

Overpopulation and Procreative Liberty

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ABSTRACT

A few decades ago, there was a lively debate on the problem of overpopulation. Various proposals to limit population growth and to control fertility were made and debated both in academia and in the public sphere. In the intervening decades, however, the idea of limiting population growth became taboo in policy discussions and was completely ignored in philosophy. More recently, there has been a small revival of anti-natalism in population policy and social philosophy. This is in part due to the growing recognition that the demographic transition might not be completed all around the world before overpopulation causes irreversible social, political, or environmental harm. Several proposals have been made to limit family size and lower fertility. However, all of these proposals are based on incentives only, and all are strictly voluntary: in their discussion, involuntary fertility control is considered coercive and therefore thought to necessarily involve a gross violation of procreative liberty and personal autonomy. The aim of this paper is to demonstrate that anti-natalist population policies need not involve the violation of procreative liberty and personal autonomy. To show this, I revive two radical proposals from the old debate. The first involves mandatory long-term contraception; the second involves the introduction of tradeable procreation entitlements. I show that contrary to what many people believe, these policies can be defended on the basis of broadly liberal principles. Not only do they not conflict with procreative liberty and personal autonomy, but they can actually increase liberty and promote autonomy.

KEYWORDS

Population growth; anti-natalism; involuntary fertility control; personal autonomy; liberalism

1. Introduction

It's been just over 40 years since Paul Herlich, John Holdren, and Anne Ehrlich published *Ecoscience*, their seminal textbook on environmental science (Ehrlich, Holdren, & Ehrlich, 1977). One of the main concerns of the authors was overpopulation and the strain put on ecological resources by the population explosion of the 20th century. Perhaps the most controversial parts of the book were its *Brave New World*-like proposals for population and fertility control.

These proposals—and the idea of limiting population growth in general—have become anathema in the intervening decades. No doubt this had much to do with

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the moral repugnance felt by many people about China's coercive one child policy, although few of them would have any idea how China could have coped with the 400 million extra people its population policy is credited with having prevented from coming into existence. Many people, including many experts, have also taken a Panglossian view on population growth, arguing that once the demographic transition is completed in most countries of the world, the problem will solve itself in a few decades.¹ And perhaps most importantly, the discussion has been stymied by the so-called 'Cairo consensus,' adopted at the International Conference on Population and Development in 1994, which specified universal primary education, reduction of infant, child, and maternal mortality, and access to reproductive and family planning services as the goals of population policy. The goals did not include limiting population growth.

Meanwhile, the focus of discussion in philosophy and environmental policy has shifted to the problem of climate change. Somewhat curiously, overpopulation and population growth have received scant attention in philosophical discussions of climate change and virtually none in climate change policy, despite the fact that overpopulation is arguably the most important factor behind climate change. (It is rarely acknowledged that the worst thing you can do to the climate is to have children.)² At the same time, the demographic transition has apparently slowed and even halted in some regions of the world, casting doubt on the Panglossian view of population growth (Guengant & May, 2013). Previous estimates of the plateau of human population growth have been revised upwards and placed later in time (Gerland et al., 2014; for a contrary view, see Bricker & Ibbitson, 2019). There is a growing understanding that we may have already reached the point where overpopulation becomes a massive problem that can lead to catastrophe unless addressed urgently on the global level.

The aim of this paper is to revisit some of the debate on overpopulation that we've never seriously had. It focuses on two particularly controversial proposals made originally by the authors of *Ecoscience*: mandatory long-term contraception and tradeable but limited procreation entitlements. I argue that contrary to what many people may believe, these policies can be defended on the basis of broadly liberal principles—in particular, procreative liberty, libertarian paternalism, and procreative beneficence.

I do not make the claim that these or similar policies are politically feasible at this point in time. It is nevertheless worth exploring their moral justification. They have surprising lessons for liberal theory, bioethics, and even feminism. And one day humanity may have no choice but to implement them.

2. Procreative Liberty and Mandatory Long-Term Contraception

Each day, the global population increases by over 200,000 people. Meanwhile, about 40% of all pregnancies are unintended, although only about 40% of these end in live births. Moreover, the number of unintended pregnancies worldwide has slightly increased in the last decade, after substantially declining in the previous one (Sedgh, Singh, & Hussain, 2014). If family planning services were universally available, they could potentially have a major effect on limiting population growth. However, efforts to extend family planning services have stalled in recent years, and there is even some evidence that existing programs are not as effective as previously thought (Bauman, 1997).

Involuntary fertility control continues to be taboo. Such measures are coercive and therefore thought to be, necessarily, a violation of freedom and autonomy. Specifically, they are thought to violate *procreative liberty*: the freedom to decide on matters related to reproduction, including whether or not to have children, how many children to have, when to have them, with whom to have them, and so on—in short, the freedom to control one's reproductive capacity. It is generally accepted that procreative liberty involves a basic negative right, with which others, including the state, may interfere only for very weighty reasons. One thing this means is that in any conflict the burden of proof always falls on those who advocate limiting the right, and therefore there is a strong presumption in favor of respecting reproductive choices (Robertson, 1994).

Recently, however, some philosophers have argued that procreative liberty may be limited in some circumstances. For example, Christine Overall and Sarah Conly both argue that people ought to have no more than one child. To justify their view, both of them appeal to the environmental harm (and hence the harm to others) of having more children. But while Overall rejects coercion or any other social policy that involves compulsion—arguing that the obligation not to have more than one child is a matter of individual moral responsibility—Conly supports at least some coercive measures, although with the exception of fines, she is curiously reluctant to discuss them in any detail (Overall, 2012; Conly, 2016; see also McKibben, 1999).

Those who support limiting family size face a dilemma. On the one hand, if, like Overall, they are reluctant to endorse coercive policies, the best they can appeal to are people's sense of moral responsibility, altruism, and good will. On the other hand, if, like Conly, they do not reject compulsion out of hand, they need to propose measures that can be both effective and minimally intrusive. They need to strike the right balance between the policy aim of limiting population growth and respect for procreative liberty. It's difficult to propose policies that are both effective and can be supported on a broadly liberal basis. Hence the frequent appeals to relatively innocuous policies like the availability of contraception, education, tax incentives, or fines.

But if overpopulation is as disastrous as it seems, the presumption in favor of respecting procreative liberty may be rebutted. This is all the more so if appeals to moral responsibility, altruism, good will, or minimally intrusive policies like the provision of free contraceptives and reproductive services, education, tax incentives or fines would not suffice to solve the problem within the necessary time frame. For this discussion, I am going to assume that this is indeed the case. What should be done then?

As it happens, the authors of *Ecoscience* had some colorful proposals decades ago, although these are, peculiarly, missing from the current debate. One of the most striking of these proposals is the introduction of mandatory long-term contraception. They imagined a capsule which could be implanted under the skin and which would release hormones to prevent pregnancy in women and to cause sperm cells to be infertile in men. Everyone would be required to have the capsule implanted at the onset of puberty, although the capsules could be removed when one would like to become a parent. Otherwise, they would last for decades and provide a safe and reliable method of birth control without any side effects.

This idea isn't as far-fetched as it seems. In fact, similar contraceptives already exist and have been available for decades. Levonorgestrel and etonogestrel contraceptive implants have been sold under the brand names of Norplant, Nexplanon and Implanon.

They are often considered to be the most effective form of birth control, although the existing variants last only for a few years and can be used only by women. But it's not beyond the realm of short-term possibility to develop implants that last for decades, or that can also be used by men. So let's suppose they exist, they are safe and reliable, cheap to mass produce, and have no side effects.

Thus, the idea is to make the use of such long-term contraceptive implants mandatory.

At first, it might seem that this would be a massive violation of procreative liberty. But is it? We already have vaccination and other public health programs that are mandatory—every child is required to undergo immunization (with exceptions for the rare cases when vaccination is contraindicated). Most people do not consider immunization programs coercive, even though they are. Rather, they consider them to be a public health benefit to themselves (or their children), and perhaps doing their bit in the effort to eradicate disease as well. Some people even consider getting vaccinated against infectious diseases a moral obligation. Immunization is coercive but most people consent to the coercion, or at least do not seem to mind it.

Mandatory contraceptive implants could be considered the same way. Crucially, they are reversible: no one is prevented from becoming a parent. What they would do, however, is change the 'natural default' of human reproduction. Getting pregnant would entirely be a matter of choice, rather than chance. Unintended pregnancies would become a rare phenomenon. Women would gain complete control of their reproductive capacity, and do it without making an effort. If anything, the implants would protect and expand procreative liberty.

Consider this: over 56 million abortions are carried out each year in the world, an increase of almost 6 million from the early 1990s (Sedgh et al., 2016). Although abortion rates have decreased in the developed world, they have remained steady or decreased only slightly in developing countries (the overall increase is due to population growth). Mandatory contraceptive implants could all but eliminate abortion, substantially increase women's health and well-being, free up medical resources for other uses, and remove the moral controversy. Couples would be able to control the size of their family and the timing of births.

I claim therefore that mandatory long-term contraceptive implants do not conflict with procreative liberty. In fact, they promote the moral values that procreative liberty protects (Buchanan, Brock, Daniels, & Wikler, 2000). One such value is personal autonomy: people should be free to make significant decisions in their life, on the basis of their own values, life plans, and their conception of the good life. Procreation is among the most important choices that people make, and they have a fundamental interest in being able to make these choices without interference from others. Long-term contraception does not violate reproductive autonomy; on the contrary, by changing the natural default to infertility from fertility and letting people decide when they are fertile, it ensures that reproductive choices are made in accordance with people's own values and preferences.

Procreative liberty also protects well-being. In many people's life, raising a family is one of the most important sources of well-being. However, childrearing can also affect well-being adversely and become a source of significant hardship, especially when you become a parent when you do not want to, or end up with having more children than

you have planned. By changing the natural default, the proposal is likely to promote people's well-being.

It would also significantly improve, in many countries, the circumstances of women, and hence promote equality of welfare and equality of opportunity between the sexes. Women often have to take on most of the burdens of childrearing, and presently in many countries they have little control over their own fertility. Changing the natural default would empower them to make reproductive choices on the basis of their own values and preferences.

Furthermore, we know from the experience of developed countries that as people become more affluent, they tend to have smaller families. In developed countries, people forgo having a large family due to its costs, impact on opportunities, and most importantly because most children survive to adulthood—in the presence of good healthcare systems and social insurance, you don't need a large family to ensure that at least some of your children survive and can look after you in your old age. Having smaller families also enables people to get more educated, embark on a career, and pursue other plans. Very few people would deny that these are positive developments or hold that the transition away from high birth rates and high child mortality is to be regretted (although people reasonably worry in some countries about fertility falling below the replacement rate). Therefore, the proposal is in line with the preferences of most people. To that extent, it might have some democratic legitimacy.

If the idea gained acceptance, a policy of mandatory long-term contraception would be easier to implement even in developing countries than current family planning programs. For one thing, the contraceptive would need to be administered only once, and could be done through campaigns similar to immunization programs. Its infrastructure requirements would be less extensive and existing infrastructure could be used for monitoring and serving those who have made the choice to procreate. In short, mandatory long-term contraceptive implants are likely to be much more cost-effective than any alternative.

The proposal can also be justified on libertarian paternalistic grounds. Libertarian paternalism is a collection of policy proposals aiming at promoting people's well-being (the paternalism part) while at the same time respecting their freedom of choice (the libertarian part). Libertarian paternalists believe that in certain conditions people are disposed to make choices that end up being harmful for them. However, by changing the circumstances of choice in ways that do not restrict liberty, people can be induced to make choices that benefit them (Thaler & Sunstein, 2008). One standard example is a school or workplace cafeteria: if the salad bar is placed before the counter for desserts, customers end up making healthier food choices. There is no coercion involved. Libertarian paternalist proposals often focus on the default option. If the default contribution to a retirement savings plan is zero, few people start contributing early enough; if the default option for voluntary organ donation is 'opt out' rather than 'opt in,' donation rates are higher (Shepherd, O'Carroll, & Ferguson, 2014).

Mandatory long-term contraception also works by setting the default. When infertility is the default option, people's intentions are aligned with their behavior, since pregnancy becomes a conscious choice. Yet it might be thought that because procreative choices are much more momentous than retirement saving or organ donation, it is unjustified to interfere with people in this case. But this objection gets things the wrong

way around: it is precisely because reproduction can have a profound impact on well-being, opportunities, and equality between the sexes, that it is justified to help people make the reproductive choices that would be best for them. Family planning programs around the world try to do just this.

Still, there may be a lingering worry that there is something ‘unnatural’ about forcing people to change the reproductive default. After all, fertility is normally the default option—that is how nature made us. But a moment’s reflection shows this worry is misplaced. In places where they have access to it, the overwhelming majority of people use contraception and prefer to be in control of their reproductive capacity. They do not care about what is ‘natural,’ just as they do not refuse to get immunized against naturally occurring infectious disease. As so often, the appeal to what is natural rests on a fallacy. That something is natural does not make it valuable or worth preserving.

Nevertheless, some people would object to the proposal for other reasons. There are those who reject all forms of contraception. Some of them may recognize that in the absence of easily available contraception, overpopulation will lead to a global catastrophe. They must thus give up their opposition, and perhaps embrace this proposal as the most effective means to avoid that catastrophe. Or, if they are unwilling to give up their opposition to all forms of contraception even at the risk of global catastrophe, they need to present an alternative set of policies that is able to solve the problem at no greater human cost.

Others might worry that even if procreative liberty is not unlimited, the proposal may conflict with other rights, including the right to bodily integrity, privacy, or the right to refuse medical treatment.³ However, these rights are not unlimited either: they must be balanced with the right of others not to be harmed. This is why, for instance, they may be outweighed in the case of immunization or in public health emergencies. Since overpopulation is a great harm, it may justify some restrictions on these rights. In fact, my arguments for limiting procreative liberty could be reformulated for limiting these rights as well.

Finally, some people might object because the proposal looks similar to the eugenic policies of the 19th and 20th centuries, which sometimes included the forced sterilization of those who were thought to be inferior (Paul, 1995). But there are crucial differences between eugenics and the present proposal. For one thing, mandatory long-term contraception does not involve sterilization. It also applies to everyone equally, and does not treat any group as inferior. Moreover, eugenic movements were primarily interested in the composition of the population. The proposal to change the reproductive default, however, concerns the size of the population only. It has no eugenic aims.

3. Tradeable Procreation Entitlements

Suppose that we succeed in changing the natural default of reproduction: most people have long-term contraceptive implants, abortion mostly becomes a thing of the past, couples have children only when they want to by having their implants removed. (A straightforward medical procedure, offered for free by primary care providers.) After some initial cultural adjustment, mandatory long-term contraception quickly becomes an unremarkable part of modern life, voluntarily accepted by most people, with little need for coercion. It becomes as mundane as immunization or dental braces.

Nevertheless, suppose it does not achieve a sufficient reduction in population growth. There are too many people who continue to have large families. Despite education campaigns and changing social norms, preferences adapt too slowly for reaching a population size that is sustainable at an adequate level of quality of life. Thus, mandatory long-term contraception needs to be augmented by other policies. What might they be?

Here again, it's natural to reach for familiar command-and-control approaches like quotas, taxes or fines. Governments could set and enforce limits on family size. The enforcement does not have to take the horrific forms that China's one child policy took. Couples with more than the number of children they are allowed to have would have to pay a one-time or recurrent tax or fine, or they could be financially penalized in some other way. As I mentioned above, Sarah Conly seems to support such policies.

But command-and-control policies are unattractive in this context. First, they do not penalize only the parents who chose to have more children than their allotment. They are also likely to penalize the extra child who is born, as well as his or her older siblings. Any policy to discourage large families should try to avoid, as much as possible, penalizing children who are born, whether they are under or over the assigned number. They bear no responsibility for the circumstances of their birth. Second, penalizing families for their reproductive choices sends the wrong kind of message—including the message to the children over the quota that they are considered a burden on society. Fines are a form of punishment for an act that has a bad result. In this case, the 'result' is a child, and it is inappropriate to treat a person as the result of wrongdoing. Philosophers who argue for taxes and fines in population policy seem to forget these points.

Finally, command-and-control policies centralize decisions in the hand of governments. They force the same quota—one child per family, say—on all couples, regardless of their different values and preferences. They ignore the importance of procreative liberty in people's lives. It's difficult to see how they could be defended on a broadly liberal basis.

Suppose the government can regulate the number of times any person can apply for the removal of the long-term contraceptive implant. Should it set a uniform quota for all people? Surely not. It would be far better to decentralize decisions about the number of children one can have as long as the overall number of children is within the limits necessary for slowing or reversing population growth.

As a solution, the Ehrlichs and Holdren proposed the introduction of *tradeable procreation entitlements*. Their proposal was based upon some remarks made earlier by the economist Kenneth Boulding.⁴ The idea is that every woman would be issued licenses to have children, which they could surrender to the government when they have a child or sell on a market to those who want children but do not have enough licenses—or entitlements—on their own. The overall number of entitlements would be set by the government to ensure that the size of the population remains manageable. No individual would be prohibited from having as many children as they want, as long as they own the requisite number of entitlements.

Here's how this might work. Suppose that each person is issued an entitlement for $\frac{3}{4}$ of a child. No person could have a child on her own, but a couple would be entitled, as a start, to have one child, since the sum of their entitlements is 1.5. (So far, this is the same outcome that Overall and Conly argue for: no more than one child per family.) But

then some couples might decide to have another child, in which case they would have to buy another $\frac{1}{2}$'s worth of entitlement on an open market. If they want a third child, they would have to buy another full entitlement for a child. And so on. Of course, they might stop after having one child and sell their remaining $\frac{1}{2}$ entitlement to other couples. Or decide to remain childless, and sell all of their $\frac{3}{2}$ entitlement. There is no person who is prohibited from having a family, or as many children as they want. But everyone has to obtain the necessary amount of entitlements.⁵

The point is that it is unnecessary for governments to set limits on family size. Population targets can be achieved by setting the overall number of entitlements, and allow individuals and couples to trade freely in pursuit of their own reproductive preferences. The price of the entitlements will reflect people's preferences for larger families. As the trends in the change in population size become apparent, governments can adjust to them by issuing fewer (or more) entitlements or by buying back some of the them. Since (it is assumed) everyone has long-term contraceptive implants, enforcement is effective and minimally intrusive: your implant can be removed only if you (together with your partner) have sufficient entitlement for having a child. Nonetheless, if compliance is not perfect—no regulatory regime ever is—governments may buy up some of the entitlements on the market to offset the additional population growth.

Such a regulatory regime is the most defensible from a liberal point of view. Given the problem of overpopulation, it involves the least violation of procreative liberty, and promotes best the values of reproductive autonomy, well-being, and equality between the sexes. It does reject the view that procreative liberty has no limits, so that people may have as many children as they want, but that view is difficult to defend in any case. Even if everyone has the right to have a family, no one has the right to an unlimited number of children if thereby others are harmed or their rights are violated, as it is the case in an overpopulated world.⁶

The main objection to tradeable procreation entitlements concerns equality. If entitlements to second (and further) children must be bought on the market, it is the better off who will be able to have larger families. Worse off families will not be able to afford additional children, especially if the preference for a second child is widespread. Demand from the better off will drive up the price of entitlements. Poor people may even have to sell their initial entitlements and remain childless. Intuitively, the system would exacerbate social inequalities.

But it is difficult to know how pressing this problem would be in practice. Recall that as people become more affluent, they begin to have smaller families—a trend that characterizes all developed and many developing countries. In some countries, average fertility is already below replacement level. Thus, maybe all that would happen is that the transition to smaller families is accelerated. The effect may be neutral with respect to the disparities between the better off and the worse off. Moreover, economic modeling of tradeable procreation entitlement markets found that under some circumstances income inequalities between the better off and the worse off can be expected to decrease, because resources are redistributed from the better off to the worse off (de la Croix & Gosseries, 2009).

Or perhaps there would be some negative impact on worse off families. Perhaps they would become better off in terms of resources, but not in terms of welfare. But the

solution should then be to address the unintended side effects of the procreation entitlement market directly. Governments may redistribute resources from the better off to the worse off to enable them to participate on the market. They might issue vouchers to the worse off to buy entitlements on the market (or the government may buy them directly on their behalf). If people are concerned with fairness, entitlements to additional children may be allocated through a lottery among those who wish to have larger families.⁷

Finally, one could just bite the bullet. It might be argued that it is ultimately no bad thing if relatively more children are born to better off parents than to worse off parents. Other things being equal, they are likely to have a better start at life that way. As Herman Daly puts it: 'From the point of view of the children, there is something to be said for increasing the probability that they will be born richer rather than poorer' (Daly, 1993, p. 336).

To be sure, taken literally, this is nonsensical: no child could have been born in a different family, for she would not be the same person then. There is no probability that you could have been born to different parents, since the person who would have been born then would not be you. So, strictly speaking, there is no such probability to be increased or decreased. And, of course, children who have not been born yet have no point of view, since they do not exist.

But perhaps it's possible to make sense of Daly's idea. Many people accept the *principle of procreative beneficence*. According to this principle, parents should select the child, of all the possible children they could have, who can be expected to have the best life (or at least as good a life as the others) (Savulescu, 2001). For instance, women are advised to postpone getting pregnant if they have been exposed to the rubella virus, as it can cause birth defects. One way to justify this advice is to say that it is worse if a child with birth defects is born rather than a healthy child, even though it is not worse for the sick child who would have been born if the pregnancy is not postponed, since she never exists. Philosophers will recognize this as an example of the *non-identity problem* (Parfit, 1984).

The principle of procreative beneficence is an *impersonal* moral principle. It assumes that it is meaningful to evaluate outcomes as better or worse even if there is no person *for whom* those outcomes are better or worse. It is worse if a child is born with birth defects than if a child is born without birth defects (and everything else is equal), even though it is not worse for the child with birth defects to be born, since otherwise she would not exist; and it is not better for her not to be born, since, again, she would not exist then. Even though procreative beneficence is a plausible—and widely accepted principle, it requires that you accept that there are impersonal harms and benefits.

Extending the principle of procreative beneficence to the population case is straightforward. If children are born to worse off parents, then they get a worse start in life than children who are born to better off parents. This is certainly not true in all cases, but it might be true for the most part. (Children born in affluent countries now get a massively better start in life than children born in impoverished parts of the world.) If social policy can affect the kind of start children get in life, then, arguably, it should do so; if it can make such an impact impersonally, then, arguably, it should do so too. Once it is recognized that the principle of procreative beneficence can be extended to the

population case, it may be able to justify social inequalities due to the introduction of a market for procreative entitlements.

It is important to note the limits of this argument. Its conclusion is not that only the rich should be allowed to have children. After all, the whole point of the proposal is to let people exercise their procreative liberty under conditions when population growth must be stopped. Rather, the conclusion is that tradeable procreation entitlements might help ensure that the people who most value large families are the ones who tend to have them, and that children have the best start in life. A market for procreation entitlements can be justified by the pressures of overpopulation, and its social consequences can be justified by the principle of procreative beneficence.

Can the principle of procreative beneficence be defended on a broadly liberal basis? After all, it was not originally formulated as a principle of political morality. However, as far as I can see, there is no reason to reject it from a liberal perspective. It does not contradict any fundamental right. It restricts procreative liberty in a minor way at most, and does so for good reasons. It can contribute to the justification of a liberal population policy.

Finally, to forestall misunderstanding, it is worth emphasizing that tradeable procreation entitlements do not create property rights in children. Clearly, it is inappropriate to treat people as commodities to be bought and sold on markets. But the proposal does nothing of the sort. True, it regulates who may become a parent, but it does not follow that whoever has that right gains property rights in children—just as when you buy a ticket to enter a national park, you do not thereby become the owner of any part of the park. Procreation entitlements do not entail the old-fashioned (and morally wrong) idea that parents own their children.

4. Conclusion

This paper started out from the idea that if unchecked, overpopulation can lead to a global catastrophe. It can cause immense suffering as a driver of climate change and as a cause of wars, famines, and mass displacement of people. It might, ultimately, destroy liberal democracies. But the idea of limiting population growth has become a taboo; any proposal to this effect is met with ridicule at best and ostracization at worst. Yet, a few decades ago, there was an open and lively discussion of the problem of overpopulation. My aim has been to revive some of that debate by evaluating two of its most striking proposals from a liberal perspective.

There is no doubt many people still find these proposals repugnant, even if they do so at their own peril. As Kenneth Boulding said of his proposal: 'The sheer unfamiliarity of a scheme of this kind makes it seem absurd at the moment. The fact that it seems absurd, however, is merely a reflection of the total unwillingness of mankind to face up to what is perhaps its most serious long-run problem' (Boulding, 1964, p. 136). The authors of *Ecoscience* end on a more optimistic note: 'If effective action is taken promptly against population growth, perhaps the need for the more extreme involuntary or repressive measures can be averted in most countries' (Ehrlich et al., 1977, p. 789).⁸

Notes

1. Perhaps the best-known representative of this view is Hans Rosling. See, for instance, the documentary film *Don't Panic: The Truth about Population Growth* (Rosling, 2013), available at <https://www.gapminder.org/videos/dont-panic-the-facts-about-population/or> <https://youtu.be/FACK2knC08E>.
2. According to the Intergovernmental Panel on Climate Change (IPCC), between 2000 and 2010, 'due to changes in technology, changes in the economic structure and the mix of energy sources as well as changes in other inputs such as capital and labour, the energy intensity of economic output has steadily declined worldwide. This decline has had an offsetting effect on global CO₂ emissions that is nearly of the same magnitude as growth in population.' Another way to say this, of course, is that *all* the gains in energy efficiency in that decade were more than wiped out by population growth. See IPCC (2014, p. 47–48).
3. I thank an anonymous reviewer for raising this objection.
4. See (Ehrlich et al., 1977, p. 787; Boulding, 1964, p. 135–136).
5. This particular version is suggested in the sci-fi novel *Green Mars*, by Kim Stanley Robinson (HarperCollins, 1992).
6. On this, see also Conly (2005). A detailed discussion of Boulding's proposal is provided by Heer (1975).
7. On the fairness of lotteries, see Broome (1999).
8. I would like to thank audiences at the Stockholm Centre for Healthcare Ethics (CHE) at the Karolinska Institute in Stockholm and at the 'Antinatalism under Fire' workshop at Charles University in Prague.

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