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The Origins and Persistence of Gender Roles in Ethiopia:

A micro-level analysis of the effects of traditional farming systems on modern gender roles.

by

Karolin Heike Lehmann
karolin.h.lehmann@gmail.com

Abstract: Perceptions of where the "natural" place for women is, vary considerably across societies. This is especially true in heterogeneous countries like Ethiopia, where stark variations between ethnicities and their attitudes towards gender roles exist. A much-debated question is how these differences emerge. Some research suggests that gender roles originated from traditional agricultural practices whereas others argue that they stem from variations in settlement patterns, language, religion, or geography. Through empirical analysis, this thesis reviews the possible origins of gender roles and explores the nexus between ancestral farming systems and modern gender roles of 22 Ethiopian ethnicities. Connecting the Ethnographic Atlas and the Demographic Health Survey, this study creates a long-term perspective on the origins of gender roles and their persistence. The findings suggest that there is a persistent, causal relationship between traditional plough usage and less equal gender roles in Ethiopia.

Key words: Gender Roles, Plough, Shifting Agriculture, Cultural Persistence, Ethiopia

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1. Introduction

The notion that "women belong in the kitchen" is still prevalent, even if its vigour has diminished over time. Perceptions regarding the suitable role of women in society varies considerably across countries and cultures. This is reflected in gender gaps in female labour force participation, education, health, access to resources as well as political, economic, and legal rights. This stands to question where these perceptions, notions, and attitudes regarding the "natural" place of women come from. Understanding the historical origins of gender roles is imperative in creating efficient and better-targeted policies to promote gender equality around the world. Gender equality advances the evolution of societies and the development of countries, to the benefit of all genders (UNPF, 2000; Duflo, 2012).

There is a growing body of literature that recognises the importance of studying the historical roots of women's role in society. Whilst a clear academic consensus on the origins of gender roles does not exist, multiple factors have been suggested. Language structures, belief systems, domestic organisations as well as soil endowments are just some of the hypothesised causes of gender roles. Yet, many of them have been traced back to the various forms of pre-historic agriculture. One of the first pieces of literature on the origins of gender roles was published by Esther Boserup (1970). In her seminal work, she argued that many social characteristics and cultural norms, including the belief of where the "natural" place for women was, originated from the type of agricultural method practised by the ancestors. Boserup claims that plough cultivation created a male-dominant farming system, in which women remain in the domestic sphere. Alternatively, shifting agriculture was mostly performed by women, which resulted in a more equal division of agricultural labour. The resulting labour divisions of these two farming systems persisted over time, still influencing the perception of women's roles today. Boserup's research was empirically analysed by Alesina, Giuliano and Nunn (2013), backing up her arguments.

More recently, a study emerged that offers contradictory evidence on the topic. Hansen, Jensen and Skovsgaard (2015) have argued that the ancestral agricultural method was not the decisive factor that formed gender roles but rather the duration of agriculture. Their premise is derived from

the Neolithic revolution, which involved the movement from nomadic to permanent settlements and its relationship to female labour force participation. They stated that earlier onsets of the Neolithic revolution enabled more advanced agricultural technologies (such as the plough) to develop, resulting in higher fertility in the Malthusian Era. As the settlement patterns predate the adoption of a farming system, the agricultural origins of gender roles remain unclear. These agricultural origins, as well as the underlying geographic and cultural traits, will be reviewed in this study.

Much of the research up to now has only been done on global, cross-country levels. In this thesis, however, I argue that a regional, micro-level study is necessary to fully understand the underlying cultural traits that shaped gender roles as well as their persistence across time. This is important because the gender roles and structures represent latent power dynamics and behaviours that were shaped over centuries, which are impossible to be accurately presented in cross-regional studies. Thus, with the use of micro-level data, this thesis aims to explore the historical roots of gender roles and investigate whether they persist across time. I highlight that a cross-country analysis, such as the one from Alesina, Giuliano and Nunn (2013), is unable to capture the cultural and ethnic heterogeneity in countries such as Ethiopia, which is the subject of this study. Ethiopia provides an unparalleled geographic, cultural, and ethnic diversity that enables me to capture different ancestral settings whilst simultaneously granting a detailed examination. Moreover, it is one of the only countries in Africa that both developed plough and shifting cultivation simultaneously, allowing for a direct comparison of the two systems. By analysing the historical, long-term developments in gender roles in Ethiopia, I hope to clarify their origins, thereby answering the following research question:

To what extent is there a causal relationship between traditional agricultural practices and modern gender roles in Ethiopia?

To answer the research question, I empirically explore the connection between the two farming systems and gender roles. My conceptual framework consists of two essential components. I adopt the hypotheses previously established by Boserup (1970) as well as the empirical model created by Alesina, Giuliano and Nunn (2013) and apply them to the context of Ethiopia. Using individual-

level survey data for a total of 22 ethnic groups across Ethiopia, an empirical strategy is employed. By combining the Demographic Health Survey, the ancestral Ethnographic Atlas, and annual crop production data, I assess the associations between plough usage and gender roles of over 14 000 women. The Ethnographic Atlas includes data from as early as the 1800s, providing a longitudinal analysis across 220 years. Moreover, this study uses Probit regressions and an Instrumental Variable approach to estimate these relationships, which are hypothesised as follows:

Hypothesis 1: Different agricultural methods influence the gendered specialisation in labour, where:

A. Ethiopian communities that use plough cultivation have less equal gender roles in terms of division of labour, where men work in the fields and women are secluded in the domestic sphere.

B. Ethiopian communities that use shifting cultivation have more gender-equal labour divisions, where women and men share most agriculture activities.

Hypothesis 2: This gendered specialisation in labour fostered persistent gender roles which are observed in various social norms and attitudes, even when the community develops out of agricultural dependence.

Hypothesis 3: The adoption of the plough is dependent on land suitability, which in turn causes persistent gender roles.

The results of this thesis will contribute to two strands of literature. First, I complement the works of Boserup (1970) and Alesina, Giuliano and Nunn (2013), determining their adaptability on a regional level. Second, my findings underline the notion spearheaded by Giuliano (2017, 2020), who has shown that the gap between policy intentions and results needs to be considered on the basis of their socio-cultural contexts. I attempt to contribute to closing this gap by contextualising the research by Boserup (1970) and Alesina, Giuliano and Nunn (2013). The historical origins of gender roles have a pivotal role in creating policies that remove some of the barriers that prevent women from participating in all areas of civil and economic life. By investigating how gender

roles are adjusted throughout history and what those adjustments mean in today's world, I hope to pinpoint the mechanisms that hinder the effective implementation of gender policies.

The overall structure of the thesis is organised as follows. Section 2 describes the previous research on the origin and persistence of gender roles. The third section explores the context of Ethiopia and the country's political, economic, and cultural landscape. Section 4 reports the conceptual framework utilised in this study, followed by its methodology in Section 5. The sixth section describes the study's data. Section 7 presents the empirical analysis of the research, which begins by laying out the results and then their discussions. Lastly, Section 8 presents the conclusions. The references are shown in Section 9 and the two Appendices are found in Sections 10 and 11.

2. Previous Research on the Origins of Gender Roles

The perception of women and their role in the economy and society varies across time and space. This chapter explores previous research on the historical roots of gender roles and the deep-rooted cultural norms and beliefs that formed them. I include research on geography, agricultural methods and technologies, ancestral characteristics like family structures, and informal institutions such as language and religion.

2.1. Geography, Agricultural Practises, and the Plough

The historical roots of gender roles were first analysed by Esther Boserup (1970), who focused on the agricultural settings and tools and how they shaped gender structures. In her book titled "Woman's Role in Economic Development", Boserup argues that agricultural practices were a defining factor in establishing persistent gender roles. She was one of the first researchers to connect farming methods to gender structures, whilst also studying the complex social and cultural mechanisms around the globe.

Female and Male Farming Systems

Boserup (1970) differentiates between two quintessential farming systems, the male one, which predominantly uses the plough, and the female one, which is based on shifting agriculture. Shifting agriculture is characterised by the utilisation of hand-held tools, such as the hoe or the digging stick, that are used on small plots of land for a couple of years until the soil loses its fertility (Boserup, 1970). Once the crop yields decline, the farmers shift to another plot of land thereby abandoning the used fields. Preparing the new plot for cultivation usually includes felling trees or burning down bushes which are tasks generally performed by young men (Boserup, 1970). Women perform the hoeing, planting, weeding, and harvesting of the crops. This labour-intensive form of agriculture established women as the main farmers, which Boserup termed the female farming system. Within such systems, men took on the tasks of hunting, tree felling, and warfare (Boserup, 1970). Boserup's observations were complemented by the data collection created by the German

anthropologist Hermann Baumann, who studied African hoe cultivation in the 1930s (Baumann, 1928). In his work, Baumann argues that "[it] was the woman who found this means of living a settled life" (Baumann, 1928, p. 290). By developing what is now known as hoe cultivation, women started growing food in their (then still unsettled) homes, reducing the need for daily food gathering. Thus, prior to the introduction of the plough, women were the dominant suppliers of food provisions and made permanent settlements possible (Baumann, 1928). Moreover, Boserup argues that historical societies that practised shifting agriculture not only allowed for a predominantly female labour pattern to emerge but also points out that such labour divisions evolved into more equal attitudes toward gender roles. Whilst other prejudiced patterns still apply to women in shifting agriculture, discrimination within the agricultural workforce was less pronounced, which generated less stringent norms "about the appropriate role of women in society" (Alesina, Giuliano & Nunn, 2013, p. 471).

In male farming systems, the main feature is the usage of the plough (Boserup, 1970). The plough is an agricultural technology that is used to loosen the soil before planting seeds, which traditionally was drawn by draught animals such as horses or oxen (Boserup, 1970). Steering the animals to plough requires a significant amount of upper body strength, thus giving men an advantage in performing such tasks (Alesina, Giuliano & Nunn, 2013). As plough cultivation requires less or no weeding, women were not needed in the fields, shifting labour patterns from a shared to a male-dominated labour division in such farming systems (Boserup, 1970). Thereafter, women specialised in home productions within the domestic sphere, establishing a clear "specialisation in production among gender lines" (Alesina, Giuliano & Nunn, 2013; p. 470). This gendered specialisation in labour and production has been argued to develop unequal gender structures, which are observed in various social norms and attitudes. For example, Boserup (1970) observed that in male farming systems, women tend to be secluded from the public entirely, only leaving the house veiled and reinforcing the belief that the woman's natural place is within the domestic sphere. According to Boserup (1970), this belief persists until today, even when a country or community is no longer dependent on agriculture.

Geographic Origins

The choice of agricultural practice depends on multiple factors. Several lines of evidence establish that geological characteristics are a long-term determinant of the different cultivation methods and their subsequent effect on gender roles. A study by Carranza (2014) in India suggests that soil endowments are a decisive factor in establishing gender roles. Studying the relationship between female employment and soil textures, which are exogenous, Carranza finds that female labour participation decreases when the soil is loamy rather than clayey. This is because deep tillage is possible in loamy soils but not in clayey ones, as the latter ones are too dense and therefore offer too much resistance to tillage. So, if the soil texture is loamy, deep tillage is used, which reduced the need for female tasks such as weeding and fertilising. Thus, the lower demand for female labour fosters discriminating gender roles and attitudes as their productive value decreases (Carranza, 2014). Moreover, a detailed examination of the invention of the plough by Pryor (1985) showed that plough cultivation is dependent on soil suitability. He distinguishes between plough-positive and plough-negative crops that have different ecological requirements. Plough positive crops include barley, wheat, teff, buckwheat, and rye, which require extensive soil preparation and deep-hole planting (Pryor, 1985). Cultivating these crops with the plough enables faster and more efficient field preparation but only if the fields are large and flat with thick soil. Plough-negative crops include maize, millet, and a variety of root plants (Pryor, 1985). These plants do not need to be planted deep within the soil and can therefore be cultivated on small, sloped, thin, and rocky soils with the use of the hoe or digging stick, which is common in shifting agriculture. Therefore, the geographic soil and land characteristics are an important predictor of whether plough or shifting agriculture is used, regardless of the climate, as both the plough-positive and plough negative crops can grow in the same climatic conditions (Pryor, 1985; Alesina, Giuliano & Nunn, 2013).

In contrast to Boserup (1970) and Carranza (2014), Hansen, Jensen and Skovsgaard (2015) argue that the type of agriculture practice was not the driving factor of gender roles but rather the duration of agricultural societies. The authors argue that ethnic groups with long histories of agriculture have more unequal gender roles, regardless of soil texture or agricultural practice. Specifically, Hansen, Jensen and Skovsgaard (2015) hypothesised that societies with an earlier onset of the

Neolithic revolution were able to develop more advanced technologies, which resulted in higher fertility in the Malthusian Era. Thus, the Neolithic revolution, which was the movement from scattered tribes of hunter-gatherers to settled farming villages, was followed by a lower female labour force participation, and subsequently led to unequal gender roles. Therefore, Hansen, Jensen and Skovsgaard (2015) argue that the introduction of the plough was not a leading determinant of gender roles, given that they were already established before the plough was adopted.

2.2. Ancestral Family Structures and Social Characteristics

Next to geographic and agricultural characteristics, societies also differ in their ancestral norms and traditions including kinship systems, marriage arrangements, inheritance laws, types of settlement, and family structures (Giuliano, 2017). This sub-section reviews the main ancestral characteristics and how they shaped and continue to shape gender roles.

Kinship Systems

Societies can be classified into two main types of unilineal kinship systems: matrilineal and patrilineal.[1] This bifurcation of kinship systems determines to which family an individual belongs after marriage, which is dependent on the descent of only one of their parents (Radcliffe-Brown & Forde, 2015). According to the rule of descent, the main distinction between matrilineal and patrilineal kinship is whom a man controls, which is either his sister's kin in matrilineal society or his wife and child in a patrilineal one (Radcliffe-Brown & Forde, 2015). This means that men have power over women regardless of kinship systems, as both belong to the patriarchy. However, the implications of patrilineal and matrilineal kinship systems go beyond descent, as they determine cultural aspects such as inheritance rules, post-marital living arrangements, and family patterns. Kinship systems are also broadly connected to the presence or absence of polygyny, endogamy, local hierarchies, and family ties.

[1] Next to unilinear kinship systems, where individuals can only belong to one linage, most societies in Europe and the Americas follow a bilateral kinship system, where the female and male linage are equally important.

Matrilineal societies are defined by the female lineage, which follows the mother's descent when it comes to clan membership, inheritance, and matrilocality (Gneezy, Leonard & List, 2009; Giuliano, 2020). In such social systems, family structures are based on the mother's house and will be inherited by the youngest daughter with the older ones creating new homes connected to the mother. Whilst the men hold authority over political and social entitlements, women in matrilineality control the household's economic entitlements (Brulé & Gaikwad, 2021). In contrast, patrilineal kinship systems follow the male line, where property and land inheritance as well as patrilocality are organised around the father's household (Lowes, 2016). Matrilineal cultures have been connected to increased competitiveness among women, female financial autonomy, social independence, and economic empowerment (Gottlieb & Robinson, 2016; Gneezy, Leonard & List, 2009; Lowes, 2016). One cross-national study by Gottlieb and Robinson (2016) revealed an association between matrilineal societies and higher scores in female political engagement, political participation, and civic participation in 26 African countries. The reason for the improvements in women's outcomes in matrilineal communities stems from the greater access to property and declining dependency on the husband. Whilst many African countries host both matrilineal and patrilineal systems, all of East Africa, including Ethiopia, only practise patrilineality (Murdock, Textor, Barry, White, Gray & Divale, 1999).

Complementary to the findings of Gottlieb and Robinson (2016), Brulé and Gaikwad (2021) show that in Indian societies practising patrilineality, men are more likely to participate in politics than women. Additionally, matrilineality is usually accompanied by matrilocality, which is the custom of the husband to join the wife's community (Gottlieb & Robinson, 2016). According to the comprehensive literature review by Giuliano (2017), matrilocality ensures stronger kinship support among the female lineage, fostering favourable dynamics for the wives. Furthermore, in a study investigating household bargaining, Lowes (2016) reported that whilst women in matrilineal societies are less cooperative towards their husbands, which can result in household inefficiencies, their children are better educated and healthier. This duality is known as the "matrilineal puzzle" referring to the struggle of cooperation between husband and wife through split allegiances of paternal and maternal kinship (Fortunato, 2012). The conflicting allegiance and the unclear male authority can create competition within the household resulting in less altruistic behaviours and

tensions between husband and wife (Lowes, 2016). Together, these studies indicate that even though women are still under the authority of men, matrilineality can have positive implications for the role of women and their children including improvements in autonomy, economic empowerment, as well as civic and labour participation. Yet, the question of how kinship systems are established remains unanswered, as little research has been done on the origin of matrilineality (Lowes, 2020).

Marriage Transaction

In addition to the kinship system, the type of marriage transaction is another crucial aspect of a society's cultural characteristics. Globally, it is common to differentiate between the bridewealth and the dowry,[2] which both entail a transaction of property at marriage (Goody, 1973). Bridewealth is the bride price paid by the groom and his family to the bride's family, whereas the dowry is a transaction that is paid by the bride's family to the couple (Giuliano, 2017). Whilst both matrilineal and patrilineal kinship systems can practise both dowry and bridewealth, some patterns have been observed in case studies from Tonga and India, indicating that matrilineal tribes are more likely to practice bridewealth rather than dowry transactions (Mizinga, 2000; Kodoth, 2008). The type of marriage transaction is considered an important determinant of long-term gender roles (Giuliano, 2017). The presence of bridewealth in Africa has been associated with a higher status of women in comparison to groups that practice dowry as a marriage exchange (Ogbu, 1978). Furthermore, the dowry system has been shown to negatively impact women's welfare. A study conducted in India by Bloch and Rao (2002) showed that wife beatings, or the threat thereof, have been used to extract more resources from the bride's family through dowry payments.

Although the research on the emergence of marriage transactions is limited, Boserup (1970) observed that in regions with little female participation in agriculture (i.e., male-farming systems/plough agriculture) the dowry predominantly persists. On the other hand, in regions where

[2] This is a simplification as I predominantly differentiate between the *direction* of the exchange and not the goods or services exchanged. Other forms of marriage transaction, for example, include gift exchange, women exchange, token bride wealth and bride service (Goody, 1973).

women are actively working in the fields (i.e., female-farming systems/shifting agriculture), bridewealth systems are the dominant form of marriage transaction (Boserup, 1970). In shifting agriculture, where women do most of the agricultural work, the groom has to pay the bride price, given that the wife is considered an economic (and reproductive) asset. In plough cultivations, where the wife is less active outside the home, it is customary for the bride's family to pay the dowry to the husband, as she is considered an economic burden (Boserup, 1970).

Domestic Organisation

Another important cultural and social attribute is the type of domestic organisation. The domestic organisation varies across cultures but is often observed through polygynous, polyandrous, or monogamous relationships that either live in stem or nuclear family structures. To date, several studies have investigated the link between polygyny and the emergence of gender roles and inequality. Tertilt (2005, 2006) demonstrated that gender inequality is more prevalent in polygynous countries and that banning polygyny would result in a 40 per cent decline in fertility and a 170 per cent increase in gross domestic product per capita. There have been some attempts on narrowing down the origins of polygamy. Boserup (1970), for example, argues that polygyny is more prevalent in societies that use shifting agriculture. Comparable to the relationship between the agricultural system and the form of marriage transaction, polygyny responds to the economic worth of women (Boserup, 1970). Thus, if a community practise shifting cultivation, where women do most of the work, getting an additional wife correlates with an increase in "the total input of labour" (Boserup, 1970, p.26).

In the same fashion, Boserup (1970) observed that plough cultivation does not benefit from an additional wife, thereby resulting in monogamous relationships. In line with Boserup's observations, Giuliano (2015) finds empirical evidence that plough cultivation is correlated to less polygyny whereas it is more prevalent in shifting agriculture. Thus, it seems whilst polygyny in itself shapes the social perception of women, as it is correlated and perhaps even originates in the ancestral agricultural method used. Another striking study by Dalton and Leung (2014) observed a link between polygyny and the slave trade in Western Africa. Their findings suggest that ethnic groups severely affected by the transatlantic slave trade were more likely to be polygynous in the

early twentieth century. The resulting skewed sex ratios of the predominately male slave trade as well as the uncertain living environment have been argued to have long-lasting impacts on the type of domestic organisation, for which polygyny was preferred or, to some extent, even necessary (Dalton & Leung, 2014).

Besides polygamy, the form of habitation after marriage is another aspect of domestic organisation. A stem family describes family structures where two generations cohabit, with either one son or daughter staying in their parental home, depending on the kinship system. A nuclear family, on the other hand, corresponds to a structure where all children leave the parental home without intergenerational cohabitation (Tur-Prats, 2019). The existing literature on family structure and gender roles focuses primarily on education gender gaps and intimate partner violence. For example, in a study based on historical Italy, Bertocchi and Bozzano (2015) conclude that nuclear residential patterns are associated with more gender equality in education. Interestingly, Tur-Prats (2019) shows that in regions of Spain where stem families are dominant there are lower rates of intimate partner violence. This is supported by a study by Alesina, Brioschi, and La Ferrara (2016) within the African context (including Ethiopia), which also shows that stem families are less likely to have favourable attitudes towards violence against women. So, even though stem families are associated with less violence against women they are more likely to foster an education gender gap.

Settlement Patterns

Lastly, I now briefly turn to ancestral settlement patterns and how they have shaped gender roles. An extensive cross-country analysis performed by Alesina, Brioschi, and La Ferrara (2016) showed how the distinct types of settlements influence a person's attitude towards violence against women. They discover that ethnic groups with nomadic and isolated settlement heritages are more likely to exercise violence against women compared to groups living in compact settlements. Nomadic communities are defined by constant or semi-constant migration and isolated settlements (Murdock et al. 1999). One probable reason for the increased violence against women, which can be used as an indirect indicator of gender roles, is the lack of social protection in migrating settlements (Gelles, 1983 in Alesina, Brioschi & La Ferrara, 2016).

2.3. Religion and Language

Informal institutions such as belief systems and language are crucial in forming gender roles and social power dynamics. Religion, specifically, has shaped cultures and gender roles like no other institution (Giuliano, 2017). In a global, individual-level study by Guiso, Sapienza and Zingales (2003) the relationship between religion and women's rights is investigated. Using data from the late 20th century, their findings suggest religiosity is negatively associated with attitudes towards women's rights. This relationship is even stronger for Muslims than it is for other religions. Another study by Algan and Cahuc (2006) proposes a "macho hypothesis", which connects religion with the support of the traditional division of labour known as the male breadwinner model. Drawing on international micro-data from OECD countries, the authors find that Muslims, Catholics, and - to a lower degree - Buddhists and Orthodox Christians are more inclined to follow the male breadwinner model compared to the Jewish, Protestants or Atheists (Algan & Cahuc, 2006). Taking a historical perspective, Becker and Woessmann (2008) argue that the spread of Protestantism decreased the female education gap in Prussia. Based on the belief that all Christians need to read the bible, Martin Luther urged both Prussian boys and girls to attend school, which had long-lasting influences (Becker & Woessmann, 2008). Researching the impact of missionary churches in Africa, Nunn, Akyeampong, Bates and Robinson (2014) conclude that protestant missions had a significant long-term effect on female education whereas catholic missions only had a long-run positive impact on male education.

Finally, I discuss language, as a vehicle of cultural transmission and its link to gender roles. Research by Gay, Santacreu-Vasut and Shoham (2013) establishes a correlation between modern gender roles and the different grammatical structures of language. By studying the grammatical gender markings, the authors investigate their impact on female labour force participation rates, politics, land property ownership and female activity in the credit market. Gay, Santacreu-Vasut, and Shoham (2013) argue that language is not only a form of communication and expression but also a depiction of a world order with inherent power dynamics. The belief that "language shapes thought" has been generally accepted since the works of Whorf (1935) and has since then been embedded in institutional economic theory by academics such as North (1990). Gender systems within languages can therefore be a defining factor to shape gender roles, as the number of genders

in a language, and the rules for gendering vary between languages. Not all languages are sex-based or have gendered pronouns, which, if absent, makes languages less gender intensive. Gay, Santacreu-Vasut, and Shoham (2013) utilise these characteristics and create a Gender Intensity Index. They find that if the dominant language of a country is more gender intensive (i.e., the language clearly differentiates between male and female), women are less likely to participate in the labour market and face more restrictions in obtaining capital and land (Gay, Santacreu-Vasut & Shoham, 2013).

In an investigation into the origin of language structures, Galor, Özak, and Sarid (2016) hypothesise a connection between pre-industrial geographical characteristics and language structures. Specifically, they discover a significant relation between plough-positive environments and the emergence of grammatical genders, indicating that cultures that have used the plough fostered a prevalence of sex-based gender markings. Consequently, this leads to larger gender gaps in agricultural participation and productivity (Galor, Özak & Sarid, 2016). Therefore, according to the authors, language is not only a vehicle of cultural transmission but also an independent force shaping human behaviour and gender roles.

2.4. The Environment of Historical Persistence

Until now, I reviewed previous research on the historical roots of gender roles, including perspectives on geography, agricultural methods and technologies, ancestral social and family structures, and informal institutions such as language and religion. However, a crucial aspect of this study is to better understand the relationship between ancestral characteristics and today's gender structures, but how do we know these relationships persist? On the one hand, the previous literature review has shown extensive evidence that there is a high degree of persistence in the links between various historical characteristics and contemporary gender roles. On the other hand, gender norms have also evolved rapidly over a brief period of time (e.g., through the introduction of the contraceptive pill; Goldin & Katz, 2002). When investigating the origins of cultural traits and attitudes, such as gender roles, it is important to discuss the environment of persistence.

To better understand the mechanisms of cultural persistence Giuliano and Nunn (2021) dissect theories in evolutionary anthropology. They argue that cultural norms, beliefs, and traditions are more likely to persist in countries with less historical variability in the environment. Countries with unstable environments, which Giuliano, and Nunn (2021) measure in changes in annual temperature, the degree of persistence is weaker. This is due to a devaluation of the information passed on from the ancestors, which is less applicable to the new environments and thus less beneficial (Giuliano & Nunn, 2021). Hence, in times of severe climate change, political and economic instability and influxes of global migration, accounting for the different degrees of persistence is important in long-term studies.

Another important piece of research on the intergenerational transmission of ethnic and religious traits was pioneered by Bisin and Verdier (2000). The authors provide a theoretical approach to the long-term dynamics of ethnic and cultural traits and their persistence across time. By examining marital segregation decisions and their effect on cultural transmission, the authors attempt to establish an economic framework that examines "the evolution and persistence of ethnic and religious traits as dynamic properties of cultural transmission and socialization mechanisms" (Bisin & Verdier, 2000). They discover that people in a heterogeneous environment with different ethnicities, cultures, religions, and norms have a higher demand for cultural pluralism. Cultural pluralism allows for a stronger intergenerational transmission of ethnic and religious traits. Ethiopia is a textbook example of a culturally heterogeneous social environment.

3. The Ethiopian Context

I use the Federal Democratic Republic of Ethiopia as a case study to investigate the historical origin and persistence of gender roles. The East African country provides an ethnically diverse and historically complex example of how various geographic, social, and cultural characteristics shape the role of women within the economy and civic life. This section introduces and captures the main aspects of Ethiopia's history, ethnology, demography, and economic development.

Ethiopia is one of the oldest countries in the world and the oldest independent country on the African continent. Records of human life in, what is now known as the country of Ethiopia, predates back 60 000 years. The first presence of statehood was the Axumite State from circa A.D 100-1100 and the Agew State from A.D 1100-1270 bordering the Red Sea and the Gulf of Aden (Marcus, 2002, pp.1-17). Since then, the country has experienced several forms of political environments ranging from the Imperial Regime from 1270 to 1974, to the communist Derg regime from 1974 to 1991 (Till, 2021; Marcus, 2002). The political context has been shaped by the continuous tensions between the several sources of power, which have roughly been divided into Ethiopia's northern highlands versus the southern and western regions (Till, 2021). Today, Ethiopia is a landlocked federal state, which was established in the early 1990s. It is bordered by Eritrea, Djibouti, Somalia, Kenya and South Sudan and Sudan.

Ethiopia is an ethnically and culturally heterogeneous country that is characterised by a variety of religions, languages, and cultures. Ethiopia houses over 90 distinct ethnic groups and 92 languages. According to the World Fact Book (CIA, 2022), the five largest ethnic groups are the Oromo (accounting for 34.4% of the country's population), the Amhara (27%), the Somali (6.2%), the Tigray (6.1%), and the Sidama (4%). The main religions in the country are Ethiopian Orthodox Christianity with 43.8% of the population practising it, Islam (31.3%), Protestantism (22.8%), Catholicism (0.8%), and other traditional African traditions (0.7%) (CIA, The World Fact Book, 2022). Ethiopia's most recent political transformation to a federal state brought forth confrontations between the different ethnicities, religions, and cultures. Especially tensions between ethnicities practising Islam and Christianity have weakened the state's social cohesion

leading to civil unrest (Karbo, 2013). More recently, the tensions between the region of Tigray and the ruling government had severe consequences on Ethiopia's stability (Till, 2021). Interestingly, Ethiopia's economic context does not fully mirror the country's political and social instability (Till, 2021). As shown in Figure 1, Ethiopia had a gross national product (GDP) of 855 USD per capita in 2019 and an annual growth rate of eight per cent between 2016 and 2020 (World Bank, 2022). Whilst the country has experienced continuous growth, over 70 per cent of the roughly 113 million inhabitants still live under the 3.2 USD a day poverty line (World Bank, 2022). The main contributors to Ethiopia's GDP are the service and agricultural sectors accounting for 36.8 and 35.5 per cent of the value-added, respectively (World Bank, 2022). Meanwhile, the manufacturing sector only contributed 5 per cent in 2020.

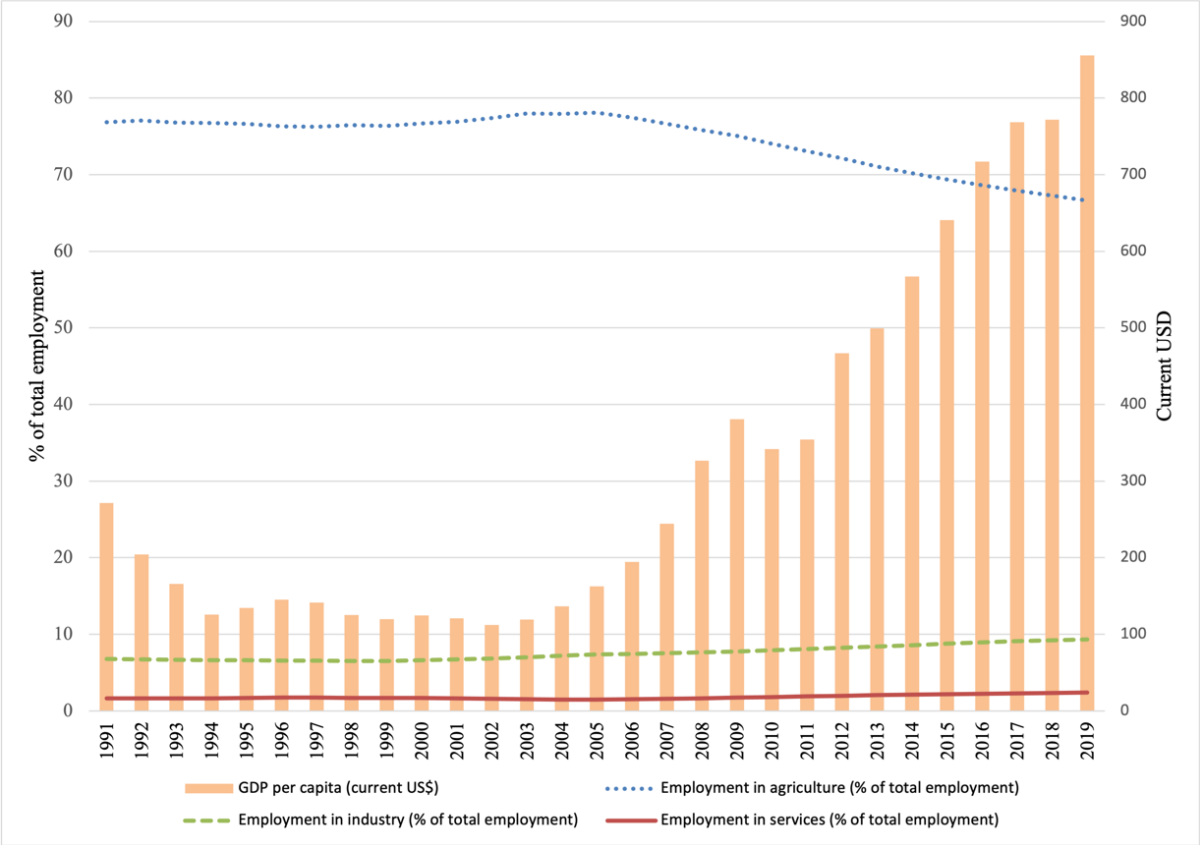

Figure 1) GDP per Capita and Employment per Sector in Ethiopia 1991-2019; Note: Employment per Sector (annual, per cent of total employment; left axis) and GDP per capita (annual, in current USD; right axis); Source: Author's calculation based on World Bank (2022)

Yet, most people in Ethiopia are employed in the agricultural sector, including the 84.1 per cent of women who participate in the labour force in 2020 (Kifle, 2013; World Bank, 2022). Figure 1 shows the distribution of employment among the three sectors, indicating that Ethiopia's labour force is primarily engaged in agriculture. Interestingly, the country shows a diverse dispersion of female labour force participation. The map in Figure 2 shows the percentage of women who have worked in the past 12 months according to the Demographic Health Survey from 2016. The administrative zone of Benishangul-Gumuz in the North-West, shows the highest female employment rate of 41.7 per cent or higher, whilst the districts of Somali, Amhara and Afar show the lowest rates with less than 27 per cent participation. Even though Figure 2 only highlights the distributions of female employment rates, the reasons behind it suggest underlying cultural differences between Ethiopia's districts.

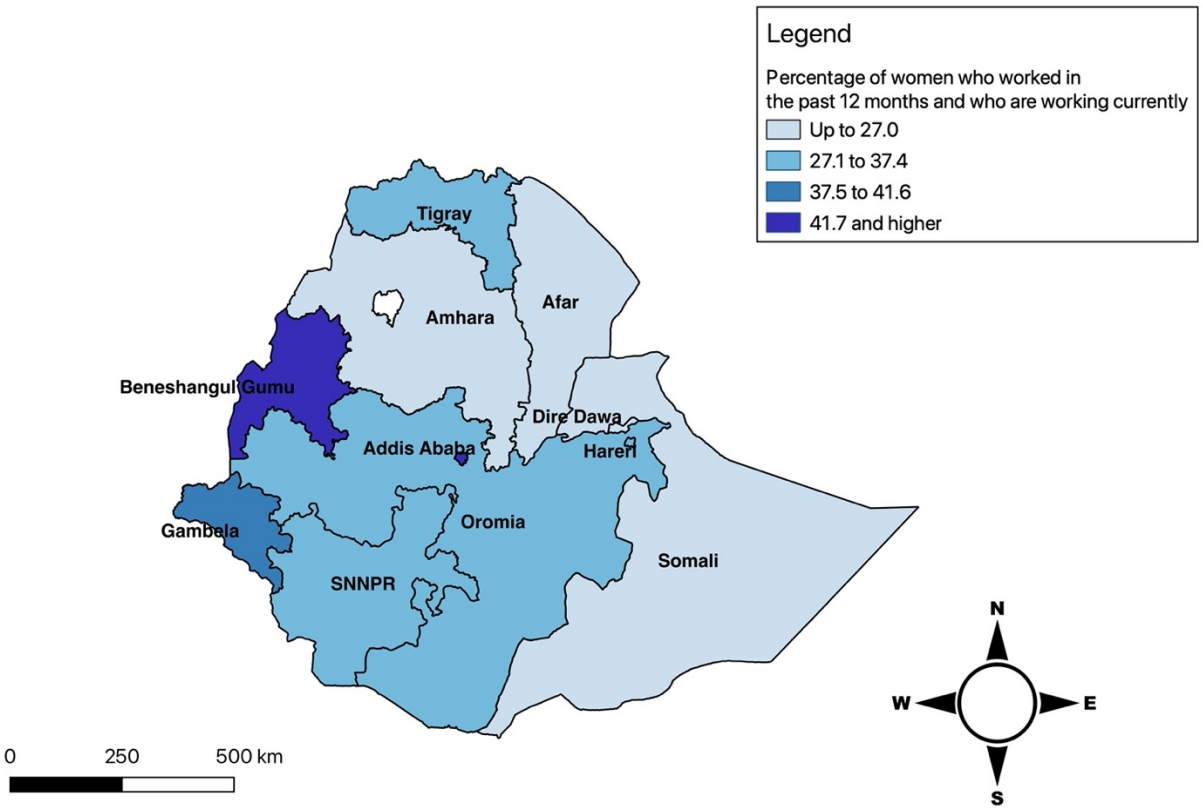

Figure 2) Percentage of women who worked in the past 12 months and are working currently in Ethiopia; Source: Author's elaboration based on DHS (2016)

The gender structures in Ethiopia are complex and spatially diverse. Exploring some of the other major indicators of women's status in Ethiopia, a complex picture emerges. The political landscape for gender-sensitive policies had a strong start with the creation of the federal state in 1992 (World Bank, 1998). Soon after, in 1993, Ethiopia established their first Women's Affairs Office and announced its first National Policy on Women (UN, 2022). Moreover, Ethiopia was an important endorser of the Beijing Action Plan (UN, 2022). However, most policy interventions are only ad hoc, which have not reached women effectively creating a gap between policy intention and result (World Bank, 1998). Whilst men and women receive, on average, the same amount and quality of primary and secondary education, roughly eight years, women are still discriminated against within the family, experiencing restricted physical integrity and civil liberties as well as constrained access to productive and financial resources (OECD, 2019). Over 40 per cent of women are married by the age of 18 and the average Ethiopian woman gives birth to her first child at the age of 19. Ethiopia has made important strides to include women politically, as roughly 40 per cent of parliament seats have been occupied by women in 2021 (World Bank, 2022). Yet, the economic participation has been slow to follow. Whilst many women work (see Figure 2), they have mostly been employed in low-skill level jobs (UN, 2022).

Next to the ethnic and cultural heterogeneity, Ethiopia is a geographically diverse country. In the Horn of Africa, Ethiopia covers a landmass of roughly 1 104 300 square kilometres and houses a wide range of geographical characteristics. The diverse topography includes mountains, deep canyons, and river valleys as well as flat-topped plateaus (Asefa et al., 2020). Moreover, Ethiopia is shaped by two geographic features: the Eastern Afar Depression situated roughly 125 meters below sea level and the Northern mountains of Ras Dashen, rising 4 533 meters above sea level (Asefa et al., 2020). Furthermore, Ethiopia includes eight distinct vegetation types, that differ depending on elevation, rainfall patterns and climate gradients (Asefa et al., 2020). This ecological heterogeneity allowed different agricultural methods to establish (Chamberlin & Schmidt, 2012). As discussed in the previous chapter, Carranza (2014) and (Pryor, 1985) argue that agricultural practices vary depending on ecological characteristics. As such, Ethiopia is one of the few countries in sub-Saharan Africa that developed both plough cultivation and shifting agriculture (see Figure 5 in Appendix A). Thus, given Ethiopia's geological heterogeneity, it is one of the only countries where a within-country analysis of plough usage and gender roles is feasible.

Figure 3 visualises the distribution of historical plough use within Ethiopia, highlighting clear patterns along geological lines. When comparing the map in Figure 3 to the natural vegetation zones, it seems that plough cultivation occurs in evergreen Afromontane Forests and grassland complexes (Asefa et al., 2020). However, Figure 3 only shows whether the plough is used or not, and thereby does not indicate which agricultural method is adopted in areas where the plough is absent. However, Westphal, Stevels and Stevels (1975) and Chamberlin and Schmidt (2012) provide detailed information on the different agricultural systems in Ethiopia, showing that shifting agriculture is common in areas of the map marked as "plough not used".

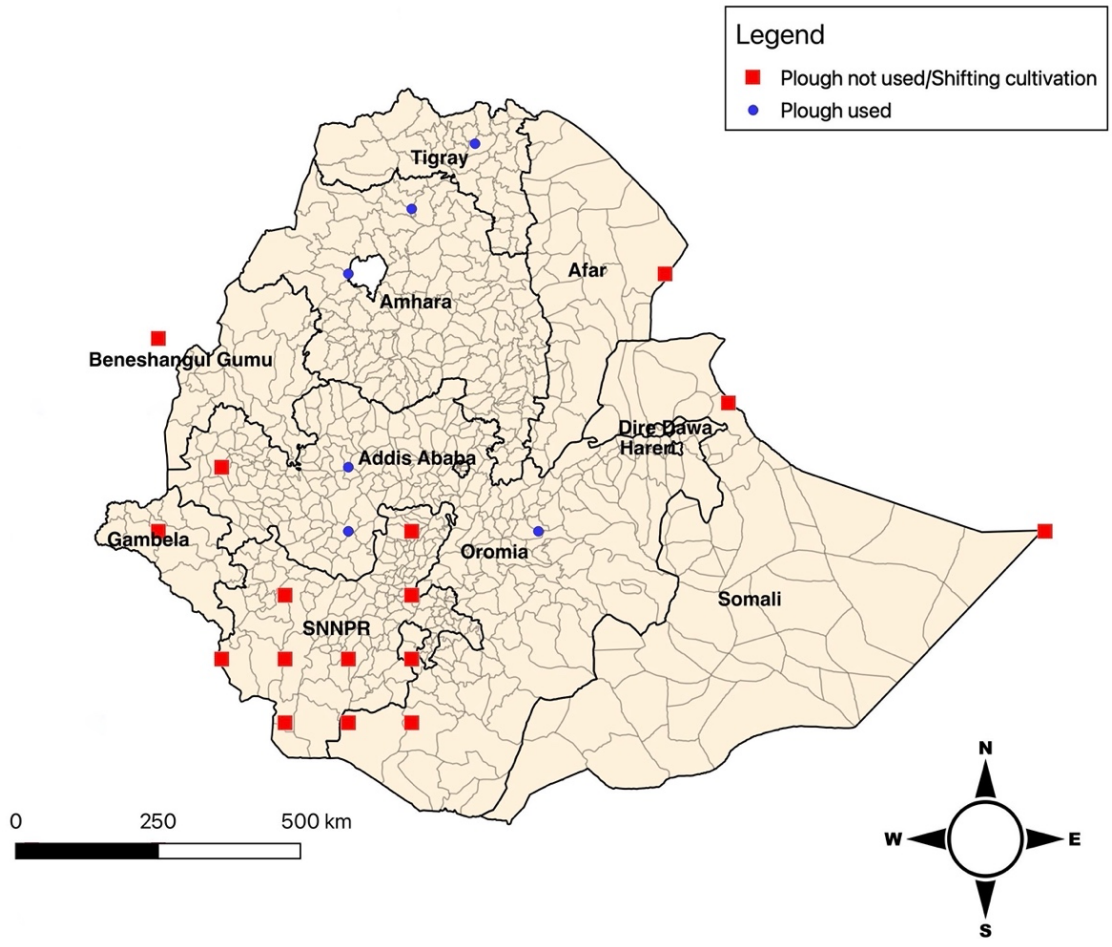

Figure 3) Map of Historical Plough Use in Ethiopia; Source: Author's elaboration based on the Ethnographic Atlas (Murdock et al. 1999)

Therefore, we can conclude that Ethiopia developed dual farming systems as observed by Boserup (1970). Furthermore, the map shows similarities with the distribution of the country's main crop production yields (FAS, 2022). Ethiopia produces four main types of cereals, namely corn, sorghum, wheat, and barley (Chamberlin & Schmidt, 2012). Other, less intensively produced crops include millet, soybean, rapeseed, and rice. Ethiopia's agricultural sector is mostly built upon smallholder farms, as they account for over 95% of production (CSA, 2013). Smallholder farms, on average, occupy a land area of roughly one hectare and are commonly dependent on family labour (Till, 2021). Interestingly, most smallholder forms, especially those practising shifting agriculture, also participate, to some degree, in animal husbandry (Westphal, Stevels & Stevels, 1975).

4. Conceptual Framework: The Origins and Persistence of Gender Roles in Ethiopia

This section now turns toward the conceptual framework used to examine the long-term relationships between the ancestral traits discussed above and modern gender roles in Ethiopia. Economists agree that history matters in explaining the differences in standards of living, economic development, and social dynamics among countries (Michalopoulos, Putterman & Weil, 2018). Moreover, there is also a consensus among anthropologists and economists that cultural change only occurs slowly, with certain cultural beliefs and attitudes persisting over time (Alesina, Brioschi & La Ferrara, 2016; Dalton & Leung, 2014; Giuliano, 2017; Michalopoulos, Putterman & Weil, 2018). Therefore, the study of how ancestral characteristics have shaped, and continue to shape gender roles is a vital piece of research.

One of the most prominent empirical studies of the historical roots of gender roles was performed by Alesina, Giuliano and Nunn (2013). Their work is an empirical investigation of Boserup's seminal work. As previously reviewed, the presence (or absence) of the plough has not only been directly connected to the social perception of women and their role in society but has also shown to influence various ancestral characteristics such as domestic organisation, family structures, and language, which all shape gender roles. As such, the adoption of the plough is an important determinant of the woman's role in economic in civil life. Thus, following Boserup's observations, Alesina, Giuliano and Nunn (2013) establish a cross-country model estimating the impact of plough usage on gender roles, which is measured in various forms of female labour participation, female company ownership and share of political positions held by women. Focusing on the ancestral agricultural practice of either plough or shifting cultivation they assess Boserup's main ideas and arguments.

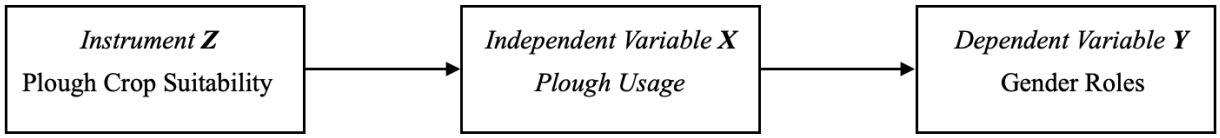

Figure 4) Ancestral Plough Use and Gender Roles: A Conceptual Framework

By studying the historical and contemporary relationships, Alesina, Giuliano and Nunn (2013) establish a causal effect between plough use and gender roles and its persistence. They do this by studying an extensive sample of countries in Europe, Asia, Africa, and the Americas. In their global analysis, they observe that most of the variance occurs across and not within countries, enabling a cross-sectional study. Whilst the authors acknowledge that there is some variance on a regional level, they argue that a study on a global scale is robust to within-country variance. Alesina, Giuliano and Nunn (2013) test this by investigating individual-level data for Bolivia, Chile, Cambodia, Malaysia, Mongolia, Nepal, the Philippines, and Uganda. The findings suggest a similar pattern to the global estimates. However, their individual-level data is only based on the individual's district of residence, giving a less accurate description of the individual. Whilst their model is without a doubt an important contribution to academia, I argue that a regional study of a heterogeneous country like Ethiopia reveals patterns that cannot be understood through cross-country analysis.

The model shown in Figure 4, is a visual interpretation of Boserup's observations and Alesina, Giuliano and Nunn's model, which will be used as the conceptual framework in this study. I adopt the cross-country model created by Alesina, Giuliano and Nunn (2013) and adjust it for individual-level data in Ethiopia for a more detailed investigation. The reasons for this are three-fold. First, most countries do not use multiple farming systems, as they dominantly practise either plough or shifting cultivation. This is not true for Ethiopia, which is one of the only countries in Africa that uses both farming systems. Second, in addition to Ethiopia's bifurcation of farming systems, I argue that the within-country variance in geographic conditions and culture is more extensive than previously assumed by Alesina, Giuliano and Nunn (2013). Third and last, a detailed within-country, micro-level analysis can provide a richer investigation of gender roles, as they vary not only across countries but also within districts, ethnicities, and households. Studying the

relationship between plough usage and gender roles on an individual level in a heterogeneous country like Ethiopia gains a more complete, contextualised picture. As such, this study assesses the following hypotheses:

Hypothesis 1: Different agricultural methods influence the gendered specialisation in labour, where:

A. Ethiopian communities that use plough cultivation have less equal gender roles in terms of division of labour, where men work in the fields and women are secluded in the domestic sphere.

B. Ethiopian communities that use shifting cultivation have more gender-equal labour divisions, where women and men share most agriculture activities.

Hypothesis 2: This gendered specialisation in labour fostered persistent gender roles which are observed in various social norms and attitudes, even when the community develops out of agricultural dependence.

Hypothesis 3: The adoption of the plough is dependent on land suitability, which in turn causes persistent gender roles.

By investigating the validity of these hypotheses, I will answer the research question and develop a better understanding of the historical roots of gender roles. Next to the relationship between plough cultivation and gender roles, I also control for ancestral family structures, social characteristics, and informal institutions, providing a well-rounded analysis of the origin and persistence of gender roles in Ethiopia.

5. Data

This study uses individual-level survey data for a total of 22 Ethnic groups across Ethiopia. By combining the Demographic Health Survey (DHS), the Ethnographic Atlas and annual crop production data, I explore the connection between plough usage and historical and contemporary gender roles. The previous sections outlined the major factors that can influence gender roles, which are translated into variables in this section.

5.1. Demographic Health Survey

The main data source used for this study is the Demographic Health Survey (DHS) from the United States Agency for International Development (USAID). The DHS is a series of cross-sectional surveys from over 90 countries which have been collected since 1984 (DHS, 2016). The programme's individual-level surveys habitually interview a randomly selected, nationally representative sample of women, men, and households. Among others, the DHS programme portrays data for topics such as education, maternal health, female empowerment, HIV prevalence, wealth, and fertility. Given the nature of the survey questions, DHS data is known for its binary, categorical and count data. The average household survey can include over 5000 different variables.

For this study, I use the most recent standard survey for Ethiopia for women[3]. Even though the 2019 DHS has been published, it is an interim survey, leaving out significant amounts of variables which were essential for this study, including indicators for ethnicity, female empowerment, and attitudes to violence against women. Therefore, the dataset from 2016 is used, being the sixth wave of DHS surveys in Ethiopia (DHS Ethiopia, 2016). The Ethiopian DHS was collected and administered by the Central Statistical Agency (CSA) from January to June 2016 (Central Statistical Agency, 2016). Prior to data cleaning, the original dataset included a total sample size of 15 683 women aged 15 to 49.

[3] The male DHS survey was intended to be included but did not have all the required variables.

5.2. Matching the DHS and the Ethnographic Atlas

The second data source used in this thesis is the Ethnographic Atlas constructed by George Peter Murdock (Murdock et al. 1999). The dataset includes ethnographic data for 1291 ethnic cohorts from across the globe with observations dating back to 1800. The Ethnographic Atlas captured 94 different variables ranging from kinship and community structures and gender roles to political and economic systems. The Atlas, therefore, enables researchers to explore cultural structures before industrialisation.

Matching the DHS ethnicity groups with the Ethnographic Atlas required a concordance of ethnicities. As mentioned before, Ethiopia houses over 80 ethnic groups within their borders. However, the Demographic Health Survey only includes 46 ethnicities for the seventh wave in 2016. To connect the DHS and the Ethnographic Atlas, I use the extensive methodology created by Michalopoulos, Putterman and Weil (2014). They were one of the first to match the two datasets successfully. Moreover, their method was also adopted and extended by other empirical studies such as the study by Alesina, Brioschi and La Ferrara (2016), showcasing their academic recognition. In their paper, Michalopoulos, Putterman and Weil (2014) merged ethnic groups using both the Ethnographic Atlas and the Ethnographic Map and individual DHS data for 21 African countries including Ethiopia. By constructing a series of ten possible matching methods between the DHS and the two datasets from Murdock, roughly 60 per cent of ethnic cohorts were able to be directly matched. The remaining ethnicities were then harmonised using the Afrobarometer based on the work by Nunn and Wantchekon (2011), the Joshua Project, and through the analysis of language structures.

Following their methodology, matching, and merging the DHS ethnic groups from 2016 with the historic data of the Ethnographic Atlas yielded a total of 22 ethnic groups, which corresponds to a total of 14 646 individual-level observations. Table 5 (in Appendix A) summarises the concordance between the two datasets. The main reason for the decrease in the number of ethnic groups is due to the grouping of smaller DHS ethnic groups into broader ones that have historic data. For example, in the DHS dataset, “Agew Hamyra”, “Agew-Awi” and “Amhara” are all individual ethnicities, whilst in Murdock’s Ethnographic Atlas all of them have been merged to

the "Amhara" cohort. Two ethnic cohorts were directly matched to the Atlas without using Michalopoulos, Putterman, and Weil's methodology, as some ethnic groups from the seventh DHS wave were not included in wave six. Furthermore, one social group named "Sheko" was matched using Wikipedia, which was inspired by the work by Alesina, Brioschi and La Ferrara (2016), who use Wikipedia's ethnic database to check if an ethnicity goes by alternative names. Lastly, I was unable to match ten ethnicities using any of the attempted matching methods. These ten ethnic groups correspond to a total of 947 observations, which had to be excluded from further analysis (see Table 6 in Appendix A).

5.3. Plough Suitability Data

Lastly, I extract data from the Foreign Agricultural Service (FAS), which is part of the United States Department for Agriculture. The department's International Production Assessment Division (IPAD) produces annual crop production data for corn, sorghum, millet, barley, wheat, rice, soybeans, and rapeseed (FAS, 2022). Moreover, the IPAD created crop production maps from 2011 to 2016 showing the distribution of cereal production on a regional level in Ethiopia (Appendix B). As mentioned in the Ethiopian Context Section, Ethiopia's main types of crops include corn, sorghum, barley, and wheat. According to Pryor (1985), corn and sorghum are plough-negative crops whereas barley and wheat are plough-positive crops. By comparing the crop production maps with the land traditionally inhabited by the 22 ethnic groups from Ethnographic Atlas using Google Maps, I estimate whether a group lived in presence of plough-positive or plough-negative crops.

According to the production volumes recorded on the maps, I assign values to the ethnic group's location representing their suitability for growing each of the four crops. This approach is based on the plough suitability variable constructed by Alesina, Giuliano and Nunn (2013), who utilised country-level FAO data. Given that an overlap between areas with high corn or sorghum production and areas with high barley or wheat production cannot be excluded, I create categorical variables. Therefore, an ethnic group could be located in an area where both plough-positive and plough-negative crops are very suitable. To ensure the robustness of my plough suitability

variables, I cross-reference my plough suitability data with the Agricultural Sample Enumeration reports from Ethiopia's Agricultural households census from 2002 (IHSN, 2022).

5.4. Descriptive Statistics

Table 1 shows the summary descriptive statistics of the numerical and binary variables utilised in this study. An overview of all other variables and their various categories are depicted in Table 7 in Appendix A. Additional information regarding the categorical distributions are shown in Table 8 (Appendix A). By using the historic data from the Ethnographic Atlas, I created a dummy variable for plough cultivation. The dummy is coded so that 0 corresponds to the plough being absent in the traditional agricultural methods of an ethnicity whilst 1 means it has been present. The Atlas also records a third category for plough cultivation which is coded "present but not native". However, it is only observed for two ethnicities corresponding to 45 observations from the DHS survey and thus was categorised as "present". Out of the 22 ethnic groups, six used the plough, translating to 9527 individuals. The remaining 16 ethnic cohorts, which include 5119 observations, did not use plough cultivation on their farms (see Table 8, Appendix A). As mentioned in the Ethiopian Context section, we can assume that when the plough is not used, shifting agriculture is the predominant form of agriculture (Westphal, Stevels & Stevels, 1975; Chamberlin & Schmidt, 2012). Female participation in animal husbandry and agriculture are coded on a five-point scale. Some indicators were intended to be included in this study but did not present any variance in the sample and had to be excluded. One example is the property inheritance law, which was intended as a proxy for kinship systems. All 22 ethnic groups used in this study did not have distinctive property rights governing the transmission of land.

As mentioned in the data section, most DHS variables are categorical. The main dependent variable is the dummy for the employment status which shows whether the respondent works or not. I created a new variable for "Skill Level of Job", which categorises whether the respondent works in a skilled or unskilled profession. The categorisation of skill levels is based on the major groups from the International Standard Classification of Occupations (ISCO) from the International Labour Organisation **(**ILOSTAT, 2022). Measures for the respondents' education level, literacy, religion, wealth, and marital status are all categorical.

Table 1) Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Ancestral Variables					
Plough Use	14646	.65	.477	0	1
Agricultural Suitability	13824	.466	.272	.059	.895
Polygyny	14624	.502	.5	0	1
Contemporary Variables					
Employment Status	14644	.358	.479	0	1
Skill Level of Job	7066	.591	.492	0	1
Education in years	14644	4.144	4.771	0	22
Respondent's Age	14644	27.927	9.185	15	49
Husband/partner's age	9117	38.738	11.366	15	95
Attitude towards wife beatings	14646	.559	.497	0	1

Note: The categorical variables and their ethnic distributions are shown in Table 8 in Appendix A

The variables for urban or rural settlement, polygyny, and attitudes toward wife beating are all dummies. The measurements for respondent's age, husband's age and education in years are numeric variables. The variable for attitudes towards wife-beating has been newly constructed and is coded as a dummy where "1" is whether the respondent thinks violence is justified for any reasons and "0" if wife beating is never justified.

Lastly, the two plough suitability variables are coded on a scale, where "1" refers to an unsuitable environment for either plough-positive or plough-negative crops whilst "2" and "3" refer to a somewhat suitable and very suitable environment, respectively. What stands out here is the relative similarity in distribution between both plough suitability variables. There is no definitive plough-negative or plough-positive direction within Ethiopia, but rather a mixture of both.

6. Methodology

My empirical strategy consists of three parts, one for each hypothesis. First, the historical relationship between plough cultivation and gender roles is estimated. Then, the contemporary correlations between the plough and modern gender roles are assessed, thereby exploring the persistence over time. Lastly, using an Instrumental Variable approach, I assess the causality between plough usage and gender roles, using the variables for plough-positive and plough-negative crops as instruments. By including different measurements for gender roles as well as various controls, and econometric specifications, I construct three robust models depicting the relationship between the plough and gender roles.

6.1. Model Specifications

Depending on the outcome variable, different regression estimates are used. If the dependent variable is binary, the regressions are estimated using Probit estimates. When the dependent variable is coded in ordered categories, I estimate the regressions using an Ordered Probit model. All estimations are clustered on the ethnic level, accounting for the different cohort sizes.

The ancestral relationship between traditional plough use and gender roles is assessed using the following econometric model:

Equation 1) Ancestral Relationship

$$GenderRoles^{H}{}_{i,e} = \alpha + \beta Plough_{i,e} + \gamma C^{H}_{i,e} + \varepsilon_{i,e}$$

Where, $GenderRoles^{H}{}_{i,e}$ is the outcome variable for historic (H) gender roles for individual i from ethnicity e in Ethiopia and $C^{H}_{i,e}$ includes vectors for historical baseline controls. The coefficient α represents the constant, β is the effect on $GenderRoles^{H}{}_{i,e}$ of a one unit change in the regressor $Plough_{i,e}$, and $\varepsilon_{i,e}$ is the error term. The main measurement for $GenderRoles^{H}{}_{i,e}$ is female participation in agriculture, which is complemented with an additional indicator for female

participation in animal husbandry. Based on the prevalence of animal husbandry in Ethiopia, including an additional measurement for gender roles ensures robustness. The historical baseline controls from the Ethnographic Atlas include ethnic settlement patterns, family structures, the form of marriage transaction, polygamy, the type of subsistence economy and agricultural suitability. The independent variable is the dummy for plough cultivation, which was either present or absent. When the plough is absent, we can assume shifting agriculture is present.

To investigate whether the ancestral relationship in *Equation 1* is persistent over time, the relationship between plough use and contemporary gender roles is assessed using the following econometric model:

Equation 2) Contemporary Relationship

$$GenderRoles^{C}{}_{i,e} = \alpha + \beta Plough_{i,e} + \gamma C^{H}_{i,e} + \delta C^{C}_{i,e} + \varepsilon_{i,e}$$

Where i denotes an individual and e an ethnic group in Ethiopia. $C^{H}_{i,e}$ is a vector of historical baseline controls and $C^{C}_{i,e}$ denotes the contemporary controls. $GenderRoles^{C}{}_{i,e}$ represents the outcome variable for contemporary gender roles measured in whether the respondent has a job, whether she works in a skilled or unskilled profession, her education level and whether she works for her family, for someone else or through self-employment. Moreover, the coefficient β is the effect on $GenderRoles^{C}{}_{i,e}$ of a one unit change in regressor $Plough_{i,e}$, α represents the constant, and $\varepsilon_{i,e}$ represents the error term. The main dependent variable is the respondent's employment status, as it accurately depicts a women's participation in civic and economic life. The other three indicators are intended to establish robustness. The contemporary controls from the DHS include a dummy for urban or rural settlement, religion, education in years, age and wealth, husband's age, and her attitude towards wife beatings.

To make inferences about causality, the third part expands the previous probit regressions from *Equation 1* and *Equation 2* using an instrumental variable (IV) approach to explore causality. This IV model is inspired by the cross-country research performed by Alesina, Giuliano and Nunn (2013). They argue that an IV is useful in exploring the causality given that there is a partially

random, naturally occurring assignment of plough-positive and plough-negative environments, which can be instrumentalised. As mentioned in the Data section, the variable for plough suitability is measuring the presence or absence of plough-positive and negative crops, which are dependent on soil endowments and topographic characteristics. The two plough suitability variables, capture this geo-climatic variance for the 22 ancestral ethnic groups sampled in this study. Using plough suitability as an instrument relies on the assumption that the variance between plough-positive and plough-negative crop suitability only influences gender roles through the plough. Given that both plough-positive and plough negative crops can grow in the same climatic (but not the same soil or land) conditions, I control for agricultural suitability, measuring whether the land is suitable for any type of agricultural cultivation (Pryor, 1985). As such, plough-suitability removes endogeneity issues and thus can be used as an instrument for this IV approach.

To identify the local average treatment effect (LATE), the estimation strategy depends on four assumptions. First, the two plough suitability variables of plough-positive crops and plough-negative crops need to have a significant effect on the endogenous treatment variable. To accommodate for the binary data, I am using a bivariate probit model with maximum likelihood estimations (MLE). This can be estimated using in first stage equation, which is as follows:

Equation 3) IV 1st Stage (Z →X):

$$X_{i,e} = \alpha_1 + \phi Z_{i,e} + \gamma_1 C_{i,e}^{H,C} + \varepsilon_{1,i,e}$$

Where $X_{i,e}$is the binary variable for plough adoptions, $Z_{i,e}$ represents the two plough suitability instruments, α denotes the constant, and $\varepsilon_{i,e}$ represents the error term, with *i* denoting an individual and *e* an ethnic group. $C_{i,e}^{H,C}$ includes the previously established baseline controls for historical and contemporary variables. Secondly, to make inferences about LATE, the identification requires no interference. Whilst a balance check using an independent group t-test displayed ambiguous results, it is reasonable to assume that plough suitability is randomly assigned and unrelated to the determinants of the outcome variable (Alesina, Giuliano & Nunn, 2013). Thirdly, using an IV approach demands the absence of treatment defiers. This requirement is called the monotonicity assumption and states that individuals and ethnic groups who live in environments that can grow

plough-positive crops are unlikely to not use the plough, i.e., practise shifting agriculture. This one-directional relationship is fulfilled as extensive research has shown (e.g., Alesina, Giuliano & Nunn, 2013; Pryor 1985). Lastly, the exclusion restriction is considered satisfied when the instrument $Z_{i,e}$ affects the outcome variable $Y_{i,e}$ only through $X_{i,e}$. Whilst this assumption is impossible to confirm, I am confident in assuming its validity given the presence of historical and contemporary controls. Having fulfilled the four LATE assumptions, the reduced form equation can be calculated as follows:

Equation 4) IV Reduced Form (Z→Y):

$$Y_{i,e} = \alpha_0 + \rho Z_{i,e} + \gamma_0 C_{i,e}^{H,C} + \varepsilon_{0,i,e}$$

This enables us to calculate the local average treatment effect (LATE), which is the ratio of reduced-form effect ρ to first stage effect ϕ, written as ($\lambda = \frac{\rho}{\phi}$). In the second stage equation, the LATE (λ), which is the slope coefficient in the regression, is estimated as follows:

Equation 5) IV 2nd Stage (X→Y):

$$Y_{i,e} = \alpha_2 + \lambda \hat{X}_{i,e} + \gamma_2 C_{i,e}^{H,C} + \varepsilon_{2,i,e}$$

Having estimated all three parts of the IV and completed the assumption checks, the goal is to establish a compelling argument for causality between plough cultivation and gender roles. Given our hypothesis, I expect a significant negative value for the LATE (λ).

6.2. Robustness Checks

There are multiple channels through which I check for the robustness of my models. Most importantly, the structure of my overall analysis is the strongest robustness check. As I analyse the relationship between plough cultivation and gender roles in three distinct stages, I hope that the models build upon each other, thereby creating convincing evidence. For the historical and contemporary Probit regression models, I adjusted for heteroscedasticity using robust errors.

Furthermore, I cluster all ethnic groups given that the individual's treatment is correlated within each group. The strength of every probit regression is evaluated using post-estimation checks such as Pseudo R^2 and the F-test. The results of those checks are reported in the result section. The robustness of the IV estimations is evaluated using statistical tests such as the Wald test of exogeneity, and the F-test. Moreover, different model estimations are used to ensure the robustness of the results. Following the recommendations of Wooldridge (2010) and Angrist and Pischke (2014), I complement the MLE with Newey's two-step estimation and a two-stage least square (2SLS) estimation, which are shown in the result section. Whilst two-step and 2SLS estimations are not ideal for my binary probit regressions, they can be compared to the MLE, providing further robustness checks.

Apart from the IV regression, I further evaluate my models using multiple dependent variables. For the historical relationship, I supplement the female participation in agriculture with the female participation in animal husbandry. Even though neither the original observation by Boserup (1970) nor the model by Alesina, Giuliano, and Nunn (2013) included theories on the role of women in animal husbandry, I include it due to its importance in the Ethiopian context. In Ethiopia, animal husbandry is often practised alongside agriculture, which needs to be represented in the model. Similarly, the contemporary model also includes multiple dependent variables representing the main measurements of gender roles. The measurements for skills level and employment type are included because Ethiopia's female labour force participation is comparatively high even though most women work in low-skilled, family-owned employments. Adding two additional variables for employment provides a more detailed investigation of the economic life of women across Ethiopia. Lastly, I include an additional dependent variable for education, to measure variance in the access to resources.

7. Empirical Analysis

The purpose of this study is to better understand the origin and persistence of gender roles in Ethiopia. By analysing individual-level data from the DHS and the historical records from the Ethnographic Atlas, I can create a long-term perspective on gender. As mentioned in the Methods section, I examine three main relationships. First, the historic relationship between ancestral plough use and ancestral gender roles is studied. Then, I investigate its long-term persistence by regressing ancestral plough use and contemporary gender roles. Lastly, following Alesina, Giuliano, and Nunn's (2013) IV approach, I assess whether there is a causal relationship between plough use and gender roles using plough suitability as an instrument. The outcomes of the analysis show that the different agricultural methods have a complex relationship with the various measurements of gender roles.

7.1. Results

Historic Regression

First, I investigate the correlations between traditional plough use and ancestral female participation in agriculture and animal husbandry (see Table 2). The main indicator used to measure gender roles is female participation in agriculture, which is complemented by measurements for women's participation in animal husbandry. Every model is estimated using an ordered Probit regression and clustered on the ethnic group level to adjust for their assorted sizes. Almost all models report strong Pseudo R^2, indicating that the independent variables can explain most of the variance in female participation. However, the pseudo coefficient of determination does not indicate high explanatory power when estimating the baseline model for female participation in animal husbandry as the Pseudo R^2 = 0.1566. Moreover, the models in columns (1), (2), and (4) report small F-values >0.01, showing that the independent variables reliably predict the dependent variable. Only the baseline model for animal participation husbandry in column (3) reports the F-value of 0.0748, indicating a less reliable estimation.

The regression estimate in column (1) shows a significant relationship between plough cultivation and sex differences in agriculture given the negative coefficient of -2.945 at the 1 per cent significance level. Therefore, when an ethnic group uses the plough, the likelihood of women's participation in agriculture decreases by 2.945 units. However, it is important to keep the categorical coding in mind. My sample does not include a category for female-only participation in agriculture (for reference see Table 7 in Appendix A). Therefore, the results in columns (1) and (2) imply that when the plough has been adopted, men are more likely to perform all agricultural tasks. When the individual's ethnic group does not use the plough, they are more likely to adopt a gender-equal distribution of agricultural tasks. By adding control variables to the baseline model in column (1), I check for robustness. The results are reported in column (2). The Pseudo R^2 increases from 0.530 to 0.95, indicating an improvement in explanatory power. The correlation between plough use and female participation in agriculture is still significant on a 1 per cent significance level, confirming the estimates from the baseline model.

In addition to female participation in agriculture, I assess the relationship between plough adoption and female participation in animal husbandry. As shown in the Descriptive Statistics sections, most ethnic groups in this sample participate in agriculture as well as animal husbandry. The models estimating female participation in animal husbandry are shown in columns (3) and (4). Both the baseline and the extended model report a significant positive correlation between plough use and female participation in animal husbandry, given a significance level of 10 per cent. To check for the robustness of model (3), I add additional covariates, which results in an increase of the Pseudo R^2 from 0.157 to 0.763. The estimation in column (4) reports that there is a positive correlation between the dependent and independent variables, indicating that when the plough is adopted, more gender-equal participation in animal husbandry is probable.

Table 2) Historic Probit Regression with Ancestral Controls

INDIVIDUAL-LEVEL PROBIT ESTIMATES WITH ANCESTRAL CONTROLS				
	Female participation in:			
	(1) Agriculture	(2) Agriculture	(3) Animal Husbandry	(4) Animal Husbandry
Plough use	-2.945***	-20.36***	1.299*	26.63**
	(0.773)	(4.790)	(0.729)	(10.98)
Ancestral Controls				
Dominant Mode of Subsistence		-3.370		10.64***
		(2.299)		(2.366)
Family Pattern		-2.703***		-31.73***
		(0.879)		(2.913)
Settlements		-0.0654		-4.893***
		(1.063)		(0.675)
Agricultural Suitability		-0.0317		-13.10***
		(4.237)		(4.421)
Polygyny		7.283***		-40.59
		(1.810)		(24.84)
Type Marriage Transaction				
Token Bridewealth		4.043***		6.083***
		(0.575)		(0.876)
Woman Exchange		0.788		
		(2.693)		
Insignificant/No Transactions		23.41***		-29.05
		(6.736)		(23.11)
Observations	10,105	9,261	11,640	10,820
Pseudo R-squared	0.530	0.955	0.157	0.763

Note: Probit estimates are reported with robust standard errors in parentheses. The unit of observation is the individual, clustered on the ethnicity level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Overall, these results indicate that women from ethnic groups that practise ploughing agriculture instead of shifting cultivation are more likely to work in animal husbandry and less likely to work in the fields. These results confirm Boserup's observations that there is a significant relationship between plough use and ancestral gender roles and their division of labour. However, the sub-hypothesis that plough usage secludes women from the domestic sphere was not confirmed. Whilst my analysis shows that plough adoption is correlated to a gendered division in labour, it does not necessarily limit women to domestic labour but rather shifts their tasks to other aspects of subsistence, such as animal husbandry.

Furthermore, the models in columns (2) and (4) provide some other interesting correlations between the dependent variable and the covariates. Firstly, the type of family patterns is correlated

on a 1 per cent significance level to both the female participation in agriculture and animal husbandry. This indicates that individuals from ethnic groups that formed nuclear families are less likely to participate in either task in comparison to one's that formed extended families, holding everything else equal. Whilst these findings are difficult to relate to the previous research on family patterns by Bertocchi and Bozzano (2015), Tur-Prats (2019) or Alesina, Brioschi, and La Ferrara (2016), they show additional complexities. Furthermore, the covariates representing the types of marriage transactions have a significant positive association with female participation in agriculture and animal husbandry. Column (2) additionally reveals a correlation between the control for polygyny and the dependent variable. All else equal, women from ethnic groups that practise polygyny are more likely to participate in agriculture. This relationship was expected given Boserup's (1970), and Giuliano's (2015) studies. They argued that polygyny is more prevalent in societies that use shifting agriculture and less likely in plough cultivation.

As Column (4) shows, agricultural suitability is negatively correlated with female participation in animal husbandry on a 1 per cent significance level. This was expected because the indicator is generally correlated with the absence of animal husbandry, as seen in the work by Alesina, Giuliano, and Nunn (2013). Lastly, the type of ancestral settlement is significantly correlated to female participation in agriculture. Therefore, communities that are settled, are more likely to have less female participation in the fields. This confirmed the arguments presented by Hansen, Jensen and Skovsgaard (2015) who reported that the movement from scattered tribes of hunter-gatherers to settled farming villages was followed by a lower female labour force participation.

Contemporaneous regression

In Table 3, I present the outputs for the contemporary relationship between traditional plough cultivation and modern gender roles. My main indicator representing modern gender roles is the dummy variable for employment status. This is complemented by alternative indicators for contemporary gender roles including whether the respondent works in a skilled or unskilled profession, whether she works for her family, herself, or someone else and her education level. Corresponding to the data type, the models in columns (1) and (2) are Probit estimations whereas columns (3) and (4) were estimated using ordered Probit models. All models report an F-test result

of <0.000, thereby rejecting the null hypothesis and signifying that the four models have explanatory power.

The main relationship is reported in column (1), showing that plough adoption and female employment are negatively associated given the negative coefficient of -0.659 at the 1 per cent significance level. Thus, women from ethnic groups that utilised the plough are less likely to be employed today. This significant correlation supports the results of the historical relationship shown in Table 2, suggesting that the gendered specialisation in labour fostered persistent gender roles even after a century has passed. As such, the observation by Boserup (1970) and Alesina, Giuliano, and Nunn (2013) can be confirmed.

Moving on to the alternative measurements for gender roles, the relationship between plough usage and the respondent's type of employment, skill level, and education level provide insightful results. As seen in Table 3, all dependent variables report a negative correlation to plough use. However, my sample provides no statistically significant evidence that plough adoption is associated with the contemporary measurements for the respondent's job skill level or her level of education. Whilst insignificant, the correlation between plough usage and professional skill level provides important insights. Based on the results in columns (2) and (3), women who belong to ethnic groups that have used the plough are less likely to be employed in a skilled job and less likely to have obtained higher education levels. Column (2) reports a negative relationship between plough use and the respondent's type of employment, which is measured by whether she works for her family, for someone else or is self-employed. Given the negative coefficient of -0.623 at the 1 per cent significance level, women from ethnicities that used the plough are more likely to work for a family member rather than for somebody else or be self-employed. This supports the main contemporary relationship between plough usage and employment status.

Overall, Table 3 indicates that having traditionally practised plough cultivation instead of shifting cultivation decreases women's participation in the labour market and reduces the likelihood of them obtaining independent employment. This relationship is statistically significant across time. Whilst insignificant, women also are shown to be less likely to be educated or employed in a high-skilled job when their ancestors used the plough. Even though the analysis of skill level and

employment type, have not been previously analysed, the notions of previous studies by Boserup (1970) and Baumann (1928) are supported.

Next to the relationship between plough usage and gender roles, a few other striking results between gender roles and the covariates are noteworthy. Across all four models, respondents living in a rural setting are less likely to be employed, have a skilled job, have achieved a high education level or work for themselves. Additionally, the contemporary controls for the various religions report some interesting results. Being Muslim significantly decreases the likelihood of the respondent being employed or highly educated, which is roughly in line with results from Guiso, Sapienza and Zingales (2003), who studied the relationship between religion and different measurements for women's rights. Furthermore, when the respondent is employed, being Muslim increases the probability of her working in an unskilled job given a negative coefficient of -0.215 at the 1 per cent significance level.

The individual controls including the respondent's age, years of education, wealth, attitude towards wife-beating, and the husband's age are all significantly correlated to the respondent's level of education on a 1 per cent level. Only education, the respondent's age and wealth index score are significantly correlated to employment status. Overall, these results confirm previously established research on female employment in Ethiopia (Mihret, 2019). Apart from the mode of subsistence, all ancestral controls are positively correlated with the respondent's employment status on a 1 per cent significance level. Simultaneously, column (2) reveals evidence that family patterns, type of settlement as well as polygyny and marriage transaction are negatively correlated to the skill level of the respondent's profession. The models in columns (2) and (3) similarly mixed results of positive and negative correlations. Thus, the four measurements for gender roles may not be as coherent as previously assumed.

Table 3) Contemporary Probit Regression with Ancestral and Contemporary Controls

INDIVIDUAL-LEVEL PROBIT ESTIMATES WITH ANCESTRAL AND CONTEMPORARY CONTROLS				
	Contemporary Gender Roles			
	(1) Employment	(2) Skill Level of Job	(3) Education Level	(4) Respondent works for family/self/other
Plough use	-0.659***	-0.227	-0.0797	-0.623***
	(0.128)	(0.200)	(0.258)	(0.185)
Contemporary Controls				
Urban/rural	-0.202***	-0.773***	-0.586***	-0.0773
	(0.0487)	(0.0732)	(0.0639)	(0.0634)
Religion:				
Catholic	-0.110	0.510	0.159	0.00773
	(0.188)	(0.355)	(0.246)	(0.231)
Protestant	0.0276	0.307***	0.304***	-0.253***
	(0.0591)	(0.0910)	(0.0755)	(0.0716)
Muslim	-0.261***	-0.215***	-0.359***	-0.0438
	(0.0443)	(0.0672)	(0.0624)	(0.0568)
Traditional	0.244	0.296	0.304	-0.814**
	(0.217)	(0.317)	(0.310)	(0.348)
Other	-0.158	-0.193	0.600**	-0.436
	(0.235)	(0.389)	(0.291)	(0.336)
Education in Years	0.0468***	0.0534***		-0.0131***
	(0.00416)	(0.00641)		(0.00437)
Respondent's Age	0.0173***	-0.00321	0.0108**	0.00673*
	(0.00290)	(0.00437)	(0.00487)	(0.00382)
Husband's Age	-0.000804	-0.00177	-0.0177***	-0.00339
	(0.00210)	(0.00313)	(0.00404)	(0.00279)
Wealth Index Score	0.0601***	0.194***	0.230***	0.0277
	(0.0141)	(0.0215)	(0.0241)	(0.0203)
Attitude towards wife beating	0.0124	-0.0635	-0.449***	0.0355
	(0.0325)	(0.0504)	(0.0455)	(0.0435)
Ancestral Controls				
Dominant mode of subsistence	-0.298***	0.456***	-0.00648	0.0846
	(0.0595)	(0.0938)	(0.116)	(0.0866)
Family Pattern	0.669***	-0.536**	-0.435**	0.539***
	(0.126)	(0.218)	(0.201)	(0.183)
Settlements	0.0890***	-0.215***	0.0214	-0.151***
	(0.0314)	(0.0554)	(0.0561)	(0.0467)
Agricultural suitability	1.092***	-0.396	-1.163***	0.636***
	(0.167)	(0.304)	(0.235)	(0.244)
Polygyny	0.875***	-0.707***	-0.387	0.455**
	(0.143)	(0.232)	(0.281)	(0.208)
Marriage transaction	0.177***	-0.267***	-0.0163	0.0572
	(0.0353)	(0.0562)	(0.0685)	(0.0496)
Observations	8,576	3,833	3,592	3,833

Note: Probit estimates are reported with robust standard errors in parentheses. The unit of observation is the individual, clustered on the ethnicity level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

IV Regression

The last part of my empirical analysis turns to the issue of causality. Adopting an IV approach with maximum likelihood estimation, I am examining the causal relationship between gender roles and plough adoption by using plough suitability as an instrument. As such, the indicator for gender roles is measured by whether the respondent is employed or not. The IV results are presented in Table 4. All models include the baseline controls for the ancestral and contemporary variables. As discussed in the Methods section, using plough suitability, or more precisely the suitability of plough-positive and plough-negative crops, as an instrument is dependent on the existence of a first-stage regression.

The main result of the first stage analysis is shown in column (1) of Panel (A). To ensure the robustness of my IV MLE regression, I run my model using different specifications including a baseline model without covariates, a Probit two-step estimation and a 2SLS regression. As the outputs are in line with the main results from the MLE estimates in column (1), I thus establish credibility of my model. In addition to the different model specifications, I use the Wald test to evaluate the strength of my instrument. The 2SLS regression shows that the Wald test's null hypothesis can be rejected as $p<0.00$, indicating a strong instrument.

The first stage regression, which estimates the relationship between the two plough suitability variables and plough usage shows significant results, with a coefficient of 0.117 at the 1 per cent significance level. Thus, individuals from ethnic groups that are located in areas where plough positive crops are suitable, are more likely to have used the plough. Ethnic groups that live in regions with suitable conditions for plough-negative crops are less likely to have practised shifting agriculture instead of the plough. Moreover, this formally shows a strong first-stage relationship, which was a requirement for the LATE assumption. The reduced form estimates in Panel (B) report a significant relationship between the presence of plough-positive crops and a decrease in the likelihood of female employment. All models show significant results that a plough-positive crop environment is negatively related to the respondent's employment status. Therefore, individuals from ethnic groups that have historically been located in environments where plough-positive crops have been suitable are less likely to be employed today. Whilst no significant correlation

was found between plough-negative crop scores and the respondent's employment status (p = .994), the coefficients indicate small positive associations.

Finally, Panel (C) reports the second stage estimates. The main IV Probit MLE are shown in column (1) confirming the Probit regression estimates shown in column (1) of Table 3. The consistency of the Probit regression and IV estimates make it improbable that the negative relationship between ancestral plough cultivation and employment status is due to omitted variables bias. Given the negative coefficient of -1.256 at the 1 per cent significance level, which equals the LATE (λ), I can confidently state that there is a causal relationship between ancestral plough usage and contemporary gender roles. As such, women from ethnic groups that have traditionally used the plough are less likely to be employed today. Similarly, women whose ancestors practised shifting agriculture are more likely to have a job today. The causal link between the ancestral agricultural practice and gender roles, which was first empirically studied by Alesina, Giuliano, and Nunn (2013) is thus confirmed within the regional context of Ethiopia.

Table 4) IV Estimates in a Bivariate Probit Regression

IV ESTIMATES OF GENDER ROLES IN BIVARIATE PROBIT MODEL USING PLOUGH SUITABILITY AS AN INSTRUMENT			
	(1) MLE Estimates	(2) Twostep Estimates	(3) 2SLS Estimates
Panel (A)	First stage estimates. Dependent variable: Plough Cultivation		
Plough-negative Crops	-0.046***	-0.046***	-0.035***
	(0.003)	(0.003)	(0.003)
Plough-positive Crops	0.117***	.116***	0.049***
	(0.005)	(0.004)	(0.004)
Panel (B)	Reduced Stage. Dependent variable: Respondent's Employment Status		
Plough-negative Crops	0.008	0.008	0.014
	(0.033)	(0.033)	(0.009)
Plough-positive Crops	-0.17**	-0.17**	-0.032*
	(0.079)	(0.079)	(0.018)
Panel (C)	Second Stage. Dependent variable: Respondent's Employment Status		
Traditional plough use	-1.256***	-1.259*	-0.586*
	(0.484)	(0.491)	(0.301)
Wald Test (p-value)	0.27	0.29	0.000
Ancestral Controls	Yes	Yes	Yes
Contemporary Controls	Yes	Yes	Yes
Observations	8,576	8,576	8,576

Note: Probit estimates are reported with robust standard errors in parentheses. The unit of observation is the individual, clustered on the ethnicity level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

7.2. Discussions

This study set out to explore the origin and persistence of gender roles in Ethiopia. The result section demonstrated that the underlying observations and hypotheses brought forth by Boserup (1970) and Alesina, Giuliano, and Nunn (2013) were generally consistent with my empirical evidence.

The first hypothesis dealt with the effect of agricultural cultivation methods on the labour specialisation between men and women. Following the observations of Boserup (1970), it was hypothesised that Ethiopian communities that use plough cultivation as their dominant agricultural method have strict gender roles in terms of division of labour, where men work in the fields and women are secluded in the domestic sphere. On the other hand, Ethiopian communities that use shifting cultivation as their dominant agricultural method have more gender-equal labour distributions, where women and men divide the agriculture tasks equally. The results in Table 2 showed that ethnic groups that use the plough are more likely to exhibit an unequal distribution of agricultural labour.

However, given that the ethnic groups studied in this sample often practise animal husbandry along with agriculture (plough, shifting or otherwise), a new pattern emerged. Women from ethnic groups that use the plough are more likely to participate in animal husbandry. Therefore, plough adoption did not result in the seclusion of women in the domestic sphere in Ethiopia, as initially assumed by Boserup (1970). Whilst a distinct division of labour along gender lines coincided with the adoption and usage of the plough, Boserup's observation was not fully confirmed in this sample. Nonetheless, the plough, whilst not excluding women from participating in animal husbandry, does have a clear negative relationship with the ancestral female participation and employment in agriculture.

In addition to the role of the plough, the investigation also yielded a noteworthy insight into the relationship between settlement patterns and gender roles. The findings suggest that communities that are settled, are more likely to have less female involvement in the fields, which is in line with the arguments presented by Hansen, Jensen and Skovsgaard (2015). As mentioned in the Previous

Research section, the authors argue that the type of agriculture practice was not the driving factor of gender roles but rather the duration of agricultural societies. Following their argument, ethnic groups with long histories of agriculture would have more unequal gender roles, regardless of soil texture or agricultural practice. Whilst there is no measurement of agricultural duration included in my analysis, we can observe a snapshot of the amount of nomadic versus settled ethnicities in the 19th century. My findings suggest that settlement patterns are also an important predictor of gender roles. This relationship can be argued to weaken my overall model, given that the settlement pattern predates plough adoption. Whilst this is true, we must keep in mind that shifting cultivation is more suitable for nomadic communities whereas plough cultivation is only possible in permanent settlements. Consequently, the collinearity between them could explain this relationship. Moreover, since the variable for settlement patterns used does not measure their duration, few inferences can be made. Regardless, future research on the relationship between settlement patterns and agricultural methods in Ethiopia is necessary.

The second hypothesis dealt with the persistence of gender roles over time. It was hypothesised that the previously studied gendered specialisation in labour fostered persistent gender roles. These gender roles are observed in various social norms and attitudes, even when the community develops out of agricultural dependence. I evaluate this hypothesis by regressing ancestral plough adoption with contemporary gender roles. As highlighted in the result section, the findings were not as clear-cut as assumed. Whilst a strong relationship between plough cultivation and employment status and type was established, no statistical evidence was found that the plough influences the respondent's skill level or education. Whilst all measurements of gender roles report the same direction of correlation, the dependent variables are highly contextual. Here, it is important to be mindful of the requirements for persistence.

As mentioned in the previous research section, the persistence of cultural values is dependent on a stable environment in which a transfer of cultural norms and structures is incentivised (Giuliano & Nunn, 2021). However, categorising Ethiopia as a stable environment may be misleading. Although the analysis showed convincing evidence of the persistence of gender norms across time, they must be treated with caution. The political turmoil and tensions among ethnicities, religions and cultures that have shaped Ethiopia's political landscape cannot be ignored. As mentioned in

the Ethiopian Context section, the country's civil instabilities have been severe, with violent disputes among political groups that resulted not only in displacement but also in the loss of life (Till, 2021). To make an argument for cultural persistence in an environment like Ethiopia is difficult. Nonetheless, I argue that the unstable environment can be counteracted by the high degree of cultural heterogeneity. As introduced previously, the study on cultural transmission by Bisin and Verdier (2000) suggested a strong persistence of cultural traits when the environment is ethnically and culturally diverse. According to Bisin and Verdier (2000), people in a heterogeneous social environment have a higher demand for cultural pluralism, which leads to a higher degree of persistence of ethnic and cultural traits. Since Ethiopia is a perfect example of a culturally heterogeneous social environment, I argue that the persistence of gender roles is possible even when the country is considered an unstable environment.

The third hypothesis turns to the causal link between plough usage and gender roles. Here it was hypothesised that the adoption of the plough is dependent on land suitability, which in turn causes persistent gender roles. The causal relationship was estimated using an IV and builds upon the first two Probit regressions. Having found sufficient support for the first two hypotheses, the third hypothesis allows me to answer my research question. This study set out to answer the following research question: "To what extent is there a causal relationship between ancestral agricultural practices and today's unequal gender roles in Ethiopia?". The combination of the findings presented and discussed above provides support for a causal relationship between plough usage and persistent unequal gender roles in Ethiopia. Thereby, I can partially confirm the observations by Boserup (1970) and the empirical analysis of Alesina, Giuliano, and Nunn (2013).

Despite the robust results, the relationship is not as clear-cut as previously assumed. Alesina, Giuliano, and Nunn (2013) explored this causal relationship in a global, cross-country context, for which I argued a regional analysis was necessary. As seen throughout the diverse measurements of gender roles, this study sheds light on the complexities when contextualising the long-term effects of plough usage on gender. Having used individual-level data, Ethiopia presented significant within-country variance that was not accounted for in the global cross-country study by Alesina, Giuliano, and Nunn (2013). Plough cultivation does not only affect labour force participation but also determines the type of employment. Thus, women whose cohorts have

traditionally practised shifting agriculture are not only more likely to be employed but are also more prone to work independently from their families. This is important because family businesses are often supervised by male family members and thus do not provide the economic autonomy needed to fully participate in economic life (OECD, 2019).

Therefore, a regional study, such as this one, provides important insights, which are difficult to be captured in cross-country studies. Gender roles are highly contextual structures that not only vary across countries but also across regions, districts, and ethnicities. This study has revealed some of those structures, which can be used to provide more efficient and better-targeted policy interventions. As Giuliano (2020, p. 958) states: "we cannot implement successful policies without a deeper understanding of where differences in gender norms come from and of the complex processes that brought us where we are today." As such, policies not only need to be gender-sensitive but also, as shown in this study, need to be mindful of the long-lasting cultural differences between the ethnicities. Thus, it is crucial for an accurate female representation and involvement of each ethnic group on all levels of decision-making processes. Eventually, this aims at closing the policy-intention gap and effectively helps to level the economic playfield. Of course, this will not be easy as Ethiopia has struggled historically to manage the diverse cultures within their borders (Marcus, 2002).

Whilst these results have shown to be overall robust, additional elements need to be considered. One limitation comes from the data used in this analysis, as it does not provide a holistic picture of Ethiopia's ethnographic diversity. As discussed in the Ethiopian Context section, the country hosts over 90 distinct ethnic groups, out of which only 22 are included in this study. Whilst all the largest ethnic groups are represented, it is important to point out that the sample of ethnicities is distinctively smaller than the actual population. As the scope of this paper did not allow for a more extensive data collection period, extending the sample in future research is recommended. Another source of uncertainty is the fact that this study only sampled the survey responses from women. The male DHS survey, given its less extensive variable collection, did not fulfil the data requirements necessary for this empirical analysis. This is a limitation because the male's perspective is entirely exempt. Perceived gender roles may vary significantly between men and women. Whilst, using a female-only sample still yielded robust results in this study, it should be

addressed in future research. Yet, given the extensive robustness checks and the general reliability of the data, the results remain meaningful and provide important insights.

8. Conclusion

The purpose of the current study was to explore the relationship between plough cultivation and gender roles. By investigating the historical, contemporary, and causal relationships between plough usage and the various measurements of gender roles, I identified three main findings.

First, ethnic groups in Ethiopia that have traditionally practised plough cultivation instead of shifting cultivation established labour divisions among gender lines. In Ethiopia, this meant that women were excluded from agricultural work and thus shifted to animal husbandry and domestic labour instead. However, this relationship is not clearly defined when considering pre-industrial settlement patterns. The debate whether the type of agriculture or its overall duration was the defining factor in creating gender roles remains ambiguous. Whilst more research on this topic is recommended, the findings remain robust to the variance in settlement patterns. Secondly, the ancestral division of labour has shown to be persistent over time, given that traditional plough use still predicts female labour force participation as well as the type of employment of Ethiopian women even two centuries later. Lastly, using the naturally occurring plough suitability variable as an instrument, the relationship between ancestral plough use and contemporary gender roles has been shown to be causal.

As such, the gender roles in Ethiopia have partially originated from the type of agricultural method practised by their ancestors over 200 years ago. These have persistently influenced the role of women. Whilst the study is robust, the generalisability of these findings is subject to certain considerations. Ethiopia houses over 90 distinct ethnic groups out of which only 22 were included. Moreover, I was not able to incorporate the male demographic health surveys in this study given the limited amount of data. Whilst the extent of this study utilised the available sources as efficiently as possible, future research would benefit from an extended sample, including additional ethnic groups and male survey responses.

The overall findings of this study complement and contribute to earlier works by Boserup (1970) and Alesina, Giuliano, and Nunn (2013). However, clear differences emerged as well. This investigation has shown that context matters. Having used individual-level DHS from across

Ethiopia, the results highlighted nuanced relationships that would have been overlooked in cross-country studies. Thus, adopting models from global analyses, such as the one from Alesina, Giuliano, and Nunn (2013) and contextualising them for individual regions can provide better insights and policy contributions. Thus, this study on Ethiopia should only be considered the beginning of a series of regional studies, linking contemporary gender structures to their historical origins.

My findings contribute to the strand of literature spearheaded by Giuliano (2017, 2020) who has continuously argued for policy assessments based on socio-cultural contexts. Economic policies and international interventions inspired by the Sustainable Development Goals, whilst admirable in theory, may not yield the desired results when applied to different regions and cultures. This is especially true for gender structures and roles, which have been shaped over centuries and originated in agricultural labour divisions. Such mechanisms in countries like Ethiopia where agriculture still employs over 65 per cent of workers require nuanced adoptions of such policies and interventions. The differences between Ethiopia's ethnic groups and their distinct cultural origins and development paths must be taken into consideration in order to create successful gender-sensitive policies. Now, the challenge is to adopt these findings and translate them into the necessary policies.

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10. Appendix A

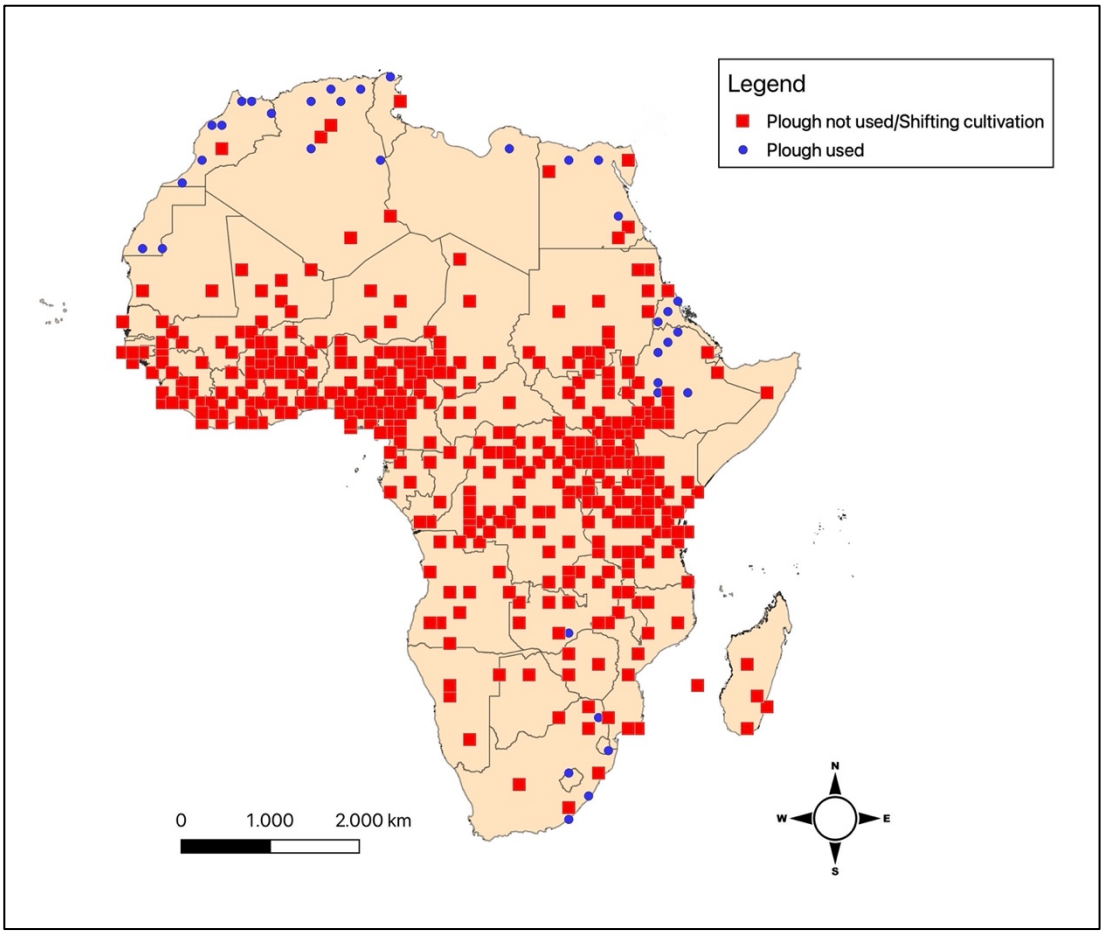

Figure 5) Map of Plough Usage in Africa Note: Author's elaboration based on Murdock et al. (1999)

Table 5) Matching DHS ethnicities to Ethnographic Atlas

DHS Ethnicity	Group name in Ethnographic Atlas	Matched	Methodology used to match
Amhara	Amhara	3688	Michalopoulos, Putterman & Weil (2014)
Oromo	Arusi	3611	Michalopoulos, Putterman & Weil (2014)
Tigrie	Tigrinya	1905	Michalopoulos, Putterman & Weil (2014)
Affar	Afar	947	Michalopoulos, Putterman & Weil (2014)
Somalie	Somali	1463	Direct Match
Guragie	Gurage	655	Michalopoulos, Putterman & Weil (2014)
Sidama	Sidamo	355	Michalopoulos, Putterman & Weil (2014)
Nuwer	Nuer	284	Michalopoulos, Putterman & Weil (2014)
Welaita	Male	322	Michalopoulos, Putterman & Weil (2014)
Kefficho	Kafa	209	Michalopoulos, Putterman & Weil (2014)
Gamo	Male	156	Michalopoulos, Putterman & Weil (2014)
Silte	Gurage	148	Michalopoulos, Putterman & Weil (2014)
Anyiwak	Anuak	252	Michalopoulos, Putterman & Weil (2014)
Kembata	Sidamo	126	Michalopoulos, Putterman & Weil (2014)
Gedeo	Darasa	119	Michalopoulos, Putterman & Weil (2014)
Agew-Awi	Amhara	62	Michalopoulos, Putterman & Weil (2014)
Dawuro	Male	54	Michalopoulos, Putterman & Weil (2014)
Debase/Gewada	Darasa	1	Michalopoulos, Putterman & Weil (2014)
Dizi	Shako	28	Michalopoulos, Putterman & Weil (2014)
Agew Hamyra	Amhara	8	Michalopoulos, Putterman & Weil (2014)
Alaba	Sidamo	1	Michalopoulos, Putterman & Weil (2014)
Goffa	Male	32	Michalopoulos, Putterman & Weil (2014)
Argoba	Amhara	11	Michalopoulos, Putterman & Weil (2014)
Ari	Bako	32	Michalopoulos, Putterman & Weil (2014)
Arborie	Gurage	1	Michalopoulos, Putterman & Weil (2014)
Basketo	Basketo	3	Michalopoulos, Putterman & Weil (2014)
Konta	Male	18	Michalopoulos, Putterman & Weil (2014)
Komo	Koma	11	Michalopoulos, Putterman & Weil (2014)
Konso	Konso	2	Michalopoulos, Putterman & Weil (2014)
Mao	Mao	10	Michalopoulos, Putterman & Weil (2014)
Me'enite	Bodi	1	Michalopoulos, Putterman & Weil (2014)
Shekecho	Kafa	7	Michalopoulos, Putterman & Weil (2014)
Sheko	Shako	62	Wikipedia as (Alesina, Brioschi & La Ferrara, 2016)
Burji	Burji	22	Direct Match
Bena	Banna	16	Michalopoulos, Putterman & Weil (2014)
Yem	Yem	24	Michalopoulos, Putterman & Weil (2014)
Total N matched	22 Ethnic Groups	14646 Individuals	

Table 6) Unmatched DHS Ethnicities

DHS Ethnicity	Unmatched
Berta	300
Gumuz	195
Hadiya	230
Derashe	31
Guagu	2
Harari	30
Koyego	1
Mejenger	36
Bench	53
Shinasha	69
Total N unmatched	947

Table 7) Variable Codes

Variable Name	Type	Coding
Ancestral Variables		
Female participation in animal husbandry Female participation in agriculture	Categorical	1 = Males only 2 = Both sexes participate, but men do more than women 3 = equal participation by both sexes but differentiation of specific tasks 4 = Equal participation
Plough cultivation	Dummy	0 = Absent 1 = Present
Dominant mode of subsistence	Categorical	4 = Pastoralism 6 = Extensive Agriculture 7 = Intensive Agriculture 8 = Two or more sources
Ancestral Polygyny	Dummy	0 = Absent 1 = Present
Type of Marriage Transaction	Categorical	1 = Bridewealth 3= Token Bridewealth 5= Woman exchange 6= Insignificant
Family Pattern	Categorical	2 = Independent Families 3 = Extended Families
Plough-negative crop environment	Categorical	1 = Not suitable 2 = Somewhat suitable 3 = Very suitable
Plough-positive crop environment	Categorical	1 = Not suitable 2 = Somewhat suitable 3 = Very suitable
Agricultural suitability	Numerical	N/A
Settlements	Categorical	1 = Fully migratory or nomadic bands 2 = Seminomadic communities 3 = Semisedentary communities 5 = Neighbourhoods of dispersed family homesteads

		6 = Separated hamlets where several such form a more or less permanent single community 7 = Compact and relatively permanent settlements
Contemporary Variables		
Employment Status (Respondent currently working)	Dummy	0 = No 1 = Yes
Skill Level of Job	Dummy	0 = skilled 1 = unskilled
Urban/rural	Dummy	1 = Urban 2 = Rural
Education in single years	Numeric	N/A
Education Level		0 = no education 1 = primary 2 = secondary 3 = higher
Religion	Categorical	1 = orthodox 2 = catholic 3 = protestant 4 = muslin 5 = traditional
Respondent works for family/self/other	Categorical	1 = for family member 2 = for someone else 3 = self-employed
Wealth	Categorical	1 = poorest 2 = poorer 3 = middle 4 = richer 5 = richest
Respondents' Age at 1st birth	Numeric	N/A
Respondent's Age	Numeric	N/A
Contemporary Polygyny	Dummy	0 = Absent 1 = Present
Partner's education	Categorical	0 = no education 1 = primary 2 = secondary 3 = higher
Husband's age	Numeric	N/A
Attitude towards wife beating	Dummy	0 = Wife beating never justified 1 = Wife beating can be justified

Table 8) Distributions of Categorical Variables per Ethnicity

Ethnic Group	Number of Individuals within group	Plough Cultivation	% of Respondents is currently working	% of respondents living urban residence	% of respondents that belief wife beatings can be justified	% of respondents ever attended school	Number of respondents in skilled employment of employment sample
Afar	947	No	12,99	93,77	76,77	19,01	803
Amhara	3769	Yes	41,52	52,88	48,93	63,81	1435
Anuak	252	No	30,95	58,33	66,27	83,73	161
Arusi	3611	Yes	38,00	64,75	57,85	56,05	1881
Bako	32	No	21,88	100,00	93,75	28,13	25
Banna	16	No	18,75	100,00	75,00	6,25	12
Basketo	3	No	66,67	100,00	66,67	0,00	1
Bodi	1	No	0,00	100,00	0,00	0,00	1
Burji	22	No	59,09	100,00	63,64	63,64	8
Darasa	120	No	53,78	79,83	60,83	38,66	41
Gurage	804	No	46,33	23,91	35,82	74,10	382
Kafa	216	Yes	32,87	80,09	66,67	55,56	118
Koma	11	No	100,00	100,00	72,73	9,09	0
Konso	2	Yes	50,00	100,00	100,00	100,00	1
Male	582	No	37,29	79,04	62,20	65,29	332
Mao	10	No	70,00	90,00	40,00	30,00	3
Nuer	284	No	35,21	81,69	61,27	53,87	168
Shako	90	No	42,22	77,78	76,67	54,44	43
Sidamo	482	No	36,31	87,76	63,49	64,11	283
Somali	1463	No	17,98	71,09	47,57	28,30	1131
Tigre	1905	Yes	39,32	66,40	61,05	61,84	739
Yem	24	Yes	50,00	83,33	45,83	79,17	10
Total	14646		35,80	64,41	55,89	55,40	7578

Table 8) Distributions of Categorical Variables per Ethnicity (continued)

Ethnic Group	Number of respondents that are Orthodox	Number of respondents that are Catholic	Number of respondents that are Protestant	Number of respondents that are Muslim	Number of respondents that practised Traditional religion	Wealth Index: Poorest	Wealth Index: Middle	Wealth Index: Richest
Afar	2	3	3	939	0	849	10	54
Amhara	2988	10	123	639	3	337	525	1892
Anuak	4	9	230	1	6	126	10	63
Arusi	872	21	598	2094	19	496	526	1438
Bako	0	0	29	0	0	4	13	1
Banna	0	0	2	0	1	3	0	0
Basketo	0	0	3	0	0	0	1	0
Bodi	0	0	1	0	0	0	1	0
Burji	18	0	3	1	0	2	1	2
Darasa	3	1	113	0	0	23	18	30
Gurage	317	1	46	436	0	15	57	626
Kafa	87	11	91	26	0	24	54	48
Koma	0	0	0	11	0	7	2	0
Konso	2	0	0	0	0	0	0	0
Male	117	5	447	10	0	58	110	184
Mao	1	0	0	9	0	5	1	1
Nuer	3	9	247	4	8	217	11	26
Shako	25	0	57	1	5	15	18	9
Sidamo	9	9	425	33	0	101	111	89
Somali	1	0	2	1457	2	855	88	320
Tigre	1786	3	17	98	1	441	254	729
Yem	20	0	3	1	0	0	3	9
Total	6255	82	2440	5760	45	3578	1814	5521

Table 8) Distributions of Categorical Variables per Ethnicity (continued)

Ethnic Group	Ancestral Settlement Patterns	Ancestral Polygyny	Type of Marriage Transactions	Female participation in agriculture	Female participation in animal husbandry	Dominant mode of subsistence
Afar	Seminomadic	Absent	Bridewealth	-	Code: 3	Pastoralism
Amhara	Separated hamlets	Absent	Marriage Transactions Insignificant	Code: 2	Code: 3	Intensive Agriculture
Anuak	Compact/ permanent	Present	Bridewealth	Equal	-	Intensive Agriculture
Arusi	Semisedentary	Present	Bridewealth	Code: 2	Code: 3	Pastoralism
Bako	Dispersed homesteads	Present	Bridewealth	Equal	Males only	Intensive Agriculture
Banna	Separated hamlets	Absent	Bridewealth	Code: 3	Males only	Pastoralism
Basketo	Dispersed homesteads	Present	Bridewealth	Code: 2	Males only	Intensive Agriculture
Bodi	Separated hamlets	Absent	Bridewealth	Code: 3	Code: 3	Pastoralism
Burji	-	-	Bridewealth	Males only	Code: 3	-
Darasa	Dispersed homesteads	Present	Token Bridewealth	Equal	Code: 3	Intensive Agriculture
Gurage	Compact/perma nent	Absent	Bridewealth	Code: 2	-	Intensive Agriculture
Kafa	Dispersed homesteads	Present	Bridewealth	-	Code: 2	Intensive Agriculture
Koma	Compact/perma nent	Present	Woman exchange	Equal	-	Extensive Agriculture
Konso	Compact/perma nent	Absent	Marriage Transactions Insignificant	Equal	Code: 3	Intensive Agriculture
Male	Dispersed homesteads	Present	Bridewealth	Equal	Males only	Two or more sources
Mao	Compact/perma nent	Present	Woman exchange	-	-	Extensive Agriculture
Nuer	Seminomadic	Absent	Bridewealth	Equal	Code: 2	Pastoralism
Shako	Separated hamlets	Present	Bridewealth	Code: 3	Males only	Intensive Agriculture
Sidamo	Dispersed homesteads	Present	Bridewealth	Equal	Code: 3	Intensive Agriculture
Somali	Fully migratory/ nomadic	Absent	Bridewealth	-	Code: 3	Pastoralism
Tigre	Seminomadic	Present	Bridewealth	-	-	Pastoralism
Yem	Dispersed homesteads	Present	Bridewealth	Code: 2	-	Intensive Agriculture

Note: Variable Code 2 refers to "Both sexes participate, but men do more than women" and Code 3 to "equal participation by both sexes but differentiation of specific tasks" (see Table 7)

11. Appendix B

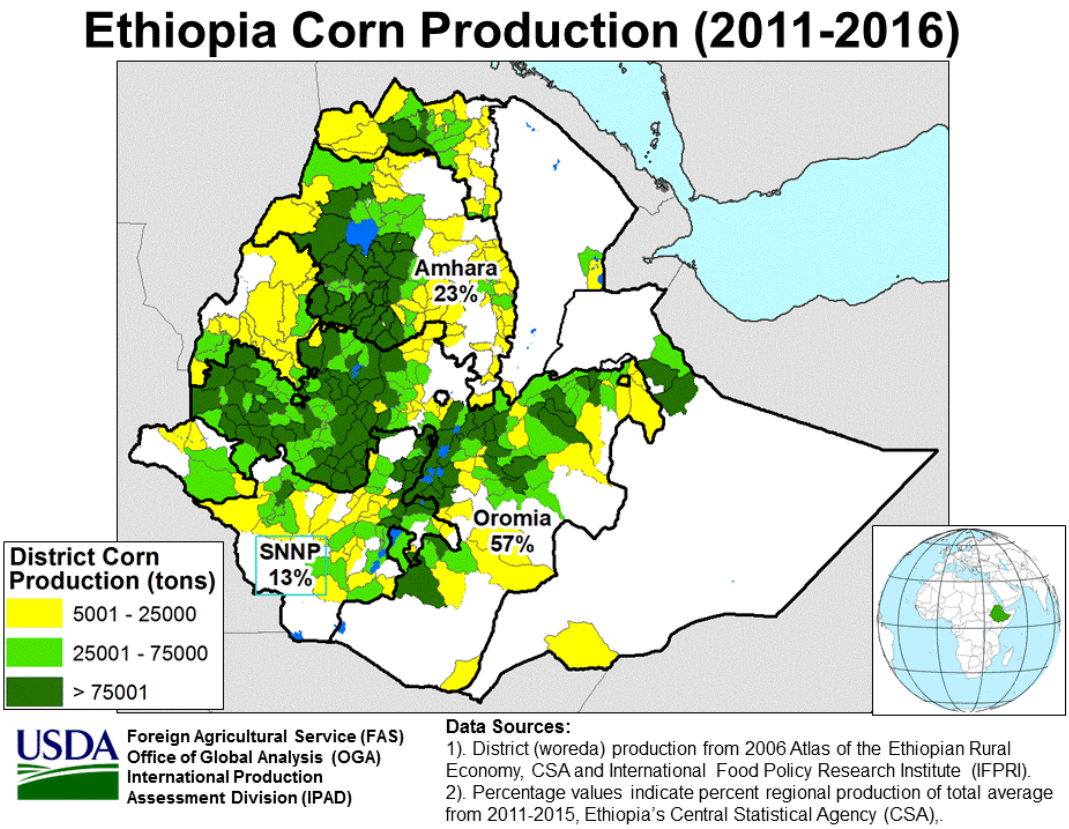

Figure 6) Ethiopia's Corn Production Map (Source: FAS, 2022)

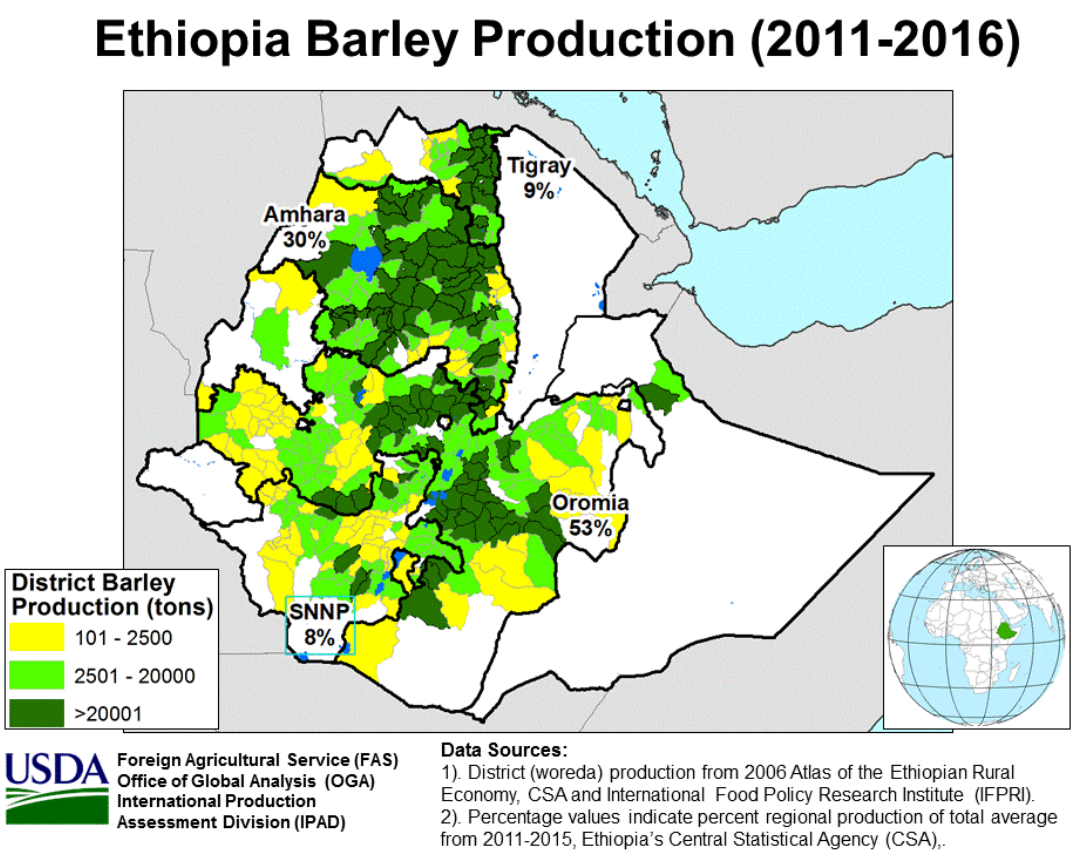

Figure 7) Ethiopia's Barley Production Map (Source FAS, 2022)

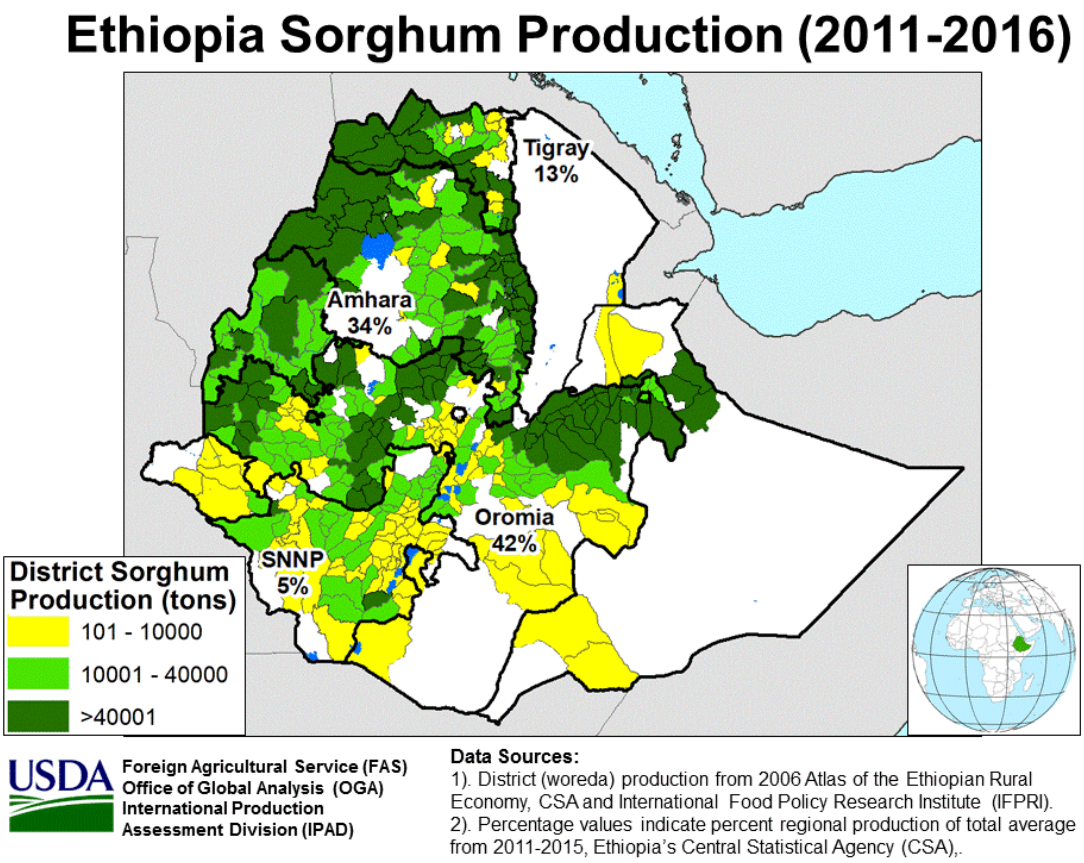

Figure 8) Ethiopia's Sorghum Production Map (Source FAS, 2022)

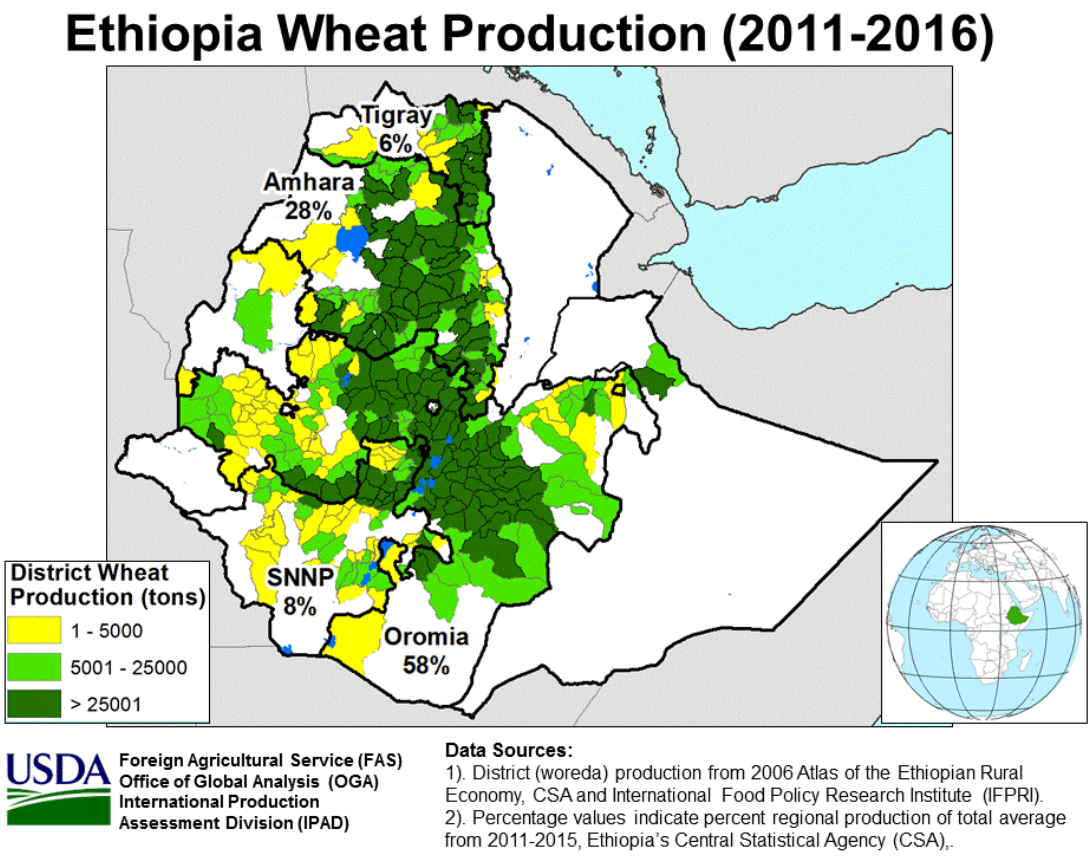

Figure 9) Ethiopia's Wheat Production Map (Source FAS, 2022)