiress before the death her father was a risky business, see Payling (2001). Arguably, waging war and deciding strategic alliances through pre-marital arrangements suffered similar problems.

³⁷The particular sequence of events we propose does not allow Lords to subscribe treaties based on future marriages. Although relevant in reality, we forgo the model from capturing that strategical aspect and postpone treaties to the aftermath of war. In any case, family bonds *per se* did not assure a peaceful relationship between parts. The conflicts of Charles the Bald with his brothers and nephew are good examples. Also, Hicks (1998) explores the case of Neville family; McLaughlin (1990, p. 199) cites the case of Richilde of Hainaut who fought her brother-in-law and Arnould III of Guînes who battled against her own son. Miller (1983, footnote 16) refers to the case of Styr Thorgrímsson who fought against his son-in-law (and afterwards changed sides).

³⁸For instance, Bouchard (1981) explains the difficulties of early Capetians in finding suitable queens for their sons. Hurwich (1998) analyses the marriage pattern of German lower nobility and ascertains that men tended to marry upwards in the social ladder due to the treatment of children of unequal marriages. In Zeeland, marriages between spouses of different strata are recorded, but they were mostly arranged between spouses of similar level, see van Steensel (2012).

³⁹Alternatively, inheritors can be classified into $\mathcal{N} > 1$ groups according to their wealth. Only marriages between spouses who belong to the same group would be feasible.

market. Finally, the state capacity of a merged manor is the average of its constituent parts.

Marriages and wars are important in shaping the dynamics because these forces concentrate land. Similarly, inheritance rules and the stochastic realisation of children's gender determine the outcome of the marriage market. Because of the non-trivial, stochastic behaviour of the model, we resort to numerical simulations in order to analyse the implications of different inheritance rules.

Each inheritance rule incorporates mechanisms that can potentially lead to higher levels of state capacity. On the one hand, male-cognatic primogeniture offers a higher probability of dynastic continuation. This is because this rule gives priority to men. In particular, a woman can only inherit if she has no living brothers. Therefore, the probability of continuing a dynasty is $(1 - 0.5)^\Phi$ for a man with Φ children.⁴⁰ This is larger than the respective probability under absolute primogeniture, which amounts to 0.5 because it dictates that the oldest sibling inherits. Hence, discount rates are such that $\gamma^M > \gamma^A$. On the other hand, absolute primogeniture balances the number of land-inheriting heirs and heiresses. Correspondingly, there are more marriages that merge manors. This generates a scale effect that allows investing more in state capacity.

2.5 Simulations and Results

We simulate the economy using a code written in the Python programming language. In each simulation we initialise it assuming 30 manors exist. For each period we simulate, we first determine the gender of each heir. Next, we use Proposition 1 to solve for the optimal levels of investments in state capacity and in the army for each manor. Ignoring the externality in Equation 2.2 greatly simplifies the required computations. Optimal values b_t^i and g_t^i for all contendants determine the outcome of war, namely, the after-war size of each manor. This step completes the static part of the model. The following step involves removing manors that are below the threshold δ . This effectively prevents tiny manors

⁴⁰Introducing endogenous fertility would not change the results for absolute primogeniture, because the gender of the heir is independent of the number of children. However, it would introduce an strategic variable under male-cognatic primogeniture. Indeed, by having more children a Lord increases the probability of dynastic continuation. Assuming a high enough cost of children, this would allow wealthier Lords to secure dynastic continuation. Consequently, this would incentivise wealthier Lords to invest even more in state capacity, giving them an additional advantage during the war. We conjecture that qualitative results would remain similar, although probably the dynamics of male-cognatic primogeniture would be expedited.

from remaining, and positively impacts the numerical accuracy of our code. Finally, we implement the marriage market for land-inheriting heirs. In doing so, we simply order heirs and heiresses according to their wealth, and we determine whether a potential couple can form computing the distance δ between spouses. In particular, for each man we iterate over heiresses until we find the richest, unmarried heiress that lies within the threshold. Ensuing, we aggregate landholdings for matched partners. The second period begins with the manors that resulted from marriages, and those whose heirs remained unmarried.

Parametrisation. The value of most of the parameters for the simulations is chosen from historical sources. For simplicity, π equals 1.

The number of children per Lord comes from Russell (1958). French data shows that 4.15 children survived their father. In England, the value is lower: 2.35. We take 3 as the number of children per Lord. Consequently, the effective discount rates are $\gamma^A = 1 - 0.5^\Phi = 1 - 0.5^3$ and $\gamma^M = 0.5$.

The crop-sharing rule value is the average of the extreme cases presented in Slicher van Bath (1966). Therefore, $\psi = 5/12$. We use Sánchez Martínez et al. (2003) and Bane-gas López (2010) to compute the cost of soldiers comparing their daily cost (2 *sous*) with typical noble daily food expenditures (1.6 *sous*). The real cost of a soldier is then $p_b = 1.2$.⁴¹ We proceed similarly to compute the cost of taxation. Following Verdés Pijuan (2004, p. 153), in the town of Cervera during the year 1424, the *racional*, that is, an auditor, received no less than 330 *sous*⁴² in yearly wages. A *racional* had to work three days a week or around 150 days per year, which gives us an equivalent wage of 2.2 *sous* per day. There is, though, great variability comparing this figure with English references.⁴³ We initially follow the first estimate and set $p_g = 1.375$.

Finally, for each simulation we draw initial manor sizes (x_t^i) from a uniform distribution between 1 and 2 and we set the initial level of state capacity equal to 0. The disappearance threshold is set to $\delta = 0.01$, it is, one-hundredth of the minimal original size. We use a time-varying marriage threshold equal to one standard deviation in manor size. The value of ϕ is larger than 1 by assumption and equals $1 + \frac{1}{10^{11}}$, which delivers a slow evolution

⁴¹English soldiers reveal a similar real cost with respect to noble food consumption which ranged between 0.428 for an archer and 2.57 for cavalrymen. The real cost of infantry was 1.14. Data for noble expenditures on food from Dyer (1989, p. 65) for the year 1380 and wages from Norman and Pottinger (1979, p. 79-79).

⁴²The source says they received no less than 30 *florins*. One *florin* corresponded to 11 *sous*.

⁴³Ives (1983, p. 323) reports that a serjeant received £10 per circuit. This figure represents a real cost of 0.93. The real cost of an ordinary judge is estimated at 4.69. In Dyer (1989, p. 47), the real cost of a lawyer is 2.44

Table 2.1: Parameters

Parameter	Value	Source
ψ	5/12	Slicher van Bath (1966)
Φ	3	Russell (1958).
ϕ	$1 + 1/10^{11}$	Arbitrarily set to have slow transitions.
p_b	1.375	Banegas López (2010) and Sánchez Martínez et al. (2003).
p_g	1.2	Banegas López (2010) and Verdés Pijuan (2004).
γ^M	7/8	$\gamma^M = 1 - 0.5^\Phi$.
γ^A	1/2	$\gamma^A = 1 - 0.5$.
δ	0.01	Arbitrarily set to 1/100 of the minimum initial size.

of the economy by hampering the effect war has on the distribution of manor sizes.⁴⁴ Table 2.1 summarizes the parametrization. Regimes are simulated 1000 times each. In the remaining part of this Section, we comment the results. Unless otherwise stated, *marriages* refer to marriages between a land-inheriting heir and heiress. Candidates in the marriage market are sorted according to the size of their manors.

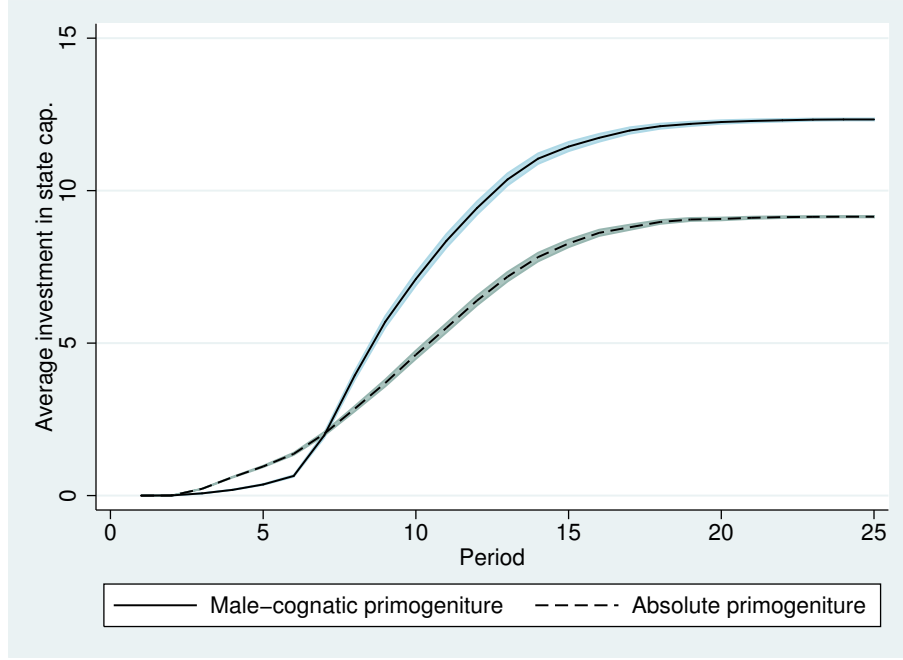
Results: Figure 2.1 illustrates the evolution over time of the average level of state capacity for each inheritance rule. The solid line corresponds to male-cognatic primogeniture and the dashed line to absolute primogeniture. Simulations provide evidence that, in the long run, a gender-biased inheritance rule allows achieving higher average levels of state capacity. Nonetheless, it is also evident that, in the short run, gender-egalitarian rules boost it more. This supports the intuition described before, namely, the importance of marriages in merging manors and the significance of income effects. In any case, in the long run, the advantage of absolute primogeniture vanishes because, albeit at a lower rate, land concentrates under male-cognatic primogeniture through marriages, too. Therefore, the direct effect of dynastic continuity dominates when manor size distributions are similar enough between regimes. In that sense, the time during which the rules apply is crucial in determining which of them is best.

As stated, marriages between heirs are a decisive factor in shaping the evolution of state capacity. Absent restrictions in the marriage market, the marriage rate —this is, the total number of actual marriages relative to the number of participants in the market— is higher under absolute primogeniture.⁴⁵ Incorporating the restriction that potential

⁴⁴In particular, setting ϕ equal to two hastens the model. Male-cognatic primogeniture takes over absolute primogeniture during period four instead of period six.

⁴⁵When the number of participants in the marriage market tends to infinity, the ratio of marriages to participants approaches 0.5 under absolute primogeniture and 0.125 under male-cognatic primogeniture.

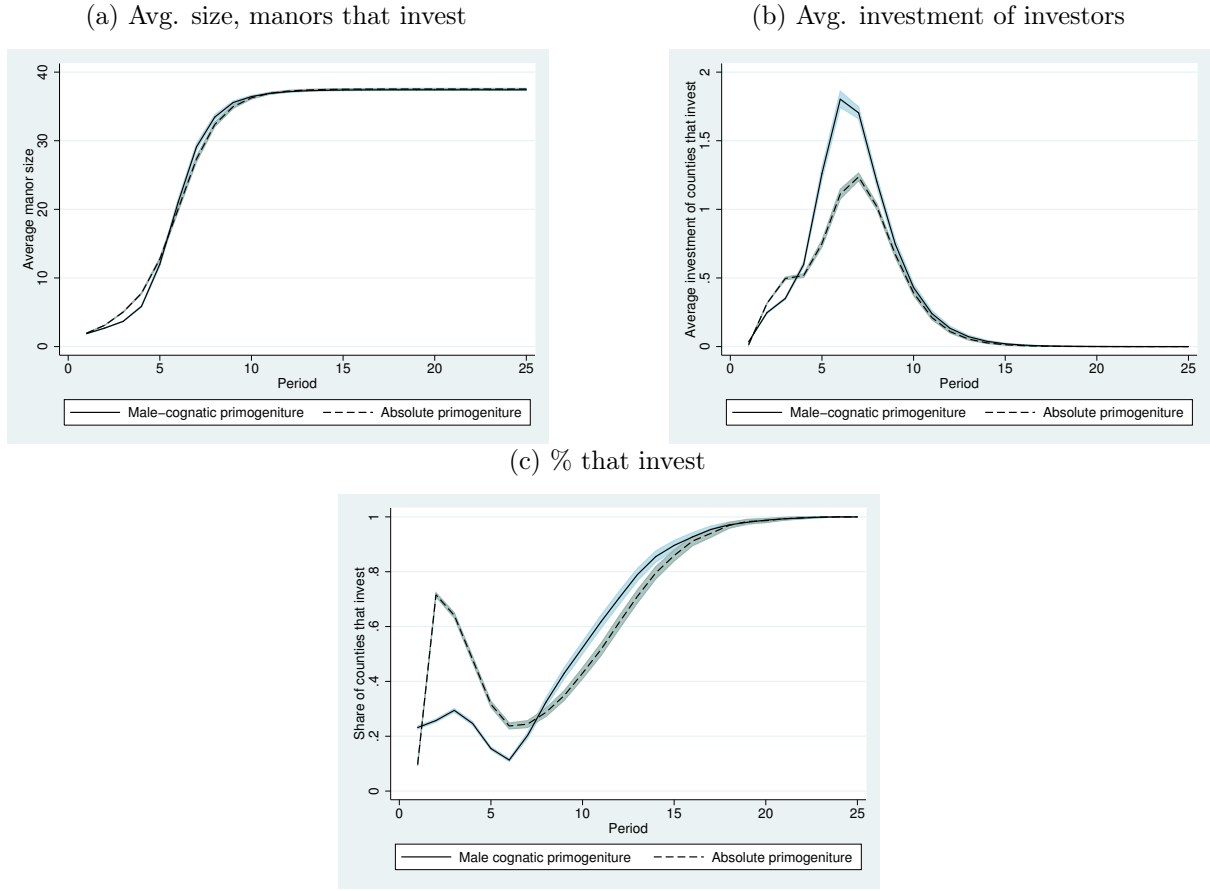
Figure 2.1: Average state capacity



Note: This Figure represents average levels of state capacity reached in the simulations for each period, distinguishing between inheritance rules. The solid line corresponds to male-cognatic primogeniture and the dashed line to absolute primogeniture.

spouses must be similar enough to wed does not significantly alter this result. Indeed, our simulations show marriage rates of 0.42 and 0.11 for absolute and male-cognatic primogeniture during the first period, respectively. Regional unification is initially faster under absolute primogeniture which generates bigger manors. This explains why it delivers larger levels of average state capacity.

On the other hand, a gender-biased rule promotes state capacity through the direct effect of γ . Although it delivers smaller average manor sizes, the surface of those large enough to build state capacity is similar across rules. Figure 2.2a confirms this is the case, especially from period five onwards. In these cases, $\gamma^M > \gamma^A$ coupled with similar size causes higher average spending in state-building under male-cognatic primogeniture. Figure 2.2b depicts average expenditures in building state capacity considering only Lords that devote a positive amount of resources to this end. Notice that male-cognatic primogeniture overtakes absolute primogeniture even before manor size equalises, evidencing the strength of continued rule as an engine for state-building. This is confirmed comparing the share of Lords that develop state capacity, as Figure 2.2c does.

Figure 2.2: Evolution of Y and investments

Note: This Figure presents the average evolution of several variables. Panel A) depicts the average manor size of manors that build state capacity. Panel B) shows the average expenditure in state-building for the cases with positive investents. Finally, Panel C) presents the percentage of Lords that devote resources to state-building.

All in all, the simulations indicate that a higher probability of continued rule does not guarantee higher levels of state capacity in the short run once richer dynamics —inter-state marriages— are incorporated in the model. Nonetheless, in the long run, the importance of continued rule remains reemerges because income differences vanish with time. Simply, the number of marriages is limited and, eventually, a gender-discriminating rule catches up.⁴⁶

Sensitivity analysis. Given the variations present in the estimates of the parameters, especially p_g , we diligently conduct a series of robustness tests. In a first approach, we modify the value of the parameters one at a time. In all cases, the main result remains, this is, absolute primogeniture delivers higher levels of state capacity in the short run only to be outperformed by male-cognatic primogeniture in the long run.

⁴⁶In that sense, the model predicts regional unification as manors merge. Appendix 2.B explores two cases of late unification in the European context and proposes amendments to reconcile the model with these cases.

However, the exact dynamics are impacted, and the timing of male-cognatic primogeniture take over hinges upon the exact value of the parameters. We explore the exact relationship between the different parameters and the timing at which male-cognatic primogeniture supersedes absolute primogeniture. In particular, starting from the baseline parametrisation in Table 2.1, we equalise each to a series of values. For each of these values, we run one hundred simulations. Finally, we compute the average period at which male-cognatic primogeniture enduringly overtakes absolute primogeniture. Figure 2.3 presents the results. The horizontal axis represents the value of the parameter we change, while keeping the remaining at the baseline level. The vertical axis indicates the average period at which male-cognatic primogeniture delivers larger average levels of state capacity. Notice that parameters vary over a relatively large interval.

First, we focus on the effect of p_g . Figure 2.3a indicates that raising p_g tends to slow down the take over process. In fact, the entire evolution of state capacity is delayed because the investments are now more costly. However, the slowdown is more salient for male-cognatic primogeniture. This corroborates the importance of the marriage market in generating manors wealthy enough to invest in state-building. Indeed, as p_g rises, the wealth threshold that determines state capacity building does so as well. Second, values p_b are changed, while keeping the remaining at their baseline level. Figure 2.3b displays the results of this exercise. In general, no clear pattern emerges, and the spread of take-over timing is tight. This result emerges because the contribution of war toward wealth accumulation is similar between norms. In particular, although Lords devote now less resources to the army, the decrease is similar for all of them. Hence, the outcome of war is akin to that of the baseline case, as is the evolution of state capacity. We continue by analysing the effect of ϕ , which is also related to the outcome of war. The results are shown in Figure 2.3c. The parameter ϕ indicates the importance of men in war. However, as it increases, deploying marginally more soldiers contributes more than linearly to the outcome of war. In that, for a given difference in army size, higher values ϕ imply widening differences in the outcome. Therefore, as ϕ grows, Lords that previously vanquished neighbours appropriate more land from them. This hastens wealth accumulation and, consequently, male-cognatic primogeniture reaches faster the threshold

determining state capacity building. The effect ψ has on the reversal between absolute primogeniture and male-cognatic primogeniture is negative, as Figure 2.3d reveals. The overall influence of ψ is twofold. On the one hand, a higher value implies that Lords appropriate a larger share of output, and rely less on taxation, depressing state-building. On the other hand, Lords are wealthier because they receive more output. The timing of the reversal clearly rises with ψ . However, the dynamics of the marriage market remain the same as in the baseline case. Consequently, wealth accumulates at the same pace under both norms. Taken together, it indicates that the reduction in the incentive to invest in state capacity dominates the wealth effect. Therefore, as the incentive reduces, the threshold to invest increases, and it is more easily reached under absolute primogeniture. Finally, we analyse the effect of changing the issue a Lord has, Φ in Figure 2.3e. As noted before, it bears no effect under absolute primogeniture, as the heir is always the first-born and hence the discount rate γ^A remains at 0.5. However, $\gamma^M = 1 - 0.5^\Phi$ and its exact value raises with Lords' offspring, directly fostering state capacity. Nonetheless, a higher value Φ also reduces the probability of having an heiress under male-cognatic primogeniture—it equals γ^M —. As a consequence, the process of land accumulation through marriages is severely hindered. Simulations portray mixed evidence, in particular a W-shaped figure emerges. The direct effect is more important at low levels of Φ , when γ^M rises more rapidly. However, despite a higher direct incentive, simulations indicate that male-cognatic primogeniture requires increasingly more time to overtake absolute primogeniture as Lords have more issue.

2.6 Conclusion

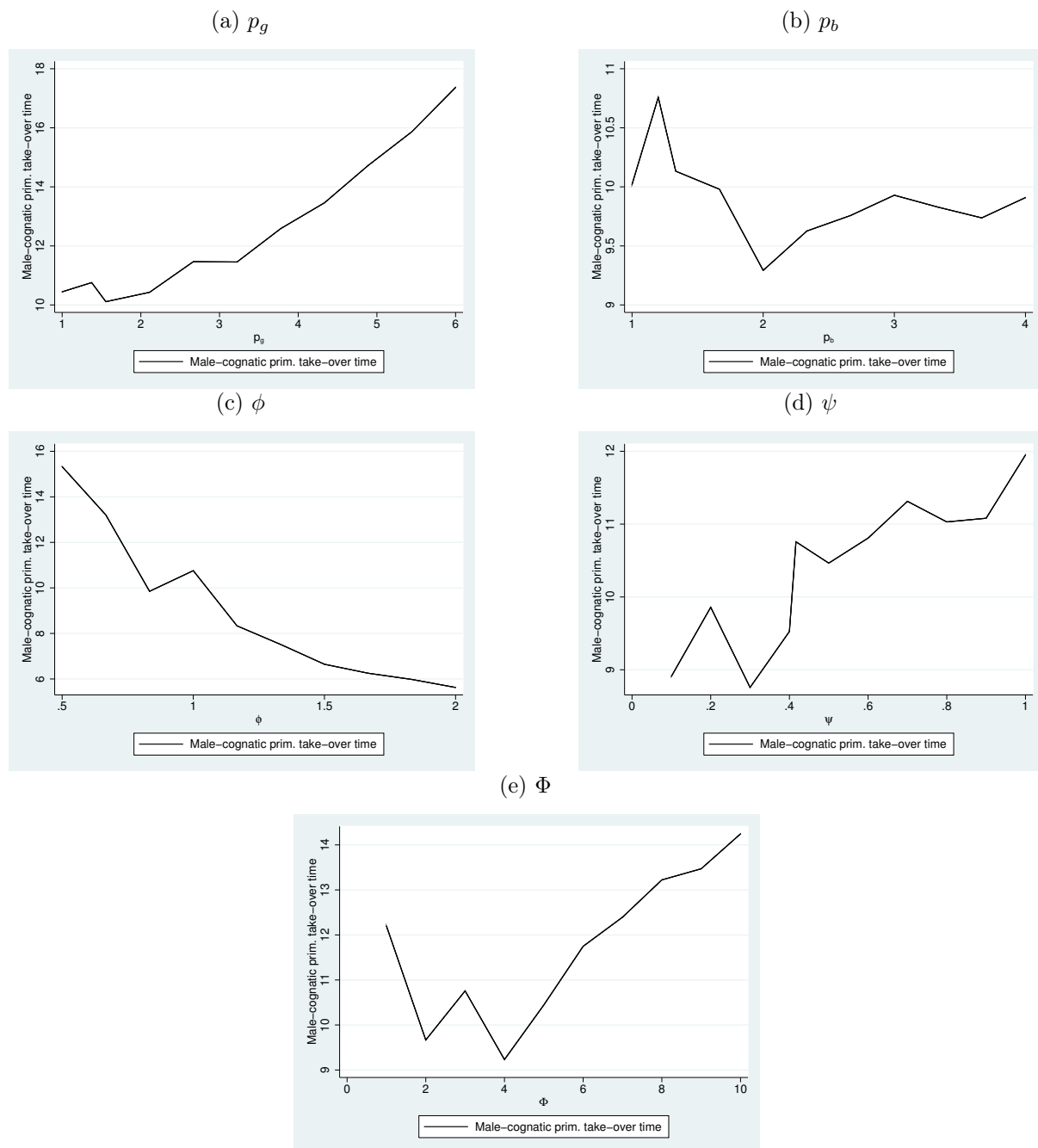
This paper is concerned with the evolution of state capacity at its early stages. Departing from the literature, it introduces inheritance rules and inter-state marriages in a simple theoretical model of state formation. The paper advances that the degree of gender-egalitarianism embedded in inheritance rules affects the development of state capacity. Two mechanisms are at play. First, the surname-carrying gender—typically male—, which continues dynastic rule. Institutions that favour male inheritance incentivise investments

in state capacity because rulers care about dynasty continuation. Second, an indirect effect of greater land-merging marriages under gender-egalitarian rules, which boosts income and allows for larger investments. The role of continued rule is often highlighted in the literature but the second mechanism has been neglected.

Our results nuance the importance of continued rule because it becomes contingent on time considerations. In particular we find that gender-egalitarian rules, although offering a lower probability of continued rule, deliver higher levels of state capacity in the short run. However, the lead is temporal because land-merging marriages take place under a gender-discriminating rule but at a lower rate. Since the number of possible marriages is finite, gender-biased rules catch up, land holdings become of similar size and the direct effect dominates. Besides lands, marriages can also merge wealth and political power, leading to a broader interpretation of the effects of inheritance rules not confined to territorial-based states. Finally, in light of the evidence relating state capacity and development, our results indicate that gender equality affects the latter through the process of state-building.

The paper provides a rationale for the pervasive usage of male-favouring inheritance rules in the European medieval context beyond dynastic continuity as this rule generates higher levels of state capacity. Moreover, it indirectly relates gender equality to economic development through state capacity insofar sustained state-level institutions foster economic growth. It also delivers some testable implications regarding state formation. First, although most European regions followed similar inheritance rules, the model indicates that regions where more marriages occurred should have developed state capacity more. Second, rulers who were fortunate enough to have a clear male, dynasty-continuing succession should similarly invest more resources in advancing the state. These two outcomes of the model can be empirically tested.

Figure 2.3: Timing of male-cognatic primogeniture take-over



Note: This Figure represents the period at which male-cognatic primogeniture overtakes absolute primogeniture in terms of average state capacity for different values of the parameters. Panel A) modifies the cost of building state capacity, p_g . Panel B) changes the cost an army, p_b while Panel C) focuses on the effect soldiers have for the outcome of war, ϕ . Panel D) varies the share of output Lords appropriate, ψ . Finally, Panel E) alters Lords' offspring.

Appendix

2.A The Marriage Market

In the marriage market, spouses sort candidates according to their wealth. Formally, let $\mathcal{M}_t \subset \mathcal{L}_t$ be the set of manors that have a male heir and $\mathcal{F}_t \subset \mathcal{L}_t$ be the set of manors that have a female heiress before marriages are arranged. Let $\Psi(\cdot)$ measure the relevant variable that determines marriages—for instance, wealth—, $D(i, k)$ measure the distance between two potential spouses and let $d_t > 0$ be threshold value during period t . Finally, let $\mu_t^{i,k} = 1$ if there is a marriage between the male heir of manor $i \in \mathcal{M}_t$ and the female heiress of manor $k \in \mathcal{F}_t$, and $\mu_t^{i,k} = 0$ otherwise. The outcome of the marriage market is summarised in the following Proposition:

Proposition 4. *The marriage market outcome described above is given by a set of $\mu_t^{i,k} = \{0, 1\}$ denoting marriages between heir i and heiress k such that aggregate valuations are maximized, each partner marries at most one spouse or remains single and partners that marry are similar enough:*

$$\mu_t^{i,k} = \arg \max_{\mu_t^{i,k}} \sum_i \sum_k (\Psi(i) + \Psi(k))^2 \mu_t^{i,k},$$

such that $\forall i \in \mathcal{M}_t, \forall k \in \mathcal{F}_t \mu_t^{i,k} = \{0, 1\}$, $\sum_k \mu_t^{i,k} \leq 1$, $\sum_i \mu_t^{i,k} \leq 1$, $\mu_t^{i,k} D(i, k) \leq d_t$, $\sum_i \sum_k \mu_t^{i,k} = \min\{|\mathcal{M}_t|, |\mathcal{F}_t|\}$.

Proposition 4 deserves some comments. First, the valuation for any given candidate is common to all potential partners. Equal valuation and functional super-modularity

generate positive assortativeness. Constraints indicate that each potential couple is either married or not, individuals can only marry once, spouses must be close enough to marry and the total number of marriages equals the number of heirs or heiresses, whichever is smaller.

2.B Country Unification

The model and the simulations predict, in general, a decrease in the number of manors over time. This holds true for countries like present-day United Kingdom or France which emerged as unified entities early. Nonetheless, some other regions like northern Italy and Germany witnessed a delayed process of unification, remaining fragmented for centuries, especially compared to neighbouring regions. This Section amends the model to reconcile it with the observed pattern considering regional specificities.

Medieval northern Italy was formed by independent city-states ruled by local elites during the high and late middle ages. Conflicts among elites to control a city were common and included the use of violence. According to Hughes (1975, p. 7), medieval Genoa consisted in “a system of long-lasting alliance within lineages and enmity between them [which] gave pattern to the seemingly pointless warfare played out on the streets of medieval Genoa and in its *contado*”. Lansing (2014) explains the case of Florence. Competition among lineages for the control of neighbourhoods was common and none achieved long-lasting supremacy. Similar conflicts arose in Venice, although according to Greif (1995), Venetians managed to reduce inter-clan tension with their devised mechanism to choose the Doge. Remarkably, the city of Siena had to call Florence to help put to an end an internal riot between Tolomei and Salimbeni families (Bowsky (1981, p. 166)). Finally, Jones (1965) also considers clan structures as a crucial aspect during Italian middle ages: a clan acted together in all activities, especially for its defence.

From this evidence, we can presume that elites focused on gaining influence in their city. From the point of view of the model, we can associate a city-state with region $\mathcal{L}$. Similarly, former manors can be represented by clans. The marriage market shall present frictions as well, since opposing clans heirs were not allowed to marry. Suppose that clans have similar initial conditions in terms of income Y . According to the model, there would

be minor changes in the distribution of wealth over time as all clans will make similar war efforts. We can also expect similar marriages to be decided within each opposing group. Then, unification will be a long-lasting process. The general model can be modified to accommodate clan rivalry in the marriage market by defining $\mathcal{N} > 1$ groups and assuming that marriages can only be concerted within each of these groups.

Germany presents a substantially different case. During the middle ages, its closest equivalent was the Holy Roman Empire. The Holy Roman Empire was not a uniform country as were France or England. Instead, it was formed by principalities, duchies, counties and Free Imperial Cities, each ruled by a prince —a generic title—. Rulers enjoyed a large degree of autonomy. Emperor's succession was also different. Early unified states relied on inheritance rules to pass the title of king across generations while the Holy Roman Empire elected the Emperor from its princes. Upon the Emperor's death, seven electors had the right to choose, in an election, who would succeed him. To be elected as Emperor, a prince would have to convince their peers, usually through promises to grant them more rights. Therefore, the emperor himself wielded little power within the empire in terms of capacity to intervene in state affairs, even lacking an imperial tax-system.⁴⁷ Moreover, Holy Roman Empire princes practised partible inheritance, dividing the land among sons.⁴⁸ These characteristics can be replicated in the model by setting $\gamma = 0$, this is, certainty for a Lord that his lineage will not rule the next period. Accordingly, no investment in state-building or in the army shall be expected. This is partly consistent with reality: the Empire lacked an imperial tax-system and Ertman (1997, p. 237) indicates that only since 1450 began building an administration as a response to outside pressure. $\gamma = 0$ also implies no military conquests. Indeed, inheritance —the Kingdom of Burgundy— and marriage —Italy— represented the largest territorial expansions for the Empire. Lack of military growth is consistent with the organisation of the Empire since neither the Emperor nor princes would have benefited from it: conquered lands would have been introduced as new states.

Despite the fact that the Empire as a whole only began to build a state relatively late, its princes were more willing to do so, see (Evans and Wilson, 2011, Ch. 4). A more

⁴⁷Emperor's revenue originated in the lands he controlled as a prince, a reason for which Johanek concludes that "the emperor was not really in a position to govern the Empire" (Hansen (2000, p. 295)).

⁴⁸The secular elector princes were forced to practice primogeniture to avoid land division since the Golden Bull of 1356, see Whaley (2012, p. 27).

efficient bureaucratic apparatus increased tax revenues that could then be used to raise an army. This was especially true for Savoy and Brandenburg that tried to expand at the expenses of weak neighbours. Finally, lack of unification through marriages between state heirs was a consequence of the inheritance policy. If the number of heirs exceeds two, marriages cannot overcome state multiplication caused by partitioned inheritances. Moreover, partitioned inheritances in the Holy Roman Empire avoided entailing land to daughters as much as possible which exacerbates the effect by over-representing men in the marriage market.

Chapter 3

If Children Suffer when Mothers Work, Do They Work Less?

by Èric ROCA FERNÁNDEZ

Abstract: This paper studies a new determinant of female employment in the context of developing countries. Using data from sub-Saharan regions, it advances that maternal job-taking varies with the mortality risk premium it poses to children. Reductions in maternal employment are sizeable and reach 5.6 percentage points among affluent families in more developed areas. We do not find such evidence among poor households, suggesting financial constraints may impede trading off maternal income against children safety. The effect we document applies only to families with under-five infants. We introduce a theoretical model rationalising our findings. It also generates a U-shaped relationship between economic prosperity and female employment.

3.1 Introduction

This paper is concerned with the determinants of maternal employment in developing countries. We focus on the sub-Saharan region, where women are frequently employed in diverse occupations. We consider all income-generating activities, paid in kind or in cash, even within informal sectors.¹ The paper advances that maternal job-taking varies with the mortality risk it poses to children. Such gradient represents a non-trivial trade-off between maternal income and child endangering. This neglected factor affects mostly well-off families where the need for additional income urges less and can afford a non-working wife. Overall reductions in mothers' job-taking are sizeable and reach 5.6 percentage points among affluent families in more developed areas.

¹Employment is highly informal in this context, especially in rural areas. We use DHS data, which encompasses urban and rural areas alike. It improves upon official statistics that consider only formal occupations and suffer from limited resources and governmental reach.

Our paper is anchored by the medical literature we review later. Empirically, we propose an original methodology to estimate a child mortality gradient associated with the working status of mothers. The gradient is, in turn, employed to assess how maternal job-taking changes with it. A simple, theoretical model rationalizes our findings. It relates the child mortality gradient to economic prosperity and generates a U-shaped relationship between development and female labour-force participation.

Female labour-force participation and economic prosperity: The economic literature proposes several theories to explain the massive incorporation of women into the labour force, and empirically tests multiple determinants. Our paper advances that maternal job-taking dwindles as the child mortality gradient between working and non-working mothers widens. Our contribution complements and contrasts previous scholarly work on the topic. In particular, we propose that economic growth has a definitive component in explaining the reduction in maternal employment during the initial stages of development. More precisely, as income rises and as long as maternal employment endangers children, mothers participate less in market activities. Galor and Weil (1996b) obtain a similar result, although it operates through increased fertility and female specialisation in child-rearing.

This paper presents a novel mechanism to relate maternal job-taking to development. It is based on child mortality, and we propose it increases with maternal employment. Among the possible causes, one possibility is the incompatibility between childcare and maternal employment, which may oblige families to resort to alternative caregivers. Attanasio et al. (2008), Thévenon (2013), Chevalier and Viitanen (2002) and Posadas and Vidal-Fernández (2013) explore in detail how the cost of childcare and the availability of grandparents as caregivers affects mothers' job-taking. Incidentally, Galor and Weil (1996b) also hint at the incompatibility between maternal housework and simultaneous childcare. Nevertheless, we refine the analysis evincing that maternal employment reductions vary with the mortality cost of relying on alternative caregivers. In that sense, we explain that, besides availability, the quality of childcare is a determinant of maternal employment. For instance, young infants left under the care of less experienced custodians —such as siblings— may be at a higher mortality risk. Finally, Albanesi and Olivetti (2016) share us the concern for health as a determinant of female employment, although the authors refer to post-partum

health issues.

Related to the previous, the association we advance assumes that families are aware of the effect of maternal work on child mortality. Still, the gradual spread of information and learning about these outcomes can delay women's incorporation into the labour force, as in Fogli and Veldkamp (2011) and Fernández (2013). Our theory represents a nice complement to this literature, indicating that being informed is only a necessary condition. In detail, we highlight that financially-constrained individuals may be forced to follow sub-optimal decisions, despite having the right information readily available.

A recurrent explanation for variations in female labour-force participation considers the effects of fertility. Indirectly, these theories point towards the degree of compatibility between motherhood and maternal work. This paper introduces the notion of incompatibility, which manifests in the child mortality differential between working and non-working mothers. Nevertheless, several authors have explored the precise implications of maternity in terms of female labour force participation, distinguishing between developing and developed countries, see Agüero (2008) and Aaronson et al. (2017); and Bloom et al. (2009), Cristia (2008) and Hupkau and Leturcq (2017), respectively.

Finally, a growing strand of the literature analyses the effects of social norms on multiple outcomes, including feminine participation in the labour force. Fernández et al. (2004), Vendrik (2003), Fernández and Fogli (2009b) and Alesina et al. (2013b) explore this channel. Even though we do not incorporate cultural prescriptions, the child mortality differential can be loosely interpreted in those terms. In that case, working mothers would derive less utility from children as they deviate from the norm.

The literature above strives, in general, to rationalise the massive incorporation of women to the labour force. However, this ubiquitous rise is part of a broader picture that economic scholars recurrently document, which takes the form of a U-shaped relationship between economic development and female labour-force participation. This association emerges using different data vintages covering an increasing number of countries and under more demanding econometric specifications, see Mammen and Paxson (2000), Luci (2009), Tam (2011) and Olivetti (2013).² Our paper presents additional evidence confirming the

²Çağatay and Özler (1995) misinterpret a coefficient and erroneously claim a U-shaped relationship as well. Actually, the authors find an opposite figure.

U-shaped relationship between variables. Nevertheless, we depart from the tradition of using macroeconomic aggregates at the country level and employ individual-level data, while focusing on developing countries in sub-Saharan Africa. In that sense, our estimates of economic development are original and include husband's education, his wage, and night-light luminosity to proxy for regional development.

Complementing the previous, we propose a simple theoretical model to rationalise our findings. It is apt at generating a U-shaped relationship between economic development and maternal employment, improving upon the literature which has traditionally focused only on its rising part.³

Feminine employment and child mortality: Woodbury (1926) provides early evidence of the risk maternal employment poses to children. A revision by Thomas (2015) summarises the findings as “[t]he mortality among infants of mothers employed outside the home was highest, of those gainfully employed in the home next highest, and of those not gainfully employed lowest. [...] [The] excess[ive mortality was] ‘due probably to lack of the care which only the mothers who remained at home could give.’ (p. 146)”

Caldwell and McDonald (1982) routinely found child mortality to be lower for the offspring of non-occupied mothers in ten surveyed countries. The authors ascribe the excess mortality to reduced childcare, dismissing income differentials. Similarly, Hobcraft et al. (1984) correlate maternal employment to child mortality using data from the World Fertility Survey from 28 countries. Similar results hold in 10 out of 14 countries surveyed by the UN during 1984, see Mensch et al. (1985).

Results from single-country analysis evidence the same mortality gradient. It surfaces in Farah and Preston (1982), using the 1973 Sudanese census.⁴ Relying on more demanding econometric techniques and using more up-to-date data, several studies corroborate the result in multiple countries, including Indonesia (Titaley et al. (2008)), Pakistan (Nisar and Dibley (2014b))⁵ and Bangladesh (Abir et al. (2015)). The effect goes beyond socio-economic background, delivery practices and community-level factors. In the latter

³The exception is Galor and Weil (1996b), whose main model is devoted to the rising portion but develop two extensions to cover the decreasing part as well. Also, the contribution of Hiller (2014) can generate a U-shaped relationship, although it focuses on the endogenous evolution of gender equality, and human capital investments.

⁴The authors dismiss decreased maternal care from working mothers and reverse causality as a cause.

⁵In a follow-up, Nisar and Dibley (2014a) control for fewer variables and find that working mothers were not different from those occupied when considering unadjusted odd-ratios. Maternal occupation status is never included when odd-ratios are adjusted.

case, the authors ascribe the result to non-traditional roles of Bengali working mothers. In historical terms, Reid (2001) analyses the causes of infant mortality in Derbyshire, England, at the turn of the twentieth century. Neonatal mortality rates were 1.58 times larger for mothers who worked while pregnant.

The Indian case is frequently scrutinised, and the evidence consistently indicates the existence of a mortality gradient. This is case in Kishor and Parasuraman (1998), Maitra and Rammohan (2011) and Singh and Tripathi (2013) that use different instalments of the Indian National Family Health Survey.⁶ Related to child mortality, Sivakami (1997) indicates that the offspring of working mothers are more prone to suffer an illness. Moreover, they devote less time to childcare, to play with children and to nourish them. These side-effects of maternal employment may lead to higher child mortality.

In general, the medical literature documents increased child mortality rates for working mothers in developing countries. This mortality gradient goes beyond income differentials and is attributed to reduced childcare and decreased feeding time. Basu and Basu (1991) present a literature review exploring potential causes for the mortality gradient over maternal employment.

The remaining of the paper is organised as follows: Section 3.2 presents the theoretical model. Section 3.3 introduces the data, and documents the mortality gradient and the U-shaped pattern between economic prosperity and female labour-force participation. The core of this paper consists in determining how child mortality changes with maternal employment, and the effect of this gradient on maternal employment. Section 3.4 is devoted to the former while Section 3.5 establishes the negative relationship between variables. Section 3.6 concludes.

3.2 A Theoretical Model

Consider an economy populated by individuals of two genders, men and women, who live for two periods of time. During the first period, agents are young and do not make decisions. When old, all agents get married. We do not attempt to formalize the marriage market, and we simply posit that each household i , consisting of a man and a woman,

⁶Maitra and Rammohan (2011), analyse nutrition practices and record a small mortality gradient. Singh and Tripathi (2013) focus on under-five mortality in rural India. The gradient surfaces for birth orders one and two.

is characterised by its level of human capital, $h_i \geq 0$. Adult agents are endowed with one unit of time that can be supplied as labour at the wage rate of w per unit of human capital. Men supply theirs inelastically. Women's labour decisions are taken at the family level.⁷ Household utility is given by:

$$\mathcal{U}_i = \log(c_i - \delta) + \gamma \log(\psi_i(h_i, l_i) n_i), \quad (3.1)$$

$$\text{s.t.} \quad w_i h_i \left(1 + \frac{l_i}{\eta}\right) (1 - \phi n_i) = c_i \quad (3.2)$$

where $c_i - \delta > 0$ is consumption above subsistence—which generates the push factor Klasen and Pieters (2012) identify—, $\psi_i(h_i, l_i)$ is the conditional probability that children survive, which depends on mother's working hours, $\eta > 1$ captures the gender wage-gap and n_i is the total number of children ever born.⁸

Raising children to adulthood has a time cost of $\phi w h_i (1 + l_i/\eta)$ per child. It is incurred regardless of children actually reaching adulthood. Despite generating income, a working wife exposes children to a higher mortality, and families optimally trade off these two opposed effects. The probability that a child lives until the second period and becomes an adult depends on human capital and on the working status of her mother. This is captured by the term $\psi_i(h_i, l_i)$. In order to have a tractable model, we assume child survival probability to be a constant, human capital dependent, probability per unit of time. Therefore, if a woman works for $l_i \in [0, 1]$ hours, child survival probability is given by $\psi_i(h_i, l_i) = [\Psi(h_i)]^{l_i}$. We impose $\Psi(0) = \underline{\psi} \in (0, 1)$, $\lim_{h_i \rightarrow \infty} \Psi(h_i) = 1$ and $\Psi'(h_i) > 0$.⁹ This guarantees a minimum survival probability for children, given by $\underline{\psi}$, even for families without any human capital.¹⁰ On the contrary, the mortality gradient vanishes among high-human capital families. Consequently, such families need not trade off maternal employment for its risk and women join the labour force, and women in such families can work without endangering children.¹¹ Proposition 5 presents the optimal solution.

Proposition 5. *The solution to the family's maximisation problem consists of three*

⁷Gobbi et al. (2018) find that parental leave allocation within the household in Germany is Pareto-efficient although data supports a collective model instead of a unitarian one.

⁸The model abstracts from education expenditures for children. In this pre-human capital economy, children quality is captured by their survival rate.

⁹The model can also accommodate a more complex specification for child survival probability. In particular, results hold for a U-shaped relationship.

¹⁰Lagerlöf (2003b) also models child mortality as decreasing with human capital.

¹¹A similar result could be obtained if households purchased external childcare services.

optimal decision rules. In particular,

$$l^* = - \frac{\sqrt{\phi^2 (h^2 w^2 + \gamma \delta \eta \log(\Psi)(\gamma \delta \eta \log(\Psi) - 2(2\gamma + 1)hw))} + \gamma \eta \phi \log(\Psi)(2hw - \delta) + hw\phi}{2\gamma hw \phi \log(\Psi)}$$

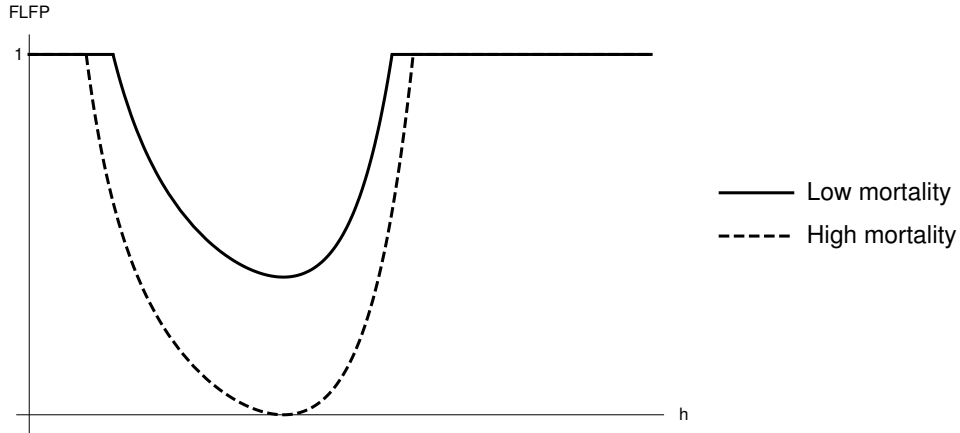
and

$$n^* = - \frac{\gamma \delta \eta \phi \log(\Psi) + \sqrt{\phi^2 (h^2 w^2 + \gamma \delta \eta \log(\Psi)(\gamma \delta \eta \log(\Psi) - 2(2\gamma + 1)hw))} + (2\gamma + 1)(-h)w\phi}{2(\gamma + 1)hw\phi^2}$$

in the interior solution. The interior solution is reached at intermediate levels of $\Psi(h)$ such that $\exp\left(-\frac{\gamma\delta+hw}{\gamma\eta hw-\gamma\delta\eta}\right) < \Psi(h) < \exp\left(-\frac{\gamma\delta\eta+(\eta+1)hw}{\gamma(\eta+1)((\eta+1)hw-\delta\eta)}\right)$. Two sets of corner solutions determined by $l^* = 0, n^* = \frac{\gamma hw - \gamma \delta}{(\gamma+1)hw\phi}$; and $l^* = 1, n^* = \frac{\gamma((\eta+1)hw-\delta\eta)}{(\gamma+1)(\eta+1)hw\phi}$ arise when $\Psi(h)$ is larger (smaller) than the previous bounds, respectively.

Figure 3.1 illustrates the behaviour of l^* as a function of human capital. The dashed line represents the optimal female labour-force participation under higher child mortality differentials than the solid line.¹² The model delivers two relevant outcomes. First, a clear

Figure 3.1: Optimal choices



Note: This Figure depicts the optimal l^* , on the vertical axis, as a function of human capital, represented on the horizontal axis. In particular, the Figure shows the model can reproduce a U-shaped relationship between economic development and the female labour-force participation. The dashed line corresponds to a higher child mortality differential —lower value for ψ — than the solid line.

positive relationship between ψ and female labour-force participation emerges. This is, as the negative effect of maternal employment vanishes —captured by an increase in ψ —, mothers devote more time to market activities. From an economic perspective, an increase

¹²Mortality differentials measure the change in mortality between working and non-working mothers: $\left[1 - \Psi(h_i)^{l_1}\right] - \left[1 - \Psi(h_i)^{l_2}\right]$, $l_1 > l_2$.

in $\underline{\psi}$ is equivalent to a decrease in the utility-cost of maternal work. Hence, families optimally allocate more female's time to this less costly activity. Notice, though, that low- and high-income families follow different regimes characterised by corner solutions, and, consequently, the description above does not apply. This result is a corollary of Proposition 5, and we formally establish it below and devote the rest of the paper to test it.

Corollary 1. *The derivative of l^* with respect to $\underline{\psi}$, the minimum child survival probability, is either null or increasing.*

Proof. For corner solutions, $l^* = 0$ and $l^* = 1$, female labour-force participation is already constrained and it does not react to changes in $\underline{\psi}$. In the intermediate case, following from $\frac{\partial \Psi(h)}{\partial \underline{\psi}} > 0$, the derivative is given by:

$$\frac{-\gamma(2\gamma + 1)\delta\eta \log(\Psi) + \sqrt{(h^2w^2 + \gamma\delta\eta \log(\Psi)(\gamma\delta\eta \log(\Psi) - 2(2\gamma + 1)hw))} + hw \frac{\partial \Psi(h)}{\partial \underline{\psi}}}{2\gamma\Psi \log^2(\Psi) \sqrt{(h^2w^2 + \gamma\delta\eta \log(\Psi)(\gamma\delta\eta \log(\Psi) - 2(2\gamma + 1)hw))}} \frac{\partial \underline{\psi}}{\partial \underline{\psi}} > 0.$$

□

Second, the model can generate a U-shaped relationship between human capital and female labour-force participation. The initial decreasing part intertwines two related explanations. First, the existence of a minimum consumption δ requires women to work at low levels of human capital. Second, at these stages, maternal work is still detrimental to children. Consequently, women work the minimum number of hours needed to assure subsistence. Finally, as human capital rises and labour-income increases, the working-hours threshold wanes. The increasing portion of the U-shaped pattern is easier to explain. As human capital increases, so does $\Psi(h)$. In particular, this means that maternal work endangers children less, enabling mothers to participate in the labour force. Moreover, a reinforcing income effect brought about by h further hastens female market activities.

3.3 Data and stylised facts

The basic data set pools together surveys from the Demographic and Health Survey project (DHS) covering various countries. These focus on developing countries and provide individual-level data for a rich host of variables for both spouses. We consider the

most recent instalment for sub-Saharan countries that is accompanied by respondents' geographical location. The main outcome of interest is whether a woman works. Since, often, individuals in developing regions are informally occupied, the DHS encompasses under the term *work* any income-generating activity, paid in kind or cash, as self-employed, as an employee or even as a helper.¹³

Working individuals have “done any work in the last seven days”, have a “job or business from which [they] were absent for leave, illness, vacation, or any other such reason” or have “done any work in the last 12 months”.¹⁴ Employment status is encoded as a four-level indicator stating whether an individual a) did not work, b) worked during the year before the interview, c) is currently working or d) is employed but has been on leave for the last seven days. As we are interested in the current occupation status, we transform it into a binary indicator taking value zero in the first two cases and value one otherwise. Formally, we define $works_{i,r}$ as follows:

$$works_{i,r} = \begin{cases} 1 & \text{if } i \text{ is currently working or on leave,} \\ 0 & \text{otherwise.} \end{cases} \quad (3.3)$$

The DHS contains demographic characteristics: spouses' age and education, the number of household members, ethnic and religious affiliation; socio-economic data: regional location, dwelling's urban/rural status, self-reported wealth and occupation of both spouses;¹⁵ child information: birth date for each child and age at death for the relevant cases; and health and sanitary conditions: water source and toilet type. We group children in several age bins to control for childcare supply and demand at the household level.¹⁶ Religious denominations are classified in major denominations: Christianity, Islam, traditional religion, voodoo, animism, other religion, and no religion.

According to the theoretical model, wages determine female employment. In particular, women must work to reach subsistence if the husband's wage is low. Regrettably, the

¹³Although we referred to female labour-force participation, the DHS does not account for it in the narrow and precise sense used by statistical entities.

¹⁴ICF International (2011, q.601-603, p. M-17).

¹⁵Our analysis covers only occupations that are consistently identified across surveys: not working; professional, technical and managerial; clerical; sales; agriculture (as self-employed or employee); household and domestic; services; skilled and unskilled manual occupations.

¹⁶Categories cover children aged zero to five, five to ten, and ten to 15.

DHS does not report income.¹⁷ For this reason, the husband's occupation proxies for his wage.¹⁸ Finally, we restrict the analysis to households where either the husband or the wife is the household head.¹⁹ The full sample comprises 70716 women aged 15 to 49. Although some women in these age categories may have completed their fertility, by focusing on relatively young workers we can ascertain the effect of the mortality gradient on *mothers*. In that sense, a sample comprising older cohorts would not allow testing the mechanism the theoretical model proposes.

The basic data set is augmented using additional information sources. First, soil suitability for agriculture is included since a non-negligible fraction of the population works in agriculture. The abundance of fertile soil can induce individuals to specialise in subsistence agriculture, especially those low-skilled. Low wages associated with agriculture may require women to work.²⁰ We control for land suitability using a rich host of controls: a) potential caloric yield before and after the Columbian exchange, following Galor and Özak (2016), b) soil pH and carbon levels, from the Atlas of the Biosphere²¹, and c) soil suitability and workability for agriculture, from the Atlas of the Biosphere, Ramankutty et al. (2002) and Fischer et al. (2008), respectively. Potential caloric yields before the Columbian exchange control for potential, persistent gender-based roles originating in agrarian societies. Second, we introduce geographical characteristics, including absolute latitude, distance to rivers, coast and large cities, temperature and precipitation. Third, following Henderson et al. (2012), night-light luminosity measured from satellite images proxy for regional development.²² Raw average luminosity in a 10 km-radius area around reported locations is normalized by population using estimates from Africa Continental Population Datasets (2000 - 2020). Finally, we derive measures of malaria prevalence and

¹⁷The unique variable related to income, wealth, is self-assessed and includes wife's earnings.

¹⁸Occupations have been used in the literature to proxy for income. Jones and Tertilt (2006) derive a lifetime income measure based on census occupations. Skirbekk (2008) analyzes the historical relationship between occupations and fertility. Finally, occupations are also used to proxy for income by Westoff (1954). Closer to our objective, Howe et al. (2012) review measures of socio-economic position for low- and middle-income countries. The authors emphasize some variables available in the DHS as good proxies, in particular, asset ownership, education and occupations. Asset ownership is determined by total income, including that generated by women. For this reason, we do not use it in this paper. Otherwise, all regressions control for spouses' education.

¹⁹This removes from the sample more complex families wherein the interviewed woman is a relative or in-law of the household head. Further, non-permanent residents are excluded.

²⁰Carranza (2014) explores the Indian case and finds that sub-par soils are related with increased female participation rates as men alone are not capable of tending the land.

²¹These data are originally derived from Global Soil Data Task (2014)

²²Data on night-light luminosity from National Oceanic and Atmospheric Administration-National Geophysical Data Center (2013). Such measure is well-suited to proxy economic activity in developing countries that lack enough governmental reach, especially at the regional level, see Michalopoulos and Papaioannou (2017).

mosquito-net usage from Bhatt et al. (2015) since malaria can directly impede working, force mothers to care for children and raises child mortality. These are averaged values in a 10 km-radius area around DHS reported coordinates over the years 2000-2015.²³ Table 3.1 presents the summary statistics.

3.3.1 Stylised fact 1: Economic development and female employment

Our data set validates the existence of U-shaped association between development and female employment in line with the economic literature. Departing from it, we evidence the relationship on individual-level data and for a set of developing countries. Moreover, we proxy for development using novel indicators in place of GDP estimates: husband's years of education, husband's occupation-specific wealth²⁴ and per capita night-light intensity. Using individual data complements previous findings at the country level. It also better reflects participation rates in developing countries where informality is high and the geographical reach of governmental agencies limited. Our last variable departs from individual measures, capturing regional macroeconomic conditions. Figures 3.1a, 3.1b and 3.1c illustrate the relationship between development and female employment. Although the Figures are not perfect, they all suggest a U-shaped pattern, more so for the first two indicators. In particular, participation rates decrease in Figure 3.1a from about 70% to 55% between zero and eleven years of education to rise later back to 70%. Figure 3.1b is tighter, concentrating the bulk of the decrease among the lowest values of wealth. The fact that over half of the male population is employed in agriculture with low wages produces this result. Finally, Figure 3.1c presents a similar drop in participation rates although it displays a much slower recovery.

3.3.2 Stylised fact 2: The effects of maternal employment on child mortality

This Section documents a mortality gradient over maternal employment using our data set. We estimate it regressing two child mortality variables on maternal working status. In particular, these are a) the number of under-five deceases, and b) an indicator for the death of the last-born, under-five child; both measured during the previous 12 months.²⁵

²³This approach does not consider random respondent's displacements introduced in the DHS for confidentiality.

²⁴This corresponds to the average wealth reported for each occupation, considering only couples wherein the wife does not work.

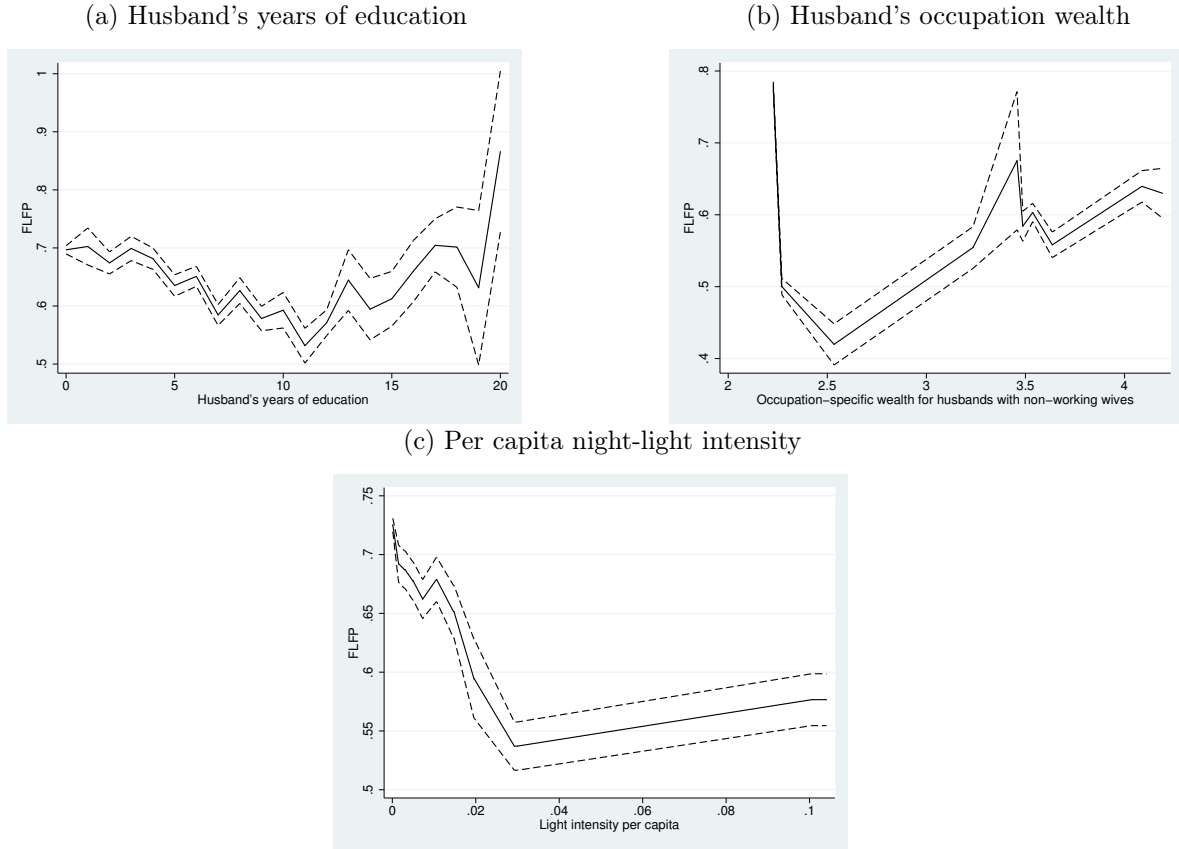
²⁵The under-five death rate is 20 per year. Considering only cadets, the figure reduces to 14.

Table 3.1: Summary statistics

	Mean	St. Dev.	Min.	Max.
<i>Socio-economic characteristics</i>				
Works (0/1)	0.66	0.00	0	1
Age	29.94	0.05	15	49
Educ. years	3.98	0.04	0	22
Hus. age	36.89	0.06	15	64
Hus. educ. years	5.30	0.04	0	22
Urban/Rural (0/1)	0.69	0.00	0	1
Child. aged 0-5	1.32	0.00	0	5
Child. aged 5-10	0.96	0.01	0	6
Child. aged 10-15	0.56	0.01	0	5
Births	0.28	0.00	0	3
Pregnant (0/1)	0.13	0.00	0	1
<i>Husband occupation</i>				
Did not work	0.01	0.11	0	1
Prof./Tech./Man.	0.09	0.28	0	1
Clerical	0.01	0.11	0	1
Sales	0.09	0.29	0	1
Agri. self-employed	0.41	0.49	0	1
Agri. employee	0.12	0.32	0	1
Household, domestic	0.00	0.06	0	1
Services	0.08	0.27	0	1
Skilled manual	0.12	0.33	0	1
Unskilled manual	0.06	0.24	0	1
<i>Religion</i>				
Animism	0.00	0.04	0	1
Christianism	0.65	0.48	0	1
Islam	0.28	0.45	0	1
No religion	0.03	0.18	0	1
Other religion	0.01	0.10	0	1
Traditional	0.02	0.14	0	1
Voodoo	0.01	0.08	0	1
<i>Other variables</i>				
Light intensity	0.03	0.81	0.00	63.44
Dist. river, log-km	2.89	0.93	0.01	5.33
Dist. coast, log-km	5.41	1.73	0.00	7.48
Avg. precipitation	2.95	1.74	0.00	7.89
Dist. large city, log-km	12.29	1.06	9.16	14.70
Soil suitability for agri.	0.38	0.20	0.00	1.00
Soil workability	1.55	0.83	0.08	7.00
Soil pH level	5.81	0.57	4.66	8.06
Soil carbon content	5.41	1.73	0.74	14.40
Caloric yield, pre-1550	1283.85	426.56	0.00	2400.68
Caloric yield, post-1550	10360.53	2244.26	0.00	15843.43
Malaria prevalence	0.31	0.20	0.00	0.84
Mosquito-net usage	0.24	0.10	0.00	0.52
Observations	70716			

Note: The description for each variable is provided in the text. Weighted averages and standard deviations.

Figure 3.1: Female labour-force participation and economic development



Note: These Figures relate female labour-force participation with economic development where the latter is proxied by husband's years of education in Figure 3.1a, husband's occupation-specific wealth in Figure 3.1b and by per capita night-light intensity in Figure 3.1c. See the text for additional details. Figures display weighted averages of female labour-force participation.

Regressions control for demographic and socioeconomic characteristics of the family, sanitation, malaria prevalence and regional economic development and include regional fixed-effects. Formally, regressions follow:

$$y_{i,r} = \alpha works_{i,r} + X_{i,r}\beta + \gamma_r + \epsilon_{i,r}, \quad (3.4)$$

where $y_{i,r}$ is child mortality indicator, $works_{i,r}$ denotes whether a woman works, $X_{i,r}$ is a vector of covariates and γ_r are region fixed-effects. Table 3.2 presents the results. In the first two Columns, the dependent variable counts under-five deceased children while Column 3) focuses on the youngest child's death. However, the outcomes of interest are nil for a large percentage of the population. For this reason, we employ non-linear methods that are non-biased when outcomes have many zeros. In particular we use tobit, negative binomial and probit models, respectively. Overall, results evidence a mortality gradient

Table 3.2: Child mortality and maternal employment

	Dep. var: Children 0-5 died		Dep. var: Youngest child died
	Tobit (1)	Neg. Binomial (2)	Probit (3)
Works	0.207*** (0.006)	0.223* (0.120)	0.134** (0.067)
Educ. years	0.004** (0.002)	0.006 (0.021)	0.007 (0.011)
Works $\times$ Educ Years	-0.019*** (0.002)	-0.021 (0.024)	-0.012 (0.013)
Demographic controls	Yes	Yes	Yes
Husband controls	Yes	Yes	Yes
Sanitary controls	Yes	Yes	Yes
Other controls	Yes	Yes	Yes
Fixed-effects	Region	Region	Region
Observations	43257	43257	40961
Pseudo R^2	0.168	0.205	0.212

Note: The unit of observation is a household. Demographic controls: age its square, children aged zero to five, five to ten, and ten to 15, births during the last 12 months and a pregnancy indicator. Husband controls: age, years of education and occupation. Sanitary controls: the source of water used, toilet type, malaria prevalence and mosquito-net usage. Other controls: per capita night-light intensity, population density and urban-rural status of the dwelling and household members. Standard errors clustered at the regional level in Columns 1) and 2) and at the country level in Column 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

penalising working mothers.²⁶ In particular, we estimate a rise of half a percentage point in the probability that the youngest child dies when the mother works and she has no education. This represents a quarter of the total probability the last-born dies, which equals 0.02. However, the increase is virtually zero when she has ten years of schooling. Although the probability of the last-born dying and the increase we measure may appear small in magnitude, the effects they represent in the expected utility framework can be large considering the dire outcome these represent. In particular, the death of a child is a large, negative utility impact, and individuals may follow costly strategies to minimise the probability of such events. Moreover, prospect theory indicates that individuals value losses more than gains—in absolute terms—and overweight small probabilities, see Kahneman and Tversky (1979). These considerations, taken together, rationalise the findings

The relationship we document in Table 3.2 between maternal employment and child

²⁶Estimating Table 3.2 under yields similar results.

Table 3.3: Child mortality and maternal employment, reverse causality

	Dep. var: Mother works			
	30 days (1)	60 days (2)	180 days (3)	365 days (4)
Lost child	−0.125 (0.078)	−0.108 (0.073)	−0.030 (0.046)	0.025 (0.043)
Demographic controls	Yes	Yes	Yes	Yes
Husband controls	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed-effects	Region	Region	Region	Region
Observations	40703	40765	41009	41307
R^2	0.172	0.171	0.172	0.172

Note: The unit of observation is a household. The sample comprises families in which no child under the age of five has died and those in which there has been a death in the prior 30, 60, 180 and 365 days. See text for details. Demographic controls: age and education years and their squares, children aged zero to five, five to ten, and ten to 15, births during the last 12 months and a pregnancy indicator. Husband controls: age, years of education and occupation, and their squares. Religion controls: Religious affiliation. Other controls: per capita night-light intensity, population density and urban-rural status of the dwelling and household members. OLS estimates. Standard errors clustered at the regional level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

mortality does not preclude the possibility of these results arising from reverse causality. This would be the case if mothers resumed working after experiencing the death of a child. That would be the case if childcare prevented mothers from working and, after a kid's death, women devoted that time to work. In that sense, having recently lost a child would be a positive and significant predictor of maternal employment. We test that possibility in Table 3.3 comparing the working status between those who recently lost a child and those that did not for several time frames, in particular, during the last 30, 60, 180 and 365 days. Coefficients associated with the loss of a child are in general negative and never significant. Our findings do not support reverse causality.

3.4 Empirical strategy

This paper proposes child mortality differentials as a determinant of maternal labour-force participation. Unfortunately, the estimates of mortality differentials are not readily available. Therefore, the empirical strategy consists of two separate parts:

1. Estimate child mortality differentials regionally and

2. relate these to maternal employment.

The first step is crucial and overcomes the lack of data on the child mortality gradient. We propose a methodology aimed at correctly estimating it. In particular, our flexible specification allows for regional variation in the effect of counfounders. Section 3.4.1 carefully details the necessary steps to correctly estimate child mortality differentials. Once we are in possession of a measure gauging the change in child mortality maternal employment causes —labelled Δ_r later—, we can proceed to correlate it with maternal job-taking. Notice that, in fact, Δ_r correspond to average changes in child mortality, which should decrease endogeneity concerns in our final regressions.²⁷ Regressions at this second stage exploit the cross-sectional variation present in Δ_r . Section 3.4.2 presents this set in detail.

3.4.1 Estimating child mortality differentials

For the moment, we are concerned with obtaining an unbiased and precise estimate that measures the child mortality gradient between working and non-working mothers. The general idea is simple, and consits in regressing an indicator of child mortality on maternal employment while controlling for other potential determinants of child death.²⁸

Equation 3.5 represents such approach. The variable mm denotes a mortality indicator, and $works$ is an indicator variable for maternal employment, i indexes families, r regions and $X_{i,r}$ is a vector of additional control variables. The coefficient associated to maternal employment, Δ_r , measures the child mortality gradient. Notice that we estimate separate regressions for each region.

$$mm_{i,r} = \Delta_r works_{i,r} + X_{i,r}\beta_r + \epsilon_{i,r} \quad \forall i \in r \quad (3.5)$$

Although simple in spirit, this generic approach suffers from an endogeneity issue. In particular, including all households i residing in region r biases the estimated value Δ . More precisely, Δ_r is upward-biased because mothers work in poor households while

²⁷Moreover, as will become clear later, we estimate Δ_r on a restricted sample, and apply the values we retrieve to larger number of individuals.

²⁸The model assumed a negative relationship between maternal employment and child survival rate but, in general, nothing prevents estimates from being positive. For instance, piecework at home may prevent youngsters from remaining unsupervised in unsafe urban environments.

Table 3.1: Wealth levels per occupation

Did not work	2.545	(0.1001)
Prof./Tech./Man.	4.260	(0.0432)
Clerical	4.318	(0.0791)
Sales	3.641	(0.0419)
Agri. self-employed	2.124	(0.0276)
Agri. employee	2.252	(0.0258)
Household, domestic	3.595	(0.166)
Services	3.573	(0.0633)
Skilled manual	3.652	(0.0375)
Unskilled manual	3.693	(0.0542)
Observations	15784	

Note: This Table presents average wealth levels for husbands' occupation categories. Weighted averages and standard errors to correct the non-random sampling techniques in the DHS.

experiencing higher child mortality. We can mitigate the extent of the endogeneity issue by restricting the sample.

Sub-population choice

Let $\mathcal{W}$ represent the relevant set of households on which we estimate Equation 3.5. Importantly, $\mathcal{W}$ must be such that maternal employment considerations are free choices, this is, not constrained by income. If this is the case, then Δ correctly measures the change in child mortality maternal employment causes. Lacking precise income data, we exploit the information on husbands' occupations and reported wealth to construct occupation-specific average wealth levels.²⁹ Table 3.1 reports the estimated wealth level for each occupation. The set $\mathcal{W}$ must balance being as restrictive as possible and comprising enough observations. In our case, we decided that $\mathcal{W}$ includes households wherein the husband works in any of the three top-paying occupations, this is, professional, technical and managerial; clerical; and sales.³⁰

²⁹To avoid counting women's contribution, we exclude households with a working wife.

³⁰ $\mathcal{W}$ also includes skilled manual workers when the sample size is, otherwise, too small. Moreover, expanding the set $\mathcal{W}$ to always include this additional category provides similar results.

Regressions and child mortality differentials

The final step to obtain an estimated value of the child mortality gradient Δ consists in regressing Equation 3.5 by OLS. As mentioned, we allow our estimates to be fully flexible running separate regressions for each region r . Moreover, the sample only includes observations that belong to $\mathcal{W}$.

The outcome of interest is our mortality measures mm . At this stage, we capture child mortality by the number of under-five infants that died in household i during a calendar year. Nonetheless, the results we present are robust to different mortality measures.³¹ Regressions control for demographic characteristics: age and its square and education years of both spouses and dwelling's urban/rural status; water source; malaria prevalence; mosquito net usage; the total number of children aged zero to five; and the number of births during one calendar year. For the sake of clarity, the exact regression we estimate at this stage is a slightly refined version of Equation 3.5. In particular, it clearly states that the sample comprises exclusively households in the set $\mathcal{W}$:

$$mm_{i,r} = \Delta_r mother\ works_{i,r} + X_{i,r}\beta_r + \epsilon_{i,r}, \quad \forall r, \forall i \in \mathcal{W}. \quad (3.6)$$

As stated before, estimating this equation yields unbiased estimates of the child mortality gradient over maternal employment status, as captured by Δ_r .³² Coefficients Δ_r reflect regional characteristics, for instance, availability of healthcare facilities, variation in informal childcare or compatibility between maternal work and child-rearing, as they average across several individuals, smoothing out idiosyncratic variations. In fact, the value of Δ_r can be interpreted as regional-specific penalty levels to be paid for having a working wife in terms of child mortality.³³

³¹In particular, using the family-specific, under-five child mortality rate; focusing on the death of the last-born; or taking the logarithm of mm do not qualitatively alter our results.

³²Data limitations only allow computing Δ_r for 251 regions. In some regions, all women were observed as either working or not working, making impossible group comparisons.

³³The estimates Δ are equivalent to a pooled regression, but with all coefficients interacted with region. In that sense, the estimation captures the direct effect of maternal employment on child mortality while allowing regressors to impact differently child mortality across regions.

3.4.2 Child mortality and maternal employment

We have previously discussed that no data offered estimates of child mortality differentials. The preceding paragraphs introduced a specific econometric approach to correctly estimate it, and we are now in a position to relate maternal employment and the child mortality risk it poses to children. To this end, following the second step described before, we estimate an OLS model that incorporates Δ_r as its main regressor, exploiting the cross-section variation in Δ_r .³⁴ In doing so, the coefficient associated to Δ_r measures the partial effect of the child mortality gradient on maternal employment. Although the theoretical model suggests a non-linear relationship between variables, we first introduce Δ_r linearly, and later interacted with husband's occupation to proxy for his income. Interaction terms allow testing the non-linear nature of the relation, in particular, whether the effects are larger for well-off families. Moreover, these highlight the mechanism generating the U-shaped pattern in our model.³⁵

Our basic econometric specification reads:

$$works_{i,r,c} = \alpha\Delta_{r,c} + X_{i,r,c}\beta + \gamma_c + \epsilon_{i,r,c} \quad (3.7)$$

where household i lives in region r of country c , and γ_c represent fixed-effects at the country level. The augmented econometric model including interaction terms follows:

$$works_{i,o,r,c} = \alpha\Delta_{r,c} + \theta_o occ_{i,o,r,c}\Delta_{r,c} + \phi_o + X_{i,o,r,c}\beta + \gamma_c + \epsilon_{i,o,r,c} \quad (3.8)$$

where o denotes husband's occupation in household i belonging to region r and γ_c represent fixed-effects at the country level. All regressions are estimated using weighted OLS to correct for the non-random sampling procedure of the DHS. Moreover, OLS facilitates interpreting coefficients when the sample changes, and the marginal effect of interacted variables is straightforward to compute, whereas non-linear models involve cumbersome computations. This is important because many of our results are based on estimated

³⁴Henceforth, we use again the full sample: the more restrictive $\mathcal{W}$ was only useful to correctly estimate Δ_r .

³⁵More precisely, low income constrains mothers in poor households to work, despite its risk, to reach subsistence. In contrast, it is possible that wealthy families do not modify maternal employment because the child mortality gradient vanishes with human capital. Alternatively, these families can combine maternity and female work purchasing childcare services.

marginal effects. Furthermore, the mean of the dependent variable is around 60%, making OLS a good approximation to the more apt non-linear models. Finally, non-linear models encountered numerical issues related to the concavity of the objective function in some of the regressions below.

In this framework, we exploit within-country variation in the mortality gradient including country fixed-effects. All regressions control for socio-economic indicators: spouses' age and years of education, both squared; husband's occupation and a wife's pregnancy dummy and religious affiliation; household characteristics: dwelling urban/rural status, number of children of ages zero to five, five to ten, and ten to 15; births and deaths of under-five kids during the prior year; household members and its square and the number of wives; and regional controls: per capita night-light intensity and population density.

3.5 Results

This Section presents the results. It advances that maternal job-taking decreases with the mortality risk it poses to children, although the results are mostly confined to well-off families where the need for additional income urges less and can afford a non-working wife. Our results additionally distinguish between areas with night-light intensity levels above and below the median. We measure greater reductions in well-lit zones, reaching 5.6 percentage points among affluent families in these more developed areas. This result further stresses the relevance of income, highlighting that women in impoverished areas must work despite its effects on children. These results are compatible with our model. In general, and as noted before, replacing our measure *mm* for others and repeating the procedure reveals similar results.³⁶

Regional level: Table 3.1 presents the negative relationship between the mortality gradient and maternal employment. Overall results under Column 1) already indicate a negative association between maternal employment and the mortality gradient, but its magnitude is relatively small. In particular, maternal employment decreases by half a percentage point when its associated risk raises by one standard deviation. However, that initial result conceals great heterogeneity.

³⁶These results are available from the author upon request.

First, allowing the estimates to vary with husband's occupation, as in Column 2), reveals that reductions are confined to high-earning husbands.³⁷ Moreover, in these more affluent households, the estimates are larger in magnitude and represent more sizeable drops in maternal employment. In concrete, mothers' job-taking dwindles by three percentage points among women married to professionals and managers. For comparison, being pregnant reduces women's participation by one percentage point for the same group. This suggests the effect we document is not negligible and provides credence to our hypothesis, namely, that constrained households are unable to trade off income and risk.

We now divide the sample according to night-light intensity levels, as in Columns 3) to 6), with above-the-median locations being relatively more developed. In doing so, we confirm our previous results insofar employment reductions are only significant among wealthy households. Moreover, we document a more intense dwindle in well-lit areas. Overall, it reaches 1.7 percentage points when regression pool occupation categories —see Column 3)—, and rises up to 5.6 points among more affluent households —see Column 4)—. In contrast, results vanish in less developed regions, except for women married to skilled manual workers —a relatively highly paying occupation—, as Columns 5) and 6) indicate.

Taken together, our results suggest that households decrease maternal employment to limit the danger posed to children. Furthermore, the association we document is confined among wealthy families and in well-lit areas, evincing the importance of development. The results we obtain are compatible with our model.

Robustness tests: The previous results demonstrate that maternal employment is depressed by the risk it poses to children. In this Section, we introduce several additional controls that could affect female employment. First, regressions are augmented with land and geographical characteristics to rule out competing explanations, namely, persistent traits caused, ultimately, by geography. Furthermore, we also introduce control variables for malaria prevalence and mosquito-net usage. Regressions in Table 3.2 first incorporate these additional controls one at a time, and then simultaneously. Overall, the previous findings remain, and the uncovered association is not challenged. In particular, the pattern relating development to diminished maternal employment resurfaces, and only well-off

³⁷Not all high-earning categories of employment display negative and significant results. For instance, we never estimate negative and significant results for the clerical category, albeit being the wealthiest.

Table 3.1: Child mortality and maternal employment, Δ_r

	Dep. var: Mother works					
	All sample		Light int. > median		Light int. < median	
	Baseline (1)	Interacted (2)	Baseline (3)	Interacted (4)	Baseline (5)	Interacted (6)
Diff. child mort.	−0.062*** (0.021)	−0.289 (0.242)	−0.213*** (0.074)	−0.650*** (0.213)	−0.034 (0.028)	−0.264 (0.487)
<i>Marginal effects</i>						
Did not work		−0.289 (0.242)		−0.650*** (0.213)		−0.264 (0.487)
Prof./Tech./Man.		−0.386** (0.153)		−0.702*** (0.156)		0.012 (0.240)
Clerical		0.154 (0.183)		0.005 (0.165)		0.295 (0.371)
Sales		−0.186 (0.163)		−0.573*** (0.193)		0.029 (0.186)
Agri. self-emp		−0.034 (0.056)		−0.105 (0.148)		−0.012 (0.058)
Agri. employee		−0.034 (0.219)		−0.257 (0.379)		0.074 (0.197)
Domestic		−0.415 (0.576)		−1.003 (0.834)		−0.154 (0.678)
Services		0.210 (0.246)		0.380 (0.447)		0.062 (0.165)
Skilled man.		−0.228* (0.116)		−0.079 (0.166)		−0.410*** (0.109)
Unskilled man.		0.310 (0.191)		0.225 (0.418)		0.158 (0.156)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects	Country	Country	Country	Country	Country	Country
Observations	40463	40463	11314	11314	29149	29149
R^2	0.175	0.176	0.155	0.157	0.188	0.189

Note: The unit of observation is a household. The dependent variable is whether a woman works. Individual controls: age, years of education and occupation, and their squares for both spouses and pregnancy status of women. Number of children aged zero to five, five to ten, and ten to 15, last-born child age, deceased children and a recent death indicator. Other controls: per capita night light intensity, population density and urban-rural status of the dwelling. Regressions control for the number of household members, its square and the number of other wives. OLS estimates. Standard errors clustered at the regional level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.2: Child mortality and maternal employment, Δ_r , additional covariates

Dep. var: Mother works												
All sample				Light int. > median				Light int. < median				
Geo.	Agri.	Mal.	All	Geo.	Agri.	Mal.	All	Geo.	Agri.	Mal.	All	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
Panel A: Baseline												
Diff. child mort.	-0.052**	-0.061**	-0.059**	-0.061*	-0.227***	-0.234***	-0.200**	-0.197**	-0.021	-0.020	-0.029	-0.018
	(0.026)	(0.024)	(0.024)	(0.032)	(0.076)	(0.083)	(0.077)	(0.088)	(0.036)	(0.030)	(0.032)	(0.039)
Observations	40463	40171	40463	40171	11314	11200	11314	11200	29149	28971	29149	28971
R^2	0.176	0.180	0.176	0.181	0.156	0.159	0.155	0.161	0.189	0.193	0.188	0.195
Panel B: Interactions												
Diff. child mort.	-0.272	-0.291	-0.276	-0.272	-0.640***	-0.669***	-0.632***	-0.614***	-0.231	-0.217	-0.234	-0.181
	(0.241)	(0.235)	(0.241)	(0.232)	(0.211)	(0.210)	(0.211)	(0.213)	(0.487)	(0.487)	(0.486)	(0.488)
<i>Marginal effects</i>												
Did not work	-0.272	-0.291	-0.276	-0.272	-0.640***	-0.669***	-0.632***	-0.614***	-0.231	-0.217	-0.234	-0.181
	(0.241)	(0.235)	(0.241)	(0.232)	(0.211)	(0.210)	(0.211)	(0.213)	(0.487)	(0.487)	(0.486)	(0.488)
Prof./Tech./Man.	-0.380**	-0.339**	-0.386**	-0.339**	-0.716***	-0.618***	-0.693***	-0.591***	0.036	0.060	0.016	0.064
	(0.152)	(0.154)	(0.155)	(0.152)	(0.163)	(0.153)	(0.156)	(0.161)	(0.232)	(0.236)	(0.246)	(0.234)
Clerical	0.162	0.067	0.156	0.073	-0.014	-0.144	0.017	-0.131	0.336	0.338	0.302	0.353
	(0.185)	(0.208)	(0.184)	(0.210)	(0.167)	(0.241)	(0.165)	(0.239)	(0.369)	(0.391)	(0.371)	(0.391)
Sales	-0.170	-0.070	-0.182	-0.060	-0.581***	-0.382	-0.555***	-0.319	0.064	0.073	0.033	0.085
	(0.171)	(0.168)	(0.163)	(0.170)	(0.192)	(0.309)	(0.198)	(0.308)	(0.194)	(0.190)	(0.185)	(0.197)
Agri. self-emp	-0.031	-0.020	-0.034	-0.029	-0.133	-0.105	-0.094	-0.082	-0.015	0.000	-0.010	-0.010
	(0.058)	(0.057)	(0.060)	(0.064)	(0.149)	(0.166)	(0.149)	(0.161)	(0.061)	(0.057)	(0.063)	(0.063)
Agri. employee	0.040	-0.049	-0.014	0.007	-0.226	-0.266	-0.234	-0.204	0.166	0.039	0.097	0.112
	(0.220)	(0.189)	(0.232)	(0.201)	(0.383)	(0.389)	(0.406)	(0.405)	(0.210)	(0.167)	(0.209)	(0.192)

Continued on next page

Table 3.2 – Continued from previous page

	All sample				Light int. > median				Light int. < median			
	Geo. (1)	Agri. (2)	Mal. (3)	All (4)	Geo. (5)	Agri. (6)	Mal. (7)	All (8)	Geo. (9)	Agri. (10)	Mal. (11)	All (12)
Domestic	−0.397 (0.586)	−0.398 (0.579)	−0.398 (0.575)	−0.383 (0.587)	−0.996 (0.886)	−0.989 (0.863)	−0.946 (0.829)	−0.900 (0.875)	−0.140 (0.690)	−0.126 (0.678)	−0.152 (0.679)	−0.129 (0.686)
Services	0.229 (0.247)	0.003 (0.189)	0.212 (0.246)	0.012 (0.192)	0.381 (0.443)	−0.177 (0.362)	0.393 (0.444)	−0.114 (0.365)	0.086 (0.173)	0.073 (0.167)	0.069 (0.165)	0.077 (0.172)
Skilled man.	−0.221* (0.119)	−0.246** (0.124)	−0.224* (0.115)	−0.238* (0.127)	−0.094 (0.180)	−0.064 (0.187)	−0.068 (0.166)	−0.025 (0.188)	−0.385*** (0.126)	−0.384*** (0.117)	−0.405*** (0.107)	−0.376*** (0.126)
Unskilled man.	0.322* (0.194)	0.316 (0.205)	0.324* (0.185)	0.319 (0.204)	0.202 (0.417)	0.091 (0.485)	0.231 (0.417)	0.143 (0.482)	0.187 (0.166)	0.183 (0.164)	0.175 (0.151)	0.198 (0.171)
Controls (both panels)												
Geography	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Agriculture	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Malaria	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coutry Fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	40463	40171	40463	40171	11314	11200	11314	11200	29149	28971	29149	28971
R^2	0.177	0.180	0.176	0.181	0.158	0.159	0.157	0.162	0.190	0.194	0.189	0.195

Note: The unit of observation is a household. The dependent variable is whether a woman works. Geographical controls: absolute latitude; distance to the closest river, coast and large city; temperature and precipitation. Agricultural controls: soil suitability and workability for agriculture, soil levels of pH and carbon and potential caloric yield before and after 1550. Malaria controls: malaria prevalence and mosquito-net usage. Individual controls: age, years of education and occupation, and their squares for both spouses and pregnancy status of women. Number of children aged zero to five, five to ten, and ten to 15, last-born child age, deceased children and a recent death indicator. Other controls: per capita night light intensity, population density and urban-rural status of the dwelling. Regressions control for the number of household members, its square and the number of other wives. OLS estimates. Standard errors clustered at the regional level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

families display significant reductions.

Finally, we acknowledge the possibility that families adopt different behaviour for sons than for daughters. This strategy may be rationalised if parents believe, for instance, that boys are more resilient and expect milder consequences for them. Alternatively, biased gender perception may attach to boys a higher valuation, protecting them more than girls. To this end, we construct gender-specific measures $\Delta_{r,b}$ and $\Delta_{r,g}$. These are analogous to those introduced before but computed exclusively considering boys and girls. Table 3.3 presents the results when these are simultaneously introduced in regressions. Further, we distinguish between only sons and only daughters families. This distinction permits documenting how a mother of only sons changes her employment when it endangers girls. In principle, girl’s endangerment should not impart any significant influence on the decision, as she has none.

Results from this exercise offer some evidence of a differentiated treatment between genders. In particular, we document that maternal employment decreases when it poses danger to daughters. We do not find similar evidence for sons. In general, the effects are confined to well-lit areas and surface mostly for wealthy families, see the results in Column 6) and under the heading *marginal effects, girls*. This new set of results complements our previous findings illustrating a differentiated effect between genders. It also reinforces the main effect we had already identified, strengthening it.

Finally, Appendix 3.A modifies the region on which we compute Δ . Departing from regions, it introduces ethnic homelands and values Δ are computed on that geographical basis. The results are similar but weaker.

Placebo: The data so far has provided supporting evidence for our hypothesis. It relates maternal employment to the risk borne by children of working mothers. This set-up gives rise naturally to two additional tests. First, we focused on under-five mortality indicators as these reflect the consequences maternal employment has on children’s health. Therefore, more general mortality measures not connected with maternal employment or those not concerned with infants should wield little influence on maternal employment. We construct such a measure, Δ_r^{15} , following the principles we outlined for Δ_r . However, we shift from focusing on under-five mortality to deaths occurred to individuals aged 15 or more. Further, we expand the time horizon, covering all deaths ever occurred.

Table 3.3: Child mortality and maternal employment, $\Delta_{r,b}$, $\Delta_{r,g}$

	Dep. var: Mother works								
	All sample			Light int. > median			Light int. < median		
	Both (1)	No Daughters (2)	No Sons (3)	Both (4)	No Daughters (5)	No Sons (6)	Both (7)	No Daughters (8)	No Sons (9)
Panel A: Baseline									
Diff. child mort., boys	-0.018* (0.010)	0.001 (0.022)	-0.023 (0.021)	-0.054 (0.079)	0.166 (0.136)	-0.008 (0.121)	-0.013 (0.014)	-0.012 (0.030)	-0.021 (0.020)
Diff. child mort., girls	-0.017 (0.023)	0.028 (0.059)	-0.049 (0.043)	-0.241*** (0.092)	-0.233* (0.122)	-0.384** (0.157)	0.042 (0.037)	0.110 (0.105)	0.008 (0.032)
Observations	38644	16934	16738	10891	5014	4960	27753	11920	11778
R^2	0.175	0.186	0.180	0.158	0.186	0.166	0.187	0.186	0.199
Panel B: Interactions									
Diff. child mort., boys	-0.500** (0.239)	-1.247* (0.655)	-0.349 (0.277)	-0.287 (0.568)	-1.299 (1.315)	0.664 (0.462)	-0.735** (0.299)	-1.314 (0.873)	-0.674** (0.302)
Diff. child mort., girls	0.296 (0.366)	1.824** (0.716)	-0.174 (0.647)	-0.751 (0.932)	1.694 (1.515)	1.118 (1.335)	0.732 (0.569)	1.680** (0.679)	-0.363 (0.690)
<i>Marginal effects, boys</i>									
Did not work	-0.500** (0.239)	-1.247* (0.655)	-0.349 (0.277)	-0.287 (0.568)	-1.299 (1.315)	0.664 (0.462)	-0.735** (0.299)	-1.314 (0.873)	-0.674** (0.302)
Prof./Tech./Man.	-0.130 (0.125)	-0.017 (0.202)	-0.188 (0.198)	-0.157 (0.241)	0.218 (0.390)	-0.988** (0.484)	-0.121 (0.146)	-0.073 (0.296)	-0.036 (0.152)
Clerical	0.076 (0.174)	0.292 (0.295)	0.205 (0.296)	0.407 (0.282)	0.843 (0.574)	0.414 (0.450)	-0.182 (0.153)	-0.003 (0.207)	-0.299 (0.444)
Sales	-0.084 (0.122)	-0.058 (0.222)	0.013 (0.103)	-0.178 (0.222)	-0.119 (0.291)	0.173 (0.357)	-0.078 (0.137)	0.045 (0.264)	-0.071 (0.101)
Agri. self-emp	-0.002 (0.033)	0.017 (0.038)	-0.046 (0.034)	-0.140 (0.255)	0.163 (0.245)	-0.251 (0.391)	0.000 (0.029)	0.011 (0.035)	-0.042* (0.025)
Agri. employee	0.039 (0.215)	0.028 (0.187)	0.214 (0.317)	-0.001 (0.494)	0.441 (0.791)	0.099 (0.641)	0.069 (0.153)	0.005 (0.140)	0.246 (0.264)
Domestic	0.038 (0.322)	0.238 (0.306)	0.856** (0.373)	-1.640* (0.870)	-0.810 (1.535)	-1.538 (1.344)	0.348 (0.220)	0.463 (0.329)	1.210*** (0.144)
Services	-0.004 (0.138)	-0.005 (0.116)	-0.030 (0.221)	1.148*** (0.395)	1.890*** (0.708)	1.227** (0.482)	-0.043 (0.057)	-0.075 (0.085)	-0.081 (0.092)
Skilled man.	-0.130 (0.114)	-0.159 (0.136)	-0.101 (0.164)	-0.074 (0.334)	0.080 (0.493)	-0.072 (0.318)	-0.127 (0.107)	-0.179 (0.150)	-0.133 (0.156)
Unskilled man.	0.095 (0.214)	-0.000 (0.263)	0.223 (0.307)	-0.256 (0.428)	-0.206 (0.558)	0.563 (0.498)	0.171 (0.136)	0.010 (0.233)	0.272 (0.189)

Continued on next page

Table 3.3 – *Continued from previous page*

	All sample			Light int. > median			Light int. < median		
	Both (1)	No Daughters (2)	No Sons (3)	Both (4)	No Daughters (5)	No Sons (6)	Both (7)	No Daughters (8)	No Sons (9)
<i>Marginal effects, girls</i>									
Did not work	0.296 (0.366)	1.824** (0.716)	−0.174 (0.647)	−0.751 (0.932)	1.694 (1.515)	1.118 (1.335)	0.732 (0.569)	1.680** (0.679)	−0.363 (0.690)
Prof./Tech./Man.	−0.233 (0.150)	−0.292* (0.174)	−0.345* (0.190)	−0.531*** (0.156)	−0.584*** (0.189)	−0.820*** (0.239)	0.133 (0.256)	0.167 (0.234)	0.048 (0.369)
Clerical	0.309 (0.203)	1.293*** (0.306)	−0.021 (0.186)	0.022 (0.183)	1.441*** (0.252)	−0.335 (0.307)	0.927 (0.796)	1.090 (1.373)	0.485 (0.837)
Sales	−0.101 (0.107)	−0.126 (0.106)	−0.047 (0.181)	−0.353*** (0.105)	−0.231 (0.158)	−0.367 (0.260)	0.147 (0.160)	−0.197 (0.232)	0.123 (0.164)
Agri. self-emp	−0.051 (0.103)	−0.019 (0.118)	−0.050 (0.098)	−0.199 (0.238)	−0.033 (0.306)	−0.759** (0.341)	−0.023 (0.089)	−0.040 (0.100)	0.019 (0.087)
Agri. employee	0.036 (0.130)	0.249 (0.264)	0.034 (0.142)	−0.393** (0.186)	−0.958*** (0.172)	−0.006 (0.276)	0.169 (0.112)	0.783*** (0.212)	−0.058 (0.129)
Domestic	0.118 (0.468)	1.009*** (0.266)	−0.028 (0.429)	−0.240 (0.571)	0.717 (0.539)	−0.362 (0.423)	0.244 (0.845)	1.170 (1.574)	−1.365 (1.940)
Services	0.492 (0.303)	0.734** (0.295)	0.256 (0.451)	0.401 (0.407)	0.722* (0.400)	0.177 (0.549)	0.577* (0.319)	0.841 (0.540)	−0.056 (0.406)
Skilled man.	−0.120 (0.094)	−0.306*** (0.104)	−0.204 (0.131)	−0.240* (0.122)	−0.337 (0.206)	−0.633** (0.267)	−0.172 (0.169)	−0.312 (0.216)	−0.036 (0.206)
Unskilled man.	0.276* (0.149)	0.346* (0.207)	0.284 (0.184)	0.006 (0.120)	0.036 (0.243)	−0.200 (0.204)	0.241 (0.340)	0.554 (0.613)	0.173 (0.239)
Controls (both panels)									
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects	Country	Country	Country	Country	Country	Country	Country	Country	Country
Observations	38644	16934	16738	10891	5014	4960	27753	11920	11778
R^2	0.176	0.189	0.182	0.161	0.196	0.172	0.188	0.189	0.201

Note: The unit of observation is a household. The dependent variable is whether a woman works. Individual controls: age, years of education and occupation, and their squares for both spouses and pregnancy status of women. Number of children aged zero to five, five to ten, and ten to 15, last-born child age, deceased children and a recent death indicator. Other controls: per capita night light intensity, population density and urban-rural status of the dwelling. Regressions control for the number of household members, its square and the number of other wives. OLS estimates. Standard errors clustered at the regional level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

This dissociates maternal employment from our measure. Second, the uncovered relation pertains to families with under-five children. Older infants are unaffected if left alone, and the bulk of child mortality concentrates before the age of five. Consequently, we explore the effect of Δ_r on a sample consisting of families with only children above the age of five or with no infants.

Table 3.1 explores these two extremes in Columns 1) and 2); and 3) and 4), respectively. The estimated coefficients cease being negatively significant.³⁸ Further, concentrating on households with older or no children, Column 4) displays a few positive coefficients, all associated with affluent households. It may be indicative that women in such families resumed working after their children became old enough, and thus unaffected by maternal employment.

Table 3.1 reveals that, first, the results we advanced cannot be ascribed to general measures of mortality.³⁹ Moreover, it also makes evident that mortality changes induced by maternal employment are relevant, insofar Δ_r^{15} does not convey information in that sense. Second, results vanish for the sample of households with no infants, and signs reverse among affluent families. These results further confirm our previous findings, lending credence to our hypothesis.

3.6 Conclusions

This paper identifies a neglected determinant of female employment in developing countries. Based on a novel empirical approach, it advances that maternal employment decreases with the mortality risk it poses to children. In the sub-Saharan context, maternal employment may not be compatible with simultaneous childcare. Moreover, alternative caregivers may compromise toddlers' and infants' health, and leaving them unsupervised can result in catastrophic consequences. Consistent with the medical literature, we corroborate that children born to working mothers experience higher mortality rates.

Our contribution evinces that families react to the child mortality gradient over maternal employment. In particular, regression analysis suggests that mothers work less when doing so is more detrimental to children. The reduction in maternal employment we

³⁸The category of domestic workers is an exception, although it comprises just 63 observations.

³⁹In fact, introducing child mortality in regressions does not alter our conclusions.

Table 3.1: Placebo regressions

	Dep. var: Mother works			
	Older than 15		No children	
	Baseline (1)	Interacted (2)	Baseline (3)	Interacted (4)
Diff. child mort.	0.026 (0.032)	−0.038 (0.097)	0.184** (0.086)	0.219 (0.808)
<i>Marginal effects</i>				
Did not work		−0.038 (0.097)		0.219 (0.808)
Prof./Tech./Man.		0.044 (0.030)		0.648** (0.309)
Clerical		−0.016 (0.059)		−0.253 (0.519)
Sales		−0.003 (0.044)		−0.051 (0.278)
Agri. self-emp		0.020 (0.037)		0.089 (0.089)
Agri. employee		0.190 (0.146)		−0.402 (0.344)
Domestic		0.092 (0.090)		−2.448** (1.153)
Services		−0.039 (0.060)		0.365 (0.382)
Skilled man.		−0.045 (0.048)		0.596*** (0.160)
Unskilled man.		0.150** (0.067)		0.278 (0.392)
Individual controls	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Fixed-effects	Country	Country	Country	Country
Observations	56004	56004	8267	8267
R^2	0.047	0.050	0.150	0.154

Note: The unit of observation is a household. The dependent variable is whether a woman works. In Columns 1) and 2) differential child mortality is based on Δ_r^{15} . It captures mortality above 15 and is not directly related to current maternal employment. See text for details. Columns 3) and 4) employ Δ_r and restrict the sample to households without children aged zero to five. Individual controls: age, years of education and occupation, and their squares for both spouses and pregnancy status of women. Number of children aged zero to five, five to ten, and ten to 15, last-born child age, deceased children and a recent death indicator. Other controls: per capita night light intensity, population density and urban-rural status of the dwelling. Regressions control for the number of household members, its square and the number of other wives. OLS estimates. Standard errors clustered at the regional level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

measure is sizeable and more relevant for well-off families, especially in developed areas. We document overall reductions in female participation ranging from half a percentage point in the most parsimonious specification to 1.7 percentage points in relatively developed areas. Additionally, it reaches almost 13.5 percentage points among wealthy families in

regions with above-the-median night-light intensity. We argue such households can trade off the loss of maternal labour income for children's safety. On the contrary, we do not find employment reductions among destitute families. Furthermore, the mechanism is not operative for families without infants, and we document that employment reductions are unrelated to mortality in general.

A theoretical model rationalises all the empirical findings. It delivers a U-shaped relationship between economic development and female labour-force participation, in line with the empirical literature on the topic. Departing from previous work, a simple mechanism generates both the decreasing and increasing parts of the observed U-shaped pattern. We consider this paper represents another building block in explaining variations in female labour-force participation rates across countries, complementing other theories.

Appendix

3.A Ethnic homelands

The previous analysis assessed the effect of maternal employment on child mortality at the regional level. This Appendix departs from it and uses ethnic homelands as unit of analysis. Differently from regions, homelands traditionally divided ethnic groups. Current country boundaries, following the Scramble for Africa, divide several of these. In that sense, an ethnic homeland may embody different levels of administrative reach, health-care facilities and market regulations. However, their existence allows testing the relationship at a different scale.

As before, we measure the mortality gradient by Δ_e , this time computed at the ethnic homeland level and using only individuals who reside within ethnic boundaries. Incidentally, introducing Δ_e allows the inclusion of more precise regional fixed-effects. Regressions include all individuals residing on a given ethnic homeland and also restrict the observations to those with a recorded ethnicity.

The evidence Table 3.1 presents is weaker than before but still evinces that maternal employment shrinks when it is more detrimental for children and parents can afford not to have a working wife. Effects are confined to well-lit areas and only when we distinguish among husband's occupation. The category professional, technical and managers is related to a decrease of 5.3 percentage points in Column 8) following a one standard deviation increase in Δ_e , although the effect is not significant.⁴⁰

⁴⁰Table 3.1 presented a reduction of 5.6 percentage points for that same category.

Table 3.1: Child mortality and maternal employment, Δ_e

	Dep. var: Mother works											
	All sample				Light int. > median				Light int. < median			
	All ind.		With ethnicity		All ind.		With ethnicity		All ind.		With ethnicity	
	Base. (1)	Int. (2)	Base. (3)	Int. (4)	Base. (5)	Int. (6)	Base. (7)	Int. (8)	Base. (9)	Int. (10)	Base. (11)	Int. (12)
Diff. child mortality	-0.033 (0.133)	-0.691 (0.538)	-0.166 (0.197)	-1.697 (1.202)	0.011 (0.184)	-1.262* (0.646)	-0.092 (0.204)	-2.642** (1.219)	-0.065 (0.168)	-0.815 (1.061)	-0.167 (0.255)	-1.096 (1.928)
<i>Marginal effects</i>												
Did not work		-0.691 (0.538)		-1.697 (1.202)		-1.262* (0.646)		-2.642** (1.219)		-0.815 (1.061)		-1.096 (1.928)
Prof./Tech./Man.		-0.162 (0.182)		-0.168 (0.247)		-0.426 (0.293)		-0.704 (0.428)		0.119 (0.178)		0.200 (0.197)
Clerical		0.135 (0.407)		0.165 (0.475)		-0.935 (0.576)		-1.767** (0.757)		0.726 (0.500)		0.825 (0.665)
Sales		-0.141 (0.267)		-0.221 (0.374)		-0.770** (0.374)		-1.078 (0.671)		0.113 (0.252)		0.013 (0.357)
Agri. self-emp		-0.078 (0.214)		-0.324 (0.323)		-0.200 (0.460)		-0.653 (0.539)		-0.053 (0.252)		-0.244 (0.381)
Agri. employee		-0.266 (0.283)		-0.310 (0.369)		0.538 (0.586)		0.726 (0.758)		-0.543 (0.334)		-0.582 (0.390)
Domestic		-0.807 (0.752)		-0.735 (1.164)		-0.863 (1.560)		-0.116 (1.654)		0.129 (0.950)		-0.009 (1.631)
Services		0.288 (0.312)		-0.123 (0.409)		0.219 (0.657)		-1.020 (0.810)		0.215 (0.239)		0.157 (0.393)
Skilled man.		0.090 (0.152)		0.139 (0.207)		0.231 (0.241)		0.361 (0.393)		-0.083 (0.211)		-0.016 (0.248)
Unskilled man.		0.270 (0.381)		0.008 (0.478)		0.635 (0.499)		0.519 (0.438)		0.042 (0.376)		-0.134 (0.500)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-effects	Region	Region	Region	Region	Region	Region	Region	Region	Region	Region	Region	Region
Observations	25869	25869	12874	12874	7173	7173	3936	3936	18696	18696	8938	8938
R^2	0.191	0.192	0.212	0.212	0.213	0.215	0.266	0.271	0.211	0.212	0.230	0.231

Note: The unit of observation is a household. The dependent variable is whether a woman works. Individual controls: age, years of education and occupation, and their squares for both spouses, pregnancy status of women and ethnic fixed-effects for both spouses Number of children aged zero to five, five to ten, and ten to 15, last-born child age, deceased children and a recent death indicator. Other controls: per capita night-light intensity, population density and urban-rural status of the dwelling. Regressions control for the number of household members, its square and the number of other wives. OLS estimates. Standard errors clustered at the ethnic homeland level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Chapter 4

Conclusion

The economic literature highlights that cultural traits are remarkably persistent, and has identified channels through which these are transmitted across generations. Among several cultural traits, gender equality and the role of women in a society have been scrutinised. Some scholars have contributed to the understanding of female employment, involvement in politics and the general perception of working women. The conclusions they reveal aid at comprehending diverse forms of social organisation throughout the world, and the position each attributes to women. This same literature also documents cases of change, whereby the relative position of women enduringly raises. Such instances are associated to female's increased ability to generate income, which follows from exogenous price changes.

My Ph.D. dissertation contributes to this literature, adding valuable insight. In that sense, I contribute a novel class of determinants of gender equality. In fact, I show that by improving the bargaining position of women it is possible to enduringly increase gender equality. Concomitant to that increase, however, cultural transmission is instrumental in generating persistence. Similarly, my findings in Chapter 2 indicate that, contrary to what the literature posits, a reduction in the probability of continued rule can foster state capacity building if it is accompanied by a sufficiently large wealth effect. I show how gender-egalitarian inheritance rules generate the kind of relations just described. Finally, in the last chapter I document an overlooked determinant of maternal employment, relevant for the sub-Saharan Africa, that operates through economic development.

The first chapter investigates the origins of gender equality and advances the importance of cultural transmission between generations in forging gender-equality. It analyses

the long-lasting effects on gender-equality that medieval, female-only and self-supporting communities called beguinages exerted in Belgium. The cultural revolution these communities represented improved girls' bargaining power, translating in better female outcomes that, increasing female's status. I document that, by mid-19th century —when beguinages already decayed— municipalities that once hosted a community displayed higher levels of gender equality. These findings are consistent with the self-same cultural attitudes that depicted the beguine movement, suggesting that gender norms attached to the role of the beguines successfully spread from within the walled beguinages to the society in general.

The second chapter of this Ph.D. dissertation singles out the importance of gender equality for state capacity building at its early stages. In particular, gender-differentiated access to inheritances affects the marriage market for land-inheriting heirs. I show that land-merging marriages, in the context of medieval Europe, crucially affects the evolution of state capacity. This aspect is combined with the concept of dynastic continuity. The economic literature indicates that higher probability of dynastic continuity positively affects the development of state capacity. My results nuance this result, offering evidence that, in the short run, a gender-neutral norm is associated with higher average levels of state capacity, although these norms offer a lower probability of dynastic continuity than gender-biased rules. In the long run, results are reversed. Given the social structure that required men to rule the land, this chapter rationalises the pervasive discrimination against women.

The final chapter analyses the relationship between economic development and maternal employment in the context of developing economies. I first document that children born to working mothers are at a higher risk of death in sub-Saharan Africa. Next, I relate this mortality gradient to maternal employment. I show that maternal job-taking decreases as the risk it poses to infants augments. Moreover, the effect is mostly confined to well-off families that do not require a working-wife to meet ends. I measure significant drops in maternal employment, especially in more developed areas, reaching up to 5.6 percentage points. Consistent with the previous evidence, mothers do not refrain from work when all their children are above five. I propose a theoretical model that rationalises my findings and predicts a U-shaped pattern between economic prosperity and female labour force participation.

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