

ARTIFICIAL WOMBS, THOMSON AND ABORTION – WHAT MIGHT CHANGE?

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Abstract: Ectogenesis (artificial wombs) might soon become a reality. This paper will analyse how the development of such technologies will affect Judith Jarvis Thomson’s defence of abortion, and what the potential consequences of this will be for society. Thomson attempts to justify abortion by appealing to the mother’s right to bodily autonomy. We will argue that once these technologies have been developed, the right to abortion can no longer be justified by such appeals. As a result, when justifying abortion, Thomson-style arguments will no longer work, and a very different strategy will have to be adopted by those wishing to justify its permissibility. Anticipating a consequent weaker position of the pro-choice view, we briefly consider some of the practical implications of ectogenesis for society: effects on parental dynamics, governmental expenditure, research, and gender equality.

Keywords: ectogenesis, artificial wombs, elective abandonment, abortion, Thomson

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Introduction

In recent times a vivid discussion has emerged regarding the impact of artificial wombs, or ectogenesis, on the abortion debate.¹ Thomson’s 1971 defence of abortion is frequently brought up in this context.² Thomson starts by granting opponents of abortion the assumption that prenatal humans have a right to life, and then defends the right to abortion by arguing that the mother does not have a duty to support that life – carrying the pregnancy to term is in Thomson’s view a Good Samaritan Act. Thomson’s paper involves a number of thought experiments, and authors from both sides of the abortion debate have raised interesting and insightful criticisms of her arguments. It is not the

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¹ Blackshaw, Rodger (2019); Kaczor (2018); Mathison, Davis (2017); Overall (2015); Räsänen (2017). While our contribution builds on previous work, we uniquely grant all of Thompson’s assumptions when forming our argument and comment on the broad societal implications of ectogenesis, particularly those relating to child abandonment and disability. As a result, the later part of this article may be of particular interest to policymakers.

² Thomson (1971).

aim of our paper to analyse or critique Thomson's argument in and of itself. Instead, we are going to argue that once partial ectogenesis becomes possible, Thomson-style defences of abortion can no longer apply, even if they are currently successful. Of course, this argument is also conditional on ectogenesis becoming legally permitted and there are potentially many reasons why effective partial ectogenesis might not become legal. These can pertain to some of the societal implications we describe later on in the paper, like the fear of employers pressurising ectogenesis on their employees as a compulsory alternative to maternity leave, as well as to norms which place a special value on the naturalness of gestation and birth.³

First, we will introduce Thomson's two key claims; that people do not have an obligation to support lives of others and that, conversely, people do not have the right to demand such support. We will do this by examining her violinist thought experiment and her thought experiment involving Henry Fonda's healing touch. Second, we will introduce the concept of ectogenesis and why it is relevant to the abortion debate. Third, we will consider how ectogenesis will impact Thomson's arguments in light of her Minimally Decent Samaritan standard.⁴ We will conclude that if certain conditions are met, Thomson's arguments, at least those that we consider here, will no longer justify abortion. Finally, we discuss how ectogenesis might affect society, particularly with reference to paternal rights.

Of note, in recent years some thinkers have argued that the location of the foetus is morally relevant, i.e., that the fact of the foetus being located inside the mother's body is part of what gives the mother the right to decide about its death⁵ (somewhat analogous to ancient Roman concept of *Patria potestas*).⁶ In this paper we are only engaging with Thomson and we will be making the same assumptions that she makes, which include the moral irrelevance of the foetal location and the recognition of foetuses' personhood. However, future work should also engage with these more recent thinkers.

³ Gelfand, Shook (2006).

⁴ Thomson (1971): 62–65.

⁵ We acknowledge that this container model might be overly simplistic in how it portrays the complex anatomical connections between the mother and the foetus, and that there might be something important about the structure of this connectivity. Nevertheless, we simply refer to how this has been presented in Mackenzie (1992) and Overall (2015) with whom we engage further in this work.

⁶ Latin for 'power of the father'; a Roman family concept describing the supreme rule of the family's patriarch over all his male descendants, including the right to inflict capital punishment (Britannica, n.d.). While in Roman Law this was grounded in a proprietary conception of these family relationships and is thus somewhat different from the issue of abortion (we thank an anonymous reviewer for highlighting this), the famed pro-choice slogan 'my body, my choice' (see, for example, Stevenson, 2019) does seem to resemble a proprietary claim (even if location based rather than relationship based), which similarly attempts to justify a right to kill (the foetus). That said, unlike *Patria potestas*, claims of the mother over the foetus are not absolute even according to most pro-choice advocates. For example, if the life, or continued life, of the foetus is chosen, actions on the part of the mother that could damage foetal development (e.g., smoking) are often judged unfavourably (we thank again the reviewer for bringing this point to our attention) by pro-choice proponents who would not judge the act of abortion negatively.

Thomson's Violinist Thought Experiment

Thomson argues that women have the right to abortion using a range of thought experiments. The first has become known as the "violinist thought experiment." She writes:

Let me ask you to imagine this. You wake up in the morning and find yourself back to back in bed with an unconscious violinist. A famous unconscious violinist. He has been found to have a fatal kidney ailment, and the Society of Music Lovers has canvassed all the available medical records and found that you alone have the right type of blood to help. They have therefore kidnapped you, and last night the violinist's circulatory system was plugged into yours, so that your kidneys can be used to extract poisons from his blood as well as your own.⁷

You then discover that in order to keep the violinist alive you must remain attached to him for nine months. The thought experiment is meant to mirror the process of going through an involuntary pregnancy. The violinist has a kidney disease and uses our circulatory system to keep himself alive in a parallel way to how fetuses use their mother's body to keep them alive during gestation. Thomson argues that under these circumstances upon waking up you are under no obligation to remain "plugged in" to save the violinist. You may choose to remain plugged in, and this would be a noble and selfless decision, but if you chose not to, then unplugging would be entirely permissible. Thus, remaining plugged into the violinist is a supererogatory act, above and beyond what is morally required. Likewise, carrying a pregnancy to term is a supererogatory act above and beyond the call of duty and thus abortion should be permissible.

The second thought experiment aims to demonstrate that an unnuanced view of the right to life could imply that people have a claim on something they manifestly do not. The example involves a person whose life can only be saved by Henry Fonda's cool touch to their fevered brow. Thomson writes:

If I am sick unto death, and the only thing that will save my life is the touch of Henry Fonda's cool hand on my fevered brow, then all the same, I have no right to be given the touch of Henry Fonda's cool hand on my fevered brow. It would be frightfully nice of him to fly in from the West Coast to provide it. It would be less nice, though no doubt well meant, if my friends flew out to the West Coast and carried Henry Fonda back with them. But I have no right at all against anybody that he should do this for me.⁸

Here Thomson tries to show that the right to life, which she grants people have, does not imply that people have a claim on another's assistance. Thomson, in her thought experiment, may have the right to life and she may require Henry Fonda's healing touch to remain alive, but none of this implies an obligation on Henry Fonda's part to touch

⁷ Thomson (1971): 48–49.

⁸ *Ibidem*: 55.

(or a right on her part to have him touch) her “fevered brow.” Thomson argues that, analogously, when someone terminates a pregnancy, they do not deprive the child of anything to which they have a right. They might have a right to their own life, but it does not follow that they have the right to their mother’s uterine space and nutritional support, and it is uterine space and nutritional support of which they are deprived. Thomson also presents other arguments to support her case, but we will concentrate on these two, as they seem to us to be the most relevant with regard to ectogenesis.

What is Ectogenesis?

Ectogenic technologies, commonly known as artificial wombs, are a form of life support that are currently being developed with at least two aims: helping in the care of premature infants and extending the time an embryo can be kept in-vitro before implantation into the mother,⁹ though some list more potential applications.¹⁰ Within the context of this paper, it is the first aim of ectogenic technology that is the focal point. Though it must be remembered that these two aims are synergistic, especially for those who hope that one day gestation will be able to completely occur outside of the human body. Moreover, the potential for this technology is not just to keep the embryo or foetus alive, but also to act as an environment in which early therapeutic¹¹ or augmentative procedures (such as gene editing or therapy) could be carried out to tackle developmental disorders or for the sake of human enhancement.

From an infant life-support point of view, ectogenesis is meant to mimic the conditions of the placenta to allow premature neonates to finish off their development in an as-natural-as-possible setting. While survival has been reported for neonates born as young as 21-22 weeks gestation,¹² complications in these neonates are very common, with respiratory underdevelopment being one of the main issues, as well as the potential damage caused as a side effect of the therapies administered to these infants.¹³ Artificial wombs have been in development for over half a century, but their progress was limited by our knowledge of early human physiology and lack of the necessary technological advances.¹⁴ At present, the designs of such ectogenic technologies aim to mimic the placenta by employing something akin to an extracorporeal membrane oxygenation device (a machine that can replace the work of human lungs) and keeping the developing organism in a bath of fluid, but the technology is currently predicted not to benefit human foetuses below 22 weeks gestation.¹⁵ Other ectogenesis technologies are in early stages of development.¹⁶ As a result, the impact of ectogenic technology on abortion cases, in many jurisdictions, will remain limited for the foreseeable future. Nevertheless, ectogenesis might one day be able to reliably support the development of

⁹ Nuffield Council on Bioethics (2016).

¹⁰ Segers (2021).

¹¹ Partridge, Davey, Hornick et al. (2017).

¹² Cable (2018); Howard (2017).

¹³ Mychaliska (2016); Romanis (2018).

¹⁴ Metelo-Coimbra, Roncon-Albuquerque (2016); Mychaliska (2016).

¹⁵ Metelo-Coimbra, Roncon-Albuquerque (2016); Partridge, Davey, Hornick et al. (2017).

¹⁶ See e.g. <https://amniion.life/>.

human organisms at early gestational stages, those at which abortion is currently legal in many jurisdictions that restrict its performance later during pregnancy.

It is also worth distinguishing between what has been called “complete” and “partial” ectogenesis. Complete ectogenesis takes place entirely outside the human body from “conception” to “birth” - if those terms are still appropriate.¹⁷ In partial ectogenesis only some fraction of the developmental process occurs in the artificial womb or with the use of some similar technology. Complete ectogenesis does not compromise the pregnant person’s bodily autonomy and thus is unaffected by Thomson’s argument, therefore irrelevant to the goals of this paper. We will be interested in cases of partial ectogenesis in which conception takes place in the human body after which the zygote or embryo is transferred to an artificial womb for long-term gestation, rather than in cases where the initial developmental stages occur outside the natural uterine environment.

Ectogenesis and Thomson’s Arguments

As shown above, Thomson defends the permissibility of abortion by arguing that the foetus has no claim to the mother’s body. Thus, in the same way that one is permitted to unplug themselves from the violinist, pregnant women can terminate their pregnancies.

At the same time, Thomson, whilst acknowledging that it is permissible for one to unplug oneself from the violinist, does grant that it would be very considerate, selfless and kind if one chose to remain connected to him for nine months in order to bring him back to full health. The point, however, is that a decision to remain connected to the violinist goes above and beyond the call of duty and would make these people, what Thomson calls, Good Samaritans. Thomson then distinguishes between Good Samaritans and Minimally Decent Samaritans. Good Samaritans are people who agree to acts like being plugged into the violinist for nine months or, more plausibly, who willingly put themselves in physical danger in order to help others. Thomson thinks that people are never morally obligated to be Good Samaritans and that the law should reflect this. Nevertheless, she does think that people are morally obliged to be Minimally Decent Samaritans and allows for the possibility that this should also be reflected in the law (although she doesn’t weigh in on this in any detail). Minimally Decent Samaritans are those who, for example, upon seeing an innocent person being physically attacked will phone the police.¹⁸ It should now become clear that Thomson is driving at the difference between supererogatory acts and obligatory acts. In Thomson’s view, carrying a pregnancy to term is a supererogatory act which is neither morally obligatory nor appropriate for legal prohibition or prescription. As a result, Thomson concludes that there is a gross injustice in a legal system prohibiting abortions. We will, for the sake of argument, grant all of what Thomson wants to say and then consider how, and if, the possibility of ectogenesis changes things with regards to the status of abortion.

The question now becomes: if ectogenesis becomes possible, does seeking such an alternative to abortion which preserves the foetus’s life remain a supererogatory act? Thomson, herself, grants that “the desire for the child’s death is not one which anybody

¹⁷ Colgrove (2019); Romanis (2018).

¹⁸ Thomson (1971): 63.

may gratify, should it turn out to be possible to detach the child alive.”¹⁹ Ectogenesis is the technology that will allow one to “detach the child alive.” Hence, by Thomson’s own standards, once it becomes possible to detach the child alive with a high rate of success at minimal or no risk to the pregnant woman’s life, it is not supererogatory to seek an alternative to abortion which preserves the foetus’s life. Rather, it is obligatory because it is now possible to detach the child alive without, in principle, paying a high price for it.

However, as it stands, this conclusion is too hasty. There will be risks associated with ectogenesis, at least for the foreseeable future until the technologies are better developed. There will be permanent scarring to the mother’s body as well as the inconvenience and associated pain, and other likely risks linked to the procedure.²⁰ The key question is whether these risks and costs are such that they would be required of a Minimally Decent Samaritan?

Our answer is that these risks and costs are such that they would be required of a Minimally Decent Samaritan. However, in order to justify this claim it is worth distinguishing between surgical and medical abortion. A surgical abortion, as the name suggests, requires surgery, whereas a medical abortion is entirely non-invasive and could, in principle, be carried out at home.²¹ As a result, surgical abortions are more costly than medical abortions, in terms of inconvenience, financial burden, and to a certain extent risk. Moreover, surgical abortions are also more akin to ectogenesis in the sense that something physical and invasive needs to be done to the mother’s body. Therefore, if we can justify the claim that ectogenesis would be required of a Minimally Decent Samaritan in the case of *medical* abortion then it seems highly likely that ectogenesis would be required of a Minimally Decent Samaritan in the case of *surgical* abortion.

Given that these technologies are not currently available, it remains to be seen what exactly the risks of an ectogenic procedure would be to the mother (there are, of course, risks, both short-term and long-term, to the foetus, but, as the alternative is death from abortion, we can consider them to be small compared to the likely benefits). However, based on the information currently available, the research team that worked on the recent development in ectogenic technology has already pointed out that the intervention would require a special EXIT procedure involving a caesarean section.²² As a result, an unsightly scar and the inconvenience, risks, and pain of a caesarean section are the likely costs to the mother if ectogenesis becomes possible. These costs should not be understated. An unsightly scar can, of course, affect a person’s confidence and perceived attractiveness. This cost is likely to be particularly pronounced in these situations because the people most likely to utilize ectogenic technologies will be young women. There is already plenty of pressure on young women regarding their appearance in our society,

¹⁹ Ibidem: 66.

²⁰ Kingma, Finn (2020).

²¹ Medical abortion requires that the woman takes two pills with an interval of 24–48h between them, which in many jurisdictions can be done at home (Pruski, Whitehouse, Bow, 2022). Surgical abortion, on the other hand, is a much more invasive process, for which there is a variety of protocols used (NHS, 2020). While the risk of bleeding that requires an intervention appears higher in medical abortions, there is increased risk of damage to reproductive organs associated with surgical abortions, with medical abortion not being an option in latter stages of pregnancy (Marie Stopes AU, 2016).

²² Partridge, Davey, Hornick et al. (2017): 10.

and a caesarean scar could, perfectly understandably, exacerbate these issues. There are also other non-trivial costs of the caesarean section. There is a risk to the mother's health due to human error, haemorrhage, and infection, although these are relatively minimal given modern medicine. There is also the time taken to undergo the surgery and to heal, which adds up to several weeks, and the associated pain, which is severe, albeit manageable, with modern pain-killers. Finally, it might affect the person's future chances of becoming pregnant.²³

In this paper we have granted Thomson all of her assumptions, as a result, it is not unreasonable for us to utilize the assumptions that she herself grants her interlocutors. One of these is that the foetus is a person. Thomson writes "I propose, then, that we grant that the foetus is a person from the moment of conception."²⁴ Now, of course, this assumption can, and has been, challenged. However, in this paper, we are analysing Thomson's argument whilst granting all of her assumptions: those that favour a pro-choice perspective and those that favour a pro-life perspective. We will therefore continue under the assumption that the foetus is a person, and that as a result they have a *prima facie* right to life.

Whilst this assumption is perhaps contentious, and whilst it may strike some readers as implausible, it is worth noting that a significant number of people do believe that foetuses are persons, both in the academic world and amongst the general public.²⁵ Further, this particular disagreement, about the personhood of the foetus, has proved infamously intractable with thinkers on both sides of the debate putting forward many sophisticated and subtle arguments. As a result, we could not possibly justify this assumption, whilst also considering its implications for ectogenesis, in the space available. However, given that Thomson grants us this assumption, and given that there are many sophisticated and subtle arguments that attempt to justify it, hopefully the reader will grant us this assumption for the sake of argument. Additionally, technologies like ectogenesis may also alleviate some of the political tension inherent in the abortion debate since they may provide alternatives agreeable to all parties. Whether this is actually the case remains to be seen, but it does suggest there is some reason to grant us the assumption that the foetus is a person in order to see where the argument leads. In addition to the assumption that foetuses are persons, we will also utilise Thomson's claim that no one has the right to demand the death of a(n unborn) child²⁶ if it is possible to detach them alive. She writes "while I am arguing for the permissibility of abortion in some cases, I am not arguing for the right to secure the death of the unborn child. It is easy to confuse these two things" and that "I agree that the desire for the child's death is not one which anybody may gratify, should it turn out to be possible to detach the child alive."²⁷

²³ See NHS (2016) and NICE (2019) – risks to fertility seem similar and appear mainly linked to potential damage to the reproductive organs or bleeding requiring a hysterectomy to stop it. See our discussion on the relationship between the cost of ectogenesis and whether it is supererogatory further down.

²⁴ Thomson (1971): 48.

²⁵ See for example Oderberg (2008) and Eberl (2020) for two contemporary defences of the view that foetuses are persons. See also Warren (1973) for one of the most famous criticisms of this view.

²⁶ Thomson uses the term 'child' to refer to the foetus in this context because she is prepared to grant, for the sake of argument, that foetuses are persons.

²⁷ Thomson (1971): 66.

This claim is important because if this assumption is granted it undercuts arguments for the permissibility of abortion on the basis of reproductive autonomy. Thomson's argument attempts to defend the permissibility of abortion on the basis of bodily autonomy, but other thinkers have attempted to defend the right to abortion on the basis of reproductive autonomy.²⁸ According to these arguments it is crucial not just that the mother can end the pregnancy (either through abortion or ectogenesis), but also that the child (to use Thomson's term) must die.²⁹ As before, due to limits on space and because of the vast amount of literature on abortion, we are unable to fully assess these arguments here. However, if we are prepared to make this assumption (that we have no right to demand the death of the unborn child if it is possible to detach them alive), which many hold to be plausible, then these sorts of arguments are automatically undercut. Of course, advocates of these sorts of arguments challenge this assumption in interesting and subtle ways, but there is simply insufficient space for us to engage with them here. As a result, we will have to leave a proper discussion of these sorts of arguments to their defenders and detractors. The question now becomes, given these assumptions: do the costs of ectogenesis sufficiently outweigh the costs of abortion so as to render an ectogenic alternative supererogatory? From what has been said so far, the answer seems negative. For one thing, abortion itself, either medical or surgical, is not without risks for a woman, and, in particular, the risks for surgical abortions are similar to those that are likely to be associated with ectogenesis.³⁰ These include the possibility of human error, infection and bleeding. Whilst a visible scar is not associated with an abortion, either medical or surgical, damage to the womb is also a possible complication which can lower fertility and cause other issues. Moreover, with the progress of medical technology, the risks of both procedures will become smaller, especially if ectogenesis becomes possible in the early stages of pregnancy. It is, though, important to highlight that progress in medical science is currently still needed for this equivalence to be reached. Caesarean sections, the most comparable intervention to the EXIT procedure, are associated (when compared to vaginal birth) with risks of hysterectomies, longer hospital stays and heart attacks, with the risk increasing with multiple caesarean sections.³¹ There is no comparable data on the

²⁸ For an interesting discussion of the distinction between the two families of arguments see Camosy (2022).

²⁹ See Reader (2008) for a defence of this claim even when applied to neonates outside the womb, and Mackenzie (1992) and Overall (2015) for a (more modest) defence of this claim applied merely to gestates.

³⁰ NHS (2016). It is important to remember that medical abortions are also not without risk. For example, a Freedom of Information request revealed an increase in the number of emergency calls made to the ambulance service after the regulation of medical abortions has been liberalised in England allowing women to take the pills at home (Adams, 2021). This probably related to higher chances of severe bleeding associated with medical abortions compared to surgical abortions (Marie Stopes AU, 2016; NICE, 2019). Similarly to surgical abortions, there might be side effects of the medications used throughout the process, such as nausea, and as the medical abortions are associated with a higher failure rate than surgical abortions, some women might require a surgical abortion to complete the abortion process. So despite lesser risk to the reproductive organs (see footnote 21), medical abortions are not without risk. Our ultimate point here is that there will always be risks associated with both ectogenesis and abortion, but ectogenesis gives the foetus a chance of survival unlike abortion.

³¹ NICE (2019); Kaplanoglu, Bulbul, Kaplanoglu et al. (2015).

effect of repeat abortions (though surgical abortions carry a risk of the development of Asherman Syndrome that can affect the chances of carrying future pregnancies to term),³² but it is fair to speculate that due to the more traumatic nature of caesarean sections, even repeated abortions carry nowadays a comparatively smaller risk than ectogenic EXIT procedures. Yet, whilst the risks associated with an abortion might currently be lower, especially when considering pharmacologically induced abortions, this difference in risk and cost will become smaller as medical technology progresses, and the EXIT procedure could perhaps in the future be done laparoscopically or transvaginally. At some point, it is likely that small cosmetic scarring will remain the main difference between both procedures (though perhaps eventually even the scarring will be rectifiable) – a cost perhaps trivial enough to make it obligatory for Thomson’s Minimally Decent Samaritan. If Henry Fonda was going to end up standing next to Thomson either way, perhaps he should touch her fevered brow, indeed perhaps he would be obliged to.

It is also worth noting that, in addition to these observations, the costs of ectogenesis do not need to be exactly equal to the cost of abortion (either medical or surgical) for it be obligatory. Whether an act is obligatory or supererogatory depends upon many factors, one of which is weighing the cost to the agent against the potential good gained or preserved. I am not obliged to stop my car to pick up a hitchhiker because the benefit to the hitchhiker is, in the scale of things, relatively minor. However, if I spot someone on the side of the road having a heart attack, for example, then I am obliged to pull over to provide assistance. Therefore, if, as Thomson is prepared to grant, the unborn child is a person, then the good preserved by ectogenesis (the life of the child) appears sufficiently significant to tip the balance. As a result, even if ectogenesis carries a higher cost to the mother than abortion (either medical or surgical), provided that cost is not too high, ectogenesis may still be obligatory.

It seems likely that early on during the development of ectogenic technologies the odds of successfully detaching the child alive would be low and the risks to the mother would be high. In these cases, it seems reasonable to conclude that undergoing an ectogenic procedure would be morally supererogatory. Nevertheless, as the technologies develop the risks to the pregnant woman would likely decrease and the odds of success would increase, as was historically the case with most surgical procedures (of particular interest here is the case of caesarean sections, which in the past were so risky that the option of performing craniotomies on the foetus was seriously considered even by Catholic theologians),³³ to a point where they became obligatory. What the precise point is at which this would happen, how low the risk and how high the odds of success would have to be for an ectogenic alternative to become obligatory is tricky to say at this stage and is something we will likely need to leave to future ethicists and medics to decide. However, the basic point still stands.

One objection that some might raise at this point concerns the implications of our argument for things like blood donation. After all, donating bloods is a relatively minor inconvenience with negligible associated risks. Does this mean that all of us are obliged

³² Smikle, Yarrarapu, Khetarpal (2020).

³³ Rhonheimer (2009).

to donate blood? Our response to this is both “yes” and “no”. There is an important disanalogy between donating blood and ectogenesis, which allows us to say “no”, but the analogy is close enough that we are, very reasonably, obliged to also say “yes”. The disanalogy is that you personally are not *necessarily* required to give blood in order to save a life. Most people are able to give blood, many do, and one person, over time, is able to donate enough blood to save more than one person. As a result, no one *need* die should you refuse to donate blood. This is unlike ectogenesis. No one but the pregnant person can undergo the necessary ectogenesis to both end her pregnancy and to save the life of foetus. As a result, there is a stronger obligation on her to undergo ectogenesis than there is for any particular person to donate blood. This allows us to conclude that our argument does not require us, as individuals, to donate blood. At the same time, it is also true that if no one were to donate blood many people would die. As a result, someone *must* give blood, and if there is a shortage of blood in your area, and no one else will make the necessary sacrifice, then perhaps you are obliged to donate.

There is another relevant disanalogy between ectogenesis and blood donation that strengthens the “no” strand of our response. In our hypothetical situation, the choice is between *doing* something which will lead to the death of the foetus (abortion) or *doing* something which will allow it to survive (ectogenesis). However, when it comes to blood donation, the choice is between *doing* something which will save someone’s life, and simply *not doing* anything at all, thus *allowing* that person to die. As a result, there also appears to be a doing/allowing distinction at play here.

Regardless of one’s views on the doing/allowing distinction, our other response allows us to avoid the conclusion that we are obliged to donate blood *in the same way* that pregnant persons may be obliged to undergo an ectogenic procedure should they wish to end their pregnancy, once the risks associated with ectogenesis become sufficiently low and its effectiveness well established. At the same time, perhaps this does demonstrate that we are obliged, or more obliged (if that is a coherent idea) to give blood under certain circumstances. To use a slightly different example, consider the case of bone marrow donation for a person with leukaemia. There is a lot of variation in human leukocyte antigens (HLA), and the more similar these are between the donor and the recipient the higher the chances of a successful transplant. Because of the large variation in HLA (greater than the variation in blood types) there are less suitable donors. As a result, the moral obligation to donate bone marrow becomes stronger if one is the only available and reasonably accessible match to a given patient. Despite this, as in the case of blood donation and unlike in the case of abortion, in the case of bone marrow donation one still has to *do* something to save a life while in the case of an abortion one is *doing* something to take a life (and, as we have argued, ectogenesis involves a similar amount of *doing* to preserve that same life). This aforementioned distinction between *doing* and *allowing* is perhaps what justifies not legally enforcing bone marrow donation whilst also allowing for the possibility of a strong moral obligation to do it. This is unlike ectogenesis which, we have argued, may well reach the threshold necessary to become a legally required alternative to abortion.

Thomson sees the Minimally Decent Samaritan standard as a means of avoiding seemingly ridiculous situations, such as carrying out an abortion an hour before nat-

ural birth would occur. Yet, one could argue that there is further cost of not having an abortion, namely that of raising children, which must be given serious consideration if a large proportion of children are aborted because they are unwanted.³⁴ How to deal with the cost of this obligation to raise children?

Impact on Society

In this paper we have only been discussing some of Thomson's arguments for the permissibility of abortion. We have simply argued that if ectogenesis becomes possible, then at least some of Thomson's arguments for the permissibility of abortion will no longer apply. There are, of course, other arguments for the permissibility of abortion and these may or may not be successful in defending a right to abortion in the presence of effective ectogenesis. It is entirely possible for someone to agree with everything we have said so far, but to still think abortion is permissible on other grounds. For them, these final sections will be of limited interest. However, for the sake of completeness, we will consider the implications of ectogenic technologies on society should they be adopted entirely instead of abortion. At the same time, we will only consider these issues briefly since the question is doubly hypothetical; *if* ectogenesis becomes possible, and *if* society decided to prevent abortion and replace it with ectogenesis when facing unwanted pregnancies, what will the consequences be? Our goal here is not primarily to discuss the ethical status of some of these consequences, but only to highlight the need for potential policy makers to consider them appropriately and to take them into account when legislating for ectogenesis in the future. It seems prudent to consider these issues now, *before* ectogenesis becomes possible, so that we are not forced to implement these technologies, and any legislation governing them, in a haphazard ill-thought-out manner. As we shall see, the impact on society will most likely be profound, so it is particularly imperative that we proceed with the development and implementation of these technologies in a prudent manner.

The impact on society, when ectogenesis becomes routinely available in the clinical setting and if the assumptions granted in this paper are reflected in the relevant legislation, would be dramatic. Most obviously abortion would become impermissible and the birth-rate (perhaps in the case of ectogenesis a term like gestation rate would fit more with current linguistic developments in the ectogenesis debate)³⁵ would dramatically increase as a result (we will not comment, though, on the issues associated with population growth due to the complexity of this issue in itself). The question now becomes: who would care for these children?

There are two obvious answers: either the parents, or the state. We will discuss each option in turn. The most obvious answer, and more in line with our current practices, for who should care for the children is the parents. The obvious disadvantage of this is that *de facto* women would have a diminished range of options available to them to avoid parental responsibilities. Currently, post-conception, fathers have no choice about whether or not they will become fathers, yet women can choose whether or not

³⁴ Department of Health & Social Care (2018); Furedi (2008): 3; Neal (2019).

³⁵ Rodger, Colgrove, Blackshaw (2021); Romanis (2018).

to become mothers by choosing whether or not to have an abortion – this disparity in freedom, and proposals on how to rectify it, have been discussed by a number of thinkers including McCulley, Sheldon, Brake, and Playford.³⁶ If the mother decides to keep the child, against the father's wishes, then she, through the courts, can legally oblige him to provide for the child. The father might be able to abandon physical contact with the child, but (at least in principle) not the financial responsibility of parenthood.³⁷ If ectogenesis were to replace abortion, and the responsibility for raising the resulting children fell to the parents, then, in effect, women would lose a significant freedom. Presumably, a woman who unwillingly found herself pregnant would undergo the EXIT procedure. Then, upon the child's 'birth,' the father could claim the child and, through the courts, demand child support from the mother (unless it is ruled that the physical trauma of undergoing the EXIT procedure³⁸ is a substitute for any future financial support). As a result, (at least *de facto*) women would potentially be losing a significant freedom that they currently possess, which might be seen as an issue. On the other hand, it would merely put women in the same position that men currently find themselves in.³⁹ If this potential new status is intrinsically just, then there is no issue. If this position is intrinsically unjust, then, at the very least, the current practices towards unwilling fathers will need to change and whatever solution is found for unwilling fathers could be applied to unwilling mothers when ectogenesis becomes a clinical reality.

Alternatively, we might think that Thomson's argument justifies not only a right to abortion, but also a right not to be a mother (and, possibly, also a right not to be a father).^{40, 41} If so, the parents after undergoing the EXIT procedure would have no further obligations to the child and responsibility for its care would fall to the state. Other arguments might be given for why the state is best positioned to care for children undergoing ectogenesis, but this takes the discussion well beyond the scope of our paper. Either way, the reality of ectogenesis might result in an increase in the number of children being cared for by the state. Presumably the care of these children would be done through a mixture of adoptive parenting, foster homes and care homes, but, needless to say, the financial cost to society would be large. This financial problem would be

³⁶ Brake (2005); McCulley (1998); Playford (2018); Sheldon (2003).

³⁷ We say 'in principle' because men (who in the UK represent 93% of parents paying child support) do often avoid paying it. It is hard to get exact statistics on payment avoidance as these are not collected for the majority of child support arrangements in the UK, circa 64% of these arrangements being made directly between both parents and not actively monitored by the Department of Work & Pensions (2022). With respect to the remaining circa 36% arrangements (covering 282300 children), 32% parents did not pay any maintenance and only 45% parents payed above 90% of maintenance. Of course, the rate of non-compliance might also change if more effective legislation is brought forward together with enforcement measures enabled by new digital technologies.

³⁸ Though as we have noted elsewhere, this trauma is likely to decrease as medical technology advances.

³⁹ Playford (2018).

⁴⁰ See Brake (2005), Playford (2018) and Sheldon (2003) for a direct application of Thomson's argument to men, and also McCulley (1998) and Cohen (2008) for a legal discussion of this issue.

⁴¹ There are, of course, motherhood specific defences of abortion. For example, see Reader (2008) and Mackenzie (1992). However, these fall outside the scope of this paper as we are engaging primarily with Thomson's defence of abortion.

particularly exacerbated if it were decided that the same policy should apply to severely disabled foetuses, many of whom are currently aborted. If they weren't aborted, and instead underwent ectogenesis, and were then cared for by the state, the financial cost to society would be significantly higher than if ectogenesis was only applied to healthy foetuses. While to some degree this might be offset by the high demand for babies for adoption⁴² (and potentially some might be particularly interested in adopting disabled babies), it is still a burden on society (even if welcome by some people) in terms of the resources necessary to care for these children. This will need to be considered by both policy makers and the carers themselves. Moreover, the desire of some not to be parents or not to pay child support might have a potential impact on homicide and suicide rates, if ectogenesis became a legally enforceable alternative to abortion. Whether there would be an increase in the homicide rate committed by those unwilling to become fathers or an increase in the suicide rate by those unwilling to become mothers remains a speculation, though possible changes to the suicide and homicide rate that might occur in light of recent rulings such as *Dobbs v Jackson Women's Health Organization* might allow for some estimation of the potential impact of ectogenesis on these phenomena.

Whilst the advancement of life support technologies might evoke images of hangars full of vegetative patients being kept alive indefinitely, artificial wombs might evoke images of enormous neonatal intensive care units full of parentless foetuses – perhaps like the hatcheries of the “Brave New World.”⁴³ This, no doubt, would be a huge drain on society's resources, as well as a possibly disturbing scenario in and of itself. The financial concern is warranted, but it is also worth considering the positive possibilities that these neonatal intensive care units would raise. Ectogenesis would offer a great tool for those working on early human development, offering the opportunity to apply a variety of developmental treatments, such as gene editing or therapy,⁴⁴ use of pharmacological or electric field gradients⁴⁵ and surgery, and the manipulation of the environment in which the foetus develops. The therapeutic value of many of these interventions is currently limited. Gene editing or therapy are most effective at early embryonic stages, which at the moment necessitates *in vitro* fertilisation.⁴⁶ Similarly, the range of pharmacological and physical interventions on the developing foetus is currently largely limited, severely impacting the way some diseases, such as ciliopathies or developmental psychiatric disorders, are treated due to the early onset of their pathophysiology.⁴⁷ Ectogenesis will not only offer an opportunity to apply such therapeutic technologies, but with the access to the developing embryo and foetus it might also help to overcome the ethical issues of germline cell editing, by developing gene editing and therapy techniques to target only specific cells during human gestation. These developmental interventions might in turn decrease adult levels of disability, and hence increase the lifelong productivity of people who would otherwise be born severely handicapped. As a result, it is entirely possible

⁴² Crary (2017); Khazan (2021).

⁴³ Huxley (2008).

⁴⁴ Gene editing is an intervention that aims to correct a faulty genetic sequence, while gene therapy aims to add a correctly working copy into the genome (Delhove, Osenk, Prichard et al., 2020).

⁴⁵ McCaig, Rajnicek, Song et al. (2005).

⁴⁶ Taylor, Galichet (2021).

⁴⁷ Pruski, Hu, Yang et al. (2019).

that society might benefit financially from ectogenic technologies. There are though medical, ethical, legal and practical risks associated with research (including uncertainty of risk) that would be required to bring these interventions about, but there are also great potential benefits, and certainly at least therapeutic trials for some conditions are likely to gain favour from those espousing a wide variety of ethical outlooks.

Moreover, ectogenic technologies will allow large numbers of people currently unable to have children to become parents, either biologically or through adoption of abandoned children. Notably, complete ectogenesis could eliminate the use of surrogates to carry the biological parents' pregnancies.⁴⁸ Partial ectogenesis could also allow the mother to both keep her child and receive cancer treatment should she develop the condition during pregnancy.⁴⁹ Furthermore, in combination with such technologies as artificially generated gametes (i.e., in vitro gametogenesis; when gametes are derived from stem cells, which themselves could be generated from a variety of somatic cells using molecular biology techniques) and gene editing, complete ectogenesis would create the potential for infertile people and male same sex couples to have children, as well as open the future for the transhuman movement.⁵⁰ Not all of these options will be viewed with favour by all members of society, but the impact of all should be considered by policy makers.

Finally, even if there is a financial cost to society, if people (as Thomson did) continue to grant that foetuses are persons, ectogenic technologies would allow society to save the lives (or to avoid the deaths) of countless people, and this is of immense value. Whilst considerations of resource allocation will be unavoidable when artificial wombs become a reality, it is important that ethics is not reduced to economics.

Ectogenesis and Equality

At the moment, the decision to have an abortion lies solely with the mother, the father has no say in the matter. If the mother decides to have an abortion, against the father's wishes, she can have her abortion and he can only grieve.⁵¹ One, at least prima facie, perfectly reasonable justification for this apparent inequality is that the burden of pregnancy falls (at least mostly) on the mother. This burden is far from insignificant (even if it is welcome, e.g., by those who struggled to conceive). As a result, the decision ultimately lies with her rather than him - for criticisms of the morality and legitimacy of this arrangement see Harris,⁵² who argues that under certain circumstances a woman's choice to have an abortion can wrong a prospective father, and Di Nucci,⁵³ who argues that under certain circumstances prospective mothers can wrong prospective fathers by not having an abortion and by carrying their child to term against his wishes.⁵⁴

⁴⁸ Singer, Wells (1984).

⁴⁹ Romanis (2018).

⁵⁰ Pruski (2017, 2019b); Bostrom (2005): 3; see also Willmott (2022).

⁵¹ Barraclough (2017).

⁵² Harris (1986).

⁵³ Di Nucci (2014).

⁵⁴ In a way, then, Harris and Di Nucci take simultaneously the same and the opposite approach. Both think that a women's reproductive choices can harm prospective fathers, but with Harris arguing that *having* an abortion can harm the prospective father, whilst Di Nucci argues that *not having* an abortion can harm the prospective father. That said, this is something of an oversimplification so see Harris (1986) and Di Nucci (2014) for full details.

Potentially, ectogenic technologies could benefit both men and women, and promote greater equality between them.⁵⁵ Ectogenic technologies would benefit women by relieving them from being the sole bearers of the burdens of pregnancy since others (using appropriate technology) could take this burden from her. Consequently, no doubt, women's economic and social liberty and equality would increase, and allow them to exercise bodily autonomy without negatively affecting the foetus (e.g., by taking recreational substances). Ectogenic technologies would benefit men by putting them on an equal footing with women with regard to family planning post-conception, and allow them to keep children unwanted by the mother.⁵⁶ Exercising bodily autonomy would no longer be so closely linked with the death of the foetus. As a result, potentially, ectogenesis puts both parents, and both sexes, on an equal playing field and presumably this is desirable on feminist grounds - Räsänen has also argued that ectogenesis would achieve this equality, although for very different reasons than those given here.⁵⁷

There is, however, a potential risk to women from such a prospective equality. Employers might start forcing or pressuring women to use artificial wombs so as not to lose employees to maternity leave, to which women (at least in some countries) have a greater legal entitlement than men. As a result, ectogenesis might as much free women from the burden of pregnancy, as prevent them from experiencing the unique joy that some associate with it. Clearly the ramifications of ectogenesis extend beyond the question of the permissibility of abortion.

Conclusions

The rise of artificial womb technologies will have a serious impact on those who support abortion. Those who defend abortion solely using Thomson's arguments, at least those considered here, will need to accept that the rise of ectogenic technology means an end to the permissibility of abortion procedures. As we have argued, Thomson herself rejects arguments for abortion based on reproductive autonomy as implied in her claim that it would be wrong to kill a child if the child can be detached alive. With the rise of ectogenesis, elective abortion becomes pure feticide based on Thomson's argument. Proponents of abortion who agree with the core of Thomson's argument might instead choose to turn to consequentialist arguments to justify abortion when ectogenesis becomes readily available and safe for the mother. Yet, as we have argued, there is large uncertainty about the societal consequences of ectogenesis for any such arguments to be compelling at this time.

Ectogenesis raises new hopes for those foetuses and mothers who might not survive the full gestational period, e.g., ectopic pregnancies⁵⁸ and situations when mothers require intense oncological interventions, but it also raises new questions for society. Those who will still hold that abortion is a right might need to reassert their reasons

⁵⁵ Kendal (2015).

⁵⁶ Cha, Wax-Thibodeaux (2019).

⁵⁷ Räsänen (2017).

⁵⁸ Pruski (2019a).

for it, governments will need to make their policy on child abandonment clear, and the limits of therapeutic experimentation will, surely, need to be reassessed.

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