Sonia Suter\textsuperscript{1} provides a rigorous legal and ethical analysis of \textit{in vitro} gametogenesis (IVG), that is, the ability to derive new human gametes in the lab. What the article does not address is the commercial and political context in which these developments are likely to occur.

Suter’s uses the notion of ‘relational autonomy’ to provide a bioethical framework for critiquing the developments. While bioethics discusses the individual’s ability to reach his or her own reproductive decisions, Suter appropriately argues that ‘our “moral identity” is shaped by our “membership in communities such as those of the family, the neighborhood, the city and the tribe”’.\textsuperscript{2} She accordingly maintains that the propriety of the new developments and suitable regulation of them depends on their relational context.

Suter admirably develops this situational notion of autonomy with attention to the personal relationships that give meaning to the decisions, but she does not devote comparable attention to the political and commercial contexts likely to inform the decisions in similar ways. The omission is understandable: in a short piece, Suter has chosen to focus on the most immediate and general implications of the new technology. This commentary will add to the analysis she provides by describing the global networks that will influence development of IVG and arguing that it may change the contexts—and therefore the social and ethical meanings—of IVG.

This commentary will, first, review the commercial, legal, and political landscape that currently exists for reproductive innovation. Second, it will describe how IVG fits within

\textsuperscript{1} Sonia M. Suter, \textit{In Vitro Gametogenesis: Just Another Way to Have a Baby?} 3 J. LAW BIOSCI. 87 (2016).

\textsuperscript{2} Id. at 97, citing Alasdair MacIntyre, \textit{After Virtue: A Study in Moral Theory} 205 (1981).
that landscape. Third, it will explain the implications for the relational autonomy Suter describes.

I. THE ASSISTED REPRODUCTION LANDSCAPE

Innovations in assisted reproduction increasingly take place through globalized fertility networks. These networks combine public and private funding to pioneer new techniques and then commercialize advances through clinics that span the globe. Commercial actors are accordingly able to circumvent regulatory restrictions by locating controversial techniques in countries willing to look the other way, and leverage differences in market demand by attracting high paying clients to developed countries while locating lower cost clinics in the developing world. These international networks will provide the infrastructure for IVG, and that infrastructure will frame the relational context for use of the new technology.

The development of these international networks begins with efforts to circumvent restrictions in individual countries. In the United States, for example, innovation in assisted reproduction takes place at the intersection of two seemingly irreconcilable forces. The first is the lack of an American top-down regulatory infrastructure comparable to that in other developed countries. The second is religious reservations about in vitro fertilization (IVF) and other fertility procedures that block public support for fertility research, testing, and guidance similar to that in other areas of medicine.

As a result, many of the most exciting fertility innovations take place abroad. The British Parliament, for example, approved mitochondrial replacement in 2015, allowing the creation of embryos with DNA from three adults to assist carriers of mitochondrial disease in producing healthy offspring. Although much of the initial research took place in the United States, FDA restrictions brought its use in humans to a halt in the late nineties. Only with parliamentary approval in the UK has the FDA indicated a willingness to reconsider the more advanced procedures now available and, even then, Congress still block them.

This means that the initial development of IVG is unlikely to take place within the United States. OvaScience, a publicly traded Boston company that is already working

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3 See June Carbone & Jody Lynee Madeira, *Buyers in the Baby Market: Toward a Transparent Consumerism*, 91 WASH. L. REV. 101 (2016).
4 See June Carbone & Naomi Cahn, *Embryo Fundamentalism*, 18 WM. & MARY BILL RTS. J. 1015, 1016 (2010).
5 James Gallagher, *UK Approves Three-Person Babies*, BBC NEWS (Feb. 24, 2015), http://www.bbc.com/news/health-31594856 (last accessed July 8, 2016).
6 See June Carbone, *Toward a More Communitarian Future? Fukuyama as the Fundamentalist Secular Humanist*, 101 MICH. L. REV. 1906, 1920–23 (2003); Judith Daar, *Multi-Party Parenting in Genetics and Law: A View from Succession*, 49 FAM. L.Q. 71, 74 (2015) (observing that after the FDA said in 2001 that any further use of cytoplasmic injection would require an Investigational New Drug application, the practice ceased throughout the United States).
7 See Dina F. Maron, *Making Babies with 3 Genetic Parents Gets FDA Hearing*, SCI. AM. (Feb. 25, 2014), http://www.scientificamerican.com/article/making-babies-with-3-genetic-parents-gets-fda-hearing/ (last accessed July 8, 2016); The National Academies of Sciences, Engineering and Medicine, *Mitochondrial Replacement Techniques: Ethical, Social, and Policy Considerations* (2016), http://iom.nationalacademies.org/reports/2016/Mitochondrial-Replacement-Techniques (last accessed July 8, 2016) (recommending authorization of clinical investigations in the United States); Joel Achenbach, *Ethicists Approve ‘3 Parent’ Embryos to Stop Diseases, but Congressional Ban Remains*, WASHINGTON POST, Feb. 3, 2016, https://www.washingtonpost.com/news/speaking-of-science/wp/2016/02/03/to-prevent-disease-ethicists-approve-creation-of-embryos-with-three-genetic-parents/ (last accessed July 8, 2016) (describing legal obstacles).
on commercialization of preliminary techniques, has felt compelled to start abroad.\(^8\) OvaScience targets improvements in egg quality, using a woman’s immature eggs to create new gametes and boost existing ones.\(^9\) Given the FDA’s insistence that such procedures be subject to the standards for drug development, which require expensive preliminary trials, OvaScience chose a Toronto clinic to give birth to the first child using its new techniques, and has tied its fortunes to expansion in Canada, the Middle East, and Japan.\(^10\)

Once a technique such as IVG reaches fruition, however, it can be made available through a global fertility network such as the one that OvaScience is trying to create. Indeed, existing IVF clinics increasingly have an international reach, with some American clinics reporting that over half of their patients come from abroad.\(^11\) The Fertility Institutes, for example, is an American operation, located in New York and Los Angeles. Yet, its webpage indicates that it also has offices in Mexico and India, and a network of over 240 associated American and international fertility centers.\(^12\) IVG is likely to develop in the context of these networks.\(^13\)

II. THE COMMERCIAL LANDSCAPE FOR IVG

Basic research on IVG is already occurring across the globe. In September 2015, a French biotech start-up, acting together with the French National Center for Scientific Research, announced that it had produced human sperm outside the body.\(^14\) In 2014, researchers at Cambridge University in the UK and the Weitzmann Institute in Israel reported that they had created human egg and sperm cells in the lab, by coaxing adult stem cells to produce early stage egg and sperm cells.\(^15\) And OvaScience is exploring

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\(^8\) Taryn Hillin, *Why an Incredible New Method to Extend Fertility Is off Limits in the U.S.*, FUSION (Aug. 4, 2015, 5:54 AM), http://fusion.net/story/164309/new-fertility-treatment-ovascience-augment-ivf-eggs/ (last accessed July 8, 2016).

\(^9\) See Dori C. Woods & Jonathan L. Tilly, *The Next (Re)Generation of Ovarian Biology and Fertility in Women: Is Current Science Tomorrow’s Practice?*, 98 FERTIL. & STERIL. 3, 6–7 (2012) (describing the potential for using egg stem cells to develop new eggs).

\(^10\) See Alison Motluk, *IVF Booster Offered in Canada But Not in US*, CTR. GENET. & SOC’Y (Jan. 14, 2015), http://www.geneticsandsociety.org/article.php?id=8304 (last accessed July 8, 2016).

\(^11\) See eg Global IVF, *U.S. Surrogacy for Gay Intended Parents*, http://globalivf.com/2014/01/06/surrogacy-for-gay/ (last accessed July 8, 2016); Tamar Lewin, *Coming to U.S. for Baby, and Womb to Carry It: Foreign Couples Heading to American for Surrogate Pregnanacies*, NEW YORK TIMES (July 5, 2014), http://www.nytimes.com/2014/07/06/us/foreign-couples-heading-to-america-for-surrogate-pregnancies.html (last accessed July 8, 2016).

\(^12\) Fertility Institutes, http://www.fertility-docs.com/about-us/clinics-and-staff.php (last accessed July 8, 2016); International Programs, http://www.fertility-docs.com/programs-and-services/international-programs.php (last accessed July 8, 2016).

\(^13\) See eg I. Glenn Cohen, *Circumvention Tourism*, 97 CORNELL L. REV. 1309, 1323 (2012).

\(^14\) Jonathan O’Callaghan, *First Lab-Grown Human Sperm Technique Revealed by Scientists*, IFL SCI. (Sept. 21, 2015), http://www.iflscience.com/health-and-medicine/human-sperm-created-lab-first-time-scientists-claim (last accessed July 8, 2016).

\(^15\) Maya Yarowsky, *Biological Breakthrough: Researchers Succeed In Creating Human Egg And Sperm Cells In Lab*, NoCamels (Feb. 16, 2015), http://nocamels.com/2015/02/human-sperm-and-ova-made-in-lab/ (last accessed July 8, 2016).
the use of egg precursor cells, which exist in a woman’s ovaries, to produce new ova.\textsuperscript{16} These developments offer the potential for creating potentially unlimited new gametes.

Ethical qualms about use of these procedures stem less from the nature of the techniques (although some object to all medical interventions in human reproduction, including IVF) than about how they might be used.\textsuperscript{17} These tensions arise from the fact that human reproduction is not just about the means of reproduction; instead care for the resulting children is the product of a social contract. Institutions like marriage have long served to marshal community resources to children through the commitment of not only the two parents, but also their extended families. The continuing preference for boys over girls in some parts of the world similarly reflects the relationship between male lines of descent and family obligations. These understandings, and the laws and norms that underlie them, vary around the world. A primary effect of international fertility networks is to change the relationship between the communities who use assisted reproductive technologies and the communities who address the needs of the resulting children. These networks affect Suter’s relational analysis.

A. Production of Children Genetically Related to Two Same-Sex Parents

Same-sex couples provide the most immediate example. IVG creates the possibility that a woman’s stem cells can be used to produce sperm or a man’s stem cells to produce eggs, allowing a same-sex couple to produce offspring genetically related to the two intended parents.

Suter rejects objections to biological reproduction by same-sex couples as either ‘unnatural’ or inappropriate. Instead, she observes that the development of same-sex parenting has placed greater emphasis on social rather than biological ties and use of IVG threatens to undermine these cultural values.\textsuperscript{18} She nonetheless concludes that same-sex couples should enjoy the same opportunities as different-sex couples to create biological offspring, and that the protection for socially constructed relationships comes from ensuring that ‘the law enforces the stability, legitimacy, and viability of socially constructed families’.\textsuperscript{19}

Yet, the availability of IVG, particularly when supplied through global networks, may make it more difficult to do so. First, given the expense of IVG, elites are more likely than non-elites to be able to create biologically related same-sex families. Elites are also likely to have more influence than non-elites on the construction of the law that addresses family legitimacy and stability, and they may become less sympathetic to—or simply less aware of—the needs of other families. Second, fertility tourism may separate the groups using IVG from the communities that regulate their families. The ability of same-sex couples to go abroad may defuse the pressure for more thoroughgoing reforms in the home country. Alternatively, if the country where the treatments take place prizes social ties, that country may not be aware that foreign visitors are using IVG in ways that strengthen the importance of biological ties in other countries.

\textsuperscript{16} See Dori C. Woods & Jonathan L. Tilly, The Next (Re)Generation of Ovarian Biology and Fertility in Women: Is Current Science Tomorrow’s Practice?, 98 FERTIL. & STERIL. 3, 6–7 (2012) (describing the potential for taking egg stem cells and using them to develop new mature eggs).

\textsuperscript{17} For a fuller treatment of the implications and the controversies surrounding IVG, see HENRY T. GREELY, THE END OF SEX AND THE FUTURE OF HUMAN REPRODUCTION (2016).

\textsuperscript{18} Suter, supra note 1, at 94, 95.

\textsuperscript{19} Id. at 95.
In short, IVG is likely to influence understandings of what it means to be a family. Moreover, if, in the long run, same-sex and different-sex couples become able to form biologically linked families in similar ways, the values that govern both groups of families will converge. Whether that results in more or less emphasis on biology will be less important than the role of these families in connecting societal resources to succeeding generations. While Suter’s relational analysis may provide grounds to criticize the laws that result, she provides no foundation for objecting either to IVG for same-sex couples or to greater emphasis on biologically defined families—if such a move results from the considered values of the community itself. The trick will be determining what constitutes ‘community’ in this new era.

B. Production of Single Parent or Multi-Parent Families
The creation of children genetically related to only one parent or to more than two genetic forbears raises different relational issues, in large part because of the continuing social disapproval of such families.

The result may slow or even block the creation of what Suter calls ‘solo IVG’, that is, the creation of both eggs and sperm from a single individual. The problem is not the creation of the gametes per se, but the additional risks that come from the reduction in genetic diversity.20 Absent public demand or strong social support, researchers may find it difficult to raise the funds that make the innovations possible and safe. ‘Solo IVG’ may simply not occur.

If it does occur, it is also less likely to do so in the context of networks that provide support for the resulting children in part because those who use solo IVG are likely to differ from other single parents in important ways. First, access to solo IVF is likely to be expensive while existing single parent families are typically poor. Second, poor single parent families typically produce children as a result of unintended pregnancy while solo IVG cannot happen accidentally. Third, today’s single parent families typically reflect the lack of a working relationship between the parents, rather than the absence of a second parent. If something happens to the custodial parent, the other parent is often available to step in. The same would not be true for children who have only one biological parent.

As Suter observes, the relational context for solo IVG is much more like that of a single parent who uses an anonymous gamete donor,21 and Suter concludes that the lack of a second genetic parent, much like the use of anonymous donors, ‘potentially threatens the child’s relational autonomy interests by severing an important kind of relational connection that defines many of us’.22 This argument, which boils down to a claim that solo IVG may affect children’s interests because they will be different, however, is not fundamentally different from the arguments opposing lesbian, gay, bisexual or trans-gender (LGBT) childrearing or IVG use.

What does distinguish the two is the creation of an LGBT community that supports such childrearing efforts and that has succeeded in winning support from the broader society. Right now, the same is unlikely to be true for solo IVG. Most adults (and most societies) prefer to create two parent families who unite the shared interests of the two

20 Id. at 109.
21 Id. at 104.
22 Id. at 108, 109.
extended families in the child. Moreover, those who intentionally create a child with only one parent though deliberate use of anonymous donors (or solo IVG) differ from those who accidentally do so in ways may defeat a sense of shared interests. Socially supporting single parents, who may for a variety of reasons be raising a child without the support of a second parent, is a very different matter from supporting the right of those who wish to be sole genetic parents to devote considerable resources to a complicated and potentially risky medical procedure. Accordingly, the claim to the financial and scientific support for the development of solo IVG is questionable. If it does develop through global networks, its use may also be isolated to a relatively small number of individuals who have the resources not only to pay for IVG, but to insure care for the resulting child. In that case, the practice could survive because of its relative invisibility, but it is unlikely to enjoy broad support.

Multi-parent IVG that creates children through use of the genetic material of more than two adults (Suter calls this ‘multiplex reproduction’) stands in the middle of these other uses. Suter focuses on the question how many biological parents become ‘too many’, creating problems of coordination if all of them wish to be involved in the child’s life or lack of investment if none feel responsible for the child. Curiously, though, while Suter does discuss the literature on polyamorous relationships, she largely concludes that they are rare and not much of an issue in modern societies.

This overlooks the question of whether today’s polygamous societies might want to embrace multiplex parenting. In the developed world context, Suter sees the primary risk as the development of cults or other small groups who use multiplex procreation to create tightly bonded and insular groups. The more difficult issues would arise if an entire society (perhaps one led by tyrant) embraced the practice.

The larger question, though, is why develop the science in the first place? The potential safety issues are complex, and current demand is limited. While governments may find it difficult to ban desired procedures, professional groups may find it easier to discourage such practices at their inception.

C. Genetic Selection

Here, Suter largely states the obvious: once gamete production takes place in the lab, genetic screening could easily become routine and, at least for the elimination of serious diseases, desirable. The line, however, between preventing disease and selecting for advantageous traits is thin. Suter acknowledges that genetic selection may change parents’ attitudes toward their children, but it is not clear that these risks are fundamentally different from existing practices, such as intensive preschools or IQ testing, that may also produce and identify higher quality children.

III. CONCLUSION

Overall, I agree with Suter—the issue is not whether the technology is to be permitted, but the system we construct to deal with the consequences. The risks of global networks implementing IVG are similar to those involved with sex selection: international networks may allow new procedures to spread while remaining invisible both in the countries in which they are illegal (with fertility tourists coming home pregnant in ways that

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23 Id. at 112, 113.
escape scrutiny) and in the countries in which they are performed (which may have social values that make sex—or genetic—selection less troublesome).24 The challenge is to develop legal and social systems that make these practices visible and encourage shared norms addressing the consequences.

24 See Meredith L. Birdsall, An Exploration of ‘The ‘Wild West’ of Reproductive Technology’: Ethical and Feminist Perspectives on Sex-Selection Practices in the United States, 17 WM. & MARY J. WOMEN & L. 223, 226 (2010) (describing the increase in couples coming to the United States for sex-selection procedures).