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Ectogenesis, the Value of Pregnancy, and Gender Inequality

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Declaration

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the preface and specified in the text. It is not substantially the same as any work that has already been submitted, or is being concurrently submitted, for any degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the preface and specified in the text. It does not exceed the prescribed word limit for the relevant Degree Committee.

Abstract

Human ectogenesis refers to the complete gestation of human offspring from conception to babyhood within an artificial womb. This thesis defends ectogenesis as a morally justifiable part of comprehensive strategies to better address gender inequality.

This thesis first examines three types of concerns raised by critics regarding the value of pregnancy. The first concern is that the defence of ectogenesis pathologises pregnancy. I situate pregnancy within prominent accounts of pathology, showing that it is not misleading to conceptualise pregnancy as pathological, and I justify a narrative that highlights its pathological aspects within a pro-natalist era. The second concern is that ectogenesis might pressure those who prefer natural pregnancy into adopting it against their wishes, thereby infringing upon their reproductive autonomy. I address this concern through liberal and adaptive preference frameworks, arguing that the potential for these pressures does not undermine the legitimacy of ectogenesis, and that many women's preferences for natural gestation are likely shaped by structural injustices. The third concern is that ectogenesis might negatively affect mother–child bonding. I challenge this with empirical evidence and insights from evolutionary perspectives, advocating for openness to changing forms of parental bonding.

I then challenge the assumptions about the strong link between the roots of gender inequality and the moral desirability of ectogenesis. I point out that whether attributing gender inequality to gestational differences between the sexes or to societal constructs, both imply improper interactions between social and biological factors; each can provide an initial rather than a conclusive defence of ectogenesis. Finally, I support ectogenesis as a means to enhance opportunities for addressing gender disparities in reproductive health, labour division, gender norms, and parenting. I argue that incorporating ectogenesis into strategies offers better chances for achieving gender equality than measures suggested by critics.

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CHAPTER ONE

Introduction

In the 2024 film *The Pod Generation*, a heterosexual couple anxiously awaits the birth of their baby from an egg-shaped machine. The woman struggles with guilt and anxiety, feeling that she has relinquished her maternal role in the pregnancy process. Her unease deepens as she watches her husband develop a closer bond with the pod. Meanwhile, a group of so-called radical feminists protest, holding banners that read, "Leave my womb alone." These scenes seem to capture today's common concerns about artificial wombs in the future: while this new mode of human gestation may sound fancy, it still replicates existing societal norms, and the prospect of women no longer being needed for gestational labour provokes anxiety in some.

Some contemporary feminist writers worry that artificial womb technologies could reinforce the status quo—a gendered world dominated by heterosexual dynamics, where pregnancy is viewed as an inherent responsibility of women[1] and maternal bonding is assumed to be more intimate than other forms of parental bonding. In other words, they emphasise that while the content may change, the form remains the same. Additionally, in line with the protests depicted in the film, some feminist voices argue that the womb has historically been a source of female identity and empowerment, and that artificial wombs threaten to strip women of both.

This thesis resists such pessimistic assumptions about artificial womb technology and defends it as an important societal effort and opportunity to promote gender equality. This thesis conceptualises this technology as "ectogenesis," which will be explained shortly. The focus is first on addressing significant concerns about what women might "lose" with the widespread adoption of ectogenesis (Chapters 2-5). These concerns include: (1) that ectogenesis might pathologise pregnancy, degrading its value; (2) that ectogenesis might lead to new social norms that coerce women preferring pregnancy into using ectogenesis; (3) that ectogenesis might disrupt mother-child bonding. At the heart of these concerns is the value of pregnancy. To address the first concern, this thesis examines pregnancy within prominent accounts of pathology, arguing that there are valid reasons to consider common conditions of pregnancy as pathological—not only because dominant accounts of pathology support this view but also due

[1] In this thesis, although I use the terms "men" and "women," I am not overlooking the situation of gender minorities, such as transwomen and transmen. The usage of these terms primarily serves to highlight how "men" and "women" are perceived as bio-social groups within gender norms, regardless of their personal gender identities.

to the social significance of emphasising pathological aspects of pregnancy. Therefore, even if ectogenesis pathologises pregnancy to some extent, this should not discredit its ethical desirability. Regarding concerns of social coercion, this thesis contends that the supposed infringement on the reproductive autonomy of women who prefer pregnancy seems invalid within a liberal framework. More importantly, women's long-standing embrace of harmful pregnancy conditions may be a result of internalised gender oppression. Regarding bonding issues, this thesis, through interdisciplinary evidence, argues that claims that ectogenesis diminishes mother-child bonding appear arbitrary and suggest openness to a future different but not inferior form of parental bonding.

This thesis then moves on to defend ectogenesis as a significant part of strategies to address gender inequality (Chapters 6-7). It argues that attributing gender inequality to gestational differences between the sexes or to societal constructs both indicate improper interactions between social and biological factors. Each perspective provides an initial, rather than conclusive, defence of ectogenesis. The more morally sound ground for defending ectogenesis is that it has the potential to provide better opportunities to address gender disparities in reproductive health, labour division, gender norms, and parenting than the existing strategies.

This endeavour is inevitably speculative in nature, as is the existing body of literature on the subject. However, this does not mean that relevant reasoning will necessarily lack substance. My approach is built on certain assumptions: the artificial womb technology being defended in this thesis is a safer alternative to physical pregnancy for babies, and it is optional. This thesis explores the potential impact of this alternative form of human gestation on women. The task is arduous because the issues surrounding pregnancy and women's social roles are deeply complex and fraught with cultural taboos, sensitivities, and significant disagreements. It requires engaging with a mass of entrenched feelings.

In this chapter, I introduce the concept of ectogenesis, discussing the progress and barriers of relevant developments, the reasons to talk about it now, the existing feminist debate, the trajectory of this thesis, and the premises of the stance taken in this thesis.

1. Conceptualising Ectogenesis

The fantasy of artificial wombs is not limited to modern science fiction. For centuries, people have imagined creating human beings outside of a woman's body, as seen in religious and mythological stories across various cultures. For example, in the Biblical story, God formed

Adam and Eve from the dust of the ground, while in Chinese mythology, Nüwa, the mother goddess, created human beings from clay.

In academia, scholars often use the term "ectogenesis," coined by British geneticist J.B.S. Haldane in 1923, to refer to not-yet-realised artificial womb technology.

In his speech paper *Daedalus, or Science and the Future*, which takes the form of a prophecy, Haldane predicted human ectogenesis as follows:

> we can take an ovary from a woman and keep it growing in a suitable fluid for as long as twenty years, producing a fresh ovum each month, of which 90 percent can be fertilized, and the embryos grown successfully for nine months, and then brought out into the air (Haldane 1923, 16).

The concept of "taking an ovary from a woman" and keeping it "alive" was pure imagination at the time. Yet it more closely aligns with current developments in the *extracorporeally perfused human uterus*. This approach involves surgical and biomedical engineering to maintain the viability of a uterus removed from a donor, such as using an externally simulated blood circulation system to deliver nutrients and oxygen. Human embryos were first implanted into an extracorporeally perfused human uterus with an oxygenated medium in 1988 (Bulletti et al. 1988). Some predict that this technology might eventually support full gestation using external vascular connections (Bulletti et al. 2023).

Another attempt that may contribute to fully extracorporeal human gestation is the *artificial endometrium.* This involves growing endometrial cells on a 3D scaffold that mimics the natural structure of the uterus (Campo, Cervelló, and Simón 2017). One intended goal of Uterine Tissue Engineering is to replace live donor uterus transplantation, which often involves immunosuppression and various severe side effects (Hellström, Bandstein, and Brännström 2017). Despite the authors emphasising its use in reproductive medicine (Campo, Cervelló, and Simón 2017), further development of bioengineered uteri for extracorporeal human gestation remains possible (Segers 2021).

However, so far, the most promising technology that aligns with public perceptions and science fiction movies appears to be *artificial placentas*. The most recent breakthrough in this technology is the sensational "*biobag*". Developed in 2017 at the Centre for Foetal Research at Children's Hospital in Philadelphia, Biobag is an experimental system that incorporates a pumpless oxygenator circuit connected to the foetus of a lamb via an umbilical cord interface.

This system is maintained within a closed "amniotic fluid" circuit that closely reproduces the environment of the natural womb. It allows foetal lambs, which are developmentally equivalent to extremely premature human babies, to be physiologically supported in this extra-uterine device for up to four weeks (Partridge et al. 2017). This development shows potential for maintaining the extracorporeal development of human foetuses during mid to late gestation and presents a highly physical and mechanised path for the artificial uterus.

Imagining and reasoning about potential paths for the realisation of artificial wombs has influenced their nomenclature in current academic discussions. Philosopher Timothy Murphy (2012, 79) favours the term "extracorporeal gestation" (ExCG) for its flexibility, as it does not specify a mechanism and can refer to gestation in a mechanically operated tank, a uterus grown from human cell lines, an explanted human uterus, or a nonhuman uterus—any method by which a child is gestated outside the human body.

Using a non-human uterus, or what is known as interspecific pregnancy, involves a conceptus and a female carrier of different species (Wang et al. 2001). Strictly speaking, this is not an artificial environment and still occurs within the uterus; and it inherently involves many additional ethical issues such as those about animal rights. This thesis does not adopt the term ExCG, as it does not aim to discuss the ethics of using animal uteri. Instead, the focus is on the complete process from conception to "birth" within an artificial environment.

The reports on the "biobag" have further ignited debates over terminology. Some authors contend that although the technology aims to address the mortality and morbidity of premature infants, it is not merely an extension of traditional neonatal intensive care units (NICU) but represents an entirely novel approach—a type of ectogestative technology (Romanis 2018; Kingma and Finn 2020). It mimics the uterine environment, substituting for the placenta and amniotic sac, but does not replacing the uterus itself. Therefore, Elselijn Kingma and Suki Finn (2020) propose that a more fitting label for this technology would be Artificial Amnion and Placenta Technology (AAPT). They distinguish between neonatal incubation, which relies on the neonate's physiological blueprint allowing near independence from the maternal system, and artificial gestation, which depends on a foetal blueprint fully integrated with the maternal physiology. Thus, they suggest:

> Let *ectogenesis* be a general term for mammalian development outside the maternal body, where this normally occurs within it. Thus, both IVF and the neonatal incubation of premature infants involve (partial) ectogenesis. Let *ecogestation* be the term for what

people usually think of as "genuine" artificial gestation, whether full or partial (Kingma and Finn 2020, 356).

For the purpose of this thesis, I will not delve into metaphysical discussions, and will use the term "ectogenesis" to represent the complete artificial womb system for several considerations. Firstly, I consider ectogenesis to be a complete process of human offspring being bred in an artificial environment, which includes everything from *conception* to *babyhood*. As Elizabeth Chloe Romanis (2022; 2024) points out, both conception and gestation are necessary stages in the process of assisted procreation, but they are wholly distinct processes—there can be no gestation without conception, and without gestation, a conceptus fails to become fully formed. Therefore, this complete system should include conception processes like fertilisation and embryo formation in a laboratory setting, not just the gestational process. In simple terms, it encompasses a period of external creation and external gestation. Since "ectogestation" seemingly excludes the conception phase, it is not suitable for the completeness of the artificial womb system as targeted in this thesis.

Secondly, adopting the general term "ectogenesis" allows for greater *inclusivity* of potential pathways. At present, there is no definitive conclusion about which specific approach will lead to the envisioned complete artificial gestation of human beings. Here, my focus is solely on the outcome—the entire process of human procreation occurring in an artificial environment—regardless of the specific technologies that enable it. Although the Biobag appears to be the most promising path toward achieving this goal so far, as Phillip S. Wozniak (2022) points out, the functions and processes of a natural womb and placenta that the Biobag cannot replicate are legion—such as uterine contractions, thermoregulation, and the transfer of maternal antibodies. Complete artificial gestation of human beings may be primarily achieved through the continued development of Biobag, or it could result from the convergence of multiple approaches. For instance, artificial endometrial tissue might provide a cellular support structure closer to natural conditions, while a physical artificial uterus could offer the necessary mechanical support and environmental control.

Notably, early embryo development in a laboratory setting will likely need to be integrated into this process. This also implies a potential shift: the IVF techniques currently used for implanting embryos into a human uterus may differ significantly from future IVF methods designed for transferring embryos into an artificial gestational device. It is possible that future

cultured embryos and their continued development will take place entirely within the same artificial environment.

In any case, "ectogenesis", which inherently includes IVF-like technologies, is better suited to describe a complete artificial procreation system. In addition, a practical possibility cannot be entirely ruled out: future advancements in neonatal incubation technologies may assist or even become an integral component of the artificial womb system.

Finally, I consider some conventions currently in use. Before the introduction of the term "ecogestation," "ectogenesis" was the most used term to refer to the imagined complete process of human procreation in an artificial environment, including in most of the sources cited in this thesis. After Kingma and Finn (2020) introduced the distinction, "ecogestation" has been more frequently used to refer to technology enabling foetal transfer to an artificial womb, particularly in discussions related to abortion (e.g. Stratman 2020; Räsänen 2023; Cordeiro 2024). Meanwhile, "ectogenesis" continues to be more commonly used to describe the entire process of human procreation occurring in an artificial womb (e.g., Kennedy 2024; Ward 2024).

In general, this thesis adopts the term "ectogenesis" to refer to any technology-driven, fully external procreation of human offspring in an artificial environment, emphasising the completeness of such an artificial system, its openness to future possibilities, and the established conventions in its terminology.

2. Progress and Barriers

From a results-oriented perspective, the successful availability of ectogenesis would mean realising the entire process—from conception to babyhood—within an artificial environment and achieving an acceptable level of infant health, regardless of the specific pathway taken.

The extracorporeally perfused human uterus and artificial endometrium mentioned previously have so far shown progress only in early human embryo cultivation—the conception side. As shown earlier, these two categories of technologies have made very limited progress in recent years in cultivating human embryos.

More established and influential advancements have been made in the culture of human embryos in petri dishes. Louise Brown, the first test-tube baby, born in 1978, marked a landmark moment in the history of in vitro fertilisation (Eskew and Jungheim 2017). If life is assumed to begin at conception, then human life has been capable of starting in a laboratory since 1978. Subsequent research has focused on extending the survival of embryos outside the

human body. In 2016, two research groups reported successful in vitro human embryo growth up to 13 days, just before gastrulation (Deglincerti et al. 2016; Shahbazi et al. 2016).

Additionally, embryoid experiments using human embryonic stem cells (hESCs) have been conducted to study gastrulation (Williams and Johnson 2020). In 2023, scientists created complete human embryo-like models from naïve stem cells, replicating key post-implantation development up to day 14 (Oldak et al. 2023). A central goal of this research is to bypass legal restrictions—particularly the UK's 14-day rule, introduced in the Warnock Report (1984) and later codified in the Human Fertilisation and Embryology Acts of 1990 and 2008, which prohibit culturing human embryos beyond 14 days (Williams and Johnson 2020). Since this rule also limits progress toward ectogenesis, embryoid models that avoid it may bring that possibility closer.

Near the *infancy* stage, the Biobag marks a notable breakthrough. It has gained widespread media attention and is often described as an artificial womb for its ability to closely replicate the uterine environment. Unlike earlier artificial placenta models that used pumps, the Biobag lets the fetus control its own circulation, better mimicking natural conditions (Hornick et al. 2018). This may reduce respiratory failure—a major cause of death before 26 weeks—by avoiding lung-damaging ventilators through gentler, womb-like support (Romanis 2018). Since 2017, the Biobag team has advanced their research using size-matched foetal lambs, non-invasive imaging, and erythropoietin therapy for anaemia (Larson et al. 2022). Moreover, research teams in the USA and Canada have tested their systems on foetal pigs, whose anatomy and size more closely resemble human foetuses, offering better translational relevance than lambs (Abrao Trad et al. 2023; Charest-Pekeski et al. 2021). In October 2019, a project led by Guid Oei at Eindhoven University of Technology received funding to advance a prototype artificial womb based on the Biobag research, anticipated to be ready for human trials in five years (Davis 2019).

These developments suggest that, with continued success, extremely premature or any stages of human foetuses might eventually be able to grow inside such systems, akin to development in a human uterus.

But how far are we from this scenario in a more specific sense? It is hard to say. Achieving human ectogenesis will require finding alternatives for a series of biochemical processes carried out by the woman's body during pregnancy, including egg maturation, fertilisation, implantation, embryo extraction, and the transport of blood, nutrients, and oxygen to the

embryo (Murphy 1989). The most successful results so far have been in animal studies, particularly with sheep. However, differences in lung and brain development mean these results may not translate directly to humans. Research on non-human primates raises significant ethical concerns due to animal rights issues (Segers 2021). Human embryo and foetal research also face strict legal and ethical limits. Some propose focusing on cases involving extremely premature infants with low survival chances, or on aborted foetuses (Alghrani and Brazier 2011). Yet this raises ethical questions, especially about whether survival with the risk of severe disability truly serves the future child's best interests (Segers 2021).

3. Why Are We Talking About It Now?

Due to technological, legal, and ethical restrictions, some authors argue that ectogenesis remains a remote possibility—even "a technically and developmentally naive, yet sensationally speculative, pipe dream" (De Bie, Flake, and Feudtner 2023, 558)—and that discussing it may divert attention from the ethical work needed to evaluate much more likely scenarios (Romanis and Horn 2020; De Bie, Flake, and Feudtner 2023).

However, as a potential development that could fundamentally alter human gestation, it is undoubtedly a topic worth discussing.

One practical reason for this discussion is that, as the advancements mentioned earlier demonstrate, ectogenesis no longer seems too distant to warrant neglect—it may emerge unexpectedly. This is not an alarmist statement; the case of Dolly the cloned sheep serves as an example. When cloning became a reality, most people believed the technology was still in its early stages, and there was no legal framework prepared for its arrival (Gelfand 2006). Although ectogenesis remains hypothetical, it is prudent to proactively consider its ethical implications rather than adopt a reactive regulatory approach (Hammond-Browning 2018). Thus, discussing its ethical implications now can help ensure that society is ready for its possible accidental emergence.

Another important reason concerns the real-world significance of debating the ethics of ectogenesis. As Seppe Segers and Dorian Accoe (2023) point out, ethical concerns about the immediate realities are not contradicted by concerns about seemingly distant scenarios, as the latter may, in fact, illuminate deeper ethical issues related to pregnancy, abortion rights, and medical or parental responsibilities—issues that are already highly relevant today.

As a form of human gestation that bypasses physical pregnancy, ectogenesis can raise profound questions about the meaning of pregnancy, the roles of women, the implications for children, and its broader societal impact. Engaging in this discussion can provide valuable guidance for future policies and directions related to pregnancy and maternal support—even if ectogenesis never becomes a reality or remains far off.

If it prompts society to seriously consider and acknowledge the risks and burdens of pregnancy for women, it could lead to greater efforts to reduce those burdens as a priority in medical and technological advancement. Thus, even as a thought experiment, ectogenesis can offer meaningful insights and guidance for improving women's well-being.

However, if there are compelling reasons to believe that this is a technology worth developing—and if the slow progress in this field is due to a failure to recognise those reasons—then as long as there is no fundamental logical impossibility in achieving it, there is no strong justification for ectogenesis to remain merely a theoretical concept. Instead, it should be regarded as a concrete technological goal for humanity's future. Especially considering that the remoteness of ectogenesis may, in fact, be a consequence of society's long-standing focus on pregnancy-enabling medicine and technology, while it neglects the development of alternatives to pregnancy that align with women's interests (Bidoli 2025). In this light, the development of ectogenesis can be seen as a corrective effort grounded in social justice.

If ethical discussions present sufficient moral reasons for its development, then the importance of such discussions lies in addressing its legal restrictions and advocating for increased investment in its research. Consequently, this could accelerate the resolution of its technological limitations and bring ectogenesis closer to reality. Therefore, for the purposes of this thesis, ectogenesis is approached as a technically possible method of human gestation.

4. **Existing Feminist Debate**

There are many angles from which to debate the ethics of ectogenesis, including its potential impact on abortion rights, gender equality, future parental rights, eugenic concerns, experimental ethics, and the metaphysical distinction between an entity in an artificial womb and a foetus, among others. Ectogenesis has been a topic of feminist discussion for decades since the 1970s, with debates primarily focusing on its emancipatory potential and its implications for abortion rights (Tong 2004; Segers 2021). This thesis contributes to the existing literature on the former—the emancipatory potential of ectogenesis.

Yet, a single thesis cannot comprehensively cover all issues around gender inequality. Therefore, it concentrates on the most prominent and significant concerns within the existing debate. Also, this thesis aims to provide strong reasons to defend ectogenesis from a perspective of gender equality rather than attempting to present an ethical conclusion on whether ectogenesis should be developed. Much interdisciplinary work remains to be done—encompassing the social sciences, natural sciences, and philosophy—to form a more realistic assessment. Overall, this thesis examines ectogenesis's potential to promote gender equality.

Feminist authors hold differing positions in this regard, largely due to two key factors: their understanding of the root causes of gender inequality and the value of pregnancy, and, correspondingly, their stance on how to address gender inequality.

Nevertheless, it is important to note that, despite these differences, they share a fundamental commonality: they are all motivated by a concern for what is perceived to be the true interests of women.

Feminist ethicists hold divergent views on *the root causes* of gender inequality and oppression, which significantly shape their perspectives on whether ectogenesis has crucial emancipatory potential. Following Simone de Beauvoir's argument (2010) that women are slaves of the human species, one of the most important proponents of ectogenesis, Shulamith Firestone, asserts in *The Dialectic of Sex* that pregnancy is inherently oppressive and physically debilitating. She argues that women cannot be truly free until they were liberated from the "tyranny of reproduction," advocating for "artificial reproduction" as a means to achieve this goal (Firestone 1970, 175–190). Although Firestone acknowledges that this kind of technology needs to be controlled by women and accompanied by broader revolutionary changes to fulfil its supposed emancipatory effects, her framing of pregnancy as the root cause of gender oppression has often served as a basis or starting point for other proponents of ectogenesis.

For example, Tuija Takala (2009, 187) begins her defence of ectogenesis by stating, "I am in agreement with her [Firestone] that the reason for the continuing lack of equality between the sexes boils down to the fact that women (and only women) are expected to bear and rear children… My claim is that women, collectively and individually, should welcome the possibility of nurturing the embryo and foetus outside the womb for the length of the entire gestation period." Similarly, Evie Kendal (2015, 49) agrees with Firestone and states that "when added to the unequal distribution of the physical, social, and financial burdens

associated with pregnancy and childbirth, the claim that reproductive difference constitutes a fundamental inequality between the sexes becomes especially convincing."

Emphasising the view that gender oppression is deeply rooted in biology, Kathryn MacKay (2020) contends that ending women's oppression requires severing the link between the identity category "woman" and female biology, positioning ectogenesis as a potential means to achieve this goal. While Anna Smajdor (2007; 2012) primarily defends ectogenesis on the grounds of redistributing reproductive burdens and promoting health equality between the sexes, she also implies that the unequal distribution of gestational harm and risk is inseparable from broader gender inequality. Thus, her arguments can also be interpreted as supporting ectogenesis as a crucial step toward gender equality.

Echoing Simone de Beauvoir's assertion that artificial reproduction could free women from their evolutionary servitude (2010, 143), Vera Tripodi (2022) defends ectogenesis as a moral option for all women, regardless of their fertility status, and as a tool for partially ending the unequal division of reproductive labour. Andrea Bidoli (2025) does not focus directly on Firestone's claim but highlights how pregnancy functions as a tool that relegates women to reproductive roles and marginalises those who reject them. From this perspective, ectogenesis, as a gestational choice, has the potential to challenge existing gender norms by removing the instrumental role pregnancy plays in gender oppression.

Other scholars highlight different aspects of ectogenesis in addressing specific gender issues. For instance, some argue that ensuring equitable access to ectogenesis is a matter of reproductive justice, as it can provide a viable pathway to parenthood for sexual and gender minorities (Kimberly, Sutter, and Quinn 2019). Additionally, Susan Kennedy (2020) contends that the widespread availability of ectogenesis could ensure that most gestational mothers are "willing" mothers, as it has the potential to enable women to more autonomously decide whether to undergo pregnancy.

Interestingly, some feminist writers from Firestone's era, despite similarly focusing on gestational differences between the sexes, were among the most vocal opponents of assisted reproductive technologies and ectogenesis. For example, according to Mary O'Brien (1981), gender oppression originates from men's jealousy of and desire to control women's procreative powers. Specifically, O'Brien argues that traditionally, a woman's "reproductive consciousness" was continuous—she experienced procreation as an uninterrupted process occurring within her body. In contrast, men perceived the same process as discontinuous,

ending with the act of sexual intercourse and continuing outside their bodies. Consequently, a child was "flesh of her flesh"—women could be certain of their maternity automatically, whereas men could not be certain of their paternity. In O'Brien's estimation, men's "alienated" reproductive consciousness—their perception that they have little control over whether human life continues and, in particular, whether their own genetic legacy endures—helps explain why men have historically sought to control women's reproductive power through means such as violence and the institution of marriage.

Holding a similar perspective, other feminist scholars such as Adrienne Rich (1977), Robyn Rowland (1987), and Gena Corea (1988) view assisted reproductive technologies, including ectogenesis, as an extension of male control over female pregnancy. Some even argue that ectogenesis could ultimately lead to the elimination of women (Corea 1988; Rowland 1987). That said, these thinkers contend that women's subordination to men stems not from their biological bodies per se, but rather from men's jealousy of women's reproductive capabilities and their subsequent desire to seize control of female biology through scientific and technological means. Based on this causal explanation, they position women's procreative capacity as a source of strength and advocated using it as a weapon to resist oppression. From this perspective, ectogenesis threatens to erase women's unique role as providers of gestational labour, thereby stripping them of a crucial bargaining power within a male-dominated society (Rowland 1987).

Compared to the previous femicide argument, recent commentators who question the emancipatory potential of ectogenesis tend to adopt a more moderate stance. They also typically begin by examining the causes of gender inequality, arguing that ectogenesis offers only highly limited liberation for women and dismissing it as essential for achieving gender equality. At the same time, they highlight the value of pregnancy and the potential harms that ectogenesis could pose to it—both as an idea and in practice—warning that it may further complicate women's situation.

For instance, Giulia Cavaliere (2020a; 2020b) contends that gender inequality is primarily a social construct rather than an issue rooted in gestational differences between the sexes. She compares using ectogenesis to address gender oppression to skin bleaching as a response to racism—an assimilationist approach that fails to tackle the underlying structural problem. Cavaliere dismisses ectogenesis as a "red herring" that diverts attention from necessary social efforts to reform policies and norms to combat gender-based oppression. Although she appears

to present a "defence" of ectogenesis—the idea of developing it, she proposes using it as a political tool to provoke debate and shift the focus from women's pregnancy to the social structures that disadvantage women. In other words, in her reasoning, ectogenesis should not be regarded as a primary or serious solution compared to other social strategies for addressing gender-based oppression.

Lisa Campo-Engelstein (2020) reinforces Cavaliere's argument by using egg-freezing technology as an example to illustrate how biomedical advancements often fail to address the root causes of social problems. She points out that while egg freezing was intended to empower women by allowing them to prioritise their careers, empirical studies show that most women delay childbearing not primarily for professional reasons, but due to a lack of suitable partners. Thus, the technology does not resolve the broader societal issue of highly educated women struggling to find compatible partners. Based on this reasoning, she argues that ectogenesis will not solve gender inequality because its primary cause is not pregnancy, but structural societal factors.

Claire Horner (2020) extends Cavaliere's critique, arguing that even as a tool for provoking debate, the usefulness of ectogenesis remains limited. She suggests that instead of focusing on how technology could mitigate pregnancy's disadvantages for women, efforts should be directed toward creating a world where women do not experience social, physical, or economic disadvantages due to pregnancy.

Other scholars, such as Emily Jackson (2008, 359), offer a more pragmatic analysis, noting that while eliminating the burdens of pregnancy might help women compete more equally in the workplace during gestation, without equality in the distribution of household labour—particularly childcare—eradicating pregnancy would not necessarily lead to gender equality. Segers (2021, 6) succinctly concludes: "If not pregnancy but other biological gender differences, gender roles, and/or oppressive social structures are the problem, ectogenesis will not resolve gender inequality."

Also, nearly all scholars who argue that ectogenesis has limited or even harmful potential for advancing gender equality highlight concerns about its potentially stratified accessibility, which could reinforce social injustice. They predict that ectogenesis may be prohibitively expensive, making it accessible only to privileged individuals, while legal, social, and clinical regulations—often centred around the heterosexual nuclear family—could further restrict access for those outside this norm. As a result, rather than serving as a tool for women's

liberation, ectogenesis could exacerbate existing inequalities and deepen social injustice (e.g., Jackson 2008; Cavaliere 2020a, 2020b; Romanis and Horn 2020; Horn and Romanis 2020; Horn 2022; Romanis 2024).

Moreover, the "*value of pregnancy*" and the potential adverse effects of ectogenesis remain central concerns for contemporary critics. Unlike earlier feminist critics who emphasise women's unique biological role in natural pregnancy, current sceptics focus more on its symbolic and subjective significance, arguing that ectogenesis—both as an idea and in practice—could undermine these aspects. Still, a shared concern with earlier feminists persists that ectogenesis might weaken the mother-child bonding. While this thesis cannot address every facet of the debate, it will focus on three key considerations raised by critics regarding the value of pregnancy.

The first major concern regarding the defence of ectogenesis to improve gender equality is that such a stance pathologises women's gestational capability, thereby devaluing it. For instance, Cavaliere (2020b, 730) argues that promoting ectogenesis as a crucial solution to gender inequality frames women's unique capacity to gestate and give birth as a deviation from the norm, thereby pathologising it. Some commentators warn of the serious adverse consequences of perceiving pregnancy as a pathological condition, arguing that it contributes to the overmedicalisation of pregnancy and the stigmatisation of pregnant individuals. For example, Romanis et al. (2020) contend that pathologising all pregnancies, including normal ones, could exacerbate notions of maternal–foetal conflict by explicitly portraying pregnancy as a source of danger, thereby justifying increased medical intervention. They further caution that framing pregnancy in this way could stigmatise those who choose to carry pregnancies themselves.

However, none of these critics have directly engaged with the question of whether pregnancy qualifies as a pathology. This gap is addressed by Smajdor (2024), a proponent of ectogenesis, along with Joona Räsänen; they examine wanted pregnancies with "normal" complications through the lens of established pathological accounts and conclude that there are compelling reasons to classify pregnancy as a pathological condition. Unsurprisingly, this stance has sparked significant opposition. A key counterargument is that maternal healthcare already treats pregnant women as "patients," not to ensure better care, but to unjustly position clinicians as primary decision-makers over them (Partridge and Knox 2024). They argue that formally labelling pregnancy as a disease would not enhance women's autonomy in medical settings;

rather, it could legitimise excessive medical interventions and perpetuate the flawed assumption that more medicalisation inherently leads to better care.

The second concern, closely linked to the first, centres on the potential social consequences of ectogenesis becoming a widely accepted gestational standard. Critics worry that women who value and prefer natural pregnancy may face social coercion to choose ectogenesis, thereby undermining their reproductive autonomy. Jackson (2008), Cavaliere (2020a, 2020b), and Romanis (2024) express concerns that certain women—particularly those from disadvantaged backgrounds—could be viewed as substandard gestators; some women derive deep fulfilment and joy from experiencing pregnancy, yet the normalisation of ectogenesis could stigmatise them if they choose to carry pregnancies themselves. Horner (2020) specifically highlights that women with high-risk pregnancies may face social stigma or institutional discrimination. If complications arise, they could be blamed for their suffering, as they "could have chosen" ectogenesis instead. Likewise, women who wish to experience pregnancy and childbirth may be socially marginalised or perceived as irrational. Thus, they assert that the potential for social coercion could undermine some women's reproductive autonomy, even if ectogenesis remains an option rather than a replacement for pregnancy.

The third concern takes a more practical perspective—ectogenesis will fundamentally eliminate the attachment formed between a mother and foetus during natural pregnancy, potentially harming long-term mother-child bonding. The bonding process between a mother and her unborn child during pregnancy is often seen as an essential aspect of female empowerment. Earlier commentators, such as Rich (1986, 36–37), emphasise that both mother and baby are deeply connected "by the most mundane and the most invisible strands," and that pregnancy and childbirth allow women to experience their own bodies and emotions in a way that becomes empowering. Similarly, Janice Raymond (1993) predicts that new reproductive technologies could fundamentally harm the mother-child relationship.

Contemporary commentators continue to raise similar concerns. Murphy (2012, 79), in his response to Smajdor (2007), argues that defending ectogenesis overlooks the fact that women who never experience pregnancy may lose essential aspects of the maternal experience, such as emotional preparation for motherhood. Even the supporter of ectogenesis, Kendal (2022), argues that the unfamiliar appearance of a foetus in an artificial womb could elicit feelings of aversion in expectant parents, potentially leading to guilt, inadequacy, and emotional detachment. She therefore suggests that, from an ethical standpoint, restricting parental

viewing of artificial wombs might be justifiable. Kennedy (2024) offers a different perspective, highlighting that women may value pregnancy for its unique form of fostering an intimate maternal bond, even if the overall level of maternal attachment is not necessarily diminished in ectogenesis.

In general, disagreements over the causes of gender inequality, concerns regarding the value of pregnancy, and worries about unequal resource distribution collectively shape the debate on whether ectogenesis is a morally desirable solution to gender inequality.

The following section outlines the structure of the thesis and reiterates two key premises of this discussion.

5.Trajectory of the Thesis

This thesis not only critically examines existing debates but also seeks to build reconciliation; on this basis, it defends ectogenesis as a morally desirable choice and a crucial component of strategies to promote gender equality.

I will first critically analyse three key concerns regarding the value of pregnancy, spanning Chapters 2 to 5. Notably, these concerns are not necessarily confined to discussions of gender inequality; rather, they can serve as broader counterarguments to any claim that ectogenesis benefits women. In addressing these concerns, I will also articulate my reasons for supporting ectogenesis. Following this, in Chapters 6 and 7, I argue that improper interaction between society and gestational biology has primarily caused gender inequality, and that ectogenesis, as a societal effort, has the potential to provide a better opportunity to address it.

Both Chapters 2 and 3 address concerns about pathologising pregnancy. Chapter 2 examines pregnancy within the most influential naturalist account of pathology—the Biostatistical Theory. I argue that this framework cannot categorically exclude pregnancy from being classified as pathological. Chapter 3 extends this analysis by evaluating pregnancy through the lens of prominent normative accounts of pathology. It presents valid reasons for classifying pregnancy as both pathological and non-pathological. However, this chapter highlights the social significance of emphasising the pathological aspects of pregnancy, particularly how framing pregnancy as pathological can counterbalance the pervasive narrative that normalises harmful pregnancy conditions.

Chapter 4 critically examines the concern that ectogenesis might lead to new social norms that pressure individuals who value and prefer natural pregnancy to opt for ectogenesis, thereby

infringing on their reproductive autonomy. I situate this argument within both the liberal framework that underpins it and the feminist perspective that recognises how internalised oppression shapes women's preferences. I show that within a liberal framework, the social coercion argument is not a valid basis for assessing ectogenesis's liberating potential. Meanwhile, the latter framework reveals that some women's preference for physical gestation might be shaped by structural injustices, indicating that gestational preferences are neither static nor free from sociocultural influence. I suggest that a morally desirable solution to social coercion lies in continuing to expand reproductive choices.

Chapter 5 challenges the concern that ectogenesis will adversely impact the future mother-child relationship. I categorise the current debate into two key arguments: the "degree argument," which emphasises the potential weakening of parental bonding due to ectogenesis, and the "form argument," which highlights a preference for the unique experience of forming an attachment through pregnancy. This chapter argues that while the latter can actually support ectogenesis, the former— which assumes that the physiological process of gestation determines the strength of bonding— is challenged by empirical evidence and interdisciplinary perspectives, including evolutionary theory. This chapter suggests remaining open to the possibility that future parental bonding might differ from traditional models, yet it will not necessarily be weaker or less meaningful.

Chapter 6 challenges the prevailing assumption that the root of gender inequality, whether biological or social, serves as the foundation for either endorsing or questioning ectogenesis as a solution. I argue that this foundation is fragile, as reasonable interpretations of both perspectives are inherently interactionist—improper interactions between society and biology have primarily caused gender inequality. Consequently, solutions targeting either the biological or social aspects can be justified in principle, which implies that both can provide an initial defence for ectogenesis rather than a conclusive one. I suggest that the focus should shift to examining how ectogenesis might realistically reshape social dynamics and contribute to gender equality.

Chapter 7 comprehensively defends ectogenesis as a means of creating better opportunities to address gender inequality. I reiterate that women's reproductive health is a crucial dimension of gender equality, one that can be significantly improved through ectogenesis. More importantly, the potential of ectogenesis extends to promoting a more equal division of labour, reshaping gender norms, and decentralising heteronormative family structures. I further

challenge the strategies emphasised by critics, such as leveraging pregnancy as a bargaining tool and pursuing social solutions without the "distraction" of ectogenesis. I argue that using pregnancy as a bargaining weapon represents a zero-sum approach, whereas ectogenesis can complement other social solutions instead of detracting from them.

6. Reiterating Two Premises

Two premises need to be reiterated. First, this thesis defends ectogenesis under the assumption that its safety meets at least the average health standards of new-borns delivered through natural pregnancy. The acceptable level of safety for ectogenesis should be evaluated relative to its intended purpose. If ectogenesis is developed to save premature infants, its success should be judged by its ability to rescue earlier and more vulnerable preterm neonates more effectively than existing neonatal incubators. However, as a widely used gestational alternative and choice, I argue that it must, at a minimum, provide new-borns with health outcomes that are no worse than the societal average for natural births. This criterion also aligns with the implicit standards underlying many critiques of ectogenesis. As presented earlier, many scholars express concern that ectogenesis might create a gestational environment superior to that of the human uterus, thereby subjecting those who choose physical pregnancy to social coercion.

Second, this thesis defends ectogenesis as a gestational choice rather than a replacement for human pregnancy. My position is that the right to use one's own body for pregnancy must not be violated by any governmental authority or any individual other than the pregnant person themselves. Therefore, even if ectogenesis can offer numerous advantages over biological pregnancy, it should remain an optional alternative rather than a compulsory replacement.

CHAPTER TWO

Pregnancy Is a Survival Pathology: A Biostatistical Approach[2]

On the face of things, ectogenesis is supposed to get rid of risks associated with pregnancy. So, pregnancy might then be thought of as a pathology. Concerns have arisen that promoting ectogenesis might pathologise women's distinctive capacity to gestate and give birth, framing this capacity as a deviation from the norm (Cavaliere 2020b, 730). Others worry that this pathologisation may further fuel an already problematic phenomenon: the overmedicalisation of pregnancy and the stigmatisation of pregnant individuals (e.g., Romanis et al. 2020; Partridge and Knox 2024).

Indeed, since Firestone's (1970, 198-199) claim that "pregnancy is barbaric" and childbirth is "like shitting a pumpkin," many other advocates of ectogenesis, such as Smajdor (2007; 2012) and Mackay (2020), have emphasised the harms and risks associated with pregnancy and childbirth. Smajdor even directly argues in her work with Räsänen (2024) that the harms and risks of the "normal" pregnancy qualify it as a disease. Although there is some logical ambiguity regarding why emphasising gestational harm and risks necessarily categorises pregnancy as a pathology, I concede that adopting such a stance may reinforce the association between the negative health impacts of pregnancy and the pathology.

However, if critics contend that pathologising pregnancy is incorrect, they might need to either: (i) argue that support for ectogenesis misleadingly portrays pregnancy as a pathology, asserting that pregnancy per se is *not pathological*; or (ii) argue that while the answer to whether pregnancy is pathological might be ambiguous, classifying pregnancy per se as pathology is ultimately *harmful* to women.

No existing critics of ectogenesis have examined so far whether pregnancy is pathological. This chapter and the next fill this gap. This chapter argues that, according to the influential Biostatistical Theory (BST) by Christopher Boorse (1975; 1976; 1977; 1997; 1999; 2002; 2011;2014), pregnancy is a survival pathology. This means that even if supporting ectogenesis links pregnancy with the pathology, it is not necessarily misleading. Due to the depth and

[2] This chapter has been converted into a paper and published in *Philosophy of Medicine*.

breadth of this discussion, the next chapter will continue this exploration and delve into the social implications of viewing pregnancy as a pathology.

To evaluate pregnancy within the BST, one must first determine whether pregnancy-related common conditions are pathological. If they are not, then no aspect of a typical pregnancy is pathological. Yet, if they are, one must then assess whether the reproductive contributions of pregnancy have an overriding power to negate its pathological aspects. In other words, the exclusion of pregnancy as a pathology can be ethically justified in two potential ways. First, the harmful conditions frequently encountered by gestators are statistically typical within the appropriate reference class and, therefore, not pathological. Second, even if these common conditions are perceived as pathological to the gestator's survival, they can be offset by the reproductive contributions of pregnancy, ultimately rendering it non-pathological overall. Boorse himself appears to adopt both approaches; however, this chapter argues that neither withstands scrutiny.

This chapter proceeds as follows: Section 1 introduces recent discussions on whether pregnancy is pathological and introduces the BST. Section 2 argues that pregnancy is a holistic condition, encompassing both its common conditions and the process of gestating the foetus, and outlines two potential approaches for classifying pregnancy as non-pathological. Section 3 refutes the first approach, establishing that many, if not all, common conditions of pregnancy are pathological within the appropriate reference class—non-pregnant women of the same age. Section 4 counters the second approach, arguing that the BST cannot provide a convincing reason to prioritise reproduction over survival. Consequently, survival and reproductive goals should be examined separately, categorising pregnancy as a survival pathology. Finally, Section 5 briefly considers the impact of emerging assisted reproductive technologies on defining whether pregnancy is pathological.

1. The Biostatistical Theory

Pregnancy predictably harms the health of women in various respects, yet it is not usually classified as a pathology in its own right. Christopher Boorse, a distinguished naturalist in the field of health who formulated the Biostatistical Theory (BST), vehemently opposes classifying pregnancy as a pathology, suggesting that such a classification would signify a "game over" for medical thought (Boorse 1997, 44). In their recent article, Smajdor and Räsänen re-evaluate pregnancy using established disease theories. After discussing how other pathological accounts do not exempt pregnancy from being considered pathological, they argue that if one accepts

the rationale of the BST, pregnancy might not be considered a disease (Smajdor and Räsänen 2024, 5). Instead, they critique what they perceive as conceptual flaws of the BST.

However, I argue that even if we accept the rationale of the BST, this framework cannot categorically exclude pregnancy from being classified as a pathology, suggesting that it may be, at least, a survival pathology for the gestator.

To proceed, it is necessary to introduce the BST's rationale. The BST aims to provide an account that distinguishes health from pathology in a way that relies solely on notions drawn from the sciences, without relying on any evaluative notions (Boorse 1976, 1977, 1997, 1999, 2002, 2011, 2014). The BST is stated as follows:

> (i)The reference class is a natural class of organisms of uniform functional design; specifically, an age group of a sex of a species.
>
> (ii)A normal function of a part or process within members of the reference class is a statistically typical contribution by it to their individual survival or reproduction.
>
> (iii) Health in a member of the reference class is normal functional ability: the readiness of each internal part to perform all its normal functions on typical occasions with at least typical efficiency.
>
> (iv) A pathological condition is a type of internal state which impairs health, i.e., reduces one or more functional abilities below typical efficiency (Boorse 2014, 684).

Key concepts need clarification for the subsequent discussion. The "reference class" in the BST is a comparison group for functional efficiency, distinguished by traits like age, sex, and species (Boorse 1977). An organism's internal part or process is considered pathological if its functional efficiency falls significantly below the average within the appropriate reference group. Pathology assessments are thus relative to the reference class. For instance, the inability to walk is pathological for adults but not for infants, as it falls significantly below the average walking capacity of adults, but not of infants.

The "survival or reproduction" (Boorse 2014, 685) of the individual are employed as the ultimate goals of organisms; function is the causal contribution to these individual (not species-level) goals.

"Functional ability" in the BST underscores that functioning is relative to specific occasions (Kingma 2010, 248; Boorse 2014, 704). For instance, blood clotting occurs only in response to

injury; the inactivity of clotting mechanisms does not imply a loss of function but rather a readiness to act when needed. Therefore, assessing functional efficiency involves evaluating its potential performance in specific occasions.

In general, the core spirit of the BST is statistical, quantitative, or, in other words, mathematical. Every notion it involves must adhere to this point; otherwise, the theory loses its essence. Perhaps the entire BST can be viewed as a mathematical matter.

To assess whether any part or process of an individual's body system is pathological, such as Lucy's thyroid secretion state, the steps may involve:

(i) Quantitatively determining, if feasible, the contribution of her thyroid secretion to survival and reproduction (i.e., functional efficiency). Note that it is the precision of secretion, not its amount, that determines this contribution.

(ii) Select a reference group using relevant parameters like sex and age to establish the group's average functional efficiency of thyroid.

(iii) Compare two results. If her thyroid functional efficiency is "far below" this average (Boorse 2014, 684), it would indicate pathology.

Nevertheless, applying the BST to determine if pregnancy is pathological is far more complex. Pregnancy encompasses various conditions across different pregnant individuals and introduces goal conflicts between reproductive contributions and survival harms. Therefore, in what follows, I will first untangle pregnancy's complexity and its implications for assessment.

2. Should "Pregnancy per se" be Distinguished from "Pregnancy-related Conditions"?

In their rebuttal of Smajdor and Räsänen's paper (2024), some authors argue for a distinction between pregnancy and its adverse conditions (Baron 2024, 2; Rezkalla and Smith 2024, 2). Yet this claim is ambiguous. If determining whether to assess a physiological change, x, and its symptoms as a whole depends on x being pathological, as implied by Rezkalla and Smith (2024, 1)[3], it creates circular reasoning.

Defining pregnancy per se is essential in this regard. If pregnancy per se only means gestating the foetus in the maternal uterus, then any survival harm to the gestator would not render

[3] They admit that such a distinction is not applicable to cases like measles. However, they argue it applies to those typically not considered pathological, such as puberty, which often involves physical, psychological, and social challenges. This creates a circularity because when assessing whether a case is pathological, we cannot determine if such a separation should apply without knowing if it is pathological.

pregnancy pathological. Yet, both lay perspectives and medical practice consider a pregnancy pathological if its harm to the gestator exceeds a certain threshold, regardless of foetal health. Moreover, constructing pregnancy solely as a process of gestating the foetus risks reducing the maternal body to a mere container (Young 1990, 167; Romanis 2024, 33). As Elselijn Kingma (2019, 626) suggests, the foetus is a proper part of the pregnant individual, as it is functionally and metabolically integrated and interdependent with other parts of the pregnant person. Following this model, pregnancy itself is a state of being that integrates gestating the foetus and all the physiological changes in the maternal body during the gestation process (in this thesis, pregnancy includes the end of pregnancy—childbirth). Besides, if pregnancy were simply defined as "gestating the foetus," much of the debate over its pathological status would lose relevance—the core controversy in discussions of pregnancy has always centred on the frequently occurring conditions that harm the pregnant individual.

Pregnancy, per se, is more reasonably seen as a process in which non-pregnant physiology is markedly altered for a period, carrying significantly higher risks of morbidity and mortality than non-pregnancy (Hern 1971, 6–7). The common symptoms and conditions[4] in pregnancy is part of these physiological alterations; thus, they are integral to pregnancy per se or a typical pregnancy.

One might still argue that pregnancy should be distinguished from its harmful conditions, in the sense that survival harms alone may be insufficient to classify pregnancy itself as a pathology. Within the BST, two potential approaches, if established, could support this claim:

(i) most common conditions in pregnancy are statistically typical within the appropriate reference class; or (ii) pregnancy's reproductive value counterbalances its pathological survival harms, rendering it non-pathological overall.

The first approach denies the pathological nature of common conditions in pregnancy. Surely, if these conditions are non- pathological, then even more so a typical pregnancy as a whole would not be. This approach largely relies on using the pregnant population as the reference class. The second approach concedes that even if many (if not all) frequently occurring harmful conditions in pregnancy are pathological, it could be offset by pregnancy's reproductive

[4] In the BST, distinguishing between symptoms and conditions is unnecessary, as it only cares about whether an organism's internal change cause statistically atypical functioning. For instance, "fever and diarrhea" are viewed both as symptoms—indications of underlying diseases—and as conditions in their own right. Boorse (1977, 552) mentions this in his discussion of Nomenclature, noting that pathology in the BST has a broader sense.

contribution, given that the reproductive goal takes precedence over survival. Clearly, this approach's validity hinges on prioritising reproduction over survival.

Boorse appears to adopt both approaches, using pregnant women as the reference class and prioritising reproductive over survival goals (I will elaborate on these points in later discussions). But the BST does not support either approach. Section 3 will refute the first approach, while Section 4 will counter the second.

3. Can Common Conditions in Pregnancy Be Considered Pathological?

In the BST, determining if a biological condition is pathological requires establishing the correct reference class and assessing if the condition significantly reduces functioning compared to this group mean. Claims that common conditions in pregnancy are normal or non-pathological rely heavily on using pregnant individuals as the reference class.

This section refutes this approach, proposing that the BST should, instead, use non-pregnant women of the same age as the reference class, thus rendering many common pregnancy conditions pathological.

3.1 The Reference Class Matters

No one would deny that certain specific pregnancies are pathological. For instance, an ectopic pregnancy or one with abnormal foetal development compared to others at the same stage is typically classified as pathological. Also, a pregnancy that results in physical harm to the gestator exceeding a certain threshold is usually regarded as pathological in medical practice. Nevertheless, the core controversy is not about such pregnancies but rather those conventionally seen as "normal," which often involve harmful conditions that would often be considered pathological if experienced by non-pregnant individuals.

According to the NHS (2024), common conditions in pregnancy include constipation, cramps, feeling faint, incontinence, frequent urination, varicose veins, and symptoms such as back pain, bleeding gums, headaches, indigestion, heartburn, nosebleeds, pelvic pain, piles, stomach pain, stretch marks, swollen ankles, feet and fingers, tiredness, sleep problems, thrush, vaginal discharge, vaginal bleeding, vomiting, morning sickness, and weight gain. Ongoing research reveals more widespread harms in pregnancy, such as a significant reduction in grey matter volume and cortical thickness across the brain (Pritschet et al. 2024).

Moreover, childbirth, the final stage of pregnancy, results in pain and tissue damage for nearly all who go through it, with international studies reporting perineal tear injury rates as high as 85% (Edqvist et al. 2017)[5].

Most of these conditions are often regarded as parts of a "normal pregnancy" in medical practice. However, according to the BST, whether these conditions are considered pathological largely depends on the selected reference group.

If the reference class is finely grained—such as using pregnant women of the same age as an independent reference group—then frequently occurring harmful conditions in pregnancy become statistically typical. When selecting pregnant women of advanced age as the reference group, even age-related pregnancy complications like gestational diabetes and preeclampsia may appear non-pathological due to statistical typicality. Similarly, if the reference group comprises pregnant women with pre-existing medical conditions, complications such as deep vein thrombosis, high blood pressure, and intrahepatic cholestasis could also be classified as non-pathological. Furthermore, when considering geographic regions—where areas with high fertility rates and limited maternal support contrast with those with lower fertility rates and greater maternal support—the same condition might be judged differently in terms of pathology.

Nevertheless, if the reference class is not limited to pregnant individuals, many (if not all) pregnancy-related conditions could be considered pathological. Since most women of reproductive age are not pregnant (Kingma 2010; Smajdor and Räsänen 2024), using women of the same age (both pregnant and non-pregnant) as the reference group reveals that many common pregnancy conditions significantly lower the functional ability of pregnant individuals relative to the mean. This disparity becomes even more pronounced if the reference group consists solely of non-pregnant women of the same age.

Therefore, the BST must first stipulate the reference group for examining these conditions; only then can it assess whether these conditions result in functioning significantly below the average.

3.2 Two Hidden Principles for Selecting a Reference Class

[5] Henceforth, "common conditions" refers to those defined by the NHS, as well as common issues like injuries and trauma caused by childbirth.

As Kingma (2007) points out, the validity of the BST relies on an appropriate set of reference classes. The BST stipulates a basic list for selecting reference classes—age, sex, and species—while remaining open to more specific categories, guided by empirical facts (Boorse 1977). This openness has sparked debates over the challenges of reference class selection, with two main criticisms suggesting that the BST may collapse under these challenges.

Criticism 1: An overly *fine-grained* reference class might cause the BST to fail in distinguishing health from pathology.

Criticism 2: The relativity of function to specific *occasions* might cause the BST to falter.

I contend that the rationale underlying the BST can likely provide reasonable responses to these criticisms and establish two principles for selecting reference classes.

Establishing Principle 1

Selecting a reference class based solely on sex, age, and species can be overly broad. For instance, classifying a trait causing altitude sickness as pathological without considering long-term residence at low altitude seems unreasonable. This raises the question of how specific the reference group should be. Cooper (2002) suggests that factors like race, location, and training should be considered in selecting reference classes, but overly narrow classes may reduce reliability in determining pathology. Kingma (2007) argues that empirical facts cannot tell whether a broad or narrow reference class is correct; for example, no empirical evidence can indicate whether "women" or "short-sighted people" is the appropriate reference class for a woman with short-sightedness. If any group could serve as a reference class, no condition could be classified as disease—for instance, using cancer patients as the reference group would make cancer statistically normal (Lewens 2015).

While this chapter does not focus on the validity of the BST itself, I contend that this type of criticism is probably overstated. At least in terms of the bottom line for narrowing the reference class, the BST can appeal to common sense—comparison necessitates differences. When determining if a condition is typical, it is unnecessary to select individuals who exactly share the condition in question for comparison. True, the mere fact that a woman has myopia does not dictate whether her reference class should be "women" or "myopic people." Yet if myopia is the trait being assessed, the reference class cannot consist *solely* of individuals with myopia. Similarly, cancer patients cannot form a separate reference class for evaluating cancer. It is meaningless to assess whether a condition is pathological by comparing it to the mean of a

population in which everyone is already known to have that particular condition. Therefore, the BST can indeed establish a fundamental principle for selecting reference classes:

> (P1): When assessing if a condition X1 (a state of a body part X's functional efficiency) is pathological, the reference class must not be restricted only to those individuals who have condition X1.

In other words, P1 indicates that we cannot use "having the condition in question" as a criterion for selecting members for comparison.

What does this imply for assessing pregnancy? Consider a challenge from other cases: one might argue that P1 would prevent us from using infants, adolescents, or aging group as reference classes to assess whether "infancy," "puberty," or "aging" is pathological, while within BST, examining conditions in these life stages using age and sex as dimensions for choosing the reference group seems reasonable[6].

Both parts of this argument are correct; the problem is that they are not contradictory. Instead, they reveal a key fact: under the BST, a life stage with multiple conditions cannot be *directly* assessed as a single condition. Each condition must first be examined individually, with the life stage's pathology determined based on statistical normality after these assessments. In this way, P1 is not violated.

For example, when assessing whether osteoporosis in an elderly man is pathological, using other aging men as the reference class does not violate P1. However, selecting a reference class based on "having osteoporosis" would violate P1. To assess whether aging, infancy, or puberty is pathological using BST, the process involves examining each common condition within the stage and then determining the overall statistical outcome to assess whether the entire stage can be considered pathological.

By the same token, any vague claim that pregnancy is not pathological, while using pregnant women as the reference class, may violate P1. To assess whether pregnancy as a whole is pathological, the process involves evaluating each frequently occurring condition individually, rather than treating pregnancy as a single condition to assess directly. When using pregnant individuals as the reference class to assess specific conditions, such as insomnia, vomiting, or

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[6] Thanks to Tim Lewens for raising this challenge.

vaginal tearing, does not breach P1 (but using groups defined solely by those conditions—such as individuals with insomnia, vomiting, or vaginal tearing, whether pregnant or not—would violate P1).

The above merely outlines the steps for assessing pregnancy; it does not imply that the pregnant population is the appropriate reference class. Using this class may conflict with a second principle concerning the situational nature of function or its relativity to specific occasions—a principle established in response to Criticism 2. This principle is more crucial than P1 for determining whether a common condition in pregnancy is pathological. I now turn to discuss this.

Establishing Principle 2

Many functions occur in specific occasions and assessing a function means examining it within the appropriate occasion—its "functional ability" (Boorse 1977, 562). For example, evaluating whether someone's vision is statistically typical requires comparison with others whose eyes are open, not closed; assessing heart rate during running involves comparing it with others also in a running state. Simply put, a reference class often refers to a group within a particular occasion. When pregnancy is treated as a specific "occasion," individuals in this state—pregnant individuals—serve as a *prima facie* reference class for assessing conditions in pregnancy.

However, not all occasions should be used in selecting a reference class; otherwise, many clear pathologies would no longer be classified as such. For example, assessing "fever" in a person with COVID-19 by comparing them with others in the same occasion—those infected with the virus—might lead to the conclusion that "fever" (and other conditions during COVID-19 infection) is not a statistical deviation.

Authors like Van der Steen and Thung (1988) have already highlighted this issue, using examples such as mountain sickness and heat exhaustion. In response, Boorse invokes a supplementary clause to the BST: "a statistically species-subnormal function (in the usual sense of an arbitrarily chosen lower tail is pathological if it results from an environmental factor outside an arbitrarily chosen central statistical range of that factor in the environments where the species lives." (Boorse 1997, 84).

This stipulation serves as the BST's response to such criticisms. As Hausman (2011, 661) clarifies, it implies that if an organism's functioning is statistically subnormal in a typical

environment, it is considered pathological, even if it appears statistically normal in an atypical environment.

Although this stipulation does not mention the reference class, I contend that it inherently implies the reference group must consist solely of individuals in typical conditions. If an organism's part develops a condition in an atypical environment, we should imagine its performance with that condition in a typical environment and compare it to others there. For example, if a person suffers sunburn in a 60-degree (atypical) environment, the sunburn is pathological because, even in a typical temperature, her burned skin would still function significantly below that of others in the typical temperature. Whether others also get sunburn at 60 degrees is irrelevant to whether her sunburn is pathological.

Furthermore, although the stipulation uses the term "environment," it logically encompasses not only the external physical environment but also the organism's biological activities, such as sleeping, exercising, and pregnancy, which I refer to as "occasions."

Distinguishing typical from atypical occasions is a question for the next part. Here, I introduce an interesting debate between Kingma (2010, 2016) and Hausman (2011) to further clarify how the BST determines the reference class concerning typical and atypical occasions.

Kingma (2010) raises a similar criticism of the BST using the example of poisoning: Carol's paralysed digestion is statistically typical among others in the same situation; unless the BST can classify poisoning as atypical, Carol's condition would not be considered pathological. In her view, the BST fails to distinguish typical from atypical occasions, risking its collapse.

Hausman (2011, 657–668) counters that even if poisoning is regarded as a "relevant" (or "typical" in BST terms) occasion, the theory can still classify Carol's paralysed digestion as pathological. He appears to adopt a different comparison approach, explaining, "What determines whether the capability of Carol's paralysed digestion is pathological is the comparison between how it would function in those situations and how people's digestive systems would on average function in *those* situations" (Hausman 2011, 664).

However, this comparison does not seem to support the conclusion that Carol's digestion is pathological. If poisoning is considered typical, "those situations" would include the occasion of poisoning. When Carol, while poisoned, engages in typical activities like eating, her digestive functioning, compared to others across a variety of situations—including poisoning and eating—would not be significantly diminished.

Also, as Kingma (2016, 393) responds, the appropriate reference group should be individuals in a specific occasion, not across multiple occasions. Consider other uncontested typical occasions. Suppose we assess whether Carol's heart rate during exercise is normal. According to Hausman's suggestion, we would need to consider Carol's heart rate across a variety of typical activities like sleeping and walking and compare them to others in these activities. However, Carol's heart rate in *each* specific occasion—whether actual (exercising) or hypothetical (sleeping, walking)—should be compared only with others in the *same* occasion. Comparing Carol's heart rate while running to those who are sleeping would be inappropriate.

To clarify again, if an occasion is typical, an individual's condition in that occasion should be compared with the average of a group in the same occasion. For example, a sleeping person's heart rate is compared with that of others also sleeping (within age and sex parameters).

Yet, if an occasion is atypical, the condition in that occasion should be compared to the average functioning of those in *typical* occasions. Since poisoning is not typical for humans, as Boorse argues in response to Kingma's challenge (2014, 704), the functioning of individuals who are poisoned should be compared to those in poison-free, typical situations (adjusted for age and sex parameters). Given that "non-poisoned human beings are fully ready to digest a meal" (Boorse 2014, 704), Carol's digestion can be considered pathological.

Thus, the second fundamental principle of the BST regarding selecting the reference class can be:

> (P2) when determining if a condition X1 in a particular occasion Y is pathological, the reference group should consist of individuals (within age and sex parameters) in the Y occasion only if Y is a typical occasion; otherwise, it should consist of individuals in typical occasions that are not Y.

At this stage, the viability of using the pregnant population as the reference group hinges on whether pregnancy is a "typical occasion." Only if pregnant individuals serve as an independent reference group can most common conditions in pregnancy be deemed statistically typical. But the BST fails to justify pregnancy as a typical occasion, as I will discuss next.

3.3 Pregnancy Is an Atypical Occasion

The BST does not explicitly provide criteria to distinguish typical occasions from atypical ones[7]. Considering some of Boorse's responses to relevant criticisms, I evaluate the following criteria—(i) species-typical design, (ii)the frequency of occurrence and (iii)comparative typicality, demonstrating that pregnancy is not a typical occasion.

The first criterion for distinguishing typical occasions from atypical ones may seem to be whether the occasion represents a species-typical design. Intuitively, pregnancy appears to be a natural function of the body, just like other bodily functions. Yet, this conclusion cannot be straightforwardly drawn from the BST because it leads to circularity.

Following the BST's statistical normality, whether a functional occasion is a typical species design depends on whether it typically contributes to the individual's survival and reproduction. In other words, questioning whether a functional occasion, such as pregnancy, is a typical species design is equivalent to questioning whether it makes a typical contribution to the overall goals of the individual. This leads to circularity because assessing typicality necessitates first determining what the reference class is, and selecting the reference class requires answering whether the functional occasion is typical, leading to an endless loop.

The second criterion is the frequency of occurrence in the human life pattern, which is most *explicitly* stated by Boorse. When disputing Kingma's conflation of digestive inhibition induced by exercise and poison, Boorse argues that exercise represents a typical human activity, whereas ingesting poison does not. He further contends, "but if consuming poison were a species-typical activity—e.g., if the poison were present in a typical foodstuff—then digestive inhibition following such a meal would be considered normal by the BST and, I contend, by medicine as well" (Boorse 2014, 706). Likewise, in responding to why endemic diseases are pathological, he states, "while it may be that most humans live in malarial regions, most humans do not have malaria, nor are most children malnourished. But if such pathology were typical, then the BST would have to declare it normal" (Boorse 2014, 707). These responses suggest that Boorse uses the high frequency of occurrence in the human population as a criterion for determining the typicality of a functional occasion. This criterion indeed aligns with the core of the BST—statistical normality.

[7] Kingma (2010) discusses how the BST fails to differentiate between typical and atypical conditions; however, this chapter does not aim to address that issue. Instead, it only focuses on examining pregnancy following the criteria suggested by Boorse.

By this criterion, however, pregnancy (or fertilisation, specifically) is an atypical occasion. Pregnancy does not occur as frequently as routine activities like eating, nor does it involve the entire population—only biological females, with around 8% of women of reproductive age experiencing infertility (Borumandnia et al. 2021). Moreover, for those who can conceive, pregnancy represents only a segment of life, even in areas with higher birth rates. Globally, the occurrence of egg fertilisation, whether naturally or via IVF, is relatively rare for women at any reproductive age, and the frequency of pregnancy may even be lower than that of contracting the flu or getting sunburned. In comparison, another major physiological characteristic—menstruation— meets this criterion. Similarly, puberty and aging fit, as they are life stages that most individuals experience. Therefore, if rarity is a key marker of atypical occasions, then pregnancy would indeed fall into that category.

Finally, I focus on the *comparative atypicality* of pregnancy. Pregnancy is not an occasion that aligns with typical ones; most common conditions in pregnancy, unlike those temporary suppressions of functional activities that support overall function, often harm both survival and reproductive goals simultaneously, resulting in significant losses in functional efficiency. I emphasise this because it is rarely addressed in existing debates and suggests that, under current BST clauses, pregnancy cannot easily be classified as a typical occasion.

Indeed, many functional activities are performed only intermittently, and when they are active, they may inhibit other functional activities. Given this, Boorse draws a parallel between pregnancy and other instances where some functional activities are temporarily suppressed:

For example, a man with an erection cannot urinate; a pregnant woman is less able to run, lift, bend over, or get up directly from a supine position, not to mention experiencing normal morning sickness; a sleeping person suffers paralysis, loss of consciousness, and lower sensitivity to various sensory stimuli... all these examples illustrate a ubiquitous physiological phenomenon: the normal inhibition of one function by another (Boorse 2014, 705).

In this parallel, pregnancy is taken for granted as a typical bodily occasion, similar to sleep or erection. Other prominent debaters, such as Kingma (2016, 395), also tend to discuss pregnancy alongside examples like male erection.

However, such a parallel is somewhat misleading. Pregnancy is uniquely atypical compared to other functional occasions like sleeping or having an erection, where certain functional activities are temporarily suppressed. Four key reasons can substantiate this distinction:

(1) lack of unified goals

When drawing a parallel between pregnancy and biological occasions like sleep or erection, it equates the "inhibitions" during pregnancy—common harmful conditions such as insomnia and digestive disorders—with the temporary inhibitions of "functional activities" in those occasions, such as reduced consciousness during sleep or urination inhibition during an erection. But they are not comparable.

In these non-pregnancy occasions, associated functional activities are complementary: reduced consciousness usually benefits sleep quality, post-exercise inactivity improves blood flow to muscles (Hausman 2011, 666), and urination inhibition supports an erection—if it does not, the condition may be pathological. In these cases, the organism operates optimally within the specific "constraints" of certain functional activities.

Pregnancy, however, differs in this regard. Many common pregnancy conditions impair the gestator's survival without clearly supporting reproductive goals (as I will discuss further in Section 4.4). A pregnancy free from these conditions would likely be more conducive to reproduction. For instance, approximately 80% of pregnant women experience insomnia (Nodine and Matthews 2013, 370); without it, pregnancy may result in healthier offspring, because research links sleep disorders to an increased risk of preterm birth (Felder et al. 2017) and miscarriage (Lee, Gutcher, and Douglass 2014). Gestational diabetes mellitus (GDM) is another example, affecting one in six pregnancies worldwide (Plows et al. 2018). Driven by placental hormones, it increases maternal insulin resistance to ensure foetal glucose supply. When blood sugar exceeds normal levels, GDM develops, raising the mother's risk of type 2 diabetes and causing foetal overgrowth, neonatal complications, and long-term metabolic disorders (Stock and Aiken 2023).

In essence, many common pregnancy conditions are harmful to both individual survival and reproductive goals, unlike typical functional scenarios where temporarily inhibiting certain activities supports better performance in others.

(2) reduction in functional efficiency: pregnancy vs. pre-pregnancy.

Related to reason one, the temporary inhibition of certain functional activities in non-pregnancy (typical) occasions does not decrease overall functional efficiency, while common conditions in pregnancy often significantly reduce the functional efficiency of many parts of the gestational body compared to the pre-pregnancy state.

In the BST, functional efficiency refers to how well a function serves survival and reproduction, not its activity level (Boorse 1997, 559). This means that the more accurately a function's activity level aligns with the requirements of a particular occasion, the higher its functional efficiency. In typical non-pregnancy inhibitions of functional activities, there is no decrease in functional efficiency (functioning) compared to the pre-occasion state, because such inhibitions are necessary to support the performance of another functional activity.

Taking sleep as an example: suppose Lucy's consciousness level when awake is T+, contributing to her survival and reproduction at level Cw. When she sleeps, her consciousness level drops to T-, contributing at level Cs. Despite the lower activity level during sleep (T- < T+), functional efficiency remains equal (Cw = Cs) because T+ and T- are each appropriate for their respective occasions—wakefulness and sleep.

Similarly, the inhibition of urination during an erection does not reduce functional efficiency because it increases blood flow to the penis, supporting the reproductive goal without affecting survival. In other words, decreased sympathetic activity and increased parasympathetic activity are exactly what the erection situation requires.

However, we cannot say on the same grounds that common conditions in pregnancy (such as constipation, varicose veins, bleeding gums, heartburn, nosebleeds, and insomnia) are what the pregnancy occasion requires, as these conditions significantly reduce functional efficiency compared to the pre-pregnancy state. Consider insomnia during pregnancy: suppose Lucy's pre-pregnancy sleep quality results in functional efficiency at level Cs. During pregnancy, she has trouble sleeping-a common condition, reducing her sleep quality to functional efficiency level Cp, which is noticeably less than Cs. This decline occurs because insomnia harms both her health (survival) and foetal development (reproduction), as discussed earlier.

Many other common conditions caused by pregnancy and childbirth (such as perineal tears), similarly lead to a reduction in functional efficiency, making pregnancy distinct from other human functional occasions.

(3) lasting functional loss: post-pregnancy vs. pre-pregnancy

Unlike typical suppressions of functional activities that leave no lasting effects, pregnancy often leads to a long-term decline in functional efficiency. For instance, closing one's eyes temporarily does not impair vision once reopened, nor do urination issues persist after an

erection, or menstruation cause lasting harm after each cycle. In these cases, where functional activities alternate, functional efficiency remains nearly the same before and after.

However, pregnancy and childbirth often result in lasting "suppressions" and decreased functional efficiency, with almost no pregnancy entirely avoiding these effects. Nearly all women experience one or more health issues within a year postpartum—such as fatigue, back pain, sleep disturbances, and postpartum depression (Cheng and Li 2008)—with rates ranging from 47% to 94% in high-income countries (Brown and Lumley 1998). Globally, at least 40 million women are likely to face long-term health issues after childbirth each year (Vogel et al. 2024).

While some studies indicate that carrying a pregnancy to term early in life may reduce lifetime breast cancer risk, pregnancy later in life can increase the risk, and certain types of breast cancer are directly linked to pregnancy (Subramani and Lakshmanaswamy 2017). Additionally, effects like reduced grey matter volume in the brain can persist for years (Martínez-García et al. 2021) and even decades (De Lange et al. 2019). Research also suggests that high fertility not only correlates with poorer health later in life but may also shorten lifespan (Ryan et al. 2024). Therefore, even framing pregnancy as a "temporary pathology" (Kingma 2016, 397) does not capture the full truth.

(4) value-laden drive mechanism

Pregnancy is also distinct from typical biological occasions in that its occurrence is deeply intertwined with cultural, economic, and religious values.

Boorse argues that most individuals pursue survival and reproduction-related activities, neutrally guided by biology: "Not only do we want to survive and reproduce, but we also want to engage in those particular activities, such as eating and sex, by which these goals are typically achieved," and "certain physiological processes, like the heart pumping, occur irrespective of personal desires" (Boorse 1975, 60).

However, the drives for eating and sex differ in mechanisms: while hunger directly responds to survival needs, sexual desire is rarely motivated purely by reproduction, and most sexual activity does not lead to it.

More importantly, the desire for sex is not the same as the desire for pregnancy; while the desire for eating and even sexual desire might largely arise from biological drives, there is little evidence that physiological changes make women inherently "want" to become pregnant. The

desire for pregnancy is almost entirely shaped by personal values, cultural norms, and socio-economic factors. Decisions about pregnancy—whether, when, and how to conceive—are influenced by these broader contexts, making pregnancy far less straightforward than other biological functions. Let alone the difference between such drive mechanisms and processes like heart pumping, which operate independently of personal desire.

In general, based on the criteria implied by Boorse's arguments for distinguishing typical from atypical occasions, pregnancy is atypical.

3.4 Establishing the Pathological Nature of Many Common Conditions in Pregnancy

What reference class should be selected if pregnancy is classified as an atypical occasion? Consider four options: (i) pregnant women of the same age, (ii) all women of the same age, (iii) non-pregnant women of reproductive age, or (iv) non-pregnant women of the same age.

Recall (P2) when determining if a condition X1 in a particular occasion Y is pathological, the reference group should consist of individuals (within age and sex parameters) in the Y occasion only if Y is a typical occasion; otherwise, it should consist of individuals in typical occasions that are not Y.

Option (i), "pregnant women of the same age," is ruled out because when an occasion is atypical, those in that occasion cannot serve as the reference group. Option (ii), "all women of the same age," is also unsuitable, as it includes those in the atypical occasion (pregnant women). Option (iii), "all reproductive-age non-pregnant women," is problematic because reproductive age spans a wide range; both 26- and 36-year-old women can reproduce but comparing the health of a 26-year-old to that of a 36-year-old is inconsistent with the BST. Thus, (iv)— "non-pregnant women of the same age"—is the most suitable choice under the BST when pregnancy is classified as an atypical occasion.

Still, theoretically, at this stage, we cannot straightforwardly determine if a common condition in pregnancy is pathological8. Two questions remain: 1) Is the functional decline resulting from these common conditions severe enough to be considered pathological? and 2) Do these conditions potentially offer reproductive benefits—a point that, although previously discussed, merits further examination.

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[8] Thanks to anonymous reviewers from *Philosophy of Medicine* for pointing this out.

The first question concerns the “degree”; a condition that results in functioning merely below average might not be enough to classify it as pathological—it must fall "more than a certain distance below the population mean” (Boorse 1977, 559). But how far is "far enough" to distinguish health from pathology? Boorse does not provide a clear answer, suggesting instead that this threshold “can only be conventionally chosen” (1977, 559).

To address the line-drawing problem, Schwartz (2007) and Hausman (2012, 2014) propose modifications to the BST. Schwartz suggests adding “negative consequence” as a criterion for pathology, while Hausman argues that the BST should abandon a statistical explication of normality. Since this chapter evaluates pregnancy entirely within the BST, discussing these modifications is beyond its scope.

Despite the absence of a precise line, we can consider whether common conditions in pregnancy would be viewed as pathological if they occurred in non-pregnant women of the same age. Perhaps not all common conditions qualify; for instance, merely experiencing increased nausea may not be sufficient in degree even for non-pregnant individuals. But most common conditions listed by the NHS, such as bleeding gums, indigestion, heartburn, and notably, perineal injuries from childbirth, indeed significantly exceed this threshold. Following the principle of statistical normality, if a biological occasion typically results in many conditions that significantly lower the average, with only a few being less severe, the overall set of common conditions should be considered a statistical deviation.

The second question—whether survival-harming conditions might somehow aid reproduction—was previously addressed in Section 4.3, where I noted that many common conditions, such as insomnia and indigestion, compromise both survival and reproductive goals.

Yet, limited research and prevailing social expectations always leave room for speculation on possible benefits of these conditions. For example, some might hypothesise that vomiting protects the foetus from harmful substances, or that reduced grey matter volume helps the gestator’s body more readily accept the foetus, thereby supporting maternal behavioural adaptation.

Here, I further highlight that this inclination to assume all existing traits serve a beneficial purpose has encountered substantial criticism, even within evolutionary biology. Gould and Lewontin (1979), for instance, argue that this view rests on an uncritical faith in natural selection as an optimising force—implying that existing traits must inherently contribute to

fitness while disregarding alternative explanations for their presence. A similar critique appears in the aging discourse, where Caplan (2017, 238) contends that common age-related conditions lack purposeful function and are instead mere by-products of natural selection—a consequence of evolution's limited foresight.

In the context of pregnancy, there is little evidence to support the claim that these conditions themselves in pregnancy provide any benefit to individual reproductive goals. They may simply be epiphenomena or by-product of evolution, lacking any causal relationship to human fitness (reproduction).

Despite the above views, I leave room for future findings—suppose research eventually shows that some conditions harming the gestator's survival may support foetal development or maternal behaviour to some extent. Yet this would not imply that survival harms can be "offset" by reproductive benefits, as the two goals are not comparable in importance—a point I will establish in the next section.

Given current evidence, most common conditions harming the gestator's survival (at least most of those listed by the NHS) offer no substantial benefit to the foetus. Within the reference class of non-pregnant women of the same age, these conditions are almost purely pathological. Even if certain "common conditions" benefit the foetus in some way, due to the non-commensurability between survival and reproductive contributions (which I will argue), these conditions would still be pathological with respect to the survival goal.

In summary, Section 3 examines whether common conditions in pregnancy (including childbirth) are pathological. I argue that determining if pregnancy is a typical occasion is crucial for selecting the appropriate reference group within the BST. Pregnancy is unique: unlike other functional occasions, it compromises survival goals to achieve reproductive ones. Based on Boorse's criteria, it is challenging to classify pregnancy as typical, especially when compared common conditions in pregnancy to temporary inhibitions of functional activities in typical occasions like sleeping and erection, which makes pregnancy exceptional.

As an atypical occasion, pregnancy should be excluded from the reference class, with non-pregnant women of the same age as the appropriate comparison group. Within this group, many (if not all) common conditions are statistically atypical. Even if some conditions may aid reproduction, they could still constitute survival pathologies, as the importance of two goals are not comparable—a point I will discuss next.

4. Addressing Goal Conflict: Offset or Separate?

So far, I have established that many common conditions in pregnancy exhibit strong pathological features within the BST. Does this imply that pregnancy per se could be considered pathological? The underlying question here is: Can we reasonably prioritise reproduction over survival within the BST?

Recalling the definition of pregnancy per se, or a typical pregnancy, as a unity of "having the foetus" and a set of common conditions, the puzzle in classifying pregnancy as pathological lies in its dual nature: it compromises survival (due to these common conditions) yet fulfils the reproductive contribution. Labelling pregnancy as pathological risks ignoring its reproductive role, while declaring it non-pathological sugar-coats the many harms to the gestator as "natural." Essentially, there is a conflict of goals.

Boorse (1997, 2014) suggests prioritising reproduction over survival to address the goal conflict. If successful, this would mean that even if most harmful conditions in pregnancy exhibit pathological aspects, they could be offset not only by their potential reproductive benefits (as discussed in Section 4.4), but even more so by pregnancy's *overall* contribution to reproduction.

However, I argue that this approach is not supported by the BST itself—neither its explicit clauses nor its core principle of statistical normality justifies the superiority of reproduction.

While the BST clauses establish a hierarchy between subgoals and the overall goal—identifying "individual survival and reproduction" as ultimate goals of the organism (Boorse 1977, 556)—they do not specify a hierarchy between survival and reproduction themselves.

It may be helpful to outline how BST defines function and the highest-level goals of organisms to support later discussions. Challenging Wright's evolutionary view of function (Wright 1973), Boorse argues that functional statement should depend on an organism's current structure and role, not its evolutionary history. For example, even if the penile urethra originally served solely as a sperm duct, both sperm conduction and urine evacuation are now functions because of their present contributions to overall goals, rather than their evolutionary details (Boorse 1976, 75-78).

Similarly, Boorse's identification of survival and reproduction as the highest goals is grounded not in evolutionary theory but in empirical observations: organisms adjust their behaviour across environments to achieve these ends, and biological structures are organised in a means-

end hierarchy directed toward survival and reproduction (Boorse 1976, 78; 1977, 556). Thus, survival and reproduction are established as ultimate goals largely based on empirical facts about their statistical frequency of occurrence—aligning with the BST.

Could statistical normality similarly be used to establish a hierarchy between survival and reproduction? Boorse's discussion on pregnancy suggests he leans in this direction. In response to concerns about conflicting goals—such as hypothetical scenario offered by William K. Goosens (1980, 112-113)— where a species must irreversibly transform into a slug-like creature to reproduce Boorse argues, "Precisely because of... the ubiquity of sacrifice by parents in reproduction—I would expect the disease concept to prefer reproduction over survival even in these hypothetical cases" (Boorse 1997, 93-94).

Here "ubiquity" can be understood as "statistical typicality" within the BST, referring to the widespread phenomenon of organisms to invest in reproduction at the expense of survival. In fact, Goosens' hypothetical example is not even as extreme as some real-life cases—for instance, certain North American salmonids exhibit semelparity, dying after a single reproductive event (Bell 1980, 53).

However, the problem is that this phenomenon *cannot* logically lead to the conclusion that reproduction outweighs survival in the BST. Here are my reasons:

Firstly, the statement that reproduction often incurs survival costs does not, in itself, establish its superiority as a goal. For instance, observing that working late commonly harms one's health does not imply that working late is more important than maintaining health—unless viewed from a specific perspective, such as "meeting deadlines," where staying up late might be deemed necessary despite the health risks. From a health-preserving standpoint, however, this would not be the case. Thus, the relative importance of goals depends on the perspective from which they are evaluated.

Indeed, reproduction might be more important than survival when viewed from the standpoint of evolutionary *fitness*. The reproductive goal of an organism—ensuring the continuity of its species—might outweigh its immediate survival within an evolutionary framework (Roff 2002). However, as previously discussed and as Boorse has consistently noted (Boorse 1977; 1997; 2014), the BST assesses health and pathology independently of evolutionary history, adaptation, or fitness. This suggests that whether fitness emphasises reproduction over survival is irrelevant to the BST's measurement of two goals.

Furthermore, the conclusion that organisms prioritise reproduction is based on studying species that have successfully adapted to Earth's environment, not the entire biological world throughout history. Statistically, the more common phenomenon in the biological world is *extinction*—well over 99.9% of all species that ever inhabited the Earth are now extinct (Saier 2006, 135). The mass extinction of species suggests that species survival (through reproduction) has not necessarily been favoured by the entire biological world. If we base statistical typicality on the entire biological and historical record, it would be just as reasonable to argue that individual immediate survival is prioritised over their reproduction.

In other words, without appealing to fitness, the BST lacks a compelling, objective basis for why an organism should prioritise reproduction over survival. As Hausman (2012, 521) rightly points out, one consequence of excluding fitness from the BST is that when survival and reproduction are in conflict, the theory offers no clear way to determine whether the organism's overall functioning has improved or declined. Pregnancy clearly exemplifies such a conflict.

Secondly, within the internal system of an organism, both harm to survival and contributions to reproduction during pregnancy are statistically typical *relative* to each other. This mutual statistical typicality prevents the BST from prioritising reproduction based on statistical normality.

Pregnancy affects various internal parts of the gestator's body—some aspects harm survival, while others (particularly the uterus) support reproduction. Based on this, one could emphasise the importance of reproduction by arguing that human gestation frequently poses survival risks. Equally, however, one could argue that nature prioritises survival, noting that, statistically, most human gestators survive the reproductive process, even without medical intervention.

Moreover, when discussing the sickle cell trait (SCT)—which causes pain, injury, disability, and infertility, but also provides a survival advantage against malaria—Boorse considers it a disease due to the universal harm it causes (Boorse 1997, 89). When survival harm and reproductive advantage conflict, the ubiquity of survival harm suggests to Boorse that pregnancy is not pathological. Yet, when survival harm and advantage conflict, the ubiquity of harm classifies SCT as pathological. If the prevalence of survival harms can define a condition as both pathological and non-pathological, it becomes a somewhat inconsistent standard.

Thirdly, the "harm" that pregnancy poses to the gestator's survival and its "contribution" to reproduction are quantitatively *incommensurable*, making any statistical hierarchy between them impossible.

The BST lacks specific measurement units for each goal (Thorell 2021), let alone a common unit for both. Empirical judgment may assist in measuring these respective goals. Metrics such as lifespan or quality of life could gauge survival goals, while reproductive success might be assessed through foetal development and genetic transmission. Consequently, one can compare an individual's survival status affected by a certain condition to that of others without the condition, and similarly for reproductive status. However, there appears to be no method for comparing how a condition impacts reproduction versus its effects on survival goals within the same body system.

One might suggest using the degree of harm and achievement as a unified metric for comparison. It can be stated thus: most harm from pregnancy to a woman's survival is not life-threatening, while achieving the reproductive goal—creating a new life—is statistically absolute. In other words, from the perspective of "degree," reproduction might appear more statistically typical.

That said, this claim may be somewhat arbitrary. Pregnancy's contribution to reproduction is not necessarily absolute if reproduction is defined as the transmission of an individual's genetic code. As Boorse (1997, 24) clarifies, survival and reproductive goals are individual rather than species wide. If reproduction involves passing on one's genetic code, then a typical pregnancy—which transmits at most half of the pregnant individual's genetic code—may not fully realise her reproductive goal, while the survival risk is borne solely by the pregnant individual.

Additionally, Boorse emphasises that physicians and medical practice never categorise pregnancy itself as pathological, but instead consider the reproductive functions as normal, despite its diminution to the efficiency of other functions (Boorse 1997, 26-8). Yet, this cannot be used as evidence to prioritise reproductive goals, as Boorse repeatedly asserts that the BST is distinct from the pathology classifications used in medical practice (Bourse, 1977, 1997, 2014).

Therefore, neither the clause of the BST nor its statistical normality rationale provides a definitive, non-value-laden priority of reproduction over survival.

Now, by combining the analyses from Sections 3 and 4, we can draw outcomes about examining pregnancy within the BST:

(i) Common conditions resulting from pregnancy are parts of pregnancy per se, as concluded in Section 3.

(ii)The appropriate reference class for evaluating the pathology of common conditions in pregnancy is non-pregnant women of the same age. Since many, if not all, of these common conditions cause dysfunction, and there is little evidence suggesting they benefit reproduction, they exhibit pathological characteristics, as concluded in Section 4.

(iii) Section 5 suggests that the BST cannot convincingly rank reproduction above survival. This implies that, even if future findings show certain pregnancy conditions benefit foetal development or maternal behaviour, many common conditions in pregnancy still impair survival, and this cannot be offset by potential reproductive benefits or pregnancy's overall contribution to reproduction.

(iv) Combining the three test results, the survival cost and reproductive contribution of pregnancy per se should be measured separately. Pregnancy statistically lowers the gestator's survival level compared to non-pregnant women of the same age, which qualifies it as pathological from a survival standpoint. Conversely, its contribution to reproduction is statistically typical, meaning it is not pathological in that regard. Given the statistical independence of these two aspects, it is reasonable to conclude that, for the gestator, pregnancy constitutes a survival pathology according to the BST.

5. The Future with new reproductive technologies

With the rise of reproductive technologies like egg freezing and IVF, it seems necessary to briefly explore their potential implications for the pregnancy-pathology debate.

The statistical nature of the BST implies that it does not focus on how changes occur within a population but rather on whether these changes become statistically typical in human life patterns. As Guerrero (2010) points out, an individual's health status could shift not due to internal physiological changes but solely because of changes within the reference class. For instance, if a person has an average heart-pumping ability but others suddenly develop stronger hearts, that individual could instantly be classified as diseased. Boorse acknowledges this theoretical possibility but argues it takes time for such shifts to become typical in human history (Boorse 2014, 715). This suggests that, as technology or medicine evolves and affects humanity's overall health profile, our assessment of what is pathological may also change.

In response to DeVito's (2000) critique, Boorse further clarifies that if humans could eliminate the need for certain physiological functions, then related conditions would cease to be pathological. Medicine might classify them as non-diseases, akin to conditions people might choose to alter, such as monthly ovulation or small breasts (Boorse 2014, 709). In short, for technology or medicine to change the pathology of conditions, they must alter humanity's overall functional pattern. This has two main implications for the future of pregnancy:

On one hand, infertility and non-heterosexuality may gradually *cease* to be considered pathological within the BST as reproductive technologies, particularly ectogenesis (gestation in an entirely artificial environment), become more widely accepted. According to the BST, infertility in women of reproductive age and homosexuality are considered pathological due to their impact on reproductive goals. Theoretically, asexuality or a lack of sexual desire (arising from psychological or religious beliefs) could also be deemed pathological, though this is rarely discussed. But if ectogenesis becomes a common mode of human reproduction, the uterus could become an obsolete organ, much like wisdom teeth, making biological and social infertility non-pathological. This is like how the absence of wisdom teeth is not considered pathological today, as they are no longer necessary for chewing. Infertility could even be seen as a kind of "vaccine" against pregnancy-related pathologies.

On the other hand, pregnancy's pathological nature may persist or even intensify with new reproductive technologies. If gestational surrogacy—where the egg is provided by the intended mother or donor—becomes a typical reproductive mode (despite ethical concerns) and reproductive success is measured primarily by gene transmission, pregnancy could increasingly be viewed as purely pathological under the BST. In this scenario, pregnancy makes a minimal contribution to the gestator's reproductive goals, while its survival-related harms remain.

Even with widespread adoption of ectogenesis, pregnancy may continue to be viewed as a survival pathology and may evolve into a reproductive pathology. If certain health risks associated with pregnancy cannot be mitigated below a specific threshold, its pathological nature will persist. In other words, while "inability to become pregnant" might no longer be classified as pathological, "performing pregnancy" could still be considered pathological. This is analogous to how lacking wisdom teeth is not pathological but using them for chewing can lead to inflammation and pain.

Furthermore, if ectogenesis is widely adopted, potentially improving genetic transmission (such as through cloning), and ensuring better foetal health, the reproductive efficiency of pregnancy would fall below that of the reference group. Some non-pregnant women of reproductive age could employ ectogenesis and cloning to pass on their complete genetic code and produce healthier offspring, thus classifying pregnancy as a reproductive pathology.

Conclusion

Pregnancy is a double-edged sword; while it facilitates the gestator's reproduction, it harms their survival goals. Pregnancy and its resultant conditions are inseparable. These common conditions render pregnancy a survival pathology under the naturalist pathology account—the BST—despite its creator's denial.

Within the BST, pregnancy is neither a single condition nor a typical occasion. Due to the atypicality, pregnant population cannot serve as an independent reference class or be included in the reference group. Instead, non-pregnant women of the same age constitute the appropriate reference group, rendering many conditions caused by gestation pathological concerning the gestator's survival goal. Moreover, the survival pathology caused by pregnancy cannot be offset by its contribution to reproduction, as the BST—which does not align with the evolutionary perspective—fails to provide a convincing rationale for prioritising reproduction. Therefore, the BST supports evaluating survival and reproductive aspects separately. In doing so, pregnancy is deemed pathological regarding survival.

Future reproductive technologies may present interesting challenges to this conclusion. Both biological and social infertility may cease to be considered pathological if pregnancy no longer depends on the human uterus, while the pathological nature of biological pregnancy may persist or even intensify.

CHAPTER THREE

Ectogenesis and the Social Implications of Pregnancy Narratives

In the previous chapter, I examined pregnancy within the most prominent naturalist account of pathology and demonstrated that pregnancy constitutes a pathology for the survival of the gestator. This means that even if supporting ectogenesis reinforces the association between pregnancy and pathology, it is not necessarily misleading. What renders pregnancy pathological within the BST are the common conditions of the typical pregnancy. This, to some extent, provides further theoretical support for ectogenesis as a means of removing such conditions for those who seek this option.

Nevertheless, there are other reasonable theoretical accounts of pathology that might render pregnancy per se non-pathological. It is also important to consider the potential harms of pathologising pregnancy.

As I summarised in the previous chapter, another possible approach to resisting the pathologisation of pregnancy is to argue that, while the question of whether pregnancy is pathological may be ambiguous, classifying pregnancy per se as a pathology is ultimately *harmful* to women. Relevant critics precisely emphasise this notion of "harm"—such as the over-medicalisation of pregnancy and the potential stigmatisation of pregnant individuals (Romanis et al. 2020; Cavaliere 2020; Partridge and Knox 2024).

Smajdor and Räsänen (2024) primarily draws on Cooper's normative account of pathology to argue that there are good reasons to consider pregnancy itself as pathological, and further uses the positive social implications of recognising pregnancy as pathological to support this position. I broadly agree with the social significance of pathologising pregnancy in the current context, but here I aim to engage more deeply with critics' concerns in order to strengthen that position.

It is true that whether pregnancy is considered pathological depends significantly on the theoretical account of pathology adopted and on which aspects of pregnancy are emphasised. As this chapter will show, within Cooper's account, there are good reasons to view pregnancy as pathological, but also reasonable grounds to consider it non-pathological.

However, I argue that the negative consequences of pathologising pregnancy, as identified by critics, are in fact largely the consequences of *normalising* the harm of pregnancy to women. I further propose a principled reason for emphasising the pathological aspects of pregnancy in the current context: the ethical imperative to prioritise the least-advantaged groups within

public discourse. This principle also provides a normative framework for shaping future narratives of pregnancy, particularly if ectogenesis becomes a standard gestational option.

Accordingly, this chapter is structured as follows: First, I examine whether pregnancy is pathological through Cooper's account, showing its ambiguity. Second, I argue for the social value of using theories of pathology to frame pregnancy narratives and analyse the logical weaknesses in claims that pathologising pregnancy causes supposed harm to women. Finally, I propose a principle for constructing reasonable pregnancy narratives, grounded in social justice within a given context.

1. Pregnancy is both pathological and non-pathological.

As demonstrated in the previous chapter, even the most stringent naturalist account of pathology, which asserts that pregnancy is not pathological, do not categorically exclude the possibility of pregnancy being pathological. Here, I further examine a pathology account more strongly supported by Smajdor and Räsänen (2024)—Cooper's normativist account (2020)—which they suggest can categorise pregnancy can as a disease.

Cooper argues that pathology is inherently anthropocentric and evaluative. She defines the normativist account using three criteria:
(i) it is harmful to the individuals who experience it;
(ii) the afflicted person is unlucky; and
(iii) the condition is potentially treatable through medical intervention.

Cooper suggests that an unwanted pregnancy could fit this definition. For instance, in cases where a woman becomes pregnant despite using contraception, pregnancy may be harmful, lead to an unfortunate situation, and be medically treatable. Smajdor and Räsänen (2024) further argue that even desired pregnancies meet these criteria. First, the harms and risks associated with pregnancy can be detrimental to pregnant individuals. Second, pregnancy may be considered unfortunate, as women often face two distressing choices—childlessness or the risks of gestation. Lastly, pregnancy typically receives significant medical attention.

I generally agree that Smajdor and Räsänen (2024) present good reasons to think pregnancy-related conditions, including those traditionally considered normal, as diseases within Cooper's framework. However, I argue that certain ambiguities or open-ended aspects of Cooper's account make it difficult to determine whether pregnancy, in its multifaceted nature, should be

classified as pathological. That said, one can also have good reasons to think pregnancy as non-pathological in this account.

The ambiguity or openness in Cooper's account arises from the following issues. First, it does not establish a clear distinction or connection between *part*-pathology and the *overall* pathology of pregnancy. In other words, it remains unclear whether pregnancy as a whole should be considered pathological when only certain aspects of it are pathological. Second, its criteria for "badness" and "unluckiness" are overly *vague or open-ended*.

As I discussed in the previous chapter, pregnancy is a holistic process that encompasses both gestating the foetus and a series of physiological changes in the maternal body that facilitate the gestation process. This understanding can exist independently of any specific account of disease. Pregnancy is a condition in which a person's body undergoes changes to enable generative work (Romanis 2024). This condition inherently involves a series of physiological transformations in the gestator. Nevertheless, unlike the BST, which clearly defines biological part-dysfunction—i.e., the failure of an internal mechanism to perform its biological function—as both a necessary and sufficient factual criterion for pathology (Wakefield 2014), Cooper's account appears to lack a comparable specification.

Moreover, determining whether pregnancy is pathological within Cooper's framework depends on the "bad" and "unlucky" criteria, because pregnancy is undoubtedly medically treatable.

However, what does it mean for a condition to be *bad* for its bearer? While Cooper primarily discusses what does not constitute "badness," she leaves the definition of what counts as badness highly open-ended.

Cooper notes that "bad" does not refer to the condition's consequences for society, nor does it mean that the condition is bad for most people—it must be bad for the individual who experiences it. However, how should we determine whether a condition is bad for its bearer? Cooper explicitly states that this question "will not be solved here" (Cooper 2020, 274). Instead, she evaluates two broad normative approaches: on one end, asking what actual individuals desire, and on the other, applying an objective standard of human flourishing.

Cooper highlights the limitations of both approaches. A purely subjective evaluation loses its appeal due to misinformation, self-deception, and a lack of self-assessment abilities. Here I add a point: these issues of subjective standard may not only be individual but also collective. For example, in past and even some present societies, homosexual groups may have reasons to

consider their sexualities bad because the situation of other heterosexual groups, conforming to societal norms, are perceived as better. If whether a condition is bad is based on subjective judgment, it may lead to collective surrender to unjust social norms.

In terms of other normative standards, Cooper argues that appealing to an "ideal human flourishing" standard appears overly anti-naturalistic and thus difficult to endorse, while approaches that fall between this and a purely naturalistic view face similar challenge.

Thus, Cooper does not clearly indicate which standard she supports for defining badness. Rather, she appears to leave the challenge of determining the appropriate normative theory for assessing whether a condition is bad for its holder to someone else.

Smajdor and Räsänen (2024) clearly do not rely on actual people's desires to determine what is good or bad; instead, they employ a more objective standard. They argue that in a world still heavily influenced by misogyny and pronatalism, even severe reproductive risks may be perceived as symbols of motherhood; yet the objective harms and risks associated with gestation are inherently bad. I agree with this perspective. In the next chapter, I will further explore how women's endorsement of gestational suffering is largely the result of internalised oppression.

Their arguments can be further bolstered by considering a clarification made by Cooper:

> Disease status depends on how the condition in and of itself is evaluated. Any secondary gains achieved via possession of the condition should be ignored in this evaluation. Thus, if someone has food poisoning, they can consider this to be a bad thing in and of itself, even though they are glad to be poisoned because this gets them out of sitting a difficult exam. In such cases, the food poisoning is a disease because the condition is only valued because it just so happens to be linked to other benefits (Cooper 2020, 275).

In other words, evaluating the "badness" of a condition depends on its direct and non-incidental consequences for the individual, rather than those that are contingent. Food poisoning causes physical harm to a person's body, which is direct and non-incidental. Conversely, the "benefit" of avoiding an exam is incidental and contextual.

By the same token, gestational harms to one's body are bad because they are direct and non-contingent—the harm itself causes physical damage to the gestator's health and does not directly produce the related child. In contrast, the sense of glory the bearer may receive from enduring gestational suffering is a secondary gain, contingent upon specific cultural norms,

and should thus be disregarded in this evaluation. Therefore, based on a more objective standard, it is difficult to argue that the harms and risks commonly associated with pregnancy and childbirth, are inherently good. Their perceived "goodness" appears to be contingent upon a pronatalist ideology and a cultural glorification of gestational suffering.

However, even when assessed using such a more objective standard, one can only conclude that gestational harms and risks are bad for the pregnant individual, but not necessarily that pregnancy as a whole is bad for them. This is because Cooper does not define the relationship between part-pathology and overall pathology.

One could acknowledge that these harms and risks are bad while simultaneously believing that having a foetus and experiencing interactions with the foetus, particularly in the later stages, are good and sufficiently compensate for the suffering caused by pregnancy. Given this comparison of different aspects of pregnancy, Cooper's account, due to its open-ended criteria for evaluating good and bad, also implies an open-ended standard for prioritisation—that is, which part is better or worse. If this prioritisation is determined by "their actual want," then in a pronatalist context that encourages women to view gestational suffering as natural and honourable, women may place greater value on the gestational outcome—the birth of a child—and therefore conclude that pregnancy is not bad.

The "*unlucky*" criterion is even more flexible. According to the Cambridge Dictionary, "unlucky" means "having bad things happen by chance," suggesting that the condition is an accidental outcome rather than something deliberately caused or predictable[9]. But Cooper's explanation is that being unlucky means being "worse off than the majority of humans of the same sex and age" (Cooper 2020, 276). This definition seems to resemble the basic parameters of BST's reference class—age and sex. Nevertheless, in Cooper's account, "worse off" includes the condition holder's subjective evaluation. Cooper identifies several ways in which an individual may perceive themselves as unlucky: whether the condition makes them feel worse than before, believe that others without it are better off, or assume that even if most

[9] Cambridge Dictionary, s.v. "unlucky," accessed February 26, 2025,

https://dictionary.cambridge.org/dictionary/english/unlucky.

people share the condition, they would still be better off without it. If any of these conditions hold, the state can be considered unlucky.

However, when one claims to have good reasons to believe something, it often implies that those on opposing sides may also have good reasons to support a different stance. On one hand, if we focus only on the health risks and harms associated with pregnancy and childbirth, it may seem reasonable to believe that avoiding these harms would be preferable. It also follows, as Smajdor and Räsänen (2024) suggest, that if medical advancements or ectogenesis could largely alleviate these conditions, people would be better off. On the other hand, a pregnant individual may have good reasons to see the unpleasant and harmful aspects of pregnancy as a natural part of life, not making them worse off than before pregnancy or compared to those who are not pregnant.

More importantly, again, pregnancy is not just about gestational harm and risks. In the case of a wanted pregnancy, the experience of having a child is often seen as positive. Some pregnant individuals may deeply value the connection formed with the foetus during gestation, a unique gestational tie (Kennedy 2024). Even with ectogenesis, which does not interfere with bonding between caregivers and children, the physical connection in bodily pregnancy may still be meaningful for those who appreciate the experience of carrying a foetus, which I will discuss more in chapter 5.

Combining the previous chapter's discussion on how BST can define pregnancy as a survival pathology with the uncertainty in Cooper's account, pregnancy seems to be both pathological and not pathological. There are also many other accounts, as much of the literature on disease is concerned with the relationship between what qualifies as a disease, how a condition comes to be labelled as a disease, and whether it is considered treatable. These different perspectives may lead to varying conclusions about whether pregnancy is pathological.

2. The Social Implications of Pathologising Pregnancy

Given that the pathological status of pregnancy cannot be consistently determined across different theories of pathology, I argue that it is necessary to draw on reasonable elements from these theories to construct pregnancy narratives that are responsive to the current context in a way that benefits pregnant individuals today.

Although medical commitment is not always based on labelling something as a disease but rather on the potential benefits of treatment (Hesslow 1993), scholarly classifications of a

condition as pathological often become part of public narratives, thereby influencing medical policies and social attitudes. This indirect impact can be significant and should not be overlooked.

For instance, the historical mistreatment of homosexuality appears to be closely linked to the pathologisation of homosexuality in academic discourse. Richard von Krafft-Ebing, a German psychiatrist, popularised the term homosexuality; his *Psychopathia Sexualis* (1886) described homosexuality as a "degenerative" disorder and framed non-procreative sexual behaviours as forms of psychopathology through the lens of 19th-century Darwinian theory. This kind of classification draw a clear boundary between what was considered "normal" and what was labelled as deviant, abnormal, and in need of a cure, thus legitimising some cruel medical treatments and reinforcing discriminatory social attitudes toward homosexuality (Halem, Manion, and Streed 2024). Given such historical precedents and the fact that pathology is often associated with negative connotations, it is not difficult to understand why people worry that the pathologisation of pregnancy in public narratives may follow a similarly problematic trajectory.

However, pregnancy has never been a comparable case to others in history that were pathologised and are now considered should not have been. Pregnancy is, in fact, the *opposite*: the harm, risks, pain and even death that women experience during pregnancy and childbirth have historically been normalised as a female duty and destiny. It is only in contemporary times that voices have begun to challenge this normalisation.

In the current context, what critics are primarily concerned about are the negative social consequences of linking pregnancy with pathology—namely, the over-medicalisation of pregnancy and the potential for negative attitudes toward pregnant individuals. For instance, Romanis et al. (2020, 825-826) point out:

> We do not deny that pregnancy can be difficult, harmful, or even dangerous in certain circumstances. The reality remains that gestation and childbirth can have serious, long-term, or even fatal consequences for women. However, pathologising all pregnancies could exacerbate maternal-foetal conflict by explicitly positioning normal pregnancy as a source of danger and justifying medical intervention.

Similarly, Partridge and Knox (2024) argue that modern medicine has already made pregnancy highly medicalised, sometimes leading to overmedicalisation, such as the excessive use of caesarean sections; Calling pregnancy pathological could push this even further. Others, like

Cavaliere (2020), also note that pathologising pregnancy could stigmatise or devalue those who see pregnancy as meaningful. In short, the concerns are twofold: overmedicalisation and stigma.

However, I argue that the pathologisation of pregnancy—particularly the emphasis on the pathological nature of gestational harm and risks—does not logically lead to the over-medicalisation of pregnancy or the stigmatisation of pregnant individuals in the current social context, mainly for the following two reasons.

Firstly, the narrative underpinning overmedicalisation of female reproduction has never been "pregnancy is pathological for women," but rather the *opposite* — "pregnancy-related harms are considered normal and inevitable for women".

At least to date, the mainstream narrative in patriarchal societies continues to emphasise that pregnancy is not a disease for women. In other chapters, I will further analyse how the harms of pregnancy have long been normalised and romanticised—whether in terms of common conditions associated with pregnancy or more severe consequences such as childbirth pain, injuries, and trauma. It is precisely with the rise of feminist movements that an alternative discourse has emerged, one that challenges the perception of pregnancy—particularly its embodied risks and harms—as something "normal."

In fact, the overmedicalisation of pregnancy and childbirth such as unnecessary caesarean sections and prenatal screening, as shown in numerous studies (e.g., Sabetghadam et al. 2022; Johanson, Newburn, and Macfarlane, 2002; Betran et al. 2021), has emerged within the broader narrative that normalises the harm of pregnancy. From a logical standpoint, only by relying on the narrative that common gestational risks and harms are "normal" can medical practice justify shifting its focus to the foetus's well-being while implementing unnecessary interventions on women, ultimately further undermining women's health interests.

Using the overuse of caesarean sections as an example—often cited against the pathologisation of pregnancy (Romanis et al. 2020)—closer examination reveals it actually reflects a narrative that normalises pregnancy-related harm to women. The increasing rate of caesarean sections is a global phenomenon (Angolile et al. 2023) and is not limited to developed countries. Low- and middle-income countries, such as India, Iran, China, and several Latin American nations—many of which have high maternal mortality rates—have also experienced a significant rise in caesarean section rates (Leone 2014; Shahshahan et al. 2016; Mi and Liu 2014; Villar et al. 2006). Although caesarean sections can be lifesaving for both mother and baby in emergency

situations, unnecessary caesarean deliveries often pose greater risks and complications for women compared to vaginal births. These risks include a significantly higher rate of puerperal febrile morbidity, wound infections, increased blood loss, and longer hospital stays (Bodner et al. 2011). After adjusting for potential confounders, research has shown that the risk of postpartum death is 3.6 times higher after a caesarean than after a vaginal delivery (Deneux-Tharaux et al. 2006). For instance, in Latin America, approximately 1.5 million unnecessary caesarean sections are performed annually, resulting in around 100 maternal deaths and 40,000 cases of neonatal respiratory morbidity (Villar et al. 2006).

To examine what kind of pregnancy narrative might have contributed to such severe overmedicalisation, we must ask: what has driven the widespread preference for caesarean sections? Research shows that "absence of pain, as a benefit to the woman, is a false promise" (Wagner 2000, 1677). Rather, the deeper, primary drive behind this trend lies in how women who choose a "natural" or home birth are often criticised by doctors as selfish—prioritising their own needs over the safety of the baby—despite a lack of evidence supporting this claim; in some cultures, such as in Latin America, women may opt for caesarean sections to "maintain the vaginal tone of a teenager." Additionally, defensive obstetric practices, driven by fears of litigation or rising insurance costs, further contribute to this phenomenon (Wagner 2000). In developed countries like the United States, one key driver is public expectations of a perfect pregnancy outcome, particularly the emphasis on eliminating any risk of intrapartum injury to the foetus (Peebles et al. 2020). Among Chinese families, auspicious birth dates play a significant role, as many opt for caesarean sections to ensure their male children are born on specific, culturally significant dates (Almond et al. 2015).

None of these driving factors centre on the gestational mother's interests; rather, they revolve around the neonate, sexual partners, doctors, or cultural traditions. Therefore, they cannot be rooted in a narrative that frames the risks and harms of pregnancy as pathological for women. If these pieces of evidence are still not clear enough to show that the true driver of the overmedicalisation of pregnancy is the historical narrative that normalises pregnancy, then its seemingly opposing yet fundamentally aligned counterpart provides even stronger proof: when the foetal or neonatal interests are not directly involved, maternal care is often severely lacking.

Unlike the sharp rise in caesarean section rates, in developing countries, only about 65% of women receive prenatal care (Neupane and Doku, 2012). Access to pain management during childbirth remains significantly restricted, even in developed countries (Ingram et al. 2022).

One major barrier is the cultural belief that childbirth pain is a natural and essential part of a woman's life experience. For instance, midwives working in religious regions of the Netherlands have shared their experiences with women in labour pain:

> In our region, people believe what is written in the Bible: 'Thou shalt give birth in grief.' This is a belief that I share. For this reason, in our practice, many women do not want to use pain relief, and they wonder, 'Is it permissible to use labor pain medication?' We have many such women…… (Klomp et al. 2016, 9).

More importantly, the lack of effective pain relief during labour has led many women to opt for caesarean sections—a factor believed to account for more than half of women's preference for CS as a mode of delivery (Shaaban et al. 2017). That said, women are often forced to choose between two undesirable options—vaginal birth without pain relief or caesarean section—ultimately selecting the one more strongly endorsed by medical professionals.

Moreover, postpartum care for women is widely neglected. Many women suffer from painful injuries during vaginal birth as well as tissue damage from caesarean sections (The National Board of Health and Welfare 2021), which can result in persistent postpartum pain lasting anywhere from 8 months to 12 years (Molin et al. 2020; Bergström et al. 2017). Nevertheless, postpartum pain is largely ignored or trivialised, leaving women without adequate management, feeling isolated, and forced to navigate the healthcare system on their own (Molin et al. 2024). Also, emerging evidence suggests a strong association between acute postpartum pain, chronic pain, and postpartum depression (Ding et al. 2014). Yet, many birthing individuals report that they receive neither the practical nor emotional support they need and deserve (Slomian et al. 2017).

Therefore, the more accurate truth is that when the foetus's well-being is directly involved, women's interests are overlooked, and overmedicalisation increases the harms and risks they face. Conversely, when the foetus's well-being is not directly at play, women's medical needs for their own health are largely ignored, delayed, or inadequately addressed (Smajor and Räsänen 2024).

If this phenomenon partly stems from adopting a certain narrative related to pregnancy, then such a narrative must prioritise foetal health while normalising or marginalising harms and risks to women, rather than framing pregnancy risks and conditions as pathologies for women. Most pregnancy symptoms including childbirth pain and injuries have been historically perceived as normal and natural, making women who do not enjoy the pregnancy process feel

selfish, weak, or inadequate as mothers, resulting in cognitive conflicts and difficulties in seeking medical help. As writer Olga Mecking (2016) describes, “When women really feel sick in pregnancy, their concerns are often met with, 'It’s a natural process.' Translation: Shut up and don’t be a weakling.”

Such norm prevents women from accessing medical help and seeking remedies for discomfort. At least to date, emphasising that pregnancy is not a disease for women is the mainstream narrative in patriarchal societies. It is precisely because of such narrative that it rationalises the medical focus shifting towards the foetus, thereby neglecting women’s needs while excessively intervening in their bodies for the benefit of the foetus. The lack of medical support and being overly medicated can be one thing—where the massive medical intervention received is not for her, and her needs are not met.

In theory, if pregnancy were viewed as a pathology, it would inherently resist or disrupt the narrative of prioritising foetal health, complicating the implementation of practices that increase women’s health risks. Challenging traditional narratives with such an approach does not equate to endorsing the overmedicalisation of pregnancy; rather, it aims to rectify both excessive and inadequate medicalisation of pregnancy. There is no convincing reason to assume that it would encourage the belief that more medical intervention in pregnancy and childbirth necessarily constitutes a better standard of care. After all, defining the harms and risks of pregnancy as pathological points toward the need for proper medical support, not excessive intervention.

Secondly, highlighting the pathological aspects of pregnancy does *not* necessarily stigmatise pregnant individuals; if stigma does occur, it is contextual. This concern must be incorporated into a broader debate concerning prejudice toward people with diseases in general. In other words, whether individuals who value pregnancy will face stigma when pregnancy or those relevant conditions are perceived as pathological collectively may depend on societal attitudes toward patients overall. In a society with a strong negative attitude toward diseased people, it is indeed possible that undesirable attitudes toward pregnant women may arise when pregnancy or those “normal” conditions are perceived as a pathology. Conversely, in societies without such prejudice toward diseased people, this may not be the case. If a society has a deep-rooted tradition of discriminating against patients, then it seems that we should be to eliminate such an unethical tradition.

In general, admitting that normal pregnancy's conditions can be perceived as pathological does not inherently link them to issues like overmedicalisation and stigma. Yet, in different societies, we may need to highlight different aspects of pregnancy to advocate for better treatment for women's reproduction, while also avoiding negative outcomes. Therefore, constructing a contextualised narrative of pregnancy is essential, as I will discuss next.

3. A Proposal: Constructing a Contextualised Pregnancy Narrative Based on Social Justice

One important feature of examining whether pregnancy is pathological lies in constructing narratives that support feminist objectives. The collective narrative of pregnancy, like other public narratives, inherently concerns *social justice*. It significantly influences the priority of social issues, shapes the logic of resource distribution, and forms the social identity of groups within a given societal context. Therefore, shaping the narrative of pregnancy should adhere to certain principles of social justice.

Public narratives are fundamentally selective emphases on reality to serve political objectives, and thus, they are inherently imbalanced. John Rawls' *Difference Principle* of justice offers a crucial insight: Inequality is only justifiable when it benefits the least advantaged groups. Specifically, this principle states that social and economic inequalities are morally permissible if they benefit, in some way, the least-advantaged members of society; this principle is consistent with the first principle of justice, which guarantees everyone equal basic personal liberties, equal political status, and fair equality of opportunities (Rawls 1971, 42-43).

The Difference Principle is instrumental in addressing injustices within our far-from-ideal current situation, guiding us in reformulating societal models that perpetuate inequality (Nagel 2003). This principle is vital when proposing new frameworks to replace existing ones that disadvantage certain groups. Under these current models, the "least advantaged group" often emerges from unjust social and economic structures. The revised model advocates for intentional inequalities to rectify these disparities. For example, the Difference Principle can be exemplified by affirmative action in higher education. Such policies aim to increase the representation of traditionally oppressed minorities in academic institutions by considering race as a factor in admissions (Nagel 2003). Affirmative action is designed to provide those marginalised by prevailing systems with a fairer competitive edge.

By the same token, public narratives represent a redistribution of social resources—specifically, the redistribution of *discursive power*. These narratives should be constructed based on principles of social justice.

In constructing public narratives based on the Difference Principle, new imbalances created by selective emphasis should have a clear direction, namely, correcting the existing disadvantages caused by current narratives, thereby promoting a more just public discourse. Selectively emphasising certain aspects of an issue over others constitutes a form of inequality in action, but it does not violate fundamental liberal principles. It is based on factual underpinnings and aims to correct the adverse effects that the current narrative emphasis has on some groups.

Therefore, constructing a new public narrative based on principles of justice generally requires two steps: 1) Identifying existing unjust dominant narratives; 2) Building the narrative by emphasising certain aspects to benefit the least advantaged groups in the current public narrative.

The current dominant narrative around pregnancy emphasises its normalcy and this narrative generally disadvantages women, especially those in impoverished and certain religious communities. Under this narrative, both the poor medicalisation and over-medicalisation of women (for foetal interests) appear justified.

In societies where the "normalcy" of pregnancy is already heavily emphasised, resisting the emphasis on its pathological aspects may not serve the best interests of women seeking proper maternal support. This is similar to emphasising the right to experience risk and find value in it in a society where many are forced to engage in high-risk labour, or highlighting women's rights to be housewives and respect their preference for being homemakers in settings where women lack job opportunities, and most women are already trapped in housework. Such narratives may only make it more difficult for those affected to have their situations corrected. They obscure the key issues within the current injustices and may hinder efforts to address the most disadvantaged problems.

On the contrary, if the discourse supporting ectogenesis contributes in some way to constructing a pregnancy narrative that emphasises the pathological harm pregnancy inflicts on women's health, then in the current context, it aligns with principles of justice. It can challenge the dominant narrative that normalises and naturalises the suffering women endure in human procreation. That said, in societies where common gestational health issues for women are considered "normal", constructing a collective narrative that underscores their

pathological nature can serve as a powerful rebuttal against such normalisation. In other chapters, I further analyse how the normalisation of women's reproductive pain and suffering is fundamentally a patriarchal narrative, designed to internalise oppression and justify a social structure centred around male reproductive characteristics—ones that do not require intensive care but instead rely on the functioning of the female uterus. In other words, such a system maintains itself through unjust institutions like violence and marriages, ensuring that women serve male reproductive interests. Therefore, constructing a pregnancy narrative that highlights the harm and risks women face is a necessary corrective to the unjust patriarchal narrative of pregnancy.

As a matter of fact, feminist scholars have long been working to correct the unjust patriarchal narratives of pregnancy. For example, regarding male and female gestational characteristics, patriarchal discourse has consistently privileged male traits, emphasising sperm as the seed—the most fundamental component of human offspring. In *The Politics of Reproduction,* Mary O'Brien (1981) deconstructs the traditional pregnancy narratives and builds a new philosophical framework for understanding gestational differences between the sexes. Starting from basic biological facts, she highlights the superiority of female gestational traits in contrast to the historically privileged male gestational traits. O'Brien argues that men, while participating in gestation through intercourse, are ultimately excluded from the gestational process itself, as they cannot directly experience pregnancy or childbirth. Because of this alienation, she suggests that men historically sought to establish certainty of paternity, leading to the construction of marriage systems and the private realm as mechanisms of control women's pregnancy capabilities. In contrast, female gestation is continuous, automatically confirming maternity without the need for external validation.

Such a narrative may still seem to imply a biological hierarchy, which, in an ideal world that truly values equality and recognises physiological differences as merely differences, might not be conducive to promoting the purpose of equality. But we do not live in such a world.

O'Brien herself explains her motivation for constructing this philosophy of pregnancy:

> Feminist theory has to be biased because it is anti-bias. We have to correct a profound and long-sustained imbalance, and this cannot be done without jumping rather brutally and without invitation on the end of the philosophical seesaw which has lingered too long in the rarefied heights of the complacent taken-for-grantedness of male conceptions of the nature of man (O'Brien 1981, 12).

I do not endorse biological hierarchies, but I support the spirit of constructing anti-bias narratives grounded in reasonable facts. A counter-narrative that resists traditional patriarchal discourses does not need to be comprehensive; rather, its purpose is to target and expose the contradictions and vulnerabilities of the dominant discourse. The significance of this new narrative lies in its *oppositional force* against the traditional narrative and its ability to remind people to critically reassess the unjust messages that have long been taken for granted.

Arguing that pregnancy is pathological follows this very trajectory of correcting unjust traditional narratives. O'Brien focuses on reconstructing the discourse around the differences in male and female participation and contribution in human procreation, whereas the pathologisation of pregnancy emphasises the harm and risk embedded in women's pregnancy and childbirth.

I do not mean, however, that insisting on the pathologisation of pregnancy as a narrative is always justifiable. Instead, as the difference principle of justice suggests, inequalities within a new social model are justified only insofar as they serve to correct the disadvantages created by existing structures for certain groups. This means that when the corrective value of such a model ceases to exist due to changes in context, the model itself should also evolve accordingly. In other words, a particular public narrative should be adjusted or replaced when, due to shifts in the social context, it no longer provides a counterbalance to existing injustices and instead creates new imbalances that disadvantage certain groups.

When analysing different pathologisation accounts earlier, it became evident that with the widespread application of ectogenesis in the future, pregnancy might increasingly be perceived as a pathological condition. This concern is also linked to another key argument raised by critics of ectogenesis—namely, that if ectogenesis significantly improves infant health, pregnancy may come to be seen as inferior, thereby pressuring those who prefer traditional pregnancy into choosing ectogenesis. I will explore this criticism more deeply in the next chapter.

Here, I offer only a preliminary recommendation based on the difference principle, as future social contexts remain highly speculative. Suppose that future social norms evolve exactly as critics such as Cavaliere (2020) and Horn (2020) fear, where ectogenesis becomes the standard choice, exerting pressure on individuals to opt for it. Suppose further that medical advancements minimise the risks of physical pregnancy. In such a scenario, the least advantaged group may become those who are willing to bear a certain degree of gestational burden and risk in order to experience the process of procreation. At that point, it may be

necessary for the public narrative to shift away from emphasising the pathological aspects of pregnancy in order to support these individuals who wish to experience it.

However, this does not mean we need to construct a narrative pre-emptively for a hypothetical ectogenetic future. The group most adversely affected by current social practices and norms consists of those trapped in reproductive burdens. Thus, a reasonable narrative of pregnancy must be historical and contextual, evolving in response to existing inequalities rather than speculative future scenarios.

Conclusion

Pregnancy is both pathological and not pathological—this is evident in Cooper's normative account, which fails to distinguish between partial pathology and overall pathology while using highly flexible and open-ended criteria for defining pathology. If we consider a broader range of pathological accounts, each of which may yield different evaluations of pregnancy-related conditions, the pathological nature of pregnancy becomes even more indeterminate. Despite this, I still support constructing a pregnancy narrative that emphasises its pathological aspects and aligns with interests of pregnant individuals.

Critics worry that emphasising the pathology of pregnancy in public discourse will further disadvantage women, particularly by contributing to the overmedicalisation of pregnancy and reinforcing stigma around it. However, this concern does not hold. Overmedicalisation of pregnancy is already a reality, and it has occurred within a social norm that normalises women's gestational harm and risk, treating them as natural, normal, and even honourable. Logically speaking, it is precisely this normalisation that justifies practices that significantly increase health risks for women for foetal interests, such as the overuse of C-sections. Additionally, pathologising pregnancy does not necessarily create stigma around pregnancy or pregnant individuals unless pathology and patients are stigmatised within that social context. In such cases, the solution should be to eliminate such stigma.

At its core, pregnancy narratives are about the redistribution of discursive power, a significant part of social justice. According to John Rawls' principles of social justice, particularly the difference principle, a reasonable public narrative should be sensitive to the groups most disadvantaged by existing social practices and norms. Since current social norms still normalise the pain and suffering of the gestator in pregnancy, thereby justifying inadequate medical support for them, it is necessary to construct an anti-bias pregnancy narrative that emphasises its pathological aspects. With the advent of ectogenesis and shifts in social context, it may

eventually become necessary to de-emphasise the pathological framing of pregnancy. However, this does not mean we should pre-emptively craft a narrative for a speculative future—because a reasonable pregnancy narrative must always be grounded in present realities.

CHAPTER FOUR

Ectogenesis, Gestational Preferences and the Social Coercion Argument[10]

The value of pregnancy ultimately concerns the person—the pregnant individual. Some critics worry that ectogenesis may become the standard mode of gestation in the future, leading to social coercion against those who value and prefer physical gestation, thereby potentially eroding their procreative autonomy. That said, people who prefer pregnancy may feel they have no choice but to use ectogenesis due to social pressure.

This concern is not about the state's legal coercion over women's choice of procreative mode, but rather about the social coercion that operates "without requiring the force of law" (Horn 2022, 536). Specifically, some bioethicists are concerned that as ectogenesis becomes a safer option for the foetus, natural pregnancy may come to be perceived as inferior (Murphy 1989; Cavaliere 2020; Horn 2022; Romanis 2024). This perception could pressure individuals, especially those with less-than-ideal lifestyles or higher risk factors, to opt for ectogenesis (Jackson 2008; Horner 2020), leading to a loss of the pleasures derived from natural pregnancy (Murphy 2012).

Cavaliere (2020a, 79) argues that the support of ectogenesis is based on conceptions of "the good life"-reflecting values typical of Western, Educated, Industrialised, Rich, and Democratic societies, which are not universally accepted. She speculates that some women might still prefer physical gestation in the future, at which point ectogenesis "may end up undermining women who find meaning and self-fulfilment in gestation and childbirth. Their decisions to conceive and birth children "naturally" may be regarded as at odds with conceptions of the good life as advanced by proponents of ectogenesis, making opting out increasingly difficult." Thus, ectogenesis "may not turn out to be equality-promoting" but could instead exacerbate class divisions, further privileging some women over others.

This thesis defines this reasoning as the social coercion argument (SCA). Its core concern is that if ectogenesis becomes a safer option, it may become the norm, creating social pressure on those who prefer physical gestation and infringing on their autonomy. Thus, SCA questions whether ectogenesis is truly a morally sound means of promoting equality. It is worth noting that most SCA proponents do not see this concern as sufficient to reject ectogenesis outright

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but regard it as one of reasons for discounting its moral potential to address gender oppression. Due to its cautious and moderate stance, I term it an "argument" rather than a "rejection".

This chapter first critically analyses the SCA's stance within the liberal framework, then further examines women's preference for bodily pregnancy from a feminist perspective. Accordingly, my argumentation has two parts:

1. While SCA's descriptive claim may be true—future women preferring physical gestation might face pressure—it provides an invalid reason for discounting ectogenesis's liberating potential within the liberal framework underpinning SCA.

2. I examine gestational preferences—both current and future—through feminist insights on adaptive preferences (APs). Some women's preference for physical gestation may be shaped by injustice, implying the evolving dynamics of gestational preferences and the need for strategies beyond cultural and social inclusivity.

Therefore, this chapter is structured as follows: Section 1 explains why concerns about future pressure on individuals preferring bodily pregnancy should not be used to evaluate ectogenesis's liberating potential. Section 2 explores how some women's preference for physical pregnancy may constitute APs and examines its implications. Section 3 concludes that concerns about social coercion should be addressed separately through the continued expansion of gestational choices.

1. The SCA within Liberalism

The SCA's emphasis on diverse perspectives on the "good life" aligns with liberalism, where respect for voluntary choice is fundamental. Liberalism acknowledges societal pluralism, recognising that individuals hold varied religious, moral, and personal beliefs about what gives life value (Levey 2005). Therefore, SCA authors argue that ectogenesis may impose a particular understanding of the "good life" on individuals, infringing on their autonomy.

What does this concern lead to? Since SCA is situated within the context of assessing ectogenesis's liberating potential, it serves as a reason to argue that ectogenesis "may not turn out to be equality-promoting" (Cavaliere 2020, 79). Some SCA proponents clarify that their stance is not to reject ectogenesis but to call for necessary social regulation or messaging to address this concern (Cavaliere 2020; Romanis 2020). Still, if achieving equality—the primary goal—through a technology or policy faces excessive barriers, its impetus weakens, prompting

a search for alternatives. Therefore, SCA can be seen as a reason for partially rejecting ectogenesis.

Here, I only elaborate on a mild version of SCA:

(i) There may be good reasons to develop ectogenesis as a choice to promote equality, particularly by accommodating diverse yet equally valid gestational preferencies.

(ii) However, there is concern that a new norm favouring ectogenesis might pressure individuals who prefer physical gestation into adopting it.

(iii) Therefore, social regulation and messaging is needed to prevent such pressure; otherwise, ectogenesis's liberating potential is discounted.

I broadly agree with the first two points but argue against using concerns about the new norm's pressure to judge the liberating potential of ectogenesis. I will first present common ground before critiquing SCA.

1.1 Equal Gestational Preferencies

People's preference for ectogenesis, just like the preference for pregnancy, falls with the remit of procreative autonomy, at least within a liberal framework. Ronald Dworkin (1983) defines procreative autonomy as a right to control their own role in procreation unless the state has a compelling reason for denying them that control, similar to the right to freedom of expression. From this liberal perspective, pursuing a safer way to have genetic children without undergoing bodily pregnancy (including surrogacy) is not morally wrong. This preference may arise from career concerns, health risks, child welfare, surrogacy's social and legal implications, or reducing the traditional link between women and pregnancy (Bidoli 2025). As Romanis and Kendal (2024, 113) note, reproductive choices are subjective and situated, shaped by deeply held personal values or intuitions. Even choosing ectogenesis to avoid stretch marks or body changes is not morally wrong within a liberal framework, as it reflects personal beliefs about bodily integrity and aesthetics—just as valid as choosing pregnancy for its physical experience or as part of one's identity.

If gestational freedom should be somewhat restricted for a related third party, choosing riskier physical gestation becomes more questionable than opting for ectogenesis. For example, O'Neill (2002) argues that gestation aims to bring a third party—a child—into existence, often imposing care obligations that restrict rather than enhance autonomy. Similarly, Savulescu and

Kahane (2009) assert that reproduction should be about having children with the best prospects. These views, which in essence suggest restrictions on riskier gestational choices (especially for the foetus), are not without criticism. However, even if these views do not plausibly challenge people's preferences and choices for riskier physical pregnancies, we can at least say that morally, preferring natural pregnancy and preferring ectogenesis are equal.

The reality is that the preference for non-physical gestation has yet to be realised. In a world without ectogenesis, women who want genetic children but not bodily pregnancy face both social pressures, particularly pronatalist norms that define women as child bearers, caregivers, and mothers (Wilkinson and Williams 2016), and technical and legal barriers. Thus, realising this preference would advance basic equality between those with differing gestational preferences.

1.2 Potential social coercion

The new norm pressure may emerge in the future, which, from a liberal perspective, indeed concerns individual reproductive autonomy. Liberalism strongly commits to autonomy, upholding the idea that "the individual is sovereign" (Mill 1989, 13) and that individuals must choose their way of life based on beliefs that give it value and meaning (Mill 1989, 117). In general, several constraints might prevent people from making fully autonomous gestational choices. One is state and legal barriers; for instance, if ectogenesis were mandated as the only gestational option due to its superior health outcomes for babies, those who prefer traditional gestation would face state/legal coercion. The second is resource limitations, where coercion could be passive, such as allowing pregnancy but withholding necessary material support for those who choose it.

The SCA, however, focuses solely on a third type—social coercion. When ectogenesis becomes the dominant gestational choice and part of the standard life model, those who choose traditional gestation might face stigma and discrimination. Indeed, even with strong anti-discrimination laws, subtle pressures from social norms—often exerted through informal, diffuse sanctions—may be difficult to avoid. For instance, those who opt for bodily pregnancy might be subtly judged by society, partners, friends, family, and colleagues as selfish for not prioritising their offspring's health. Therefore, it is difficult to deny that, in the future, some individuals may experience pressure due to the social endorsement of ectogenesis, making their gestational choices deviate from their preferences.

1.3 Can Social Coercion Undermine the Moral Appeal of Ectogenesis?

The central question is whether potential social coercion can undermine the moral desirability of ectogenesis as a tool for promoting equality. I argue that, from a liberal perspective, it cannot.

Social coercion is a contextual issue—it arises not from ectogenesis itself, but from the possibility that societal norms might come to pressure individuals to choose ectogenesis—especially if it promises better foetal health—against their preferences. Whether such contextual consequences should influence the moral evaluation of ectogenesis depends on a broader question: how do we distinguish between ethically weighty and ethically marginal consequences of new developments?

Not all contextual outcomes are morally equivalent. Some carry deep ethical significance, while others—though socially consequential—do not alter the moral permissibility of the development itself. For example, access to sex-selective abortion technologies in certain societies may result in strong familial pressure on pregnant people to terminate female foetuses. This is an ethically weighty consequence: it reinforces gender injustice and undermines reproductive autonomy. As a form of social coercion, it is typically considered important in the ethical evaluation of this technology.

By contrast, suppose there existed an advanced form of pain-relief medication that allowed women to give birth without pain, trauma, or side effects, and even enhances foetal safety. Its widespread adoption might create subtle pressure on women who prefer natural birth without pain relief, leading them to feel judged or compelled to conform. This too is a kind of social coercion, but unlike the previous case, it is not typically regarded as a comparably weighty ethical concern in evaluating the technology itself. Rather, the more appropriate ethical inquiry might be directed toward the cultural or economic conditions that lead women to reject such medication in the first place.

This distinction suggests that the ethical relevance and weight of a contextual ramification largely depend on the nature of the ramification itself. Accordingly, I examine why the potential social coercion within SCA does not compromise the moral permissibility of ectogenesis, by analysing its specific characteristics.

The first consideration is that the issue of social coercion in the SCA is extremely *universal*—it can apply to nearly any significant societal change, not just technological ones. Even initiatives widely recognised as progressive for gender equality are not immune to such issues. For instance, efforts to promote women's education and workforce participation might inadvertently establish norms that pressure women who prefer traditional homemaking roles to

opt in to higher education or demanding careers. Similarly, advocacy for diverse spousal relationships that challenge heteronormative standards may, in the future, pressure those who prefer traditional marriages, making them feel marginalised. Despite these possibilities, scholars rarely assess the overall potential for progress of these changes based on such issues, and proponents of SCA are unlikely to do so either.

The second consideration is that social coercion in SCA pertains to the *remote* risk for the current majority, which may occur long after the availability of ectogenesis. Using such risks to judge the ethical desirability of ectogenesis may convey a subtle attitude that expanding inclusivity for the current minority should first consider the distant risk of disadvantaging the majority who fit the current norm.

Women who find meaning and fulfilment in physical gestation form the majority, adhering to current norms that tie their identity and worth closely to their capacity for pregnancy—even in Western liberal societies where the ideal of the "perfect mother" remains dominant (Meeussen and Van Laar 2018). This does not imply that their preferences for bodily pregnancy purely conform to patriarchal norms; rather, it suggests that the current norm positions these individuals as the standard and majority, while those who do not derive value from pregnancy are seen as deviants and the minority.

Women who most need or want ectogenesis for genetic children include those with uterine factor infertility and those who, despite being capable of gestating, choose not to—and reject surrogacy. These individuals deviate from pronatalist norms. In particular, the latter group remains largely invisible in public discourse and political agendas, with only limited recognition in academic discussions on ectogenesis. The development of reproductive technology also reflects a political agenda that overlooks their preferences, prioritising innovations that enable physical pregnancy while neglecting gestational alternatives such as ectogenesis (Firestone 1970; Bidoli 2025).

We still live in a world where deeply ingrained gender norms and essentialist beliefs closely tie pregnancy and childbirth to the very definition of "womanhood" (Lotz, 2018, 502). If the ongoing debate over ectogenesis is crucial in exposing existing gender struggles (Cavaliere 2020a), then focusing on the distant risk of groups—who align with prevailing gender norms—being marginalised and pressured seems poorly timed and exhibits some unintentional bias.

The final and more significant consideration is that the presumed harm in the SCA—autonomy infringement from social coercion—may *not* hold when assessed through a liberal lens.

No choice is entirely free from social influence; even the most autonomous decisions are shaped by one's background, upbringing, and personal experiences, all of which contribute to an individual's conception of the "good life." Liberalism, as a political philosophy, seeks to establish a just and legitimate framework for governance in a pluralistic society by recognising diverse beliefs and ensuring fairness, stability, and mutual respect (Gardbaum 1996). This framework does not dismiss choices shaped by gendered norms but rather respects them as autonomous.

Some SCA supporters seem to uphold this autonomy standard when defending public funding for physical pregnancy technologies. For example, Cavaliere (2024) argues that even if gestational choices, such as pursuing a uterine transplant, are influenced by patriarchal norms and might reinforce them, they should not be dismissed as mere false consciousness. In other words, even if societal norms pressure a person into viewing pregnancy as central to female identity and lead to undergoing risky surgeries, these choices are considered autonomous if they align with their sense of well-being.

By the same standard, future cases of choosing ectogenesis under new normative pressures could still be considered autonomous. Human values and preferences are multifaceted—one can value the physical experience of pregnancy while also prioritising health for themselves and the foetus. The weight of these considerations is always shaped by external influences. As it is today, so it will be in the future.

When someone today chooses the risky uterine transplant to achieve pregnancy, their decision likely involves weighing multiple values and preferences. While they value their health, they may prioritise the identity and meaning attached to pregnancy, influenced by gender norms and societal expectations (Lotz 2018). Their choice reflects what they deem most important: health or the experience of pregnancy. In the future, someone might value the experience of physical gestation but prioritise foetal health (partly) due to societal norms that emphasise the latter. Under this pressure, they could opt for ectogenesis. If the former choice is considered autonomous, then so is the latter. Both are acting in accordance with their own multifaceted values, desires, and conceptions of the good life, balancing these according to their own sense of what is best. Their choices reflect their own interests, as they understand them (Romanis and Kendal 2024). From a liberal perspective, such choices are not necessarily non-autonomous.

Therefore, from a liberal perspective—which underpins the SCA—the concern about social coercion does not undermine ectogenesis's liberating potential. In fact, this concern may be the

weakest doubt about ectogenesis's morality raised by critics. This is reflected in an empirical study by Romanis (2023) on the equality-enhancing potential of new assisted gestation: respondents primarily highlight barriers to access, with no concern about future social coercion against those preferring bodily pregnancy.

This is not to say that preferences for physical gestation are unworthy of respect or attention. On the contrary, stepping beyond liberalism into feminist critiques of how oppressive environments shape women's preferences, this concern becomes even more profound. It shifts from simply respecting diverse gestational preferences to addressing broader structural inequalities. This is what I will explore in the next part.

2. The SCA within the Adaptive Preference Framework

The SCA holders often project future preferences based on current attitudes toward pregnancy, assuming that since some today reject Western values (Cavaliere 2020a) or campaign for the right to gestate and receive womb transplants (Romanis et al. 2020), some future women will also prefer physical pregnancy. I generally agree with this possibility.

However, the way the SCA is framed lacks a deeper inquiry into why individuals today, when imagining a safer alternative to bodily pregnancy, and individuals in a future with ectogenesis still prefer physical gestation. It is insufficient to attribute this solely to finding meaning, fulfilment, or identity through pregnancy. A deeper examination of the underlying causes of these attitudes suggests that future gestational preferences may be more dynamic. More importantly, critically assessing the nature of these preferences may shift the focus from merely ensuring cultural or social inclusivity to addressing more substantive issues.

Some scholars have critically examined women's preference for physical gestation. Smajdor (2012) argues that women's acceptance of gestational harm may result from the lack of alternatives and the normalisation of gestational risks, making them less likely to question pregnancy's value. Bidoli (2025) further suggests that the desire for pregnancy may constitute an adaptive preference (AP) shaped by oppressive constraints. However, no systematic analysis has been conducted within the AP framework—this section will address that gap.

2.1 What Are Adaptive Preferences?

The concept of APs aligns with long-standing feminist analyses of the tension between feminism and liberalism/subjective welfarism. For example, Rawls (1999) argues that liberalism must allow traditional gendered divisions of labour in families if they result from

voluntary choices. However, women may "freely" prefer caregiving roles due to early gendered socialisation. While liberalism protects such choices, they conflict with feminist opposition to gendered norms (Levey 2005).

Subjective welfarism holds that individuals are the best judges of their own well-being. Yet, scholars like Nussbaum (2000; 2011) and Sen (1984) argue that deprivation can impair people's ability to assess their own welfare, explaining why some women voluntarily endure abusive relationships or poor living conditions. Even collective preferences, such as heterosexual norms and sexual desires, may stem from indoctrination in male-dominated contexts (MacKinnon 1989). Simply fulfilling these preferences without scrutiny risks perpetuating internalised oppression (Walker 1995) and reinforcing the patriarchal order (Cudd 2004).

A more systematic discussion is within the AP framework. Here, I outline several frequently discussed accounts of APs, including (1) Jon Elster's procedural account, (2) Luc Bovens' formal account, (3) Martha Nussbaum's substantive account, and (4) Serene Khader's perfectionist account, as summarised by Polly Mitchell (2018). Through analysis, I embrace (3) and (4), contending that *harmfulness* and *injustice* are the two essential conditions for APs.

Elster (1983) defines APs as those unintentionally formed towards feasible options, with their unintentional acquisition being the primary issue. He employs La Fontaine's fable of the "sour grapes phenomenon" (SP) to illustrate this: when the fox cannot reach the grapes, she convinces herself that they are too sour and not worth desiring. Elster views this preference shift as irrational because it lacks deliberate character planning (CP) — a process of consciously fostering new preferences in response to constrained choices. If the fox had intentionally developed a preference for a reachable fruit after finding the grapes unattainable, the preference would be rational. Thus, the problem of SP, representing AP in Elster's procedural account, is the absence of autonomous formation.

Bovens (1992) critiques Elster's account and introduces the formal account. He argues that intentional acquisition cannot determine a preference's rationality; an unintentionally formed preference can still be rational. For example, someone might enrol in a Spanish course to learn the language but unexpectedly develop a love for Spanish culture. Although this was not intentional, it is still rational. Instead, Bovens suggests "consistency" as a measure of rationality: a preference change is rational if it aligns with the agent's other preferences. For instance, if the fox stops liking grapes but still enjoys grape-flavoured food, that is inconsistent

and irrational. If she shifts all her food preferences to non-grape-flavoured fruits, the change is consistent and therefore rational.

Both Elster's and Bovens' accounts may provide certain perspectives on why preferences for physical gestation are problematic. According to a small-scale survey, some women reject the idea of ectogenesis due to concerns that such machines could harm babies (Landau 2007). This may indicate an unintentional preference acquisition—they do not even envision that ectogenesis might better ensure foetal health. Also, a woman's preference for physical pregnancy and acceptance of its harms may conflict with her lifestyle if she otherwise favours non-harmful methods to achieve her goals, suggesting inconsistent preferences.

However, I reject procedural and formal accounts for examining women's gestational preferences because they overlook the moral issues in the *content* of preferences and some of the *constraints* on choices. According to Elster, the problem arises only when individuals are unaware of these constraints; awareness supposedly resolves the issue. Similarly, Bovens identifies a problem only when a preference conflicts with the agent's other inclinations; if consistent, it is morally unproblematic. Nevertheless, I argue that preferences, whether intentionally or consistently formed, remain morally concerning if they are harmful and shaped by unjust conditions.

Consider an alternative fable of the fox. Imagine the fox's access to grapes is unjustly restricted because poachers drive her into an area with only poisonous berries. To survive, the fox decides to prefer these berries and dislike grapes. Through long-term deliberate effort, she even becomes addicted to similar harmful fruits. While Elster and Bovens might view this preference as intentional, consistent, and thus rational, it is clearly problematic. In other words, women may intentionally and consistently develop preferences to comply with oppression.

Foot binding—a Chinese custom of binding young girls' feet to keep them small (Ko 2005)—and female genital mutilation (FGM), involving partial or total removal of external female genitalia for non-medical reasons (World Health Organisation 2025), are extreme examples of self-enforcing misogynistic practices. Women themselves sustain and transmit these harmful traditions, feeling compelled to conform to societal expectations for marriage, sometimes resisting abolition efforts (Mackie 1996). Such preferences also match their daily prioritisation of male interests. A more common contemporary example is women in abusive relationships preferring to stay, often due to weighing the consequences of leaving and internalising self-disadvantage, believing they deserve no better (Nussbaum 2000). These examples do not

absolve the men who perpetuate harm or blame the victims but illustrate that—even when preferences are deliberate and consistent—if they emerge from navigating oppression for immediate survival, they remain problematic and fall within the scope of APs, which address the moral issues underlying subjective preferences.

The substantive and perfectionist accounts address issues of oppression more effectively, with the latter concretely articulating the former. APs are central to the capability approach (Nussbaum 2000; 2011; Sen 1984; 1988; 1990), which defines welfare through essential capabilities. Nussbaum (2011, 33) lists core capabilities like life, health, and bodily integrity. To thrive, individuals must engage with these; without them, true well-being is unattainable. As Sen (1988, 46-47) describes:

> A person who has had a life of misfortune, with very limited opportunities, and rather little hope, may be easily reconciled to deprivations than others reared in more fortunate and affluent circumstances. The metric of happiness may, therefore, distort the extent of deprivation, in a specific and biased way. The hopeless beggar, the precarious laborer or the dominated housewife, the hardened unemployed or the over-exhausted coolie may all take pleasure in small mercies and manage to suppress intense suffering for the necessity of continuing survival, but it would be ethically deeply mistaken to attach a correspondingly small value to their loss of well-being.

In other words, immediate benefits from compliance in an oppressive system cannot equate to the deprivation it enforces, nor does such satisfaction truly reflect well-being. I will explore this later.

It is worth nothing that for Nussbaum and Sen, most cases of APs are about local forms of injustice, such as those caused by deprivation in impoverished areas. Yet, there is no reason why they cannot also apply to cases of global injustice, where women worldwide are subjected to similar unjust conditions. Also, neither Nussbaum nor Sen provides clear standards for identifying APs, while Khader's work addresses this gap. She clarifies key conditions for constituting APs[11]:

11 Khader uses the term "inappropriate adaptive preference" to suggest that adapting to limited choices is not inherently wrong. However, I find "inappropriate" unnecessary because none of the aforementioned accounts view "adaptive" as merely "adapting." In other words, "adaptive preferences" in their accounts refer exclusively to problematic ones, even though they may have different standards for determining what is problematic.

(1) They are inconsistent with an individual's basic flourishing.

(2) They are formed under conditions not conducive to an individual's basic flourishing.

(3) An individual can plausibly alter the preference into one that is more consistent with flourishing and endorse the change (Khader 2011).

I agree with Khader that conditions (1) and (2) are crucial for identifying APs. I simplify them as "harmfulness" and "injustice" respectively. While Khader's formulation may be effective in other contexts, the simpler notions suffice for my argument on pregnancy and ectogenesis.

Harmfulness and injustice are both indispensable conditions. Preferences shaped by injustice are not necessarily problematic; what matters is the nature of the response to such injustice. For example, a woman preferring a nutritious and healthy lifestyle and rejecting the "skinny" ideal as a response to misogynistic beauty standards—which are "driven" by injustice yet might be beneficial to her—is ethically commendable. Conversely, preferences that entail some harm but are not shaped by injustice, such as a preference for sports with some risks, generally do not raise ethical concerns.

I cautiously set aside Condition (3)—that APs can be altered to align with fundamental goods—as it serves more as an ideal than a reliable criterion. If preferences remain unchanged despite interventions, we cannot determine whether they were never APs (making the intervention irrelevant) or if they are APs but require a different intervention. For example, if someone prefers manual labour even after AI job replacement—the intervention—there are two possibilities: either their preference stems from genuine enjoyment rather than oppression, meaning it was never an AP, or their preference is an AP shaped by injustice, but AI replacement is not the right intervention—what they truly need is a non-exploitative work environment. Thus, I contend that APs are preferences that are harmful to the agent and formed in response to injustice. Within this framework, I examine whether some women's preference for physical pregnancy over ectogenesis constitutes APs.

2.2 The Harm, Trade-Off, and Injustice

Preferring physical gestation to ectogenesis prima facie meets condition 1—it is harmful. Physical procreation imposes significant health risks on women, a fundamental aspect of basic well-being. Despite a global decline in maternal mortality over recent decades, a maternal death still occurred almost every two minutes in 2020 (World Health Organisation 2020). Beyond common conditions in pregnancy, many pregnancies involve significantly higher risks

(Smajdor and Räsänen 2024). Even symptoms often considered normal during gestation, such as morning sickness, headaches, and bleeding gums, represent risks beyond those of everyday health (Kendal 2015). Moreover, the impact of pregnancy extends beyond childbirth; about one in seven women may develop postpartum depression (Mughal, Siddiqui, and Azhar 2022); over a third of women experience lasting health issues postpartum (Vogel et al. 2024). Additionally, research shows that physical gestation adversely affects the gestator's cognitive abilities due to grey matter volume (GMV) reductions during pregnancy (Pritschet et al. 2024), which persist postpartum, particularly in regions related to theory-of-mind processing—lasting for six years after parturition (Martínez-García et al. 2021) and detectable even decades later (Orchard et al. 2020). Thus, from the perspective of physical health, preferring physical pregnancy over ectogenesis is inevitably harmful.

However, a rebuttal—the *trade-off* argument—can be expected. One may argue that despite the health risks, bodily gestation could offer other crucial aspects of well-being that ectogenesis cannot, leading to greater overall good. Indeed, pregnancy-related well-being is multifaceted; if other significant benefits compensate for the well-being lost, overall good may not diminish. But its validity hinges on the specific contents of the trade-off—specifically, whether the motivations behind it are shaped by injustice.

Considering concerns frequently raised by sceptics of ectogenesis, I consider three trade-offs: 1) maternal bonding, 2) personal experience, and 3) immediate interests within the system. I first outline why the first two—maternal bonding and personal experience—may not necessarily qualify as APs, and then focus on the third—immediate benefits within oppressive systems, which I argue exhibits characteristics of APs.

Maternal bonding and personal experience overlap to some extent. In trade-offs, maternal bonding may refer to either a specific form of bonding or to a higher degree of it, the former being more of a personal experience. The interaction between the foetus and the maternal body is rich; it constantly touches the maternal body from the inside and hears and experiences some of her social network through her (Kingma and Finn 2020). Some women might prefer such unique intimacy of physical pregnancy with the foetus, even though bonding does not necessarily diminish in the absence of pregnancy (Kennedy 2024). Personal experience may also include viewing pregnancy as a challenge, akin to high-risk sports. It might resemble activities like marathon running—difficult and potentially harmful, yet personally meaningful

(Woollard 2020). Therefore, preferences driven by such personal experiences appear unrelated to injustice and could exist even in a gender-equal society. I do not consider them APs.

The trade-off for "better bonding" is likely more complex. The assumption that bodily pregnancy fosters a stronger bond is questionable—many pregnant individuals do not experience prenatal bonding, and assuming gestation inherently creates unique parental attachment overlooks individual differences (Romanis 2024, 149). Research also shows that oxytocin, often called the "love hormone", is released at comparable levels in biological and non-biological parents during sustained caregiver-infant interactions, particularly through skin-to-skin contact (Cong et al. 2015). This suggests that with sufficient interaction and care, bonding in ectogenesis may not be diminished. I will further challenge the argument that ectogenesis will diminish mother-child bonding in the next chapter.

What matters for our inquiry here is the drive behind the assumption that ectogenesis—the "cold machine"—will harm maternal bonding, as indicated in previously mentioned research (Landau 2007). This belief may stem from an instinctive fear of new technology and uncertainty rather than from injustice. Even in a fully gender-equal society, similar concerns could arise due to limited evidence on how pregnancy influences bonding. Nevertheless, the strong belief among some women that pregnancy is essential for bonding may be reinforced by societal expectations that tie a woman's identity to unconditional maternal love and the experience of pregnancy. This connects to the third trade-off, which I will discuss later.

More scientific research and ethical debate are needed regarding "maternal bonding" and "self-experience." I particularly focus on the third type of trade-off—using physical pregnancy to seek *immediate benefits* within oppressive systems, as emphasised by Sen (1988). This may be the most entrenched reason for valuing physical gestation in pronatalist societies, leading some to dismiss ectogenesis over fears of losing something important, without much reflection.

Let us consider the warning from Robyn Rowland: since "for the history of mankind, women have been valued primarily as child-bearers," the advent of ectogenesis could leave women "without a product of any kind with which to bargain," potentially rendering them obsolete (Rowland 1987, 45).

Rejecting ectogenesis over fears of losing women's status as primary child bearers is defeatist. It wrongly suggests that women's social progress depends on negotiating with patriarchy through pregnancy and exaggerates the role of exclusive capabilities in achieving equality. If

such capabilities were essential, anti-racism and anti-classism movements would be futile, as these marginalised groups lack a unique biological function relative to dominant ones.

Nevertheless, this warning accurately exposes a deeper societal phenomenon: in patriarchal systems, women's identity and value have historically been tightly tied to their gestational role. This linkage has fuelled collective anxiety, rooted in the fear that women will lose their "social significance"—as defined by oppressive societies—if their pregnancy function is no longer essential.

How does society bind women's worth to gestation? One key mechanism, I argue, is that patriarchal structures systematically *curtail* women's opportunities to find fulfilment beyond childbearing and rearing. As a result, some women might internalise this strong association, pursuing the glory, identity, and sense of worth tied to pregnancy, and develop a preference for gestational labour over ectogenesis.

Women's worth and identity has been historically closely tied to their role as child bearers. This connection itself is not problematic as people have the right to view their biological abilities as part of their identity. The problem lies in the degree: when women's opportunities to gain identity and value outside of reproduction are severely curtailed, they are subtly coerced into seeking recognition primarily within the reproductive realm—childbearing and rearing—the space permitted by patriarchy, making this connection excessive.

In the most oppressive societies, refusing or being unable to conceive can be prohibitively costly. For instance, studies on infertility among Nigerian women reveal that infertility often leads to abusive marriages, divorce, poor living conditions, abandonment, and mistreatment in old age (Larsen et al. 2010). In today's Western societies, although women can largely gain identity and value through careers and personal interests, the patriarchal link between women's reproductive function, the identity category of "woman," and the social role of "mother" remains deeply entrenched (MacKay 2020); infertile women's social identity can still be severely damaged in these societies (Alamin et al. 2020). This entrenched link sustains patriarchy by ensuring women's cooperation, as Marilyn Frye notes that "efficient exploitation requires that those exploited be relatively mobile, self-animating, and self-maintaining" (Frye 1983, 59). Women as a group may internalise imposed values, viewing gestation as central to their identity and deriving self-worth from it. This creates a cycle: shaped by gender norms from an early age, women's beliefs and interests revolve around their reproductive role, making them more inclined toward caregiving and housework. Fulfilment from these activities

reinforces the idea that childbearing defines their identity, further entrenching pronatalist norms and pregnancy preferences. Thus, restricting avenues for fulfilment beyond gestation subtly coerces women into seeking social recognition through pregnancy, significantly shaping their gestational preferences.

Another mechanism underpinning the trade-off 3 is probably the collective *normalising* of gestational harms and risks. Historically, childbirth pain has been deemed natural and even meaningful, a belief reflected in religious doctrines that have hindered the development and application of pain relief in childbirth (Pence 2006). Childbirth trauma was once dismissed as a sign of women's psychological weakness (Michaels 2018). Today, one in 20 mothers in the UK develops post-traumatic stress disorder (PTSD) due to unbearably painful childbirth experiences (Triggle 2024), which is closely linked to obstetric violence (Silva-Fernandez et al. 2023)—manifesting as "negligent, reckless, discriminatory, and disrespectful acts by health professionals, legitimised by power structures that normalise and trivialise their occurrence" (Jardim and Modena 2018, 7). Nearly half of mothers with postpartum depression go undiagnosed, fearing abandonment and lack of support (Beck 2006). Despite widespread suffering from long-term postpartum conditions, these issues remain historically neglected (Vogel et al. 2024).

Even severe gestational harm and risks are treated as signs of motherhood suitability and often go under treated due to their perceived normalness (Smajdor and Räsänen 2024). Meanwhile, women face excessive medicalisation to address foetal risks, such as unnecessary C-sections (Romanis et al. 2021). Though seemingly contradictory, these practices align seamlessly with the "normativity" narrative: since common gestational harm to the gestator is seen as a normal sacrifice, treating it is deemed unnecessary, and additional sacrifices for foetal well-being are framed as justified.

Very likely, the collective marginalisation of gestational pain and suffering has led women to view it as taken for granted and even essential for good motherhood. Consequently, they may see enduring this pain for social recognition as a worthwhile trade-off rather than considering other options.

Both mechanisms behind Tradeoff 3—the limitation of opportunities for fulfilment beyond pregnancy and child-rearing, which fosters women's identity and value around gestation, and the idealisation of gestational pain and harm as necessary burdens of motherhood—may have influenced women's preference for physical gestation. These mechanisms are deeply unjust,

and physical gestation can be harmful to women's health overall; therefore, preferences for physical pregnancy driven by this third trade-off are APs.

2.3 Implications

I have argued that, so far, some women's gestational preferences may be APs. I contend that this suggests two key points. The first is *predictive*: with the emergence of ectogenesis and related societal changes, women's gestational preferences are likely to shift significantly, while some APs may persist. The second is *normative*: the current preference for pregnancy over ectogenesis does not reliably reflect women's well-being, and future APs may necessitate societal efforts to rectify relevant injustices. Due to caution regarding speculative situations, I will only briefly discuss two implications in a general and principled manner.

2.3.1 The future Dynamics of Gestational Preferences

Paradoxically, history seems to suggest that women, who bear gestational harms and risks, are less enthusiastic about ectogenesis than men. As mentioned earlier, the term "ectogenesis" was coined by Haldane (1933), a male biologist. Aldous Huxley's Brave New World (1932) popularised the literary image of artificial wombs.

Nevertheless, with the rise of the feminist movement, women's desire for ectogenesis has increasingly been voiced. Firestone (1970) has argued that ectogenesis, accompanied by other revolutionary changes, is essential for women's liberation—a view later echoed in Marge Piercy's feminist novel Woman on the Edge of Time (1976). Western middle-class women have been the primary consumers of both the discourse and practice of artificial reproduction, surrogacy, and ectogenesis research (Aristarkhova 2005, 53). This trend is likely not coincidental. In societies with greater gender equality, women are less reliant on patriarchal incentives for childbearing. Women who prioritise roles beyond childbearing are less likely to tie their identity to pregnancy and more open to acknowledging its harms and risks. As patriarchal structure diminishes and gestational choices expand, many women may favour ectogenesis, though it is likely not a straightforward process.

Shifts in attitudes toward formula feeding might offer clues for prediction. Initially popular among upper-class families, formula feeding later became stigmatised as the benefits of breastfeeding were overstated (Buturovic 2020). If history repeats itself, ectogenesis may provoke a similar backlash, with higher classes first embracing its exclusivity, and abandon it as natural pregnancy regains prestige. More specifically, ectogenesis (once proven safe) may

first be a luxury accessible only to the privileged, while underprivileged groups lack access. Over time, this dynamic could reverse—natural pregnancy, requiring extensive medical and social support, might become a status symbol among the elite, valued for its experiential aspect and exclusivity, while wage-dependent individuals may turn to ectogenesis to ease pregnancy burdens and enhance career and economic stability.

But eventually, as stronger evidence confirms ectogenesis's superior safety for babies, it is likely to become the dominant gestational choice, as critics predict. If this happens in the future, it may itself indicate that the previous preference for physical pregnancy was largely shaped by a lack of choice and a gendered culture. Still, some may prefer pregnancy for this personal experience itself, while others may do so due to limited access to ectogenesis or the influence of unjust cultural factors. There can be two general scenarios:

Scenario 1 is that some women may lack substantial access to ectogenesis due to *unequal resource distribution*. Especially in its early stages, ectogenesis is expected to be highly expensive (Romanis and Kendal 2024, 149). While it may become a norm-like choice for middle- and upper-class individuals, it could remain inaccessible for women in impoverished communities. For these women, the reality of deprivation may lead to a form of APs—where, as Nussbaum (2000, 68) notes, "it becomes less painful to be kept in total neglect; otherwise, she is bound to suffer, and suffer pointlessly, the pain of injustice, if she cannot change the rules governing her life."

Stratified access to ectogenesis is another major concern SCA holders raise. However, this concern has not been directly linked to the formation of gestational preferences. Once we make this connection, it suggests that disparities in access to ectogenesis may not only determine who can utilise the technology but also shape the collective psychology of deprived communities. This means that those lacking substantial access to ectogenesis would not only face the pressure of a new societal norm but also the deprivation itself.

Scenario 2 could arise from familial and community traditions. If one's religious community or family upholds traditional patriarchal beliefs that tie women's worth to gestational capabilities and glorify childbirth's pain and suffering, this may still foster APs for physical pregnancy. For example, despite legal and social bans on practices like the above-mentioned FGM and "honour killings"—the murder of women and girls by male relatives for perceived sexual misconduct—some migrant communities in Western countries, such as the UK, continue these practices to maintain their cultural identity (Njue et al., 2019; Doğan, 2013).

These harmful practices illustrate how cultural communities can deviate from mainstream norms to uphold their traditions. Thus, even in a broader environment that prioritises ectogenesis, certain communities or families may impose strict prohibitions against it, with members facing condemnation or punishment for using it.

Both scenarios meet the two basic conditions of APs: harmfulness and injustice. That said, deprivation and certain community or family cultures that devalue women may still foster APs for physical pregnancy. In both cases, AP holders endure *double* harm—oppression from deprivation and unjust traditions within their communities, while misunderstanding or discrimination from the broader society advocating ectogenesis further marginalises and pressures them.

2.3.2 Normative Implications

Khadar (2011), Sen (1988), and Nussbaum (2011) suggest that the presence of APs indicates preferences might not accurately reflect individuals' well-being, and thus, should not be the primary basis for policymaking. I generally agree with this point.

It is likely that a large proportion of women today may not support ectogenesis. However, given the presence of APs, these preferences should not be taken as direct or complete evidence for informing relevant policies. This does not mean undermining democratic principles. Rather, it highlights the need for extensive interdisciplinary public discussions, including ethical debates on oppression and preferences.

Regarding potential future APs for physical pregnancy, again, we should be cautious when debating ethics grounded in speculation. Here, I focus solely on overarching principles. One the one hand, women's legitimate rights to physical gestation must be upheld regardless of the AP phenomenon. One compelling reason is that bodily autonomy grants women the right to decide what happens to their bodies (Thomson 1976), protecting pregnancy rights from any coercive interference. Although bodily autonomy is often cited to defend abortion rights, it also inherently supports the right to choose pregnancy. Further discussion of this principle is unnecessary, as the SCA does not involve scenarios where physical gestation is legally prohibited.

On the other hand, while I oppose paternalistic interference in gestational choices, I argue that examining unjust factors influencing these preferences is crucial. If some women prefer or choose physical pregnancy due to a lack of access to ectogenesis or because of oppressive

family or community environments, it indeed necessitates a societal responsibility to rectify these conditions.

How to intervene? Surely, victims of double harm from both their immediate surroundings and broader society should not be blamed or coerced into choosing ectogenesis. Instead, efforts should empower women to choose their gestational methods free from injustice. On this point, I am not fundamentally at odds with the SCA holders, as I support calls for greater societal action. However, the approach may differ somewhat from what the SCA framework implicitly suggests.

Within the SCA, addressing social coercion logically seems to involve creating an inclusive cultural environment to accommodate diverse preferences. However, when linked to APs, this approach is clearly insufficient and may even obscure deeper issues. Just as merely advocating for tolerance of an extremely minimalist lifestyle—without addressing its roots in poverty or past abuse—fails to solve the real problem, simply promoting inclusivity without tackling the underlying forces shaping gestational preferences risks doing the same.

Perhaps the concern in the SCA and issues related to limited access to ectogenesis could be addressed together to some extent. In cases where unequal resource distribution restricts access to ectogenesis, state-sponsored programs (Kendal 2015) or other public funding initiatives could help. Where harmful community or family norms shape preferences, lessons from how liberal states address similar issues may be instructive, though each case requires separate consideration. Since proposing specific solutions based on rough predictions of future complexities is imprudent, I refrain from further elaboration here. The key point is that only when the injustices shaping a preference for physical gestation over ectogenesis disappear will gestational preferences more accurately reflect individual well-being and calls for an inclusive culture will better address related pressures.

3. Reconciliation: Levelling Up Choices

The SCA warns of a distant scenario in which ectogenesis becomes dominant, pressuring those who find meaning in physical pregnancy to conform. Combined with other concerns, it questions whether ectogenesis is a morally sound solution to gender oppression. While some SCA advocates frame them as a call for regulation and social messaging, the underlying logic implies that if these issues are difficult to resolve or risk reinforcing inequality, ectogenesis should be rejected.

I have argued that the potential for social coercion does not undermine the morality of ectogenesis as a pro-equality tool in the liberal framework. Such issues are overly universal—even widely recognised progressive social changes can generate social coercion for those who prefer previous ways of life. Judging the expansion of choices for the current minority based on the distant risk to the current majority inadvertently conveys an unpromising attitude. More importantly, from a liberal perspective, which maintains a high tolerance for the influence of gender norms on people's preferences and values, future choices for ectogenesis under social pressure can still be autonomous.

This is not to say that respecting the preference for bodily pregnancy is unimportant. Rather, I suggest scrutinising gestational preferences through a feminist lens, particularly considering internalised oppression. Why do women often prefer physical pregnancy over ectogenesis, even when the latter may be safer? It is insufficient to assume this preference stems purely from joy, experience, or bonding. While women may genuinely prefer pregnancy, gendered norms have long shaped—and will continue to pressure—women into seeing it as central to their worth. Internalised oppression blurs the line between personal preference and cultural conditioning, making it difficult to determine whether such choices are truly autonomous or socially ingrained.

If ectogenesis eventually becomes the standard choice for the majority, this shift itself would suggest that women, as a group, have taken the opportunity to critically "re-evaluate certain assumptions regarding women's bodies and their roles in procreation, which have historically been taken for granted" (Kendal 2015, 70). For those who continue to prefer physical pregnancy in the future, their preference likely falls into two broad categories: some are shaped by deprivation or unjust community and family norms, while others are motivated by seeking personal experiencies. Both deserve protection, but through different approaches. For those affected by deprivation or unjust cultural expectations, their preference should be understood as a signal to address deeper injustices. Only when women are fully informed about both gestational options and have substantial access to both can their choice be truly autonomous. At that point, cultural inclusivity will be more effective in eliminating stigma and discrimination on pregnant individuals, rather than obscuring deeper issues.

Regardless of how difficult it may be to address these concerns, they should never justify rejecting ectogenesis, even partially. The morally correct solution lies in expanding substantive gestational choices. While "levelling down" by restricting options to prevent inequality may

seem appealing, it ultimately deprives everyone of meaningful choices and exacerbates the problem. Instead, "levelling up" by expanding options empowers individuals without limiting others' freedom (Reaume 2013). This approach is essential when addressing constraints on gestational preferences, whether due to material deprivation or cultural pressures.

In general, the potential social coercion in the SCA should be addressed separately, not within the ethical evaluation of ectogenesis. The approach to addressing such concerns should focus on expanding gestational choices—both materially and culturally—rather than levelling down existing or potential options.

Conclusion

This chapter has critically examined the social coercion argument, which warns that if ectogenesis becomes a safer and standard gestational option, it may create social pressure on those who prefer physical gestation, thereby reinforcing inequality. While this concern raises important ethical considerations, it is not valid to judge the ethical desirability of ectogenesis.

Through a liberal framework, I have shown that although the descriptive claim of the SCA—that future women who prefer bodily pregnancy may face pressure—might hold, it does not provide a sufficient reason to diminish ectogenesis's liberating potential. Further analysing gestational preferences through a feminist lens, particularly in relation to adaptive preferences, reveals that some women's preference for physical gestation may be shaped by structural injustice, suggesting that gestational preferences are neither static nor free from sociocultural influence. Ultimately, I argue that the SCA's core concern—potential social pressure—should be distinguished from the ethical evaluation of ectogenesis itself. Instead of partially rejecting ectogenesis, the appropriate response to such concerns is to continuously expand and enhance reproductive choices, ensuring that people have genuine autonomy over their gestational decisions.

CHAPTER FIVE

Will Ectogenesis Weaken Mother-Child Bonding?[12]

One perspective is more concerned with the practical value of pregnancy, suggesting that ectogenesis may weaken mother-child bonding due to the absence of gestational ties, diminishing the "degree of emotional preparedness for motherhood" (Murphy 2012, 79) and fundamentally harming the mother-child relationship (Raymond 1993). This thesis refers to this stance as the "degree" argument. If this argument holds, it may serve as a reason to conclude that ectogenesis is not as morally desirable a solution to gender inequality, nor as beneficial in advancing women's interests, as its critics suggest.

Regarding the concern about maternal bonding, Kennedy (2024) presents the "form" argument, which suggests that women may value pregnancy for its unique way of forming an intimate attachment, even if the level of maternal bonding is not reduced in gestational alternatives like ectogenesis.

This chapter challenges the "degree argument" while arguing that the "form" argument is compatible with defending ectogenesis. After analysing the concept of gestational ties in Section 1, Section 2 argues that the "form" argument can defend ectogenesis and examine the foundations supporting the "degree" argument. Sections 3 and 4 then contend that these foundations lack validity from the perspectives of both the foetus and the gestational mother. Finally, Section 5 proposes openness to developing alternative, non-inferior forms of parent-child bonding in the era of ectogenesis.

1. What Are Gestational Ties?

Gestational ties can simply be defined as the attachment that develops between the gestational mother and the growing foetus during pregnancy (Redshaw and Martin 2013). "Bonding" and "attachment" are terms often used interchangeably; however, in this chapter we use "attachment" to denote parental prenatal emotional ties, while "bonding" refers to the long-term, enduring, affectionate, and responsible relationship between the parent and the child.

[12] This chapter has been developed into a paper, with Ji Young Lee invited as a co-author. The paper is currently under review at *Bioethics*. As the first author and primary contributor, I developed the core idea, structured the argument, and drafted the full manuscript. Lee contributed refinements to three paragraphs on pages 92, 98, 99, and 101, as indicated in the text. Her input accounts for approximately one-tenth of the total content of this chapter.

Gestational ties involve both the mother and the foetus. For the gestational mother, prenatal attachment is likely to tap into maternal attitudes and projections toward the growing foetus in her womb (Redshaw and Martin 2013). For the foetus, John Bowlby's (1969; 1988) attachment theory suggests that foetal development plays an important role in attachment, as infants are biologically driven to seek care. In his view, this innate mechanism, established before birth, is essential for survival and reflects the foetus's emerging capacity to form emotional connections with caregivers.

Compared to the scarce evidence on foetus-to-mother attachment due to the foetus's hidden position and uncertain sensory experiences, empirical research on mother-to-foetus attachment is more extensive. Mother-to-foetus attachment is often referred to the mother's emotions, perceptions, and behaviours toward the unborn child and is widely regarded as a universal, natural process across cultures and ethnicities (Müller 1993). It is commonly believed to directly influence postpartum maternal bonding, facilitate the transition to motherhood, and play a key role in establishing a long-term mother-child relationship (e.g., Rubin 1975; Laxton-Kane and Slade 2002; Bussel, Spitz, and Demyttenaere 2010). Empirical studies, like Katharine Dow's (2015), suggest that prenatal attachment is widely seen as stable, universal, and automatic, arising naturally from pregnancy. They indicate that gestational mother-foetus attachment plays a key role in forming the lasting mother-child bonding.

However, the mechanisms of prenatal attachment and its role in lasting bonds remain contested. Is it inherently tied to physical gestation, or essential for mother-child bonding? These questions are key in assessing whether ectogenesis can be morally challenged on maternal-foetal attachment grounds.

2. The "Form" Argument and the "Degree" Argument

2.1 the "form" argument

Kennedy's "form" argument emphasises the unique process of maternal-foetal attachment during pregnancy, suggesting that women may value this specific form of attachment, even if a similar level of attachment could be achieved without bodily pregnancy. Indeed, the interaction between the foetus and the maternal body is rich; they constantly touch the maternal body from the inside and hear and experience some of her social network through her (Kingma and Finn 2020). A gestator may derive unique enjoyment or special feelings from the deep physical interaction, shaping the personal experience of pregnancy.

Yet, this argument does not oppose ectogenesis in and of itself, but instead defends women's right to choose pregnancy over safe non-bodily gestation. We argue that her position can consistently support ectogenesis for individuals needing or preferring non-gestational ties.

The view that pregnancy and motherhood is a universally joyful or intimate experience which all women look forward to having is unfortunately a romanticised view about how this process is experienced by those gestating. It appears that the socialisation of women as destined to become mothers, no matter the cost, can be so convincing that even women who were actively uninterested in motherhood might end up following this social script out of a fear of missing out– only to regret the decision later (Bodin 2024). The rhetoric that women ought to embrace their 'innate' maternal instincts when it comes to childbearing thus "creates a complicated (dis)engagement with risk assessments, concealing the realities of pregnancy and childbirth" (Nelson 2024, 345).

Even in cases where the hypothetical child is highly desired, we must acknowledge a fact: in the past, present, and future, there are and will be women who do not particularly enjoy pregnancy, despite its potential for intimacy with the foetus. In medicine, "fear of childbirth" describes the common anxiety or dread experienced by both pregnant and non-pregnant women, while "*tokophobia"* refers to severe, pathological fear (Bhatia and Jhanjee 2012). Fear of childbirth can negatively impact the mother-infant attachment, as women with this condition may struggle to feel emotionally connected to the foetus (Alemu, Wudu, and Lakew 2024), leading to lower attachment levels both pre- and postnatally (Molloy, Biggerstaff, and Sidebotham 2021). Women with traumatic birth experiences are often less inclined to have more children and may fear future pregnancies (Tan et al. 2013). In the U.S. and U.K., 25–35% of birthing individuals experience childbirth as traumatic (Nelson 2024). Some develop PTSD or CPTSD, further complicated by shame, guilt, and bonding difficulties (Watson et al. 2021). Clearly, improved social and medical intervention and support is crucial to ensure that the kinds of negative experiences described above can be avoided, treated, or at least minimised for all would-be gestators. Perhaps this is what is needed for more women to be able to fully appreciate the unique journey of becoming a biogenetic mother. Given what we know about the potential complications and difficulties of pregnancy, however, ectogenesis may constitute a clinically relevant intervention in the future for women who are at risk of being affected negatively by the embodied process of pregnancy and childbirth (or who already have undergone a complicated or traumatic pregnancy). Alongside other types of support from the healthcare system, then, ectogenesis has the potential to facilitate a less traumatic mother-

foetus relationship in cases where the idealised version of pregnancy and bonding does not materialise[13].

As technologies and ethical perspectives progress, the potential for prospective parents to prefer emotional connections through caregiving rather than through pregnancy should not be ruled out. Given that traumatic experiences of pregnancy and childbirth can be detrimental to the health of the mother and baby, and of course to the relationship which develops between them pre- and post- birth, the possibility to use ectogenesis may reassure hesitant potential mothers that they can still have a baby, without necessarily subjecting themselves to these risks. Some may therefore favour "ectogenetic ties"—attachments formed between prospective parents and a foetus growing in an artificial womb. Such ties may be appealing as they avoid the pain and burdens of pregnancy, and the enhanced visibility of the foetus in an artificial womb could potentially strengthen emotional bonds. This option would plausibly be attractive to women who are eager to become mothers, but who worry that a high-risk pregnancy, or a traumatic birth experience, might get in the way of mother-infant bonding or compromise their ability and enthusiasm to step into motherhood. We will discuss this further in later sections. Logically, then, the "form argument" could indeed support the development of ectogenesis.

2.2 The "degree" argument

Compared to the "form" argument, the "degree" argument may offer stronger grounds against ectogenesis if valid, as weaker maternal bonding could counterbalance its benefits. Can a foetus in an artificial womb, assuming comparable health to one born naturally, still own the capability to form attachments? Will caregivers inevitably struggle to bond with a machine-born baby? These questions are central to the "degree" argument. From the perspective of the foetus and child, Amel Alghrani (2007) argues that the absence of the mother's voice, heartbeat, and emotions may weaken maternal-foetal attachment and ultimately harm ecto-children. From the mother's perspective, some worry that ectogenesis may lead to weaker maternal instincts associated with physiological aspects of pregnancy, such as hormonal changes, thereby reducing their emotional preparedness for motherhood (Landau 2007; Murphy 2012).

[13] This paragraph was primarily contributed by Lee.

We argue that the "degree" argument—that ectogenesis is very likely to weaken mother-child bonding—rests on two key suppositions:

(1) Maternal-foetal attachment is inherently created by the physical form of pregnancy—specifically, the foetus's presence in the human womb, which is a neither *replicable* nor *replaceable* mechanism.

(2) Such maternal-foetal attachment is indispensable for establishing a lasting mother-child bond.

Theoretically, while ectogenesis may replicate many aspects of pregnancy, it lacks the intimate bodily connection between prospective parents and the foetus. If prenatal attachment depends on this connection, ectogenesis might struggle to foster the same bond. However, if emotional ties do not primarily rely on it, alternative ways to establish attachment could emerge.

Also, if maternal prenatal attachment is crucial for a lasting mother-child bond, its absence in ectogenesis could be problematic. But if long-term bonding depends more on post-birth care and interaction, parents using ectogenesis could achieve comparable attachment through nurturing and engagement.

In the following sections, I contend that neither supposition is supported by convincing evidence, suggesting that, with proper arrangements, ectogenesis can indeed facilitate sufficient mother-child bonding.

3. Will Ectogenesis Weaken the Foetus' Capability to Form Attachments?

Ectogenesis eliminates gestational woman-foetus attachment since ecto-children never experience the maternal uterine environment (Hammond-Browning 2018). Indeed, without a gestational woman, such a specific "gestational woman-foetus" attachment cannot exist. What really matters, however, is whether the intended mother's bond with the ecto-foetus/child is compromised by the foetus's absence of uterine experience.

A new-born's ability to form attachments is evident in actions like swallowing, sucking, and kicking to seek care, ensuring survival (Bowlby 1969). Could an ecto-newborn, despite being physically healthy, lack these capabilities? The underlying questions are: What factors have affected the development of the unborn's capability to seek care after birth? Can these factors be replicated or replaced? How crucial is this prenatal capability for long-term bonding?

Answering these questions is essential to understanding whether and how ectogenesis can preserve attachment in ecto-children.

According to Bowlby (1988), the foetal and infant ability to form attachments is largely instinctive and a result of natural selection. If so, then genetic factors are likely the primary drivers. Some might argue that such capabilities could be influenced by their uterine experiences. Indeed, some studies suggest that foetuses are capable of learning and memorising sounds, stories, and specific voices while in the womb (Chamberlain 1994), and full-term foetuses can even recognise their mother's voice and scent at birth (Kadic and Kurjak 2018). Such evidence seems to imply that sensory experiences during gestation may influence a new-born's ability to form attachments—but in what way? If natural selection enables the foetus to develop awareness or consciousness, it may make the new-born more familiar with the gestational mother and her close network, such as the prospective father. The issue is that if a foetus forms a strong emotional attachment specifically to the gestational mother and those close to her, it seems to imply that only these individuals can interact well with the new-born. However, there is little evidence to support this claim.

In fact, young children born through surrogacy, adoption, or raised by single fathers often form strong attachments to non-birth caregivers. Attachment primarily forms within the first year of life (Bowlby 1988) and the mother-infant relationship is considered the most essential and significant process during the postpartum period (Brockington 2004). Moreover, the quality of attachment hinges on caregiver interactions (Ainsworth et al. 1979).

It is also crucial to be aware that neural connections between the gestator and the foetus do not exist; thus, I believe the factors influencing foetal consciousness development would not go beyond genetic factors, environmental influences, and experiences in the womb. Genetic information can be kept in ectogenesis; as for the latter two factors, such as interactions with caregivers, ectogenesis might be able to artificially simulate some. Thus, the claim that an artificial womb cannot preserve the foetal ability to seek care might be arbitrary, regardless of whether this ability is an instinctive or conscious behaviour developed during natural gestation.

A more logical interpretation, supported by attachment theories and relevant findings, might be: Evolutionary factors—primarily reflected in genetic traits—shape the mechanisms underlying the formation of foetal consciousness. While uterine experiences may influence certain dispositions of foetal consciousness, such as familiarity with the gestator, they might not alter the foetus's innate ability to seek care. This ability is primarily developed through

close post-birth interactions, especially during infancy. Thus, while the factors influencing a new-born's immediate ability to seek care might be shaped by genetic traits, prenatal sensory experiences, and environmental factors, lasting bonding with a caretaker still relies on postnatal interactions.

This has several implications for ectogenesis: 1) As long as ectogenesis does not introduce harmful genetic alterations, the care-seeking capability should remain intact 2) Ectogenesis might be able to replicate certain uterine experiences of the unborn, such as the prospective parent's voice and scent, to enable the unborn to become familiar with the prospective parent(s). 3) Even if these experiences cannot be fully replicated, close post-birth interactions with caregivers can compensate for these differences.

4. Will ectogenesis weaken mother-to-child bond?

The question of whether ectogenesis weakens maternal emotional ties still depends on the mechanisms underlying prenatal attachment and its role in long-term bonding. Specifically, if attachment mechanisms are intrinsic to physiological pregnancy and essential elements cannot be replicated or replaced, ectogenesis may reduce mother-to-foetus attachment. If prenatal maternal emotions play a crucial role in shaping long-term relationships, lower prenatal attachment could compromise mother-child bonding. However, we contend that these assumptions are largely unfounded.

4.1 Gestation-Built Love

Physiological changes during pregnancy, such as hormonal increases in gestators, are often considered foundational for prenatal bonding (Kim and Strathearn 2016). Much of our understanding of how these changes influence maternal behaviours comes from animal studies, with some indeed demonstrating a positive correlation between hormone levels and maternal behaviours (Walter, Abele, and Plappert 2021). The assumption of hormone-driven maternal love is widely held as instinctual, automatic, and inevitable (Dow 2015). Moreover, recent studies reveal neuroanatomical changes in the brain structure of gestators during pregnancy (Pritschet et al. 2024), with long-lasting effects (Hoekzema et al. 2017). These findings appear to support the hypothesis that neurobiological adaptations contribute to maternal behaviours.

Some might also speculate that the lack of enriched, intimate interactions during physical pregnancy could adversely affect the mother's psychology, impairing her ability to form a strong emotional connection with the ecto-newborn.

Still, the key questions are: Do the tracked neuroendocrine changes themselves, or the gestator-foetus interaction, play a primary causal role in forming the prenatal attachment from the maternal side? If so, can the factors that bring about these changes and interactions be replicated and replaced in artificial gestation? Does such prenatal attachment have a profound impact on long-term bonding? Next, we challenge the idea that pregnancy itself is the primary driver of prenatal maternal attachment and that this attachment is essential for long-term maternal bonding.

4.2 Questioning Gestation-Driven Love

The notion that pregnancy itself is essential for maternal love lacks convincing evidence. More likely, maternal love is a product of both human cognitive ability and social influence. Here, we examine cases that challenge the biological essentialism of maternal love—detached gestational mothers, committed intended mothers, fathers, and other caregivers. Then, we explore the mechanisms behind prenatal maternal attachment and consider the implications for ectogenesis.

4.2.1 Empirical Cases That Challenge Maternal Instinct

The assumption that gestation is the primary determinant of maternal love faces challenges from real-world cases.

Detached Gestational Mothers. Robson and Kumar (1980) find that women who underwent artificial rupture of membranes, experienced painful labour, or received over 125 mg of pethidine were more likely to struggle with maternal affection postpartum. Similarly, as discussed in Section 3.1, fear of childbirth and PTSD can contribute to lower attachment levels. In cases of unwanted pregnancies, maternal attachment is often minimal, with little evidence of grief following birth. Historically, many aristocratic women entrusted their new-borns to wet nurses—if prenatal attachment were entirely natural and automatic, greater resistance to this practice would be expected. Instead, maternal bonding may have been less culturally emphasised at the time, leading to weaker emotional ties in women's cognition (Drummond 1978). This suggests that maternal attachment and bond is, at least in part, a modern social construct.

Committed Non-Gestational Mothers. The commonplace phenomenon of Committed Non-Gestational Mothers challenges the assumed power of bodily gestation in building maternal love. Many non-gestational caregivers—including intended mothers in surrogacy

arrangements and adoptive mothers—form deep, meaningful bonds with their children. Surrogacy provides a sharp challenge to traditional beliefs about maternal instinct, as it involves both detached gestational mothers and committed non-gestational mothers. The assumption that surrogates relinquishing the child contradicts natural instincts or leads to emotional harm is not supported by substantial empirical research. A 2018 study by Lamba et al. (2018) reveals that surrogate mothers had lower emotional bonding with the foetuses they carried compared to women carrying their own babies, yet exhibited higher levels of instrumental bonding, such as adopting healthier habits during pregnancy. All surrogate mothers willingly relinquished the child without experiencing additional psychological harm. Interestingly, interactions with the intended parents positively influenced the satisfaction of surrogate mothers, while meeting the baby did not have the same effect. Numerous studies have reported similar findings (Teman 2008; Baslington 2002; Blyth 1994; Einwohner 1989; Jadva et al. 2003; Ciccarelli 1997).

On the contrary, social mothers—such as intended mothers in surrogacy and adoptive mothers—often develop deep emotional connections with their children. For instance, adoptive families achieve a similar level of closeness, especially if the adoptive child and the adoptive parent share the same racial background (Sigismondi 2024). These mothers, however, may face higher social pressure to glorify parenting and suppress negative feelings toward their child (Fontenot 2007). Infertile women and those who conceive via alternative methods often experience higher stigma and are perceived as less capable mothers compared to those who conceive naturally (Wegar 1997). Thus, stigma around certain forms of non-traditional motherhood might give the impression – without real evidence – that negative mother-child bonding outcomes necessarily await non-traditional mothers[14].

Fathers and others. Heterosexual fathers, gay intended fathers in surrogacy, non-gestating partners in lesbian relationships, and adoptive parents are all able to establish strong parental bonds without experiencing pregnancy (Goldberg, Moyer, and Kinkler 2013).

Interestingly, hormonal changes are not exclusive to gestational mothers—expectant fathers also experience shifts in testosterone and estradiol, which are believed to facilitate parental care (Edelstein et al. 2015). Fathers are not pregnant; they are merely observing, contemplating, and feeling. Yet, hormonal changes occur. Studies show that a majority of expectant fathers, as

[14] This paragraph was primarily contributed by Lee.

high as 95%, experience pregnancy-like physical symptoms during their wives' pregnancies (Yogman 1990; Clinton 1986). Thoughts and emotions about the foetus are remarkably similar in pregnant women and expectant fathers, although fathers tend to express these emotions less in their behaviour, possibly due to concerns about conflicting with traditional ideas of masculinity (Condon 1985). Some other studies suggest that heightened emotions in women can be attributed to their direct physical experiences of pregnancy, such as feeling foetal movements (van Bakel et al. 2013). Nevertheless, this difference may diminish in the later stages of pregnancy, with both parents' emotional connection to the foetus growing (Slade et al. 2009).

Notably, advances in ultrasound imaging have strengthened fathers' emotional connection to the foetus by helping them visualise the unborn child (Widarsson et al. 2015). These findings suggest that hormonal shifts likely respond to emotional engagement, which is largely driven by imagining the foetus in the womb.

Such an imagination-driven mechanism may also explain why intended parents in surrogacy experience strong prenatal bonding. The surrogate may help intended parents feel emotionally bonded with the growing foetus; for instance, the intended parents may conceptualise the surrogate pregnancy as a "gift" or "embodiment" of their child (Carone, Baiocco, and Lingiardi 2017). This shows that even in the absence of first-hand gestation (and possibly other biogenetic ties), the intention to parent is highly subjectively meaningful to aspiring parents as a starting point for establishing intimate ties[15].

In addition to expectant fathers experiencing hormonal changes and developing emotional bonds with the foetus, the release of oxytocin—often considered a key bonding or love hormone—also occurs during sustained interaction between caregivers and infants, especially through skin-to-skin contact (Cong et al. 2015). Research shows that there are similar basal concentrations of oxytocin in both maternal and paternal plasma (Gordon et al. 2010), and similar findings have been documented in the case of adoptive parents (Bick et al. 2012).

This not only suggests that pregnancy may not be the primary driver of prenatal maternal attachment but also that attachment at this stage is not indispensable.

[15] This paragraph was primarily contributed by Lee.

4.2.2 Maternal Love as a Cognitive and Social Construct

The discussion above suggests that prenatal maternal love is not an automatic biological response but is shaped by people's— not only gestators'—imagination and anticipation of the foetus. This raises a deeper question: what enables this imagination and expectation? Research highlights both biological and social influences, with cognition—not pregnancy—as the key biological driver and societal expectations as the primary social factor.

From an evolutionary perspective, maternal love is more a conscious love with a deep link to human beings' cognitive capabilities rather than an instinct. Primatologist Sarah Blaffer Hrdy (1999; 2009) argues that, unlike the instinctive possessiveness observed in other primates, human maternal love is primarily shaped by human cognition. She states:

> By itself, giving birth does not guarantee that a mother can learn to love any baby she bears. A woman predisposed to be a mother can learn to love any baby, while a mother not so disposed does not even learn to love her own. This is what it means to live with the emotional legacy of a human who evolved in a hominid context where mothers relied on assistance from others to help rear offspring (Hrdy 1999, 116).

In other words, a mother's emotional commitment to her child is not inherently tied to pregnancy and childbirth but is shaped by her reflections on contextual and cultural factors. Why, then, does human maternal love form in this way? Hrdy (2009, 78) suggests that the "obvious possibility" lies in the evolution of the human neocortex. As the brain's control centre, the neocortex enables humans to evaluate the costs and benefits of their actions within specific environments, allowing mothers to consciously adjust their emotions and caregiving strategies. This helps explain why some gestational mothers, such as surrogates, may feel little emotional connection to the foetus they carry, while intended mothers, fathers, and other non-gestational parents can develop strong prenatal bonds. Their cognitive abilities enable them to regulate love through intention, desire, personal experiences, and social influences. Thus, maternal love—like that of non-gestational parents—is shaped by biology, but the key biological factor is not pregnancy itself, but rather human capacity for complex cognition and conscious reflection.

Moreover, a crucial function of the human brain is imagination. Ultrasound imaging enhances paternal prenatal attachment; it also influences maternal attachment. According to Widarsson et al. (2015), ultrasound served as a "turning point when the pregnancy became more real for them both [mother and father]". Without ultrasound, the foetus lacks physical interaction to

elicit an emotional response from the mother. By providing a direct visual, ultrasound compensates for this absence, reinforcing the idea that maternal love emerges from perceiving the foetus as a distinct individual rather than merely acknowledging pregnancy (Smajdor 2007).

If the neocortex governs human emotions, what shapes the *disposition and intensity* of maternal emotion toward a foetus or new-born? Research suggests *societal expectations* of traditional motherhood play a particularly significant role.

According to Andrea O'Reilly (2019), the belief that all women want to become mothers, that mothering comes naturally to all women, and that women experience mothering as fulfilling and gratifying is constitutive of patriarchal "motherhood". While many women may enjoy pregnancy and motherhood, societal norms place immense pressure on all women to conform to this standard, regardless of their personal desires. The socio-cultural essentialisation of mothering, coupled with the stigmatisation of non-motherhood, reinforces the idea that not becoming a mother is a failure (Gotlib 2016).

Pregnancy is already highly publicised and fetishised in the public sphere, thanks to popular depictions and idealisations of the pregnancy experience (Tyler 2011), the increasing medicalisation of pregnancy and foetuses (Gentile 2023), and the growing prominence of infertility treatments like ARTs (Petropanagos 2017). On top of this, "government-sanctioned" pronatalist discourses also situate women's fertility and childbirth as essential to secure the economic future of nation-states (Forati and Bartz 2024)[16]. At the individual level, pregnant women frequently encounter social scrutiny, including unsolicited advice from strangers on their behaviours and responsibilities (Davidson 2001). These societal pressures shape how pregnant women perceive their role, influencing their emotional responses, expectations, and sense of attachment to the foetus.

On the flip side, there is a pervasive global culture of silence and taboos around (the experience of) pregnancy, the pregnant body, and postnatal care, ranging from when and how to share news about pregnancy to birth experiences and poor obstetric care (Dimitrov, Jelen, and L'Etang 2022). Unfortunately, this means that many "negative" aspects of maternal life are still taboo, leading more women to remain silent—or be silenced—when sharing testimonies and counter-narratives that challenge essentialised social norms and ideals about motherhood. This conveniently reinforces the status quo, asserting that pregnancy, childbirth, and

[16] The part from "Pregnancy is already highly publicised" to "future of nation-states" was contributed by Lee.

motherhood must be a universally positive and expected life path for all women while obscuring other possibilities.

Moreover, the assumption of a "maternal instinct" reinforces the gendered division of labour. This narrative legitimises the idea that those who give birth are inherently better suited than fathers to be primary child caretakers because they are "prepared" for the role (Hays 1996). As the primary caregiver, the gestational mother naturally interacts more with the new-born, and research shows that maternal attachment strengthens through repeated interactions, physical touch, and postnatal bonding (Rankin, Krouskop, and Fisher 2024). In this way, a self-reinforcing cycle emerges gestational mothers are assumed to have a maternal instinct, justifying greater caregiving responsibilities; their intense care then strengthens bonding, further reinforcing the belief that pregnancy inherently creates stronger maternal attachment than others.

4.3 Implications for Ectogenesis

The discussion above suggests that human brain function allows mothers to regulate emotional ties to the foetus and new-born, while social influence shapes these emotions, often imposing undue pressure to essentialise childbearing and maternal identity—potentially overstating their necessity for mother-child bonding.

This does not dismiss the physiological aspects of pregnancy—such as the physical connection that enables intimate gestational interaction—but rather suggests that these effects are psychologically mediated and potentially replicable in non-bodily gestation. Moreover, prenatal attachment is not strictly necessary for lasting maternal bonding, as it can be effectively fostered through postpartum care and interaction. Accordingly, in theory, sufficient parent-child bonding in ectogenesis could be achieved through alternative means.

Firstly, increasing postpartum interaction is essential. Various methods, like current practices, can enhance parental-infant bonding once a baby is born from an artificial womb. Evidence from Neonatal Intensive Care Units (NICUs) may provide some insight. Research shows that the maternal emotional state and the environment of the NICU can limit bonding development, while nursing care that encourages communication, participation, massaging, or breastfeeding can facilitate mother-infant bonding (Fernández Medina et al. 2018). This suggests that the lack of maternal womb interaction experiences may require compensation through intimate post-birth interactions.

In the future, regulations may mandate bonding activities to ensure attachment and prevent the devaluation of humans born outside the body, though we do not explore this further.

Secondly, the degree of visualisation in ectogenesis and the new forms of interaction it can provide between prospective parents and the foetus may influence bonding development. If real-time monitoring can deepen bonding beyond ultrasound, it would be necessary to allow prospective parents to view the foetal development process in real time. However, if evidence suggests that the foetus's "non-baby-like" appearance may lead to feelings of inadequacy or guilt in parents, limiting the visualisation of the artificial womb could become an ethical consideration (Kendal 2022). Additionally, wearable devices, such as smart wristbands, could be used to track foetal movements in real time, allowing prospective parents to feel these movements. The foetus, in turn, could gain early sensory exposure by hearing caregivers' voices and sensing their smells, potentially fostering a sense of familiarity and connection with the prospective parents.

Thirdly, social norms can significantly shape future maternal attachment and bonding. This could have two potential outcomes: if societal expectations around maternal roles remain largely unchanged, expectant mothers using ectogenesis may still form earlier and stronger bonds with their expectant children than most fathers. However, if societal expectations around motherhood evolve—becoming more like those surrounding fatherhood due to ectogenesis and other social transformations—the resulting maternal and paternal bonding may also become more alike in depth.

Finally, it would be plausible to consider that if certain hormones effectively trigger the caregiver's feelings toward the baby, and some individuals lack these hormones using ectogenesis to have a child, hormone supplementation for caregivers could be a viable option. After all, some experts have researched the intranasal administration of oxytocin to improve the maternal behaviour of biological mothers (Bartz et al. 2010) and research indicates that the injection of vasopressin can increase fathers' caregiving interest (Cohen-Bendahan et al. 2015). If hormone therapy to enhance maternal behaviour in traditional gestation is acceptable, there is no strong reason to argue that using the same approach in ectogenesis is immoral.

Therefore, in theory, successful ectogenesis would not necessarily compromise the love ties between mother and child, as pregnancy is very likely not essential for establishing maternal-foetal attachment and lasting mother-child bonding.

5. Open to the Future: Different Parental Bonding, Not Inferior

Although we have discussed how bonding factors in traditional gestation can be replicated or substituted in ectogenesis, we remain open to the possibility that future parental bonding may differ but not be inferior to current forms.

Concerns about parental bonding in the era of ectogenesis often stem from two underlying, perhaps unconscious, assumptions:

(1) that future mother-child bonding will occur mainly between the body-born mother and the machine-born baby,

(2) and that current parent-child bonding styles should serve as the standard for future forms of bonding.

Both assumptions are clearly unfounded. The idea of parents being born from a female body while babies are created through machines may apply in the early stages of ectogenesis. However, if ectogenesis becomes widespread, it is possible that both parents and children will be born from machines, fundamentally altering parent-child dynamics. What future humans, born from machines, perceive themselves and their descendants could shift significantly, making it difficult to evaluate through today's lens.

Future parental bonding can be influenced by various factors: the ultimate development of artificial wombs may not replicate the entirety of the human womb's functions, or adjustments may occur during the imitation process. Even minor variations could result in a series of changes in the neurological development of ecto-babies, while still maintaining their functionality and health. For instance, ecto-babies might be more independent. According to the "obstetrical dilemma" concept (Washburn 1960) bipedalism freed human hands, promoting tool use, which resulted in larger brains, while simultaneously reducing the size of the birth canal relative to other primates. As compensation, human foetuses are born at an earlier developmental stage, making new-borns less independent. This implies that ectogenesis, which bypasses this dilemma, could lead to more independent human new-borns. Furthermore, the future social environment, profoundly affected by the emergence of ectogenesis, can also significantly shape forms of parent-child relationships.

Due to these potential physiological and environmental changes, future human parental bonding may be different, but not necessarily worse. After all, our current parent-child bonding is already quite diverse, thanks to different kinds of parenthood and family relationships. More importantly, bonding based on gestational ties is deeply rooted in patriarchal norms and carries

certain toxic elements. As previously discussed, this model reinforces the ideology of women as primary caregivers and entrenches gendered divisions of labour. That said, current bonding forms are not qualified as standards.

With ectogenesis, there is potential to create more egalitarian forms of parental bonding. A more equal gender environment could not only make motherhood, fatherhood, and diverse forms of parenthood more equal, but it also has the potential to construct more equitable relationships between parents and children, as children are profoundly influenced by their family environments. In particular, ectogenesis could also mean more independent babies, as discussed before, and less possessive parents due to the absence of bodily gestation. Therefore, evaluating future parental relationships based on today's model may lead to misguided conclusions.

Humans are highly adaptable, with multiple reliable pathways for forming bonds. It's hard to imagine that such a life-sustaining relationship would rely on a single process. In the era of ectogenesis, future generations will determine how they wish to shape parent-child relationships in their new context.

Conclusion

The current debate concerning the negative impact of ectogenesis on future mother-child relationships includes two main perspectives: one claims that ectogenesis could fundamentally harm long-term mother-child relationships due to the loss of the intimate gestational attachment formed during natural pregnancy. The other perspective suggests that, even if mother-child bonding is not compromised, women may value and have the right to choose natural pregnancy for its unique bonding process. In fact, the latter argument can coexist with support for ectogenesis. Just as some value and prefer the attachment formed through pregnancy, others might favour non-pregnancy bonding methods due to fear of childbirth or traumatic pregnancy experiences.

The first viewpoint faces challenges from existing evidence and theories. Relevant findings and theories indicate that the factors influencing foetal consciousness development do not extend beyond genetic factors, environmental influences, and experiences in the womb. Considering that new-borns from natural pregnancies can interact well with primary caregivers other than the gestational mother, the impact of foetus-to-gestational mother attachment during the prenatal stage on long-term parental relationships is also questionable. This implies that as long as ectogenesis does not introduce harmful genetic alterations, the care-seeking capability

should remain intact, and ectogenesis might be able to replicate certain uterine experiences, such as the prospective parent's voice and scent, to familiarise the unborn with the prospective parents. Even if these experiences cannot be fully replicated, close post-birth interactions with caregivers can compensate for these differences.

Meanwhile, it is difficult to attribute the emotional ties from mother to infant/child primarily to pregnancy itself. Although pregnancy typically involves a series of hormonal changes, and interactions between the gestational mother and foetus may trigger emotional responses in the gestational mother toward the foetus, there is no evidence that these factors predominantly determine the mother's love for the born infant. The contrast between detached gestational mothers and committed non-gestational mothers is notable; similarly, heterosexual fathers, gay intended fathers in surrogacy, non-gestating partners in lesbian relationships, and adoptive parents all successfully establish strong parental bonds without experiencing pregnancy. These widespread phenomena demonstrate that mother-child love ties are not primarily driven by physiological pregnancy but are more imagination-driven. From an evolutionary perspective, maternal love is more a conscious love deeply linked to human cognitive capabilities rather than an instinct, and societal expectations of the traditional mother's role may significantly affect mother-to-foetus/child bonding. This means that in the era of ectogenesis, increasing interactions between parents and children born from machines and shaping more gender-equitable social norms are necessary, and hormone supplementation to enhance emotional ties in certain cases is also plausible.

More research on the impact of pregnancy on bonding and the mechanisms of parental bonding formation is undoubtedly necessary. However, based on existing research, claims that ectogenesis would compromise mother-child bonding appear arbitrary.

Besides, it is necessary to maintain an open attitude towards future parent-child bonding. Beyond the initial stages, the future will likely involve relationships between parents and children who are both born from machines. Ectogenesis may enhance the independence of infants from machines, and social norms may also change to make parent-child relationships more equitable. Future human parental bonding might be different, but not necessarily worse.

CHAPTER SIX

Ectogenesis and Gender Inequality: Two Pathways Converge[17]

In the previous chapters, I critically examined concerns raised by critics of ectogenesis, focusing on the value of physical pregnancy. These concerns primarily focus on the potential losses ectogenesis may bring to women; if valid, they at least partially undermine its promise of liberation. I hope to have addressed these concerns in previous discussions.

Another key reason critics question the emancipatory potential of ectogenesis is the view that gender inequality is not primarily caused by gestational differences between the sexes (GDS). From this, they tend to conclude that even if ectogenesis were to practically create gestational sameness between men and women, it would not address the *aetiology* of gender inequality (GI). Therefore, this chapter I turn to another key aspect of the debate: how the causes of GI shape the assessment of ectogenesis's emancipatory potential.

Some people think GI results from GDS (Firestone 1970; Smajdor 2007; 2012; MacKay 2020; Kendal 2015). Others believe it is caused by social structures (SS) (Cavaliere 2020a; 2020b; Campo- Engelstein 2020; Horner 2020). These beliefs affect people's views on ectogenesis: the former see ectogenesis as a morally desirable solution to GI, while the latter are sceptical.

These opposing positions, termed the "biological model" and "social model," in this thesis, suggest that if the cause of GI is primarily biological or social, the solution should align accordingly. However, it is unclear what is meant by saying that GI being biologically or socially caused. Without taking either side, I argue that both can be interpreted to suggest that the interaction between biology and society has caused GI, and neither can categorically reject or accept ectogenesis from a moral standpoint.

To examine this issue, I draw on insights from Ronald Dworkin's (2000) luck egalitarianism and the social model of disability, particularly Ron Amundson's perspectives, both of which grapple with the biology versus society dichotomy. I will show how a sensible interpretation of both frameworks can help find a way around this problem. Applying both frameworks to GI will demonstrate that there are good reasons to incorporate ectogenesis as a significant component of GI solutions, while whether ectogenesis is a morally desirable remedy remains an open question.

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1. The Debate

Feminist authors disagree on whether GI is rooted in biology or social structures, somewhat leading to their divided attitudes toward ectogenesis.

The biological model that views ectogenesis as liberating often starts with the notion that GDS have caused GI. For example, Firestone's influential argument posits that pregnancy is the root cause of GI, necessitating the liberation of women from the "tyranny of reproduction by every means possible," including "artificial reproduction" (Firestone 1970, 175-190). A recognition of the causal influence of GDS does not require that we deny the impact of non-GDS factors. Firestone also notes that initial biological inequality was later "consolidated and institutionalised in the interest of men" and emphasises the importance of other radical changes, rather than viewing ectogenesis as a panacea. Other authors who endorse Firestone's position often highlight ectogenesis's potential to improve women's reproductive health (Smajdor 2007; 2012), reduce gestation-related burdens (Kendal 2015), and decouple women's social roles from pregnancy, without denying the need for social changes (Mackay 2020).

What is unclear in this biological model is why the social response—consolidating and institutionalising biological inequality to advantage men—cannot be considered a cause. The distinction between the biological cause and the later social response seems to be merely a matter of temporal sequence. Suppose a person falls and passers-by do not help her, instead trampling over her and causing serious injury. Although her fall is the origin of the accident, there seems to be no compelling reason to exclude the trampling as a cause of the injury. Theoretically, cutting the later part of the causal chain—correcting the social response—could also work. The argument that biology is the origin of inequality itself cannot generate the normative guidance that eliminating this origin is the only or best path to equality.

Conversely, authors viewing GI as primarily social tend to dismiss ectogenesis as crucial for achieving gender equality. Some strongly assert that the root of GI is social, not medical, or biological (Campo- Engelstein 2020; Horner 2020). Giulia Cavaliere (2020a; 2020b) concedes that even if GDS have impacted GI, social mediation is the primary cause; thus, ectogenesis, which misleadingly attributes GI to GDS, should only be used to provoke attention towards unjust SS or as a minor part of a much broader political, social, and ethical agenda.

Cavaliere (2020b) uses an analogy to illustrate her stance: employing Whitening™ to change skin colour to white to end racism is morally undesirable, "regardless of its practical efficacy," for two reasons: 1) oppressive social norms need changing, not biological traits, and 2) it

promotes liberation through contentious assimilation. This analogy appears inaccurate at first glance. Pregnancy involves embodied harm and health risks for women, while skin colour does not; ectogenesis bypasses biology rather than changing it. Creating "sameness" through shared means is not necessarily assimilation; for example, ramps that accommodate both wheelchair users and others are not considered such tools. Or imagine a wearable limb—Bypassing™—that facilitates effortless walking for people with mobility issues and even allows non-impaired individuals to walk faster. Intuitively, proposing Bypassing™ to address the disadvantages faced by people with impairments seems less morally objectionable. Therefore, I will draw on disability discourse to clarify my points about the social model later.

Cavaliere's (2020b) doubt about ectogenesis's emancipatory potential hinges on her assessment of GI's root and its normative role in guiding solutions. She asserts that GI is primarily social—because of this, social norms should be changed first; and because of this, ectogenesis symbolises superficial alignment with the dominant group by "obliterating their difference" rather than accommodating diversity and addressing deeper societal structures. This stance leaves key questions unresolved:

Firstly, is there a convincing method to weigh whether biological or social factors are primary in forming GI? Cavaliere's claim that GDS are socialised into oppressive structures does not confirm the dominance of social factors; it just presents an interaction. She also forecasts that ectogenesis will struggle to dismantle oppressive norms, but this still cannot serve as an argument for "GI is primarily social," even if likely, since social efforts such as those in education and employment have not achieved that either.

Secondly and very importantly, does defending ectogenesis for gender equality necessarily mean locating GI in pregnancy? Relatedly, must accommodating biological diversity mean maintaining original biological modes? Ectogenesis is a human artefact that connects human biology with the external environment. Why cannot it indicate that GI stems from this interaction?

Thirdly, how can we determine that "social" means are morally superior to "biological" means? I endorse Cavaliere's distinction between practical efficacy and moral desirability. She correctly argues that biological solutions, while effective, may lack moral justification. Nevertheless, the same applies to social means—they can be effective yet morally questionable. For instance, lower fertility rates often correlate with higher gender equality (Kolk 2019). The seemingly most effective solution might be lowering gender equality, such

as reverting to forced marriages and pregnancies, but this would clearly be morally unacceptable.

Finally, how can we justify medical support for women's reproductive health as crucial to gender equality? If the social model suggests that altering biological traits for equality is misleading, then medical interventions to improve reproductive safety seem even less desirable than ectogenesis, which bypasses biology. However, if social model holders aim for "a world where pregnancy does not disadvantage women socially, physically, or economically" (Horner 2020) medical intervention becomes essential. It would be inconsistent to deem these interventions crucial while dismissing ectogenesis. With these points in mind, I will explore a more reasonable social model of GI in the fourth section.

In general, the simplified biological and social models face similar issues: both assume there is a way to weigh the causal contributions of social and biological factors to GI, which I contend is arbitrary. Moreover, both consider locating the cause of GI in biology or society as a foundation for accepting or rejecting ectogenesis, but this foundation is fragile—neither can straightforwardly achieve the intended objective, nor can they categorise ectogenesis as pure "biological" or "social." To clarify, in what follows, I will explore two frameworks that ostensibly represent "biological" and "social" causes of inequality, respectively.

2. The Biological Model and Luck Egalitarianism

Ronald Dworkin's luck egalitarian theory can be seen as a kind of biological model, viewing certain inequalities as resulting from unchosen natural endowments—brute luck (Ronald 2000). It emphasises society's moral responsibility to compensate for these inequalities, rather than the individual bearing the misfortune; accordingly, if society fails to do so, it creates systematic and structural inequality in a social sense.

Within this framework, GDS, when seen as the cause of GI, can be interpreted as brute luck. Smajdor (2007) has applied this perspective to defend ectogenesis. By further analysing her work, I argue that interpreting GI through Dworkin's framework leaves the question of whether ectogenesis is morally desirable unresolved.

2.1 Dworkin's framework

Dworkin's theory of distributive justice is illustrated through a fictional scenario where shipwreck survivors allocate island resources equally, following three key steps:

1. Initial equality auction: Each survivor receives an equal number of clamshells to bid on preferred resources. Initial equality is achieved when no one envies the possessions of others.

2. Establishing prima facie right to compensation: Over time, initial equality is disrupted by two types of luck: "option luck," arising from calculated risks such as planting a risky crop, and "brute luck," involving uncontrollable risks like bad weather or illness. Compensation is warranted only for disadvantages caused by brute luck, not option luck.

3. Generating the actual right to compensation: With limited resources, survivors must prioritise which instances of brute luck to compensate. Standing behind a veil of ignorance, individuals can select insurance against specific types of brute luck, aware of the suffering they cause but uncertain whether they will experience them. This process *democratically* establishes the actual right to compensation.

2.2 Ectogenesis as a form of compensation

The second and third stages of Dworkin's philosophical story are pertinent to GI. However, they only provide principles for identifying conditions that can generate prima facie and actual rights to compensation. Ultimately, we need to ask whether ectogenesis is a plausible form of compensation in this framework. Accordingly, three sequential questions are critical:

1. Can GI be seen as the result of brute luck, thereby justifying prima facie right to compensation?

2. If so, should it be prioritised to establish the actual right to compensation?

3. And, can ectogenesis be a plausible and significant form of compensation?

As previously discussed, authors viewing ectogenesis as liberating usually hold that the origin of GI lies in GDS. According to Smajdor (2007), this origin can be seen as brute luck or natural inequality—stemming from the unequal biological choices available to men and women to avoid gestational harms and risks, justifying prima facie right to compensation. To establish an actual right, Smajdor suggests a proactive role for ethicists and policymakers, because "people need to be persuaded" (Smajdor 2007, 243). I believe ethicists may function like insurance brokers in Dworkin's hypothetical scenario, encouraging individuals to purchase insurance against gestational risks. Smajdor argues that if individuals consider that about 50% of the population are susceptible to harmful burdens involved in female gestation, choosing ectogenesis as compensation becomes plausible. She (2012) also contends that such natural

inequality cannot be separated from the further disadvantages that women endure. Therefore, if ectogenesis is considered a plausible solution to natural inequality, it also represents an important step toward addressing GI in her reasoning.

I agree with Smajdor that in Dworkin's framework, the natural inequality involved in reproduction entails compensating women. Yet, Smajdor's analysis seems somewhat hasty, lacking a full distinction between the right to compensation and the right to a specific form of it. Gestational harm and risks may justify prioritising the protection of women from these issues, but they do not directly justify ectogenesis.

Dworkin's framework only identifies which inequalities caused by brute luck should be prioritised in compensation, without specifying whether the compensation should focus on biological or social aspects. Some of Dworkin's discussions suggest that compensation might take the form of finance. For instance, he illustrates, "one would count monetary compensation for the loss of his sight as worthless in the face of such a tragedy, while the other, more practical, would fix his mind on the aids and special training that such money might buy" (Dworkin 2000, 78). However, money can also serve as initial compensation to fund various pro-equality projects, supporting expansive solutions as long as they achieve the goal. As Buchanan et al. (2000) note, luck egalitarians tend to focus on changing social factors to address natural inequalities, but their theories also inherently support using medical means to directly mitigate natural disadvantages. Accordingly, addressing inequalities resulting from GDS can involve both medical and social means.

Perhaps we can extend the democratic procedure to determine forms of compensation. After deciding which types of brute luck to insure against, people can return to the veil of ignorance to select the form of compensation. To do so, they need to be fully informed about the strengths and weaknesses of each compensatory option. There are, of course, good reasons to choose ectogenesis such as its best effectiveness in removing gestational harm and risks. However, the democratic nature dictates that the desirability of ectogenesis ultimately depends on people's actual choices. Smajdor (2007) also proposes an open choice for people to decide: If individuals did not know their gender at birth, would they prefer a society where women bear all pregnancy burdens and risks (Society A) or one where ectogenesis is perfected (Society B)?

Perhaps the truly difficult choices lie between: (i) Society A, where pregnancy is easy and safe without disadvantaging women, and (ii) Society B, where optional and perfect ectogenesis exists. Apart from considering the feasibility of the two paths, attitudes and values toward

pregnancy inevitably play a crucial role in luck egalitarianism because of its democratic nature. If a society's majority prefers to accept a certain degree of gestational risk while pursuing non-ectogenesis forms of compensation that enable women to achieve life goals beyond gestation, they may not choose ectogenesis. Therefore, the narrative that "GI is rooted in pregnancy" offers ectogenesis only an initial defence, not a conclusive one.

Another natural inequality is men's inability to experience pregnancy, which Smajdor (2007) identifies as a deficit warranting prima facie restitution. Individuals behind the veil of ignorance need consider if ectogenesis best compensates for such a deficit if they prioritise avoiding it. At least, compared to the patriarchal approach of sacrificing women's autonomy and other life goals (discussed further in the next section), ectogenesis is morally preferable, fulfilling men's procreative desires while alleviating women's gestational burden.

It is precisely society's mishandling of the "compensation" for both natural inequalities that has led to structural gender inequality. Here, a reasonable biological model begins to converge with a reasonable social model, as I will demonstrate in what follows.

3. Ectogenesis in The Social model of Inequality

As discussed, sceptics argue GI is best addressed through social methods, but their reasoning is unclear on why social factors are primary or ectogenesis is "biological"; they also inconsistently support medical care for pregnancy while dismissing ectogenesis.

The disability discourse offers rich insights into similar issues. Debate on disability-based inequality is often divided into the medical and social models. The social model, critical of the medical model, attributes inequalities to societal influences. However, if the social model only focuses on eradicating biases, discrimination, and stereotypes, it may not benefit individuals with impairments because some impairments inherently cause discomfort and limitations (Shakespeare 2006). They often require external facilities, technological devices, and medical interventions. Thus, a sensible social model should comprehensively address actual needs. Ron Amundson's insights, especially on tool use, can inform such a model.

3.1 Interaction, technology, and medical interventions

Amundson, a defender of the social model, rejects labelling traits as "normal" or "abnormal," with the latter often perceived as less functionally capable. He contends that people just have "typical" and "atypical" traits without a value hierarchy, and those with atypical traits can function well with proper social arrangement, such as tools. For instance, people with mobility

impairments can use wheelchairs and ramps to move effectively. Thus, society should offer adequate technological support for those with atypical traits (Amundson 2000).

One might argue that the ability of atypical individuals to function well with technological aid does not directly justify a societal obligation to provide such support. For instance, the fact that someone can fly with the right equipment does not imply that society must provide it. I agree that moving from "can" to "ought" requires further justification.

Though not explicitly stated, Amundson and other philosophers indeed suggest a plausible reason—fairness. It is not just atypical individuals who need external tools; using tools for physiological functions is routine in everyday human life (Amundson 2000).

Human survival depends on interacting with the environment, and humans excel at niche construction (Odling-Smee, Laland, and Feldman 2003). As Tim Lewens (2015, 179) elaborates, constructing stairs for leg users illustrates niche construction for locomotion, while ramps and wheelchairs serve similar purposes for people with impairments; even those deemed healthy rely on tools like clothing and shelter.

What is unfair is that society overly prioritises altering the environment to meet the needs of typical individuals while marginalising those of atypical individuals. Significant advancements have been made in developing technologies to unlock the biological limitations of typical people, but comparable efforts have not been proportionately extended to support atypical individuals. And those using tools to aid physical functions often face bias and stigma, further deepening their disadvantages (Amundson 2000). Therefore, "society has caused inequality" encompasses not only "society doing what it should not have done," such as fostering discriminatory attitudes and creating barriers for atypical individuals, but also "society failing to do what it should have done," such as not fairly providing tools for atypical individuals to overcome biological limitations or ensuring non-discrimination against their users. Accordingly, improving tool use is ethically crucial for accommodating biological diversity.

Furthermore, this social model does not inherently exclude medical interventions. A common concern with some versions of the social model advocating social changes is that they may overlook bodily experiences and the role of medical interventions in improving disabled individuals' lives (Manago, Davis, and Goar 2017, 172). However, a social model emphasising societal responsibility for ensuring the proper interaction between biology and the environment can avoid this issue. If the goal is to improve the interaction, there is no good reason to exclude medical interventions that help achieve this.

In summary, the ability of people with atypical traits to function well with appropriate tools, medical support, and inclusive social attitudes, combined with the principle of fairness, supports the conclusion that society must provide comprehensive arrangements to accommodate atypical people. Simply put, "ability" and "fairness" underpin this claim for goal-oriented solutions to inequality.

3.2 The social model of GI and ectogenesis

I apply the rationale of the above social model to GI. In this framework, socially constructed inequality arises when society fails to accommodate individuals with certain biological traits, contributing to systemic and institutional inequality. To address this, society must provide support for effective interaction with the environment. The reasoning is: 1) Various biological types can function well with proper social arrangements; 2) Fairness requires equal consideration of different biological needs; 3) Since the goal is "good interaction," the means are not limited to altering biological traits, tool use, or social norms.

Accordingly, a social model of GI can be viewed as society's failure to accommodate female reproductive features, necessitating comprehensive remedies. The reasoning is: 1) People with female reproductive traits can interact well with their environment under proper social arrangements; 2) However, society has overwhelmingly structured around male reproductive characteristics, thus restoring fairness requires more efforts to improve the interaction between women's reproduction and the environment; 3) Relevant societal adjustments should be goal-oriented, requiring comprehensive methods that do not inherently exclude ectogenesis as a significant component.

There is no reason to believe that individuals with female reproductive traits, under proper arrangements, cannot interact effectively with their environment. Good interaction can roughly mean achieving lives comparable to those with male reproductive traits. This highlights the need to ensure GDS do not disadvantage individuals. What arrangements can achieve this? To address this, I focus on examining historical unfair arrangements to understand what the correct arrangements should entail and the role ectogenesis might play.

3.2.1 Unfairness.

Society is obliged to equally address the needs of individuals with different biological traits. Historically, however, patriarchal societies have operated based on male reproductive traits,

disadvantaging women in many aspects. To explore this, it is necessary to present the fundamental GDS, which I classify into two main aspects:

Men are not gestators; they do not experience the harm, risks, and significant time and energy investment in gestation. In contrast, women, as gestators, bear all these reproductive burdens.

The female body contributes far more essential biological elements to human reproduction than the male body. From conception to birth, the entire process usually takes place in the female body, meaning women provide the gestational environment, labour, and the vital egg, while men only supply sperm. Even the egg is more crucial for embryonic development than the sperm, as it contains mitochondrial genes and other cytoplasmic structures absent in the sperm (Lewens 2021). Using cooking as an analogy: a woman provides all the tools, labour, and most ingredients, while a man provides less than half. That said, to achieve the same reproductive goal, men rely much more on women's reproductive biology than women rely on men's. As Mary O'Brien (1981) suggests, male reproduction is somewhat alienated-being biologically unnecessary after delivering their "seed".

Simply put, female reproduction involves higher participation and contribution but comes with pain and suffering, whereas male reproduction is alienated but free from gestational harm. A just society should recognise women's reproductive contributions, strive to eliminate reproductive burden, and empower women to achieve other life goals without being disadvantaged by reproductive investment.

Nevertheless, societies have operated in the opposite direction. Firstly, patriarchal structures prioritise alleviating male reproductive alienation at the expense of women's autonomy. Force, laws, and institutional forms like marriage, which physically isolate specific women from other men, might be conventional ways to reduce male alienation from procreation and their uncertainty of paternity (O'Brien 1981). In such contexts, women's wombs were seen as "gestational carriers," with men's preference to replace "worn-out wombs" rather than prioritise women's health (Romanis et al. 2021). Even new assisted reproductive technologies (ARTs) might have become complicit in this tendency. Authors like Gene Corea (1988) argues that many women using ARTs are still catering to male reproductive desires, driven by invisible emotional coercion from social norms. But this tendency shows that coercion, not the development of ARTs, is the problem, nor is fulfilling male procreative needs inherently wrong. While men require more external elements to achieve reproductive goals than women,

this is a difference, not a deficiency, in the social model. The real error lies in society's bias toward serving male reproductive traits while compromising women's reproductive autonomy.

Secondly, the unfairness is further manifested in the normalisation and disregard of health losses women suffer from gestation. For instance, anaesthesia for childbirth once faced strong opposition for contradicting biblical teachings that saw sorrow in childbirth as a natural obligation for women (Pence 2006). Even in today's UK, those who seek elective caesareans or epidurals for pain relief still face significant barriers (Nelson 2024). As Smajdor and Räsänen (2024) note, health professionals often implement extensive and invasive medical interventions to manage foetal risks, yet they frequently deny or delay necessary medical support for pregnant individuals by normalising their conditions. Contrary to seeming contradictory, the over-medicalisation and under-medicalisation are unified in their harm to pregnant individuals. Globally, pregnancy complications are rising due to factors like advanced maternal age, yet safe treatments remain scarce, hindered by systemic sexism and paternalism (Stock and Aiken 2023). Over one-third of women worldwide face long-term postpartum complications, yet these issues are largely ignored. So far, most breakthrough reproductive technologies focus on enabling physical pregnancy rather than gestational alternatives—a trend that is hardly coincidental but a consequence of societal reluctance to embrace non-female-exclusive gestation that could disrupt traditional family structures (Firestone 1970; Bidoli 2025).

Thirdly, women have been historically confined to primary childcare, restricting their pursuit of other life goals and exacerbating this unfairness. The pressure to be a "perfect mother" still strains women's career ambitions, even in contemporary liberal states (Meeussen and Van Laar 2018). Binding women to reproductive roles, whether through restricted access to public spheres or social norms, does not reflect their importance in human reproduction but quite the opposite. Perhaps a non-reproductive analogy can better illustrate this injustice, given that the topic of pregnancy often triggers emotional reactions that cloud logical reasoning.

Suppose person A has an ability that person B lacks, and this ability can achieve a shared important goal. However, employing this ability consumes a significant amount of A's time, energy, and health, and A has other goals like B's. For fairness, A's sacrifices should be recognised and compensated. Restricting A to the role of exercising this ability further limits their pursuit of other life goals. Therefore, a fair society should aim to reduce A's investment in achieving the common goal while providing extra support for A in pursuing their other life

goals. That said, shared housework, child-rearing, and equal pay—frequently emphasised by advocates of the social model—are insufficient to achieve true fairness; additional support is necessary.

In general, the patriarchal response to GDS has been to assume that only male reproduction matters, prioritising the fulfilment of male procreative desires—especially the certainty of paternity—at the expense of women's reproductive autonomy. Instead of reducing women's reproductive burden, society has disciplined them to embrace these burdens and confined them to primary childcare roles. In this way, women, and their wombs together, become subjects to male procreative desires.

3.2.2 Goal-directed solutions.

The moral compass derived from the social model of GI suggests that society is obligated to invest more effort into accommodating women's reproductive characteristics for fairness. Based on the previous discussion of how relevant unfairness operates, restoring fairness generally requires society to eliminate practices that harm women's autonomy to satisfy male reproductive desires, reduce women's reproductive burden, and empower women to pursue life goals beyond reproduction.

Theoretically, under the right circumstances, ectogenesis may become a crucial tool in achieving these goals. Eliminating physical gestational burdens, especially harm and risk, is the most certain benefit of ectogenesis. For this goal, ectogenesis serves as a fundamental extension of relevant medical care. Regarding autonomy, elective ectogenesis could effectively address involuntary male childlessness (Räsänen 2024). If the fundamental motive behind gender oppression is male envy of pregnancy capability (O'Brien 1981), ectogenesis could provide a significant reason for men to relinquish their oppressive motivations. Also, compared to existing ARTs, which usually require hormone-induced super-ovulation and procedures to harvest oocytes and implant embryos (Inhorn and Birenbaum-Carmeli 2008). Ectogenesis, especially when combined with in vitro gametogenesis to develop gametes from somatic cells (Pennings 2023), can eliminate invasive procedures on women. Not only can ectogenesis free women's health, time, and energy during pregnancy to pursue other life goals but it can also arguably weaken the ideological link between women's identity and reproduction (MacKay 2020), empowering them to embrace diverse aspirations. Thus, within the social model, ectogenesis can be a significant component in addressing GI.

However, this does not mean ectogenesis is necessarily the most reasonable choice in this model. As previously discussed, another morally appealing option is the combination of easy and safe pregnancy with other proper arrangements. People may have good reasons to choose it, particularly because some women may highly value the specific gestational ties formed during pregnancy (Kennedy 2024). Which option is better? The social model itself cannot provide a definitive answer. It focuses on ensuring good interaction between biology and the environment. If good interaction means meeting people's actual needs based on their values and preferences, then, like the biological model, the moral desirability of ectogenesis would be determined by democratic choice, making it an open question. If good interaction is based on some objective standard, then the two options should be evaluated according to that standard, which also means the social model cannot provide the answer.

Hence, there is no need to reject ectogenesis to show that GI is socially caused—the social model can accommodate ectogenesis in principle. In other words, there might be other reasons to oppose ectogenesis but "society has caused GI" is not a plausible one. Meanwhile, it is also difficult to directly justify ectogenesis from this model; a comprehensive evaluation of potential future scenarios within particular normative theories might be necessary, though it is beyond the scope of this thesis.

4. Reconciling the Biological and Social

When GI is viewed through reasonable biological and social models, its primary cause is society's improper response to female reproductive traits. This supports comprehensive solutions not limited to medical support, tool use, or social modifications, providing an initial defence for ectogenesis. To recap:

Both models are inherently interactionist. Claiming that GDS has caused GI places pregnancy at the beginning of the causal chain. When interpreted through Dworkin's theory, women are entitled to compensation for pregnancy's adverse effects. Society has failed to provide this compensation, instead addressing male reproductive alienation at the expense of women's autonomy and interests, reinforcing male dominance, and deeply contributing to systemic inequality. Meanwhile, claiming that SS has caused GI still largely links with biological factors—society's disregard and marginalisation of female reproductive traits are crucial to gender oppression. Acknowledging that women's struggles in patriarchal societies predominantly revolve around motherhood, marriage, and gender bias—deeply connected to

pregnancy—we cannot deny the significant role of GDS in GI. Still, when society fails to fairly accommodate GDS, systemic inequality arises.

Both reject a hierarchy between GDS and assign accountability for redressing unfairness to society. In a reasonable biological model, the debilitation and risks of female reproduction, and the alienation of male reproduction, can be seen as two forms of natural inequality or unchosen misfortunes. This model calls for society to collectively bear the former misfortune while avoiding the sharing of the latter in ways that harm women's autonomy. These two "natural inequalities" are seen as two "differences" in the social model. A reasonable social model similarly calls for equal efforts to accommodate them, preventing society from solely focusing on addressing male alienation. In both cases, moral accountability lies with society, not biology or individuals. Failure to fairly compensate or accommodate GDS creates GI.

Both advocate for comprehensive solutions to GI, offering only a preliminary defence of ectogenesis. Enhancing interaction itself is the correct path to equality, not limited to targeting biology or society. Practices—whether bypassing biology through ectogenesis or adjusting societal norms—are responses to inequality. Ectogenesis can be seen both as compensation for women's reproductive burden and as societal action to increase efforts to accommodate female reproductive biology. It is biological because it bypasses physical pregnancy; it is social because it reflects society's self-correction. Still, neither framework can directly dictate that strategies including ectogenesis are necessarily superior. This is precisely the core impasse in the relevant feminist debate: should we pursue a path without ectogenesis, but with enhanced medical support and empowerment for women to achieve goals beyond reproduction, or should we seek a path that integrates ectogenesis to spark a series of transformative changes for equality? Which path is more feasible and morally preferable? The debate on the origin of GI cannot provide an answer.

Therefore, for the pro-ectogenesis stance, the narrative that "GI is rooted in pregnancy" is not a strong crutch. The potential benefits of ectogenesis emphasised by these authors-such as improving reproductive health, reducing reproductive burden, and weakening the connection between female identity and reproduction--are important dimensions in addressing GI, without relying on that prop. Focusing on exploring how these benefits can trigger a series of transformative changes in various contexts may be a more persuasive approach. Meanwhile, the narrative that "GI is primarily social" does not justify dismissing the emancipatory potential of ectogenesis—there may be other reasons to critique ectogenesis, but this is not one of them;

calls for broader programs need not rely on this assumption either. That said, weighing GI's biological and social contributors is not an enlightening start for our debate; it is better to set it aside and direct attention to the potential changes ectogenesis may bring across scenarios.

Conclusion

The debate on whether ectogenesis is a morally desirable solution to gender inequality often begins by questioning whether gender inequality is primarily caused by biological reproductive differences or social structures—what I have termed the biological model and the social model. Rather than endorsing either perspective, this chapter has argued that both models provide an unstable foundation for evaluating the moral desirability of ectogenesis.

Drawing on Ronald Dworkin's luck egalitarian theory and Ron Amundson's perspective, I have demonstrated that both models are inherently interactionist, recognising that society's inadequate response to female reproductive traits plays a crucial role in gender oppression. This suggests that interventions addressing either biological or social factors are prima facie valid. However, neither model can offer a definitive conclusion on whether ectogenesis is morally desirable, highlighting the need for a more nuanced approach to this ethical debate.

A key question that remains is whether, in a likely future context, a strategy that incorporates ectogenesis would have advantages over one that does not in promoting gender equality. This is the focus of the next chapter.

CHAPTER SEVEN

Defending Ectogenesis for Better Opportunities

In previous chapters, I have argued that major concerns—such as pathologising pregnancy, enforcing social pressure on individuals' gestational preferences, or diminishing mother-child bonding—do not validly hold that ectogenesis will make women worse off or cause them to lose something valuable. I have also challenged the claim that socially constructed gender inequality (GI) renders ectogenesis an undesirable solution to GI. Instead, ectogenesis can be defended as a societal response to the burdens of female-only pregnancy. Therefore, most claims in the existing debate that the emancipatory potential of ectogenesis is limited or even harmful to women's interests have been refuted.

This chapter continues to defend ectogenesis with a more forward-looking attitude, not by claiming it can solve all issues of GI, but by suggesting it can unlock certain stubborn problems, thereby providing better opportunities to address GI. Also, I do not explore how society's ethical frameworks determine whether ectogenesis should be developed, whether through democratic processes or otherwise.

Instead, I only present reasons supporting the idea that incorporating ectogenesis into a pro-gender equality initiative has the potential to offer more foreseeable advantages than strategies that exclude it. Specifically, I defend ectogenesis from several key dimensions: reproductive health, the gendered division of labour, social norms, and family structures. I also examine counterstrategies that exclude ectogenesis, further affirming the better opportunities ectogenesis may offer.

The structure is as follows: Section 1 argues that reproductive health is a fundamental dimension of gender equality, one that could benefit most from the development of ectogenesis. Sections 2 and 3 explore how the potential of ectogenesis could shift the gendered division of labour and norms. Section 4 discusses the significance of ectogenesis for unpartnered individuals in achieving reproductive equality, along with its broader societal implications. The final section challenges two main counterstrategies: using women's role in pregnancy as a bargaining chip and adopting social solutions "undistracted" by ectogenesis.

1. Reproductive Health as a Fundamental Aspect of Gender Equality

Since fully recognising reproductive health disparities as an integral part of GI and improving women's reproductive health is a crucial dimension of promoting gender equality, we already have good reasons to argue that ectogenesis can offer better opportunities for advancing gender equality.

Critics often argue that the impact of ectogenesis on equality may relate only to the distribution of reproductive labour, suggesting its emancipatory power is very limited (Cavaliere 2020; Horn 2020; Romanis 2020). However, they seem to overlook that improving women's reproductive health is itself a crucial aspect of gender equality in a social sense. Empirical research demonstrates that women's reproductive health significantly depends on gender equality and development policies (Wang 2007). As discussed in previous chapters, societies have focused on male reproductive needs, mostly requiring women's gestational capabilities in order to ensure paternity. Consequently, societal structures like marriage and nuclear families are incentivised to secure paternity, while minimising and normalising the health damages women endure during pregnancy. Thus, any strategy that disregards these harms perpetuates this pattern.

Authors like Cavaliere (2020) and Horn (2020) emphasise the importance of appropriate medical policies to safeguard women's health, which I fully support. Murphy (2012, 82) even suggests a "paternity tax" on men with children to fund research aimed at reducing pregnancy-related diseases, thereby converting the advantage men benefit from in women's pregnancy into a certain degree of benefit for women.

These measures, in principle, are consistent with employing public funding to develop ectogenesis to improve women's reproductive health—all represent the distribution of the reproductive burden across society. That said, utilising public funds to develop ectogenesis for improving women's reproductive health is, in itself, a measure to promote gender equality. In this regard, ectogenesis undoubtedly has the best potential to avoid most gestational harm and risks compared to any other method. Arguably, no medical intervention or support, including highly trained midwives, can eliminate the complications associated with pregnancy.

Therefore, the potential of ectogenesis in improving women's reproductive health and addressing reproductive health disparities between the sexes already demonstrates its ability to offer better opportunities in promoting gender equality.

2. The Potential to Shift the Gender Division of Labour

The second key potential of ectogenesis in advancing gender equality, I argue here, lies in its ability to provide better opportunities to dismantle significant barriers to eliminating the gendered division of labour.

The division of labour between men and women makes a major contribution to the material and social inequalities associated with gender; this division is reflected in the fact that most women still bear primary responsibility for caregiving and domestic work (which is usually unpaid) and, in aggregate, do not receive the same level of rewards from paid employment as men do (Crompton 2007). The gendered reward gap is not only a matter of unequal pay for equal work between men and women but also a result of *gendered occupational segregation*—occupations dominated by men generally offer higher wages than those dominated by women, reflecting an extension of the traditional division of labour at home (Badgett and Folbre 1999). For example, "female-dominated" professions such as nursing, caregiving, and secretarial work typically pay less than "male-dominated" occupations like technology and finance. Women's disadvantages in the workplace, in turn, push them back into the traditional role of primary caregiver, reinforcing the gendered division of labour at home.

Some bioethicists question ectogenesis on the important grounds that pregnancy is only a nine-month process, and without equality in the distribution of household labour after birth—particularly in relation to childcare—eliminating pregnancy would not necessarily eliminate gender inequality (Romanis and Horn 2020; Jackson 2009). However, setting a standard for addressing GI that requires solving all related significant issues would make nearly no solution approvable. Even state-sponsored childcare might not directly resolve the problem of gendered occupational segregation. If advocating for free childcare is justified because it enables women to invest more time and energy in competing in the public sphere, then by the same logic, one should also advocate for ectogenesis, which eliminates the health, time, and energy demands of pregnancy for women.

Moreover, although pregnancy typically lasts only nine months, the instrumental role it plays—as used by societies to disadvantage women, as characterised by Bidoli (2025)—persists well beyond this period and extends beyond gestational labour. This suggests that the widespread use of ectogenesis as an alternative to pregnancy has the potential to reshape the broader gendered division of labour by removing the instrumental role pregnancy plays in gendered societies.

Society's mistreatment of women's gestational traits significantly contributes to gender inequality, evident in two interrelated aspects of labour division. First, there is a widespread societal failure to accommodate women's gestational characteristics, including the burdens of pregnancy and the highly sensitive age-related reproductive window, which substantially disadvantages them in the workplace. Second, these gestational traits have been exploited to reinforce perceived gendered competencies, tying men and women to traditional roles and further entrenching divisions in domestic and workplace labour.

I now elaborate on both aspects and show how ectogenesis could potentially challenge and transform these deeply rooted issues.

On the one hand, ectogenesis has the potential to significantly alleviate the negative impacts of the embodied burden of pregnancy on women's career arrangements—effects that have historically been underestimated—as well as relieve the pressures from the highly age-sensitive reproductive window.

The burdens of pregnancy on career are not limited to a small number of specialised professions such as professional athletes, actors, models, military personnel, or those working with certain chemicals (Kendal 2015; Bidoli 2025). Nor is it confined to pregnancies with severe complications that significantly impact work. Even "normal" pregnancies pose significant risks due to physical and physiological changes.

Physical tasks such as prolonged standing and heavy lifting may restrict blood flow to the placenta, potentially stunting foetal development and increasing the likelihood of preterm delivery (Cai et al. 2020). The loosening of ligaments and tendons during pregnancy also heightens the risk of injuries and falls for pregnant women (Jackson et al. 2018). Additionally, women in highly interactive jobs, such as teaching, face greater exposure to infectious diseases like influenza, which is linked to higher risks of miscarriage, low birth weight, and premature births (Schwandt 2018). As discussed in previous chapters, common complications arising from pregnancy and childbirth, such as back pain and tearing injuries, have the potential to substantially limit major life activities, including work. These complications may induce a temporary disability—albeit one that can either partially or wholly incapacitate a woman from working, potentially driving the pregnancy penalty observed in the labour market due to employers' reactions to these pregnancy-induced disabilities (Shinall 2018).

Also, pregnant women are expected in all societies to prioritise foetal health, thereby inviting scrutiny over women's everyday lives. It is not only pregnancy experts but also family

members, friends, co-workers, and even complete strangers who monitor the daily activities of pregnant women and judge them based on the perceived quality of their pregnancy performance (Brubaker 2007; Brooks-Gardner 2003). These daily restrictions are often taken for granted. When women resist such scrutiny, they are often urged to toughen up or are criticised for being overly selfish, leaving many to cope with their concerns in silence (Bidoli 2025). Under such severe societal restrictions on their daily activities, it is inevitable that the engagement of pregnant women in their work is adversely impacted.

Moreover, women's gestational characteristics are not just pregnancy—— there is also the pressure of reproductive age—women's *fertility window* is significantly shorter than men's, and their peak fertility often coincides with phases focusing on completing one's education and starting one's careers.

Women are subjected to societal expectations to complete childbearing within their optimal reproductive years, often experiencing significant psychological stress as a result (Martin 2017). They must either find a suitable partner or decide to use assisted reproductive technologies within this age range—especially in the later stages of their reproductive window—if they desire a biological child, whereas men do not face the same pressure partly due to their longer reproductive period. Not only do women have less time in which to bear children, but childless women are also more heavily stigmatised than their male counterparts (Tamas 2018). As discussed in Chapter 5, mothers who choose adoption may face heightened social pressure to idealise parenting and suppress any negative emotions they may feel toward their child (Fontenot 2007). In the face of the ticking biological clock, career pressures, and the difficulty of finding a suitable partner—particularly among highly educated women (to be discussed further later)—a growing number of women around the world are choosing to delay childbearing (Inhorn and Smith-Hefner 2020). Turning to assisted reproductive technologies, such as egg freezing followed by later-in-life pregnancy, often entails considerable health risks, including diabetes, hypertension, congestive heart failure, dental problems, blood abnormalities, and vision impairments—and may even result in long-term health consequences (Alonzo 2002). Yet, these risks and harms are borne solely by women, whose careers are often disrupted as a result.

As discussed in the previous chapter, it is unjust that social arrangements, including the division of labour, fail to account for women's gestational characteristics in a way that protects them from being disadvantaged—compared to men. Society should therefore implement gender-

sensitive interventions to correct unjust arrangements. Critics like Jackson (2009) and Cavaliere (2020) rightly call for solutions such as a more equitable distribution of household labour and a stable, fair, non-exploitative labour market. I fully agree that adapting the workplace to accommodate pregnancy is crucial. Yet, advocating for ectogenesis is not in opposition to these calls.

Ectogenesis has clear potential to alleviate both the negative impacts of pregnancy on work, and the tension between reproductive desires and career or personal development. I have extensively discussed the health, time, and energy costs associated with pregnancy, which can significantly impact women's career aspirations. The elimination of pregnancy's physical demands through ectogenesis would undoubtedly benefit women's career pursuits. To some extent, this could reduce the need for many women to delay childbearing. While women might still need to prepare for childrearing, the absence of childbearing-related burdens would, in most cases, allow them to begin parenting earlier under the same external conditions.

More importantly, even if some women continued to delay parenthood—or delayed it further because ectogenesis made doing so more feasible—they would, at the very least, no longer face the health risks associated with late-age pregnancy or the negative career impacts that often accompany them. Current assisted reproductive technologies like egg freezing exemplify this, as many women view it as a means to proactively shape their lives, rather than as a response to their biological constraints. This sense of self-determination and control over the direction of their lives provides them with added hope and allows them to plan their careers and other pursuits with less pressure (Schmid, Weber, and Ehlert 2025). Ectogenesis could be even more radical in empowering women if it becomes widely available.

Ectogenesis bypasses the need for carrying a pregnancy altogether**.** It may still require viable eggs and sperm if in vitro-derived gametes (IVGs)—produced from pluripotent stem cells through a process known as in vitro gametogenesis (Takahashi and Yamanaka 2006)—are not yet available at that time. Although female follicle quality and quantity are significantly more sensitive to aging than sperm, egg-freezing technologies have already made substantial progress in mitigating this issue and are likely to be even more advanced by the time ectogenesis becomes an option. If IVG is successfully developed and integrated with ectogenesis, the physiological and age-related requirements for parenthood would become virtually identical for men and women. Technically, individuals could become biological parents even very late in life, aligning reproduction more flexibly with their personal and

professional trajectories. Crucially, this would reduce the pressure associated with a shorter reproductive window—women would no longer need to make additional arrangements for pregnancy during the critical phases of education and career development.

I am aware that the capability of ectogenesis to enable very late parenthood will likely raise ethical concerns about age limits, potentially leading to the creation of a new (artificial) reproductive window. Considerations may include parental competency, such as the ability to raise a child to adulthood. Such questions, however, lie beyond the scope of this thesis. In any case, any age restrictions should apply equally across genders. Once women are no longer disproportionately burdened by biological reproductive limits, the role of the reproductive window in producing unfair gender disparities in the division of labour would be significantly diminished.

On the other hand, the widespread application of ectogenesis has the potential to reduce workplace discrimination against women stemming from certain pervasive assumptions—by employers and the public—about *gendered caregiving responsibilities and professional competence.*

The long-term discriminatory effects associated with pregnancy primarily stem from the societal assumption—especially among employers—that pregnancy indicates an impending increase in a woman's household responsibilities. There is a broad belief held by employers, clients, and even pregnant individuals themselves that mothers are the primary caregivers (Shinall 2018). In this way, the motherhood penalty emerges as an extension of the pregnancy penalty, grounded in concerns about the long-term caregiving demands expected to follow childbirth.

Crucially, such discrimination and penalties are not limited to pregnant workers but extend to all women by virtue of their potential to become pregnant, regardless of their actual intentions (Romanis 2024; Bidoli 2025). As a result, even women who are infertile may face discrimination simply because they are perceived as potential child bearers.

From this perspective, Romanis (2024) emphasises that pregnancy-related workplace discrimination does not arise from women's biological capacity for pregnancy itself, but from the social and institutional assumptions attached to that capacity. Still, the issue still returns to how we understand "cause". When someone is discriminated against based on the possibility of pregnancy, the underlying concern for employers remains the potential economic costs associated with the reproductive role of women—as a (biosocial) group. At a deeper level, this

reflects a societal failure to establish material structures and cultural norms that require society to share the reproductive burden carried by women. Thus, it still represents a problem arising from the interaction between social structures and biological realities, as discussed in the previous chapter.

Enhancing workplace inclusivity and fairness through education, anti-discrimination policymaking, and enforcement is undoubtedly necessary. However, the widespread adoption of ectogenesis could offer additional benefits by altering the conditions that give rise to such biases — as employers would be less likely to assume that any employee with female characteristics will eventually become pregnant. Even if some women in the future still prefer traditional pregnancy, once ectogenesis becomes a common option, employers would no longer easily assume that individuals who appear capable of pregnancy will do so during their employment.

This strategy for reducing mistaken assumptions is a practical one, as it targets certain biases and tendencies shaped by our basic cognitive system—specifically, the inclination to *generalise* traits or behaviours that are true of many members of a group to all members of that group. According to the theory of generics (Leslie 2007), human beings possess a primitive cognitive mechanism for generalisation. Many generics are considered true when a majority of the kind exhibits the relevant property—for example, "Tigers have stripes," even though not all tigers do**.** This type of generalisation is prone to quirks and biases because, as Leslie (2007) notes, our primitive cognitive system is itself "quirky."

In this light, the leap from "many women workers will become pregnant" to "women workers will become pregnant"—an assumption and a bias—can be seen as partly a result of our fundamental cognitive mechanism. Recognising this mechanism can help in identifying *practical* strategies for dismantling such assumptions. The widespread use of ectogenesis holds the potential to serve as one such strategy by inducing a new generic assumption—if many women choose ectogenesis to have children, employers may generalise that women no longer become pregnant. While far from ideal, this shift could, in theory, challenge the prevailing assumption that female workers of reproductive age, in general, impose economic costs due to pregnancy.

Still, I do not ignore that this new assumption may impose pressure on women to avoid pregnancy to have children. As discussed in Chapter 4, anti-pregnancy discrimination laws

remain relevant, and expanding substantive gestational choices remains a morally desirable way to counter such pressure.

The more significant—and morally compelling—potential of ectogenesis in challenging gendered divisions of labour, I argue, lies in its capacity to reshape assumptions about distinctive work *competency* between the sexes. This shift may also, at least in part, be facilitated by recognising and confronting the cognitive mechanisms that give rise to such biases.

At the core of systemic gendered labour division is a widespread belief—held by employers, the public, and often by women themselves—that women are inherently more competent in maternal or caregiving roles. Women are commonly perceived as more caring, supportive, nurturing, better communicators, and more organised, while men are stereotyped as more creative because they are seen as less constrained by rules (Hesmondhalgh and Baker 2015). These assumptions have significantly contributed to the persistent gendered division of domestic labour and occupational segregation. This assumption is flawed. As discussed in Chapter Five, fathers and other non-gestational caregivers are equally capable of parenting, and there is no compelling evidence that women are less creative than men—especially given that historical confinement to domestic roles has limited their opportunities to realise their creative potential.

However, as the earlier discussion has shown, the falsity of an assumption is one thing; the cognitive mechanism that gives rise to it is another. Recognising the latter is essential when considering how to dismantle such biased assumptions practically.

Research shows that biases are necessary cognitive strategies to manage *uncertainty*—wherever inductive reasoning occurs, bias follows (Johnson 2024). The belief that women are naturally better suited for motherhood likely arises from such inductive reasoning under uncertainty. Female reproduction forms a continuous process—historically, women have moved seamlessly from pregnancy to childbirth, breastfeeding, and childrearing, creating a seemingly "natural' trajectory that few have questioned. In other words, claims that women are meant to be primary caregivers are rooted in the physical proximity, responsibilities, and dependencies inherent in gestation, childbirth, and nursing (Fontana and Schoenbaum 2019). Even today, as I discussed in Chapter 5, evidence on mother-infant bonding through pregnancy remains inconclusive. To confront uncertainty, people often rely on observation and inductive reasoning to identify patterns. At the same time, as previously discussed, the human cognitive

system tends to generalise complex realities—projecting the traits exhibited by many individuals onto entire groups. In this way, it is highly likely that, historically and across societies, the fact that women have predominantly occupied maternal roles has led people to infer that women are better suited to be primary caregivers.

Addressing such biases requires introducing instances of *counter-stereotypical exemplars* (Johnson 2024). Education, public campaigns, or academic debates alone might not be strong enough to address deeply entrenched gender stereotypes. In reality, people typically need to witness concrete and widespread changes before they are willing to shift their beliefs on a large scale.

Ectogenesis has the potential to provide such exemplars. While it will not instantly transform traditional parental roles, the removal of the biological necessity for women to carry pregnancies can effectively establish gestational equality among men, women, and people of other gender identities. This shift opens new possibilities for men to assume parental roles without requiring more from women than the provision of their oocytes. As more male primary caregivers emerge, the stereotype that women are inherently more suited to care work is more likely to be challenged, thereby weakening the foundations of gendered labour division.

This also means that the changes ectogenesis may bring to gendered labour divisions are closely linked to its potential to reshape broader gendered norms and parenting—which I will discuss next.

3. The Potential to Shift Gender Norms

The third key potential of ectogenesis in advancing gender equality lies in its capacity to shift broader gender norms. As a technology that radically overturns human reproductive patterns since the inception of humanity, it is hard to imagine that ectogenesis would not profoundly transform social norms. Leon R. Kass (1985) warns of the potential dangers of the new science of baby-making:

> Not merely new ways of beginning individual human lives, but also new ways of life and new ways of viewing life and the nature of man. Man is defined partly by his origins and his lineage; being bound up with parents, siblings, ancestors, and descendants is part of what we mean by being human. By tampering with and confounding these origins and linkages, we are involved in nothing less than creating a new conception of what it means to be human.

Such ground-breaking changes might not be what conservatives wish for but could align with the goals of feminists striving to overturn deeply entrenched gender norms.

3.1 Pronatalist, Essentialist, and Geneticist

In gender norms, reproduction is often central. According to Mianna Lotz (2021), pervasive gender norms surrounding reproduction fall into three categories—PEG norms:

(1) Pronatalist: These norms promote having children as superior to being childfree, portraying reproduction and parenting as essential components of a good and fulfilled life.

(2) Essentialist: These norms link womanhood and femininity to the ability to conceive, gestate, give birth, and raise children, framing these biological functions as central to female identity.

(3) Geneticist: These norms privilege genetic ties, portraying biologically related children as more authentic or truly one's own.

I argue that among the PEG norms, only Essentialist is inherently gendered—that is, it tends to channel women's value into reproductive roles and positions them as primary caregivers. By comparison, Pronatalist and Geneticist are not intrinsically gendered; rather, they operate in gendered ways within a gendered society. Their core effect in our gendered world, I suggest, is to reinforce essentialist beliefs—namely, the perception of pregnancy as central to a woman's identity and value. Crucially, this perception is closely tied to a biological reality: the unique capacity for gestation makes women the sole bearers of gestational labour.

Pronatalist norms, if defined as privileging having children over a childfree lifestyle, can theoretically persist even in a society without gender hierarchy—if people, for various reasons (including biased ones), continue to regard parenthood as a standard component of a flourishing life. However, in the absence of alternatives to gestation—such as ectogenesis—the burden of realising that ideal falls disproportionately on those capable of pregnancy. Arguably, there is no more effective way to advance the pronatalist ideal than by encouraging women to internalise the belief that their core value lies in bearing and raising children. As Laura Purdy (2019) observes, pervasive pronatalism persuades women that they will not be fulfilled without having children of their own. In this way, pronatalism reinforces essentialist norms.

Similarly, geneticist norms could theoretically persist even in a society without gender hierarchy, if people continue to prioritise genetic relatedness—for reasons such as a preference for biological resemblance, as emphasised by J.D. Velleman (2005). Yet, as discussed in the

previous chapter, for men to ensure genetic paternity when there is only physical pregnancy, they must rely on women's pregnancy to gestate their genetic children. In misogynistic societies, this reliance often manifests in the restriction of women's sexual autonomy and the enforcement of gendered roles—casting women as child bearers and primary caregivers. In doing so, it compromises women's reproductive autonomy to secure genetically related offspring for men, reinforcing essentialist norms.

As a technology that acts on gestational labour, ectogenesis—if widely adopted—may not directly affect pronatalist or geneticist norms. In a future with ectogenesis, people may still harbour biases against those who remain childfree or continue to prioritise genetic relatedness. It is worth noting that ectogenesis is not inherently tied to genetic relatedness, distinguishing it from other ARTs such as egg freezing or in vitro gametogenesis (IVG), which act to preserve the genetic link between parent(s) and children[18]. Ectogenesis does not inherently exclude the use of donor gametes, nor does it reject alternative forms of family-building such as adoption or the choice to remain childfree. If ectogenesis becomes a broadly accessible option, those who choose pregnancy may increasingly be individuals who actively prefer it—what Kennedy (2020) refers to as "willing gestational mothers." In this case, demand for adopting children born through natural birth may decline, but new forms of adoptive demand could emerge—for instance, for those developed in artificial wombs, as discussed in abortion debates (e.g., Räsänen 2017), though this lies beyond the scope of this thesis. That said, even with ectogenesis, individuals may still face choices between adopting unwanted foetuses or children born from artificial wombs and pursuing other paths to parenthood, such as pregnancy or ectogenesis.

However, I argue that ectogenesis has the potential to significantly reduce the disproportionate harm these two norms impose on women compared to men—by effectively stripping away their essentialist components, which constitute the core of gender norms. While people may continue to prioritise having genetically related children over alternative lifestyles in a world with ectogenesis, that prioritisation would no longer place the burden and harm disproportionately on women, as it does in the pre-ectogenesis era.

[18] Notably, as argued by Daniela Cutas and Anna Smajdor (2015), and Yolinliztli Pérez-Hernández and Michiel De Proost (2023), even technologies like IVG and egg freezing—which help preserve genetic ties between parents and children—do not necessarily reinforce geneticism. Many people choose these methods primarily for reasons such as greater accessibility compared to adoption. In any case, ectogenesis is even less likely to reinforce geneticism.

3.2 The Potential of Ectogenesis to Challenge Gender Essentialism

Ectogenesis has the potential to challenge essentialist norms by decoupling womanhood from physical pregnancy. The connection between female identity and pregnancy is deeply entrenched and complex, largely because societies have cultivated in people—including women themselves—a set of seemingly paradoxical but ultimately consistent attitudes toward pregnancy that serve to devalue women.

On one hand, in most cultures, both historically and globally, there has been a persistent expectation that women should become pregnant, with pregnancy framed as central to their worth. Those who embrace these restrictive roles are often socially rewarded, while those who deviate face marginalisation or stigma (Kendal 2015; Bidoli 2025). This expectation begins not at reproductive maturity but in early childhood. Girls are culturally encouraged to view pregnancy and motherhood as essential to womanhood—even in contemporary Western societies (Takala 2009). This early socialisation primes them for traditional maternal roles, tightly linking women's honour and shame to their reproductive capacities—including both their biological fertility and their ability to secure a partner.

On the other hand, pregnant individuals endure significant discrimination across societies. Most societies have long viewed a woman's pregnant body merely as a vessel for the foetus, diminishing her role in pregnancy (Kingma 2019; Kingma and Finn 2020; Romanis et al. 2020). Pregnant women's bodies are scrutinised primarily for the foetus's benefit, and social norms demand that women conceal all pregnancy-related physical changes and lifestyle modifications, urging mothers to "restore" a metaphorical virginity—that is, to return to a pre-pregnancy physique—a phenomenon that remains widespread (Lee, Bidoli, and Nucci 2023). For example, the popularity of showcasing perfect pregnant bodies on social media exemplifies societal control influenced by neo-liberalism, consumption, traditional medicine, heteronormativity, and hegemonic masculinity, which lead to the self-surveillance, policing, and monitoring of pregnant bodies (Mayoh 2019). Thus, while women are valued for their ability to become pregnant, their actual pregnancy-related activities are systematically devalued.

In other words, pregnancy is simultaneously a source of praise and discrimination for women—a seeming contradiction that, upon closer inspection, is not one at all. Claiming that a particular biological function X (such as pregnancy) constitutes the central and defining value of a group such as women, while treating X as a basis for discrimination in practice, reveals that X is not genuinely valued. Meanwhile, since X is perceived as the defining value of the group,

devaluing X effectively entails devaluing the group itself. In this case, framing pregnancy as the primary value of women, while simultaneously devaluing it in practice, ultimately diminishes the perceived worth of women as a bio-social group.

To resolve this dilemma, efforts can logically proceed in two directions. 1) *Revaluing pregnancy*, as some scholars have attempted by reinterpreting women's bodily involvement in pregnancy and their physical connection with the foetus (Kingma 2019; Kingma and Finn 2020). If pregnancy is perceived as holding high value within broader societal activities—not merely within the sphere of "women's roles"—then the social value attributed to women may also be elevated. 2) *Dismantling the strong association* between pregnancy and women's value, empowering women to be recognised for contributions beyond their reproductive roles. Historically, liberal feminist movements—which have focused on suffrage, employment, and public participation—have exemplified this latter approach to achieving gender equality.

Promoting gender equality through ectogenesis aligns with the second approach. Some authors have convincingly argued that ectogenesis has the potential to heighten *awareness* of how women's identities and values are closely tied to pregnancy and childbirth (Ferreira 2022; MacKay 2022), significantly decoupling this association. If women are not the only ones capable of gestating offspring, then tying women's value to reproduction becomes nonsensical.

To strengthen these points, I highlight two potential effects of ectogenesis that may amplify its ability to challenge gender norms.

First, it can provoke wide-ranging *debates* on equality and justice, generating momentum for transformative change. Although concerns about stratified access to resources often serve as a point of questioning the liberating potential of ectogenesis (Cavaliere 2020; Horn and Romanis 2020; Romanis 2024; Romanis and Kendal 2024), this underscores the value of revolutionary technologies like ectogenesis in provoking wide-ranging debates on equality and justice.

The extensive discussions triggered by new technologies and practices have the potential to facilitate societal changes towards equality. For instance, debates on reproductive ethics have been calling for broader access to ARTs, allowing singles and same-sex couples to use IVF, with some countries progressively adopting these changes. Under The Human Fertilisation and Embryology Act of 1990 (HFEA 1990), clinics were required to consider "the welfare of any child who may be born as a result of the treatment (including the need of that child for a father)" before providing treatment. The provision of "the need for a father" has been subject to intense debate and criticised as a heteronormative and homophobic expression of the idealistic two-

parent, opposite-sex family, thus further discriminating against single and lesbian women (Sutherland 2003). Opponents of abolishing this clause vociferously claimed that removing it would universally suggest that fathers are unnecessary, fundamentally undermining the father's role in a child's life (The Guardian 2007). Eventually, the 2008 Act (HFEA 2008) replaced the "need for a father" with the words "need for supportive parenting" to avoid indirectly discriminating against single women and lesbian couples and restricting their access to fertility services.

This case illustrates how the advent and application of new reproductive technologies can serve as a catalyst for changing some entrenched gender inequalities. By sparking large-scale discussion, this effect not only promotes substantive reproductive equality but also strengthens civic education around equality.

Ectogenesis has already sparked extensive discussion even before its availability, and it is expected that the ensuing discussions and debates about gender equality and social justice could drive significant changes in societal norms once it becomes available. These debates and discussions are valuable in themselves as they provide an opportunity to change social norms.

Second, the widespread use of ectogenesis could potentially address a major barrier to shifting entrenched norms—*pluralistic ignorance*—thereby facilitating broader changes. This phenomenon occurs when individuals privately reject a norm, belief, or behaviour but assume others accept it, leading them to conform publicly (Cislaghi and Heise 2018). For example, many women privately reject traditional female roles, yet they may still refrain from publicly expressing these views due to fear of social prejudice (Lahad 2012). This degree of social prejudice may stem from their own assumptions about the majority's views. Since most people assume and act following this assumption, social norms are hard to change significantly.

To address pluralistic ignorance, encouraging open and honest dialogue is crucial, especially after many people's expectations about gender roles have shifted. As previously mentioned, the emergence of ground-breaking technologies is providing opportunities to provoke debates, and undoubtedly, ectogenesis will stimulate more extensive discussions.

Moreover, nothing challenges social norms more effectively than vivid, non-normative cases. The development and application of ectogenesis could create more diverse household units than those currently seen in society. This technology in theory can enable cisgender women with health constraints, transgender individuals, men who physically cannot carry a pregnancy, and cisgender women who are averse to pregnancy to become parents. People may opt for

ectogenesis simply because it makes having a genetic child more accessible. As more people choose new gestational methods and lifestyles, along with the public discussions that follow, pluralistic ignorance may be resolved, thus driving substantial changes in social norms. The challenge that ectogenesis might pose to gendered families will be further discussed in the next section.

4. Disrupting Traditional Gendered Parenting

Another particular potential of ectogenesis in addressing gender inequality lies in its ability to *decentre* the heteronormative family structure. Current debates argue that, if available, access to ectogenesis should be extended to gay men and transgender individuals as a matter of distributive justice (Kimberly, Sutter, and Quinn 2020). Some highlight ectogenesis's potential to ensure equal opportunities for parenthood across genders and sexual orientations (Kendal 2015; Cohen 2020; Horn 2020; Lee, Bidoli, and Di Nucci 2023).

I agree with these arguments but wish to highlight another often-overlooked group—unpartnered individuals, regardless of gender or sexual orientation. This is not a small group; in fact, it is growing globally (Inhorn and Smith-Hefner 2020). I argue that society should do more to support their reproductive goals, including through ectogenesis if the technology becomes available. Doing so would not only promote equality in access to parenthood but also have broader significance: unpartnered individuals, together with sexual and gender minorities, could form non-normative households through ectogenesis, helping to *decentre the heteronormative family* and signalling a profound shift in social structure.

4.1 Being Unpartnered and Involuntarily Childless

Thanks to artificial insemination and other fertility treatments, many unpartnered women now avoid involuntary childlessness by pursuing motherhood independently of male partners (Deech and Smajdor 2007). From 2012 to 2022, the number of single women undergoing IVF or insemination in the UK more than tripled (HFEA 2022). Studies also show that children in planned solo mother households are not notably disadvantaged (Golombok and Murray 1999).

Nonetheless, research indicates that many highly educated women in demanding careers continue to delay childbearing mainly due to the lack of a suitable partner (McAllister and Clarke 2000; Carmichael and Whittaker 2007), with many turning to egg freezing to extend their reproductive window in hopes of eventually raising children with a committed partner (Carroll and Kroløkke 2017; Brown and Patrick 2018).

This reflects a broad social transformation: more women remain single, with some actively using reproductive technologies to shape lives that suit them, while others turn to these options as a last resort. Some attribute women's lack of partners to higher education levels and reluctance to marry down, suggesting the partner shortage should be addressed (Pennings 2021). However, I argue that instead of focusing on partner availability, society should prioritise advancing reproductive technologies including ectogenesis and provide more support for unpartnered people, especially women who desire parenthood—solutions that are both more ethical and practical.

Focusing on the "partner shortage" risks obscuring deeper gender inequalities and may reinforce discrimination against women. Both the rise of unpartnered women and involuntary childlessness reflect structural gender and cultural issues. The growing number of unpartnered women is likely driven by increasing female economic independence clashing with persistent cultural lag. In many industrialised countries, including China and South Korea, women's advances in education and employment have raised their autonomy and partner expectations, yet patriarchal norms—such as Confucian traditions that emphasise female obedience and homemaking (Cheng 2020)—constrain their ability to find partners who align with these expectations. Besides, traditional mating preferences exacerbate this trend. Women with advanced education often enter the labour and marriage markets later (Blossfeld and Timm 2003), but men typically prefer younger women regardless of their own age (Skopek et al. 2011), making it harder for older women to find partners (Kolk 2015). These preferences reflect patriarchal norms that expect women to exchange age-sensitive sexual and reproductive value for status, while men accumulate resources and power less constrained by age, placing women at a structural disadvantage in this regard.

Fortunately, in modern industrial societies, women are no longer trapped in the fate Jane Austen described for Charlotte Lucas— "Without thinking highly either of men or of matrimony, marriage had always been her object; it was the only honourable provision for well-educated young women of small fortune, and however uncertain of giving happiness, must be their pleasantest preservative from want." Although failing to find an ideal partner may still be seen as unfortunate, women today face less pressure to enter humiliating partnerships out of economic necessity or social stigma.

More importantly, being unpartnered does not necessarily lead to involuntary childlessness, given the availability of sex outside of partnerships and access to IVF and artificial

insemination; the real barriers are lack of support for pregnancy and parenting, and persistent heteronormative norms.

Even with affordable reproductive technologies available, women who prefer not to pursue adoption for various reasons usually still need to undergo pregnancy. Pregnancy is care-intensive and often requires partner-like support. Though having a partner does not guarantee better care—women with unsupportive partners are at higher risk of postnatal depression than unpartnered women (Bilszta et al. 2008)—heteronormative culture pushes women to pursue the ideal of a traditional family. Deeply rooted norms idealising the heteronormative family make women see alternatives as inferior, and women face greater pressure than men to conform, as femininity is tied to care and dependence (Budgeon 2016).

Moreover, raising children is costly in most countries. A single income is often insufficient to sustain family life, making the absence of a second income a significant disadvantage for single-parent families (Deech and Smajdor 2007). Even for high-income women, a double income still provides better support for raising a child.

However, this does not mean that "addressing partner shortage" is a reasonable solution. Some countries, like South Korea, have pursued this path by promoting state-sponsored dating events and pronatalist incentives to boost fertility, yet these efforts have failed to reverse marriage and birth rates. Such approaches idealise marriage and procreation without addressing women's real dilemmas, like balancing motherhood with careers (Lee 2024). Also, suggesting that women should "marry down" in (Pennings 2021) wrongly places the burden on women, and given that women's reproductive sacrifices remain uncompensated, and marriage often entails more unpaid labour in almost all societies, this would only deepen gender inequality.

Besides, as I previously noted, some unpartnered women embrace solo parenthood. In-depth interviews suggest that some women "offset" the stigma of "singleness" by "demonstrating interest in becoming coupled" (Byrne 2003, 445). That said, they may not actually feel a strong drive to find a partner but say so because of persistent social stigma toward unpartnered women beyond a certain age. For many, whether involuntarily or voluntarily single, remaining unpartnered reflects a refusal to compromise dignity and self-respect within unsatisfactory gender relations. Without addressing the underlying gendered norms, this issue is unlikely to be resolved. Thus, focusing on "fixing" the partner shortage risks reinforcing discrimination and is unlikely to offer a practical solution.

A better alternative is to address what an "ideal partner" actually represents in women's *reproductive goals*. For heterosexual women, an ideal male partner, in theory, may be able to provide sex for conception, desirable genetic traits for future children, reliable support during pregnancy, and cooperative parenting. While society may never "solve" the problem of finding ideal partners, it can separate and independently offer what such partners are expected to provide. Existing reproductive technologies, including sperm banks, already enable women to have genetic children on their own. The selective use of ectogenesis could go further by eliminating the physical risks and burdens of pregnancy, especially for women of advanced maternal age. With adequate social support and accessible ectogenesis, unpartnered women could form households far more secure and fulfilling than solo motherhood as it exists today.

Not only women or individuals with wombs can benefit from ectogenesis; theoretically, *men* may benefit even more in terms of achieving parenthood. There has been a growing number of adult men of reproductive age without romantic or sexual partners—often involuntarily unpartnered, unlike many women who may choose to remain single; and unlike unpartnered women or lesbian women, these men typically lack access to necessary fertility services that would enable them to have genetic children (Räsänen 2025). In countries where surrogacy is permitted, cisgender men who wish to become parents—whether single or in same-sex relationships—can do so through donor eggs, but this route is often far from ideal. Surrogacy typically requires women to relinquish parental rights, as most legal systems still recognise the surrogate as the mother (Ber 2000). Ectogenesis, combined with donor eggs, could make achieving parenthood significantly easier for unpartnered men without such ethical and legal complications.

4.2 Broader Implications: Decentring the Heteronormative Family

The realisation of parenthood for gender and sexual minorities, as well as unpartnered individuals, through ectogenesis may bring a broader social transformation beyond reproductive equality. As Kendal (2015, 31) notes: "the pronatalist construction of motherhood as essential to female identity is a symptom of the biological reality in which species propagation depends on encouraging women to be pregnant." This does not imply that the biological reality of species propagation depending on women's pregnancies morally justifies male control and oppression. Rather, it highlights a key motive behind collective male behaviour. When this motive is rendered obsolete by technological advances, gender-based control over female reproductive outcomes loses its foundation. From this perspective, men

may, in the future, adopt a more *cooperative* stance toward supporting women's liberation—especially in democratic and egalitarian societies.

Moreover, the rise of unconventional households enabled by ectogenesis, and other changes has the potential to decentre the traditional nuclear family, long identified by feminists as a core patriarchal institution. By loosening the link between biological reproduction and heterosexual relationships, ectogenesis could foster more egalitarian social structures.

The heteronormative family, typically composed of a man, a woman, and their biological children, remains the dominant social model in most industrialised and liberal societies (Willis 1984). This model reinforces a strict public/private divide—where men dominate public resources while women manage private life on unequal terms (Okin 1994). Within such families, women bear a disproportionate share of household and childcare labour, even when employed—a burden Hochschild (1989) calls "the second shift." As previously discussed, this gendered division of labour extends into the public sphere, contributing to persistent occupational segregation.

The heteronormative family also marginalises and stigmatises those who do not or cannot enter it, particularly heterosexual women beyond a certain age. Rooted in the assumption that heterosexual sex and reproduction are inseparable, it imposes narrow gender roles framed as "natural" life courses (Budgeon 2008). The coercive ideal pressures woman—regardless of sexual orientation—to treat marriage and motherhood as central life goals and measures of worth. Globally, although varying in intensity, this pressure is reinforced by stigma against unpartnered women over a certain age. In East Asian countries like China and South Korea, unmarried women beyond reproductive age are labelled "leftover women" or compared to expired goods (Hong-Fincher 2023; Lee 2024). In Western societies, unpartnered women are often blamed for being single, portrayed as flawed—promiscuous, immature, selfish, or undisciplined (Morris et al. 2004).

Interestingly, compared to normative families, research shows that lesbian co-mothers often participate more in childcare than fathers (Probert 2004), and partners in gay and lesbian couples tend to divide household labour more equitably and resolve conflicts more constructively than do heterosexual married couples (Patterson, Sutfin, and Fulcher 2004; Kurdek 2005).

This is not to say that heterosexual relationships are inherently unequal—rather, it is the traditional gender roles within them that create inequality. These roles require reform, but

reform needs pressure. If the heterosexual normative family remains the dominant household model in patriarchal society—acting as "the only gender game in town," as Allan G. Johnson (2005, 28) describes—its monopoly will continue to resist changes.

From this perspective, the diverse household forms —offering an *"exit"* from heteronormative relationships—have the potential to decentre the dominant family model and catalyse its reform. In political philosophy, scholars have emphasised the transformative power of "exit" from illiberal communities, noting that large-scale departures can pressure oppressive systems to reform to prevent further losses (Kukathas 1992; Barry 2001). For instance, research shows that when divorce laws were unexpectedly liberalised, granting women greater exit options, domestic violence rates dropped significantly (Brassiolo 2016). As Susan Okin (2002) argues, meaningful exit requires that individuals possess the real capacity to leave. Ectogenesis, in this light, can be defended as a way to expand that capacity, enabling more people to exit the constraints of the normative family structure.

On an individual level, as previously discussed, ectogenesis could relieve women of the burdens of pregnancy and the pressures of reproductive timing, supporting workplace equality. By severing the cultural link between womanhood and reproduction, it can also challenge entrenched gender norms and spark broader societal debates about gender equality and justice. On a structural level, ectogenesis would enable not only women but also men and gender and sexual minorities to achieve parenthood without conforming to heteronormative family models, fostering diverse household formations. If a critical mass of individuals forms more egalitarian alternatives to traditional heterosexual families, this might drive significant social transformation.

In general, by further separating reproduction from heterosexual partnerships, ectogenesis could undermine the cultural and material dominance of the heteronormative family and reshape societal expectations around gender, reproduction, and family—thus advancing broader gender equality.

5. Counterstrategies

As discussed in the previous chapter, what truly divides debates on the liberating potential of ectogenesis are two strategies: some support integrating ectogenesis with broader social change, while others prefer preserving women's unique role in gestation. The latter includes earlier scholars who emphasise pregnancy as a bargaining tool against patriarchy, and recent scholars who argue that social solutions are more effective and fear ectogenesis may distract from them.

While I have addressed both views in earlier chapters, here I go further to challenge the logic of bargaining with pregnancy and to refute the distraction argument, thus further establishing that ectogenesis can offer better opportunities for achieving gender equality.

5.1 Using Pregnancy as Bargaining Power?

Some feminists argue that women's power and value lie in their gestational capacities or maternal identity. For instance, Robyn Rowland (1984, 274) suggests that without this unique role, women would have nothing to bargain with men—a claim I have already challenged in chapter 4. Here, I explore more deeply what this supposed "bargain" actually involves.

Reyes Lázaro (1986) similarly argues that pregnancy and gestation can, under certain conditions, empower women by granting them political power, prestige, or moral status within specific communities. However, Lázaro does not specify what conditions would enable such gains. Romanis and Kendal (2024) also reference Lázaro's view but do not clarify how pregnancy would translate into political status. This vagueness perhaps reflects a deeper discomfort with the idea of bargaining through pregnancy itself.

The concept of a patriarchal bargain usually means women bargaining within heteronormative families and communities. Historical evidence shows that this often happens in societies where women's value is closely tied to pregnancy, forcing them to use it to bargain for resources and status. Deniz Kandiyoti (1988) provides an example of the "patriarchal bargain"—a young woman may endure living as a daughter-in-law in her husband's family, anticipating that she will someday gain the position of mother-in-law, with control over property and the labour of daughters-in-law.

Nevertheless, such examples already present problems: these bargains are based on women enduring long-term oppression and, in turn, oppressing other women. For the social status of women as a group, it is a *"zero-sum game*"—some women gain social status at the expense of other women and sexual minorities.

Pregnancy within patriarchal narratives triggers gender anxieties, particularly for transgender individuals, intersex people, and asexuals (Romanis 2023). Bargaining within patriarchal families not only produces discrimination against the interfile and sexual minorities but also stigmatises women who do not prioritise reproduction as a primary life goal, regardless of their sexual orientation. It delegitimises singlehood, especially childless ones, which society views as non-normative and tragically incomplete (Lesch and Watt 2018). Moreover, as I discuss in

Chapter 4, it encourages women to develop their self and consciousness around patriarchal narratives of femininity and sexual attractiveness, limiting their growth beyond gestational and caregiving capabilities, and internalising oppression.

This bargain effectively encourages women to harm and undercut each other to gain certain resources and glory from the dominant male group. It strikingly resembles a scene from the movie "Squid Game": the wealthy (dominant men) exploit the rights of the impoverished (women and gender/sexual minorities) and then offer a sliver of resources and glory to incentivise them to harm each other, thereby perpetuating the status quo. In such a bargain, winners appear to secure a "good buy" with their abilities, such as pregnancy, childcare, and fulfilling patriarchal sexual expectations. But in essence, the winners only receive a portion of what other women and they themselves have been deprived of, in the form of rewards from the patriarchy. This "bargain" privileges some women over others, and even some men, but women as a group are never safe and can always be made "less than," especially by men willing to wield threats, coercion, and violence (Bennett 2009). Eventually, it merely conceals deeper exploitation and inequality, making resistance and change even more difficult.

Moreover, the role of women as primary caregivers, which is often associated with pregnancy, does not provide women with real negotiating power. As Lee Badgett and Nancy Folbre (1999) point out, most forms of bargaining are based on the ability to withhold something valuable; however, caregivers, almost by definition, are driven by intrinsic concerns that make it difficult for them to withhold care. In other words, neither pregnancy nor women's role as primary caregivers truly grants women effective bargaining power for improving their social status.

Interestingly, contemporary social changes seem to have created a new form of pregnancy-related bargaining in the context of declining global fertility rates. Low fertility rates have become a significant issue in some societies, especially those with traditional family structures and modern economies, such as South Korea, China, and Japan. In South Korea, some feminists have directly voiced their refusal to procreate in patriarchal societies. Especially notable, the 6B4T movement proposes rejecting heterosexual relationships, marriages with men, and procreation— a sharp departure from traditional feminist approaches, promoting a broader rejection of male-centred norms (Wu 2024). This online feminist discourse has spread to China via digital platforms (Cheng 2023) and has recently drawn attention in Western media, though it remains underexplored in Western academia.

However, this does not appear to be a genuine form of collective bargaining for political power through refusing reproduction, and its effectiveness seems limited. As previously discussed, many women end up childless not by choice but due to gendered social structures and norms. Framing such movements as collective resistance risks obscuring women's actual reproductive desires.

More importantly, even encouraging women to use reproductive technologies to have children without men—thus not suppressing women's reproductive desires—would likely trigger extremely strong patriarchal *backlash*. As discussed in the previous chapter, patriarchal societies are structured around meeting male reproductive needs, which depend on women's pregnancies, enforced through heteronormative family norms. If boosting fertility rates is a priority, patriarchal systems may prefer pushing women back into traditional roles over promoting gender equality. This backlash is already evident: South Korea has blamed women's careerism and feminism for low birth rates (Gunia 2022); China bans unpartnered women from egg freezing while allowing widows to use ARTs to "continue the husband's bloodline" (Wang 2023); and in Western countries like the UK and Germany, pro-natalist policies favour families, while unpartnered women face more barriers to accessing reproductive technologies (Krajewska 2015).

The backlash problem might be largely circumvented through optional ectogenesis. While the patriarchal resistance to supporting women's independent reproduction without men may appear to uphold traditional family values, at its core, it is primarily aimed at achieving male reproductive goals. When these goals no longer depend on women's bodies, the motivation to maintain these values might significantly weaken, suggesting a shift towards objective cooperation—not confining women to gestational roles.

To clarify, I do not mean that women's refusal to procreate is a fully hopeless or misguided form of resistance in a world without ectogenesis. I believe that women's control over reproduction is a crucial part of gender equality and should be pursued by all available means. My point is simply that adding ectogenesis to feminist strategies can expand the possibilities for achieving gender equality.

More broadly, feminist debates on gender equality usually reflect different views on which aspects of women's value should be prioritised for liberation. As Julien S. Murphy (1989, 76) points out, even with ectogenesis, women continue to serve patriarchy in at least four roles: nurturers, a diligent workforce, maintainers of male ego, and objects of sexual desire. Feminist

struggles aim to reclaim and redefine these values into women-centred values—such as reproductive autonomy, empathetic care, self-determined sexuality, and the full realisation of women as intellectual, autonomous human beings. As I discussed in Section 3, some feminists focus on revaluing women's pregnancy. However, history and research show that expanding women's access to public opportunities—such as higher income and leadership roles—produces more immediate and tangible effects on women's empowerment, shifting power dynamics within households and shaping how children perceive gender roles (Seguino 2007). This is not to dismiss other efforts but to argue that liberating women's potential beyond pregnancy and caregiving can more effectively advance feminist goals.

Ultimately, my defence of ectogenesis reflects a commitment to feminism as an ongoing effort to enable women to realise their full human potential—their intellectual work, autonomous consciousness, and unmediated reflections on life and the world—free from patriarchal constraints.

5.2 Social Solutions Without "Distraction" from Ectogenesis?

Most contemporary critics of ectogenesis—such as Cavaliere (2020a; 2020b), Romanis (2020; 2024), Horn (2020), and Jackson (2009)—tend to favour social approaches to addressing GI.

In the previous chapter, I have argued that even if gender inequalities are social constructs, ectogenesis can be seen as part of the social effort to challenge them. Moreover, there is no convincing reasons to claim that other social reforms are necessarily more effective than ectogenesis. In fact, like most current supporters of ectogenesis, my position is not to replace but to combine ectogenesis with all other efforts aimed at achieving gender equality.

Yet, one relevant critique remains not directly addressed: whether developing ectogenesis will "distract" from ongoing, urgent efforts—such as expanding childcare support and advancing workplace equality. For example, Cavaliere (2020a, 79) calls ectogenesis a possible "red herring," and other scholars have similarly voiced concerns that advocating for it may divert attention from more effective social solutions.

However, claiming that A (ectogenesis) distracts from B (social solutions) implicitly assumes two things:

(1) B is more important than A.

(2) A and B cannot effectively work together.

While I have already argued that ectogenesis could create better opportunities for women's liberation, I now briefly refute the second assumption — that ectogenesis and other efforts cannot well coexist.

First, regarding attention: Most discussions supporting ectogenesis — including my own — highlight women's reproductive burdens and the systemic inequalities they face both at home and in the workplace due to the lack of fair accommodation for their reproductive traits. Far from being a "distraction," ectogenesis draws attention to the very injustices that feminist critics seek to address, making these issues more visible.

Similar debates have surrounded social egg freezing. Some argue that it diverts attention and resources from broader social solutions to women's challenges in the labour market (Petropanagos et al. 2015). Yet, as Thomas Søbirk Petersen (2020) convincingly argues, there is little evidence that women's use of social egg freezing detracts from social reform efforts—public and scholarly discussions around egg freezing often highlight and critique the social and moral problems women face in patriarchal labour markets. As I have discussed earlier, even critics of ectogenesis like Cavaliere (2020a) acknowledge that the very idea of ectogenesis sparks crucial debates on women's struggles in society, which can contribute to addressing inequality.

Second, regarding technological development: Advancing in vitro gestation technologies can directly benefit the study and treatment of pregnancy-related health complications. For instance, placental organoids that form key components of placental epithelial cells represent a major advancement. In preeclampsia research, they also generate extravillous trophoblast cells, offering new insights into placental biology and pregnancy complications (Stock and Aiken 2023). If we recognise that reproductive health is a key aspect of gender equality, then the development of technologies related to ectogenesis is already contributing to feminist goals. The path toward ectogenesis—through improving knowledge of gestation—supports women's health. That said, rather than distracting from other efforts, the discussion and development of ectogenesis can draw attention to women's broader struggles and contribute to addressing pregnancy-related complications.

Conclusion

Building on previous chapters, I have further defended ectogenesis as a powerful tool for advancing gender equality by creating more opportunities to achieve it. Addressing women's gestational burdens is not merely about natural inequality but a core issue of justice.

Ectogenesis goes beyond equalising gestational labour — it can eliminate the long-underestimated negative impacts of pregnancy on women's careers and reduce gendered occupational segregation. Also, ectogenesis holds the potential to shift social norms toward equality by challenging gender expectations, stimulating debates on gender equality and social justice, and breaking entrenched patriarchal assumptions. It may further promote non-normative households, weakening the dominance of patriarchal family structures, and opening paths to broader social transformation. Crucially, counterstrategies proposed by critics have significant disadvantages compared to strategies that include ectogenesis. Relying on pregnancy to bargain with patriarchy is a zero-sum game that has never succeeded. Collective refusal to bear children, while symbolic, is unrealistic and risks patriarchal backlash—something ectogenesis could help mitigate. Furthermore, combining ectogenesis with social solutions is more likely to foster cooperation rather than cause distraction. Ultimately, ectogenesis, alongside social reforms, offers a stronger path toward gender equality.

CHAPTER EIGHT

Conclusion

This thesis has explored concerns regarding the emancipatory potential of ectogenesis and defended it as an important and morally justifiable element of comprehensive strategies to better address gender inequality. I have clarified where the real divisions lie in the existing debate—namely, in differing views on the root causes of gender inequality and the value of pregnancy. These perspectives significantly shape their corresponding strategies for addressing gender inequality.

Historically, pregnancy has been a unique power exclusive to individuals with the uterus, placing them in a pivotal role in human reproduction. With the widespread adoption of ectogenesis, there is a potential to side-line this unique and essential role of women in ensuring the perpetuation of the species (Smajor 2016). It is understandable that there are serious concerns about women losing something important due to the idea and the application of ectogenesis. This thesis has addressed some major concerns that have arisen in existing debates.

Scholars who support ectogenesis for its liberating potential often emphasise the health risks and harms related to pregnancy, including those considered normal pregnancies. This stance has been criticised by some authors as portraying pregnancy as pathological and inferior to male reproduction. However, as I have pointed out in Chapter 2, such accusations should first verify whether pregnancy is pathological rather than presuming it to be non-pathological. This inquiry is crucial because it challenges traditional perceptions and invites a re-evaluation of pregnancy's role and impact on women's health.

When I examine the "normal" pregnancy within the most influential naturalistic account of pathology—the Biostatistical Theory (BST), whose creator argues that categorising pregnancy as pathological would make discussions on the definition of pathology "game over", an interesting insight emerges. Under this framework, pregnancy does not seem to be categorically excluded from being pathological. Rather, these common conditions depict pregnancy as a survival pathology. The BST defines pathology as a significant adverse deviation from average functioning within a certain reference class. Due to the standards for defining reference classes presented in the BST discussions, pregnancy cannot be categorised as a typical occasion, and therefore, the pregnant population cannot serve as an independent reference class or be included in the reference group. Instead, non-pregnant women of the same age constitute the appropriate reference group, making many conditions induced by pregnancy pathological in

relation to the survival goals of the gestator. Moreover, the survival pathology brought on by pregnancy cannot be offset by its contribution to reproduction, as the BST, which diverges from the evolutionary perspective, fails to provide a convincing rationale for prioritising reproduction over survival. Therefore, the BST supports evaluating the survival and reproductive aspects separately, leading to the conclusion that pregnancy, from a survival perspective, is pathological. Future reproductive technologies, including ectogenesis, might further amplify the pathological sense of pregnancy.

Since pregnancy per se is considered pathological in the most influential accounts of pathology, even if ectogenesis reinforces this pathological image, it is not necessarily misleading but rather draws attention to an existing fact. In this sense, it lends a degree of legitimacy to the use of ectogenesis as a means of improving women's reproductive health.

In the following Chapter 3, I examine pregnancy through a well-known normative account of pathology—Cooper's account (2000). Interestingly, the flexibility and openness of this account's standards blur the classification of pregnancy as pathological. Furthermore, the existence of multiple accounts of pathology—each potentially leading to different conclusions—suggests that both arguments for and against viewing pregnancy as a pathology have their respective merits.

However, I then emphasise that even if the question of whether pregnancy is pathological remains ambiguous, in today's social context—where the common harms and risks of pregnancy are often normalised—it is crucial to construct a public narrative that highlights the pathological dimensions of pregnancy.

Critics are concerned that emphasising the pathology of pregnancy in public discourse could further disadvantage women, especially by leading to the overmedicalisation of pregnancy and reinforcing stigma around pregnant individuals. However, as I have analysed, there is no evidence supporting this concern. Indeed, pregnancy is often treated as a medical event today, particularly with the prevalent use of caesarean sections, but the more logical underlying rationale is the prioritisation of foetal interests while continuing to normalise the harm pregnancy can do to women's health. Precisely because the harms associated with pregnancy are often normalised, women seeking medical support solely for their own benefit are often overlooked or delayed. Yet, for the sake of foetal benefits, increasing unnecessary caesarean sections and other forms of medicalisation—which cause more harm to the pregnant individual—seem justified. Moreover, pathologising pregnancy does not necessarily create

stigma around pregnant individuals unless pathology and patients are stigmatised within that social context. In such cases, the appropriate response would be to challenge and eliminate this stigma.

Therefore, I have argued that, in the current context, endorsing a narrative that recognises pregnancy as pathological is a reasonable and necessary anti-bias stance. This recommendation can also be justified on the basis of principles of social justice. As I have emphasised, pregnancy narratives are not merely private views but concern the allocation of discursive resources in society and are fundamentally tied to questions of justice. John Rawls' Difference Principle (1971) offers valuable insights into how such narratives should be constructed: public narratives ought to be sensitive to those most disadvantaged by existing social norms and practices. Given that current social norms continue to normalise the pain and suffering of gestators, thereby legitimising inadequate medical care for them, it becomes crucial to adopt an anti-bias pregnancy narrative that emphasises its pathological dimensions. While such a narrative may be unnecessary in a future with ectogenesis, it is essential for challenging pronatalist and gendered assumptions today.

Also, considering women's current struggles for reproductive autonomy, some scholars worry that widespread ectogenesis might create reverse pressures—if widely embraced for being safer, it could impose normative pressure on women who prefer physical gestation.

However, as I discussed in Chapter 4, if critics adhere to liberal principles, such choices under social coercion might not be considered non-autonomous, as they involve personal balancing various aspects such as foetal benefits and the personal enjoyment of pregnancy. Besides, focusing on distant risks faced by the majority—those aligned with current pronatalist norms—seems untimely when the debate concerns whether to develop ectogenesis for minorities who do not conform to these norms.

Further analysis of gestational preferences through a feminist lens, particularly considering adaptive preferences, reveals that some women's preference for physical gestation might be shaped by structural injustices, suggesting that gestational preferences are neither static nor free from sociocultural influence. Therefore, I believe this concern should not serve as a reliable guide for whether to develop ectogenesis now; for the future pressures envisioned by critics, continuing to level up choices might be a more reasonable solution.

Beyond the symbolic and subjective value of pregnancy, there are some practical concerns about whether parental bonding might be harmed when a machine, rather than a human,

facilitates gestation. Some argue that even if long-term bonding is not compromised by ectogenesis, people might still choose natural pregnancy due to a preference for the unique bonding experience it offers. As discussed in Chapter 5, I support this viewpoint and argue that it underscores the legitimacy of choosing ectogenesis if individuals feel that non-pregnancy-based attachments suit them better.

Will a safe ectogenesis harm long-term parental bonding? This thesis has drawn on interdisciplinary evidence and theories to address this question. Findings and theories suggest that factors influencing foetal consciousness development are limited to genetic factors, environmental influences, and experiences within the womb. This implies that as long as ectogenesis does not introduce harmful genetic alterations, the care-seeking capability should remain intact, and ectogenesis could replicate certain uterine experiences, such as exposure to the prospective parents' voices and scents, helping to familiarise the unborn with their future parents. Moreover, considering that new-borns from natural pregnancies can interact well with primary caregivers other than the gestational mother, attachment formed during pregnancy appears to have a limited impact on long-term bonding, which can be compensated for by post-birth interactions.

It is also challenging to attribute the emotional ties from mother to infant/child primarily to the physiological process of pregnancy itself. As I have highlighted through various examples: detached gestational mothers versus committed non-gestational mothers, heterosexual fathers, gay intended fathers in surrogacy arrangements, non-gestating partners in lesbian relationships, and adoptive parents—all these groups can establish strong parental bonds without experiencing pregnancy. These widespread phenomena indicate that mother-child emotional ties are not primarily driven by physiological pregnancy but rather by imaginative engagement.

From an evolutionary perspective, maternal love is more a product of conscious cognition rather than instinct, with societal expectations of the traditional mother's role significantly influencing mother-to-foetus/child bonding. In the era of ectogenesis, it will be necessary to increase interactions between parents and children born from ectogenesis machines and to shape more gender-equitable social norms. Hormone supplementation to enhance emotional ties might also be plausible in certain cases. Furthermore, maintaining an open attitude towards future parent-child bonding is essential, as the future may involve relationships between parents and children both born from machines. Parental bonding in the future may be different, but not necessarily worse.

If ectogenesis becomes a widespread option without leading to the significant loss critics fear, what about its effectiveness and morality in addressing gender-based inequality? As analysed in In Chapter 6, both sides of the debate appear to be at an impasse over whether gender inequality is primarily rooted in gestational differences or in social structures—an issue that significantly shapes their views on ectogenesis. My analysis first seeks to move beyond this deadlock. Drawing on Ronald Dworkin's luck egalitarian theory (1983) and Ron Amundson's perspective (2000), I have shown that both models are inherently interactionist, recognising that society's inadequate responses to female reproductive traits play a crucial role in gender oppression. This indicates that interventions targeting either biological or social factors are fundamentally valid. Further support or opposition to ectogenesis should consider it within potential contexts, judged by reasonable principles.

The principle I propose — centred on significantly better opportunities — serves as the foundation for my comprehensive defence of ectogenesis in Chapter 7. In fact, addressing women's gestational burdens is an essential part of tackling gender inequality. As analysed in Chapter 6, societal structures primarily revolve around male reproductive traits, which do not entail gestational harm and risk, thus normalising the harm and risks associated with pregnancy and childbirth for women. This natural inequality is already a form of social inequality.

Moreover, the potential of ectogenesis extends beyond merely equalising gestational labour between the sexes; it could also significantly mitigate the long-underestimated negative impacts of pregnancy on women's careers and broader life trajectories, while helping to reduce gendered occupational segregation. Ectogenesis also holds the potential to shift social norms toward equality by challenging gender expectations, stimulating debates on gender equality and social justice, and breaking entrenched assumptions. It may further promote non-normative households, weakening the dominance of heteronormative family structures, and opening paths to broader social transformation.

Crucially, counterstrategies proposed by critics have significant disadvantages compared to strategies that include ectogenesis. Relying on pregnancy to bargain with patriarchy is a zero-sum game that has never succeeded. Collective refusal to bear children as a resistance to patriarchy is unrealistic and risks patriarchal backlash—something ectogenesis could help mitigate. Furthermore, combining ectogenesis with social solutions is more likely to foster cooperation rather than cause distraction. Ultimately, ectogenesis, alongside social reforms, offers a stronger path toward gender equality.

This is precisely what I have defended ectogenesis for — not a panacea, but a better opportunity and a catalyst for changes.

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