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I. INTRODUCTION

Current jurisprudence under the Dormant Commerce Clause of the United States Constitution generally prohibits states from discriminating against, or treating differently, products solely based upon the jurisdiction in which the product was produced or manufactured.[2] Typically this means that states may not ban or levy higher taxes or fees on products originating from other states. This is true even if the discrimination does not occur at the state border itself, so long as the effect is to disproportionately burden interstate commerce. For example, without a compelling justification, a city may not make it unlawful to sell pasteurized milk that has not been processed and bottled within five miles of the city.[3] Even though other in-state milk producers are also harmed, because the effect is to exclude out-of-state milk producers, the city has nonetheless violated the Dormant Commerce Clause. As the Supreme Court said in just such a case, dealing with the city of Madison: "To permit Madison to adopt a regulation not essential for the protection of local health interests and placing a discriminatory burden on interstate commerce would invite a multiplication of preferential trade areas destructive of the very purpose of the Commerce Clause."[4] The principle at stake, according to the Court, was that "one state in its dealings with another may not place itself in a position of economic isolation."[5]

Indeed, the dangers of state economic isolation were expounded upon at some length in 1935 by the Supreme Court in *Baldwin v. G.A.F. Seelig Inc.*[6] In that case, the Court worried that "all that a state will have to do in times of stress and strain is to say that its farmers and merchants and workmen must be protected against competition from without, lest they go upon the poor relief lists or perish altogether. To give entrance to

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[2] *See* Dep't of Revenue v. Davis, 553 U.S. 328, 337–38 (2008) ("The modern law of what has come to be called the dormant Commerce Clause is driven by concern about economic protectionism—that is, regulatory measures designed to benefit in-state economic interests by burdening out-of-state competitors.") (citation and internal quotations omitted); *see also* Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070, 1089 (2013) (noting that "the Supreme Court has consistently recognized facial discrimination where a statute or regulation distinguished between in-state and out-of-state products and no nondiscriminatory reason for the distinction was shown").

[3] *See* Dean Milk Co. v. Madison, 340 U.S. 349, 356 (1951).

[4] *Id.*

[5] *Id.* (quoting Baldwin v. G.A.F. Seelig, Inc., 294 U.S. 511, 527 (1935), which deemed this principle the "overmastering requirement").

[6] *See* 294 U.S. at 523–27.

that excuse would be to invite a speedy end of our national solidarity."[7] By contrast, the Court noted, the Constitution was "framed upon the theory that the peoples of the several states must sink or swim together, and that in the long run prosperity and salvation are in union and not division."[8]

Interestingly, the Court expounds upon these constitutional justifications without citing the words of the Constitution itself. This is perhaps not surprising, given the fact that the Dormant Commerce Clause had not always been interpreted in such a strict fashion. Indeed, the "strong" version of the Dormant Commerce Clause—the one that treats the United States as one great free trade zone, with very few exceptions—was only developed during and after World War II, and was a departure from earlier interpretations that gave much wider latitude to state regulation. Of course, this post-World War II period was also a time when the entire world was focused on lowering barriers to trade in order to help prevent future conflicts, through mechanisms such as the General Agreement on Tariffs and Trade, which was originally negotiated in 1947.[9] In effect, a more robust Dormant Commerce Clause was one more song to free trade amid a rising chorus of similar singers.

The question now is whether that song still resonates: whether the policy rationales behind a robust national free trade zone remain paramount or whether new exigencies warrant another alteration of the doctrine. In particular, the question is whether climate change—and the existential threat it poses to many areas of life—warrants a policy that focuses more on resilience, and whether resilience can be best achieved, at least in some areas, with an approach that actually favors states being more isolated, and hence insulated, from climate shocks elsewhere.

This Paper seeks to develop a plausible line of argument—bolstered by data on food production and adverse climate events—that states do have some latitude under the current doctrine to become more resilient by fostering local agriculture, but that some clarification—perhaps even change—in the doctrine may be necessary in order to deal with the inevitable climate adversity to come. In essence, the argument boils down to the idea that greater crop diversity—both in terms of location and genetics—will become ever more urgent as the era of climate stability ends. While it might make sense to centralize crop production in areas that we *know* present favorable growing conditions, and to use fast-growing monocultures to maximize yield in those areas, this system becomes extremely vulnerable when the climate behaves in extreme or unpredictable ways—when a drought or flood or heat event targets the centralized growing region, or when a pest takes advantage of climate change to move into new areas where monocultures are preferentially vulnerable to it.

This Paper contends that a "softening" of the Dormant Commerce Clause—especially for rain-fed agriculture, which is particularly vulnerable to such climate stressors—can be a useful tool in encouraging diversity. Although there is considerable room for states to maneuver even under the current doctrine, the goal of such a move

[7] *Id.* at 523.
[8] *Id.*
[9] *See* Chad P. Bown & Douglas A. Irwin, *The GATT's Starting Point: Tariff Levels Circa 1947* 1 (Nat'l Bureau of Econ. Research, Working Paper No. 21782, 2015), for an illuminating discussion of average pre-GATT tariff levels.

would be to allow states to encourage more local production of food that would otherwise be priced out of the market. In economic terms, a softer Dormant Commerce Clause would mark a trade-off: allowing higher average food prices with some cushion against price spikes in the event of climate shocks, versus lower average prices with greater price-spike vulnerability. In financial terms, such a move would broaden the portfolio of crops, so that a crash in any given crop or region would not prove as disastrous. While a rigorous empirical analysis of this trade-off, taking into account international trade, is beyond the scope of this Paper, my hope is to at least frame and begin the necessary debate.

Part I of this Paper outlines modern agriculture's climate vulnerability in the wake of several decades of Green Revolution "success." This Part focuses on recent climate events such as the ongoing California drought, as well as projections of future crop losses due to drought, heat, flood, and pests, and the ways in which the modern agriculture system is increasingly vulnerable to such events due to geographic concentration and narrowing crop genetics. Part II then discusses the ways in which free trade regimes exacerbate these vulnerabilities in entirely expected ways. Part III analyzes the Dormant Commerce Clause as it has come to be interpreted, and shows what latitude states currently have to promote local agriculture and what a "softening" of the doctrine might look like in order to allow for greater climate resilience. Finally, Part IV describes how a subsidy scheme might work to encourage crop diversity and address the climate vulnerabilities described in earlier parts of the Paper.

II. MODERN AGRICULTURE'S CLIMATE VULNERABILITY

a. Declining Geographic Diversity

In many ways, modern agricultural systems are a tremendous success story—if success is measured solely by the amount of total food calories produced. From 1948 to 2013, total U.S. food production rose by almost 270%.[10] By 2000, the aggregate U.S. food supply produced 3,800 calories per person per day, 500 calories above the 1970 level.[11] U.S. consumers ate a whopping fifty-seven pounds more meat annually in 2000 than in the 1950s.[12]

But lurking behind this success has been a dramatic decrease in the diversity of crops and growing regions, as described below. Let us begin with the agricultural sector's aggregate physical footprint. From 1948 to 2013, at the same time that U.S. food production skyrocketed, the share of land devoted to farming actually decreased by about 35%.[13] While this can be seen as a tremendous success—if success is measured in

[10] *See Agricultural Productivity in the U.S.*, U.S. DEP'T AGRIC., https://www.ers.usda.gov/data-products/agricultural-productivity-in-the-us/agricultural-productivity-in-the-us/#National%20Tables,%201948-2013 (follow "Table 1-Indices of farm output, input, and total factor productivity for the United States, 1948-2013" hyperlink).
[11] *See* U.S. DEP'T OF AGRIC., AGRICULTURE FACT BOOK 14 (2002), http://www.4uth.gov.ua/usa/english/trade/files/2002factbook.pdf.
[12] *Id.* at 15.
[13] *See Agricultural Productivity in the U.S.*, *supra* note 10.

efficiency, and perhaps even environmental "footprint," terms—it also highlights how narrow the geographic base for agriculture has become.

At the same time that farmers were growing ever more crops on ever less land, they were planting ever fewer kinds of crops on that land. In 1900, the average number of commodities produced per farm was approximately five; by 2002 that figure was less than two.[14] Note that this figure actually understates the narrowing effect, because the average farm size also ballooned from about 150 acres to nearly 450 acres during that time (and the number of total farms decreased from nearly 6,000 to about 2,000).[15] In other words, in 1900 farmers were growing a more diverse array of crops over a relatively small farm area, while today farmers grow only a few crops over a relatively large area, even as the *total* area devoted to farming has shrunk.

None of this is particularly surprising. There have been many accounts in the local and national news media documenting the death of the small family farm, the rise of large "agri-business" operations, and the lack of crop diversity on those mega-farms.[16] Indeed, these trends are all mutually reinforcing, as large farms achieve economies of scale that allow them to undercut—and drive out of business—smaller and less efficient operations.[17] To put some numbers to these comparisons, while farms with less than $5,000 of annual sales accounted for about 50% of farms in 2007, they generated less than 1% of farm sales, while larger farms—those with sales over $500,000—represented only 5% of farms, yet had 74% of sales.[18] "This means that just 116,286 farms accounted for almost three fourths of all the value of sales of agricultural products in the country."[19] As one source succinctly puts it: "Large farms now dominate crop production in the United States."[20]

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[14] CAROLYN DIMITRI, ANNE EFFLAND & NEILSON CONKLIN, THE 20TH CENTURY TRANSFORMATION OF U.S. AGRICULTURE AND FARM POLICY 5 (2005).

[15] *Id.*

[16] *See, e.g.*, Maggie Koerth-Baker, *Big Farms are Getting Bigger and Most Small Farms Aren't Really Farms at All*, FIVETHIRTYEIGHT (Nov. 17, 2016), https://fivethirtyeight.com/features/big-farms-are-getting-bigger-and-most-small-farms-arent-really-farms-at-all/; *Sweeping Study of U.S. Farm Data Shows Loss of Crop Diversity the Past 34 Years*, PHYS.ORG, (Sept. 15, 2016), https://phys.org/news/2015-09-farm-loss-crop-diversity-years.html; Roberto Ferdman, *The Decline of the Small American Family Farm in one Chart*, WASH. POST (Sept. 16, 2014), https://www.washingtonpost.com/news/wonk/wp/2014/09/16/the-decline-of-the-small-american-family-farm-in-one-chart/?utm_term=.fea6c868f4f2; Mark Koba, *Meet the '4%': Small Number of Farms Dominates US*, CNBC (May 6, 2014), https://www.cnbc.com/2014/05/06/state-of-american-farming-big-producers-dominate-food-production.html.

[17] *See, e.g.*, Catherine Morrison Paul et al., *Scale Economies and Efficiency in U.S. Agriculture: Are Traditional Farms History?*, 22 J. PRODUCTIVITY ANALYSIS 185, 186 (2004).

[18] Michael Duffy, *Economies of Size in Production Agriculture*, 4 J. HUNGER & ENVTL. NUTRITION 375, 379 (2009).

[19] *Id.* at 390. Note that many of the smaller farms in this comparison may not truly be commercial farming operations at all, because the USDA defines a farm as "any place from which $1000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year." *Id.* at 378. Over 30% of farms in the census have sales of less than $1000. *Id.*

[20] JAMES M. MACDONALD ET AL., U.S. DEP'T OF AGRIC. ECON. RESEARCH SERV., FARM SIZE AND THE ORGANIZATION OF U.S. CROP FARMING 1 (2013), https://www.ers.usda.gov/webdocs/publications/45108/39359_err152.pdf?v=41526.

This is true despite the fact that farm size on average has held fairly steady over the past three decades.[21] Essentially, mid-sized farms have been squeezed out, leading to an increasing number of very small farms and very large farms.[22] This trend has continued despite the fact that "the average cost curve of most agricultural production is L-shaped."[23] In other words, average costs decrease most during the transition from small to medium size farms, but then remain relatively flat above a certain size range. Nonetheless, "[i]ncreases in size beyond where the curve becomes flat lead to increased income," even if not increased efficiency.[24] This is especially attractive to many farmers who face tight margins, which means they must increase production to produce an adequate income.[25]

Not only do individual large farms grow relatively few crops over a large area, but these crops are also heavily concentrated in just a few types. In 2007, corn, soybeans, hay, and wheat accounted for over 83% of all harvested acres, with corn alone accounting for nearly 28% of all harvested acres.[26] Not surprisingly, these staple crops are increasingly grown in larger farms. For example, the midpoint acreage for a corn farm tripled over only twenty years, from 200 acres in 1987 to 600 acres in 2007.[27] Midpoint acreages for soybeans, wheat, cotton, and rice all more than doubled over the same time period.[28]

The concentration of these crops can also be described geographically. In recent decades, as livestock and crop production have separated, farming regions have become increasingly specialized.[29] "Corn Belt states concentrated more heavily on the production and sale of feed crops, and livestock production moved from the Corn Belt to Mountain, Southeastern, and Southern Plains."[30] For example, in "Corn Belt 4"—Illinois, Indiana, Iowa, and Ohio—the crop share of regional cash receipts went from 29% in 1950 to 68% in 2010, and the corn and soybean share of crop receipts went from 63% in 1950 to 93% in 2010.[31] These shifts also affected farm size. "Cropland declined in regions with hilly topography and mixed land use—cropland interspersed with forests, residences, and commercial uses—and shifted toward regions with flatter land and more of the land base devoted to crops."[32]

b. Declining Genetic Diversity

Another effect of this tremendous farm consolidation has been the narrowing genetic base of the few crops that are planted. In other words, when large farms plant a

[21] *Id.* at 4.
[22] *Id.*
[23] Duffy, *supra* note 18, at 389.
[24] *Id.*
[25] *Id.*
[26] MACDONALD ET AL., *supra* note 20, at 11.
[27] *Id.* at 12. The "midpoint acreage" is defined as the "farm size, in harvested acres, at which half of all harvested acres are on larger [farms] and half on smaller [farms]." *Id.*
[28] *Id.*
[29] *See id.* at 37; Price Edwin et al., *The Dilemma of Biodiversity and Specialization in Agricultural Development*, 5 J. DEV. & AGRIC. ECON. 168, 169 (2013); *see generally* Mary Eschelbach Gregson, *Long-Term Trends in Agricultural Specialization in the United States: Some Preliminary Results*, 70 AGRIC. HIST. 90 (1996).
[30] MACDONALD ET AL., *supra* note 20, at 37.
[31] *Id.* at 38.
[32] *Id.*

given crop such as corn, the varieties of corn planted on that farm tend to decrease. In many cases, this is because the variety of crop planted is genetically engineered to tolerate herbicides or resist pests. Over 90% of U.S. corn, soybean, cotton, canola, and sugar beet acreage was planted with genetically engineered (GE) crops in 2014.[33] Crops engineered to be *both* herbicide tolerant (HT) and pest resistant (Bt), accounted for 76% of field corn acres and 79% of cotton acreage in 2014.[34]

The purpose of this Paper is not to debate the merits or demerits of GE crops. Instead, it is to make the simple point that no matter what one thinks of GE crops, such crops tend to narrow the genetic base of what is planted. Farmers (and seed companies) tend to concentrate on only a few types of GE seeds for any given crop, and such seeds, due to their herbicide- and pest-resistance and their fast-growing nature, tend to crowd-out traditional "landrace" crops.[35] It is an incontrovertible fact that "[c]rop genetic diversity also declines as landraces are displaced by scientifically developed modern varieties."[36] Of course, "[i]n the broadest sense, alteration and narrowing of crop genetic diversity began with the first domestication of wild plants."[37] Nonetheless, the current rate of genetic engineering, combined with financial pressures and other factors, has radically narrowed the genetic base of most major crops in the United States.

The issue of genetic narrowing, however, is not without its controversies. First, there is the issue of whether there is a real genetic narrowing and whether such narrowing is the same for all crops. For example, genetic narrowing might actually be worse for wheat than for corn, given that corn "cross-pollinates," meaning that different varieties—even genetically engineered ones—can breed.[38] "Because of this feature, corn populations are inherently less stable genetically. Therefore, corn landraces may be very diverse genetically. Furthermore, if farmers continue to replant seed (even from hybrids or other scientifically improved corn varieties) rather than buying new seed, the resulting progeny may also be quite genetically diverse."[39]

The rub, of course, is that corn farmers by and large do not replant seeds but rather buy new seeds each year, a trend that pre-dated the advent of GE crops, but has certainly

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[33] CATHERINE GREENE ET AL., U.S. DEP'T OF AGRIC. ECON. RESEARCH SERV., ECONOMIC ISSUES IN THE COEXISTENCE OF ORGANIC, GENETICALLY ENGINEERED (GE), AND NON-GE CROPS 3 (2016), https://www.ers.usda.gov/webdocs/publications/44041/56750_eib-149.pdf?v=42424.

[34] *Id.* at 3 n.2.

[35] A "landrace" is "a dynamic population(s) of a cultivated plant that has historical origin, distinct identity and lacks formal crop improvement, as well as often being genetically diverse, locally adapted and associated with traditional farming systems." Tania Carolina Camacho Villa et al., *Defining and Identifying Crop Landraces*, 3 PLANT GENETIC RES. 373, 373 (2006). In other words, a "landrace" is a cultivated crop (not a wild variety), but one that has been improved without the use of modern genetic engineering. It also bears some local adaptations that may be different from the local adaptations in other populations of the plant elsewhere.

[36] KELLY DAY RUBENSTEIN ET AL., U.S. DEP'T OF AGRIC. ECON. RESEARCH SERV., CROP GENETIC RESOURCES: AN ECONOMIC APPRAISAL 14 (2005), https://www.ers.usda.gov/webdocs/publications/44121/17452_eib2_1_.pdf?v=41055.

[37] *Id.* at 15.

[38] *See id.* at 16 ("Unlike wheat and rice, which self-pollinate, corn cross-pollinates, which means that one plant is often fertilized by another.").

[39] *Id.*

been accelerated by it.[40] As a result, "[l]arge swathes of the Midwest are effectively devoted to monoculture, with single varieties of maize covering hundreds or thousands of contiguous acres."[41] According to Major Goodman, a plant geneticist at North Carolina State University, only six (of about 300) "races" of maize "are represented in the maize of commerce, and the maize of commerce of the United States includes only one race. We are relying on the use of a very narrow but very elite germ plasm base . . . ."[42] Moreover, "[w]ithin the one maize race used in the United States there were in the early 1900s thousands if not tens of thousands of open-pollinated varieties . . . . Essentially each farm had its own variety . . . ."[43] That variety, however, has largely disappeared: "It is virtually impossible to find a widely used U.S. hybrid whose parentage can be traced to neither Reid's nor Lancaster [two open-pollinated hybrid varieties] . . . ."[44]

The issue of fast-growing modern hybrid monocultures driving out more traditional landraces is not limited to maize, nor to the United States. Rather, it has been a worldwide phenomenon affecting most staple crops, even ones that are not genetically engineered. "Basically, we are increasing productivity—and usually stability—at the cost of variability of virtually every crop. . . ."[45] This loss of variability is especially stark for food staples such as corn or rice. In tropical Asia, for example, 95% of high-yield rice varieties are based on a single dwarfing gene, and in countries such as Indonesia and Sri Lanka, approximately 75% of cultivated rice varieties are descended from a common stock.[46] Other countries don't fare much better. "In Sri Lanka, where farmers grew some 2,000 traditional varieties of rice as recently as 1959, only five principal varieties are grown today."[47] Similarly,

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[40] Dan Charles, *Top Five Myths of Genetically Modified Seeds, Busted*, NAT'L PUB. RADIO (Oct. 18, 2012), http://www.npr.org/sections/thesalt/2012/10/18/163034053/top-five-myths-of-genetically-modified-seeds-busted ("By the time Monsanto got into the seed business, most farmers in the U.S. and Europe were already relying on seed that they bought every year from older seed companies. This is especially true of corn farmers, who've been growing almost exclusively commercial hybrids for more than half a century. (If you re-plant seeds from hybrids, you get a mixture of inferior varieties.).").

[41] CHARLES C. MANN, FORD FOUND., POLITICAL ECON. RESEARCH INST., DIVERSITY ON THE FARM 10 (2004), https://www.peri.umass.edu/fileadmin/pdf/Mann.pdf.

[42] M. M. Goodman, *Genetic and Germ Plasm Stocks Worth Conserving*, 81 J. HEREDITY 11, 13 (1990). A few terms here are worth defining further. While the term "race" is no longer used much, even for plants, it is a category meant to mark differences within a species. Professor Goodman, in an earlier work, referenced the following definitions: that a race can be defined "as a group of related individuals with enough characteristics in common to permit their recognition as a group" or "a group of individuals with a significant number of genes in common, major races having a smaller number in common than do sub-races." *See* WILLIAM L. BROWN & MAJOR M. GOODMAN, RACES OF CORN, *in* CORN AND CORN IMPROVEMENT 49 (1977). A "race" is perhaps best understood in relative terms, as a category within a species and sometimes synonymous with a sub-species, and within which there can be different varieties. While these terms and notions are hardly precise, they are nonetheless useful for describing the larger picture, namely the loss of genetic variability among crops.

[43] Goodman, *supra* note 42, at 13.

[44] *Id.*

[45] *Id.*

[46] *See Genetic Diversity in Rice: Table 20*, FOOD & AGRIC. ORG. UNITED NATIONS: AGRIC. & CONSUMER PROTECTION DEP'T, http://www.fao.org/docrep/006/Y4751E/y4751e0b.htm#TopOfPage (last visited Sept. 24, 2017).

[47] *See* Robert E. Rhoades, *The World's Food Supply at Risk*, 179 NAT'L GEOGRAPHIC MAG. 74, 83 (1991).

> India has probably grown over 30,000 different indigenous varieties or landraces of rice. This situation has, in the last 20 years, changed drastically and it is predicted that in another 20 years, rice diversity will be reduced to 50 varieties, with the top 10 accounting for over three-quarters of the sub-continent's rice acreage.[48]

Gradually, traditional varieties of rice, like corn, are being replaced by modern varieties. For example, in one of the largest rice producers, Vietnam, only 17% of the rice growing area in 1980 was planted with modern varieties; that figure climbed to over 94% in 2002.[49]

c. How The Lack of Geographic and Genetic Diversity Increases Vulnerability

Putting together all the data, the picture becomes clear. Fewer varieties of staple crops are grown on large farms, which are themselves more and more highly concentrated in fewer growing regions. A cursory look at the state-level data bears this out. For example, Iowa and Illinois alone contribute approximately 33% of the national production of corn,[50] while Kansas alone produces 24% of the national production of winter wheat.[51]

The risks of such two-dimensional concentration—of geography and of genetics—are similar to the easily understood risks of a lack of diversity in a financial portfolio. This Paper focuses on two interrelated risks: the risk of adverse weather events and the risk of pests and disease. Both risks focus on the same core scenario: that major crop losses in the areas of concentrated food production would jeopardize food security across the nation, and perhaps even globally.

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[48] *See* David Ehrenfeld, *Globalisation: Effects on Biodiversity, Environment and Society*, 1 CONSERVATION & SOC'Y 99, 100 (2003), http://www.conservationandsociety.org/article.asp?issn=0972-4923;year=2003;volume=1;issue=1;spage=99;epage=111;aulast=Ehrenfeld.

[49] *See* Tran Thi Ut & Kei Kajisa, *The Impact of Green Revolution on Rice Production in Vietnam*, 44 DEVELOPING ECON. 167, 174 (2006).

[50] *See What Region of the United States is Corn Production Prevalent*, WORLDATLAS, http://www.worldatlas.com/articles/what-region-of-the-united-states-is-corn-production-prevalent.html (last visited Oct. 27, 2017) (citing 2016 statistics from the U.S. Department of Agriculture's National Agricultural Statistics Service); Rob Cook, *Ranking of States that Produce the Most Corn*, BEEF2LIVE (Oct. 23, 2017), http://beef2live.com/story-states-produce-corn-0-107129 (citing same). Indeed, according to 2010-2012 data, just 220 counties accounted for a whopping 50% of U.S. corn production. *See* Dept. of Agric. & Consumer Econ., Univ. of Ill. at Urbana-Champaign, *Concentration of Corn and Soybean Production in the U.S.*, FARMDOC DAILY (July 9, 2013), http://farmdocdaily.illinois.edu/2013/07/concentration-corn-soybean-production.html.

[51] *See CME: Wheat Feeding, Impact on Corn Demand*, PIG SITE (Apr. 18, 2011), http://www.thepigsite.com/swinenews/26259/cme-wheat-feeding-impact-on-corn-demand/. Note that winter wheat represents 70–80% of total U.S. wheat production. *See Background: U.S. Wheat Supply*, U.S. DEP'T AGRIC. ECON. RES. SERV.: WHEAT, http://www.ers.usda.gov/topics/crops/wheat/background.aspx#supply (last updated Nov. 23, 2016).

1. Adverse Weather

One of the most common misconceptions surrounding climate change is that its primary effect will be to cause a gradual warming of the globe.[52] This is not to say that warming will *not* occur, simply that temperature does not bear an easy linear relationship to CO_2 concentrations.[53] Temperatures may begin—indeed, have already begun—to swing wildly in different parts of the globe even as the overall trend is one of increasing temperatures.[54] Another way to put this is that, at least in the short- to medium-term, the primary effect of climate change will be to destabilize what has been, over the past 12,000 years, a remarkably stable climate period in earth's history.[55] This climate stability itself formed the precondition to agriculture and, by extension, settled urban civilization.[56] The absence of such stability leaves agricultural systems extremely vulnerable. In particular, heat, drought, and flood threaten agricultural systems in ways that are unprecedented over the course of human civilization.[57]

The issue of heat is an especially sensitive one for heat-sensitive crops such as corn. "Corn was originally a tropical grass from the high elevation areas of central Mexico about 7,400 feet above sea level, 2,000 feet higher than Denver. Today, corn still prefers conditions typical of that area—warm daytime temperatures and cool nights."[58] High heat, especially when combined with drought, disrupts the pollination of the corn plant, which is essential for creating the "ears" of corn consumed and used by humans.[59] In particular, sustained daily high temperatures in excess of thirty degrees Celsius leads to a marked decline in corn yields.[60] There is a direct effect of heat on the corn plant itself, but perhaps even more importantly, sustained high heat contributes to water stress, which has a profoundly negative impact on corn yields.[61]

Unfortunately, the U.S. Corn Belt is extremely vulnerable to such rising temperatures. Recent climate models show the U.S. Corn Belt to be an area highly

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[52] *See* COMM. ON ABRUPT CLIMATE CHANGE, NAT'L RESEARCH COUNCIL, ABRUPT CLIMATE CHANGE: INEVITABLE SURPRISES 10 (2002).

[53] *Id.* (noting that "[t]he climate system in the past has made large jumps between typical patterns of behavior . . . . Especially large and abrupt climate changes have occurred repeatedly over the last 100,000 years during the slide into and climb out of the most recent global ice age"); *see also id.* at 74 ("In a linear model, doubling the forcing doubles the response. The linear approach does not hold for abrupt climate change, in which a small forcing can cause a small change or a huge one.").

[54] *See, e.g.*, Ashley Potero, *Warm-to-Freezing Winter Temperature Fluctuations may be Connected to Global Warming: Study*, INT'L BUS. TIMES (Oct. 31, 2011), http://www.ibtimes.com/warm-freezing-winter-temperature-fluctuations-may-be-connected-global-warming-study-363550.

[55] *See, e.g.*, GABRIELE GRAMELSBERGER & JOHANN FEICHTER, CLIMATE CHANGE AND POLICY: THE CALCULABILITY OF CLIMATE CHANGE AND THE CHALLENGE OF UNCERTAINTY 10 (2011).

[56] *Id.*

[57] *See* Damian Carrington, *Shattered Records show Climate Change is an Emergency Today, Scientists Warn*, GUARDIAN (June 17, 2016), https://www.theguardian.com/environment/2016/jun/17/shattered-records-climate-change-emergency-today-scientists-warn.

[58] *See* Tom Hoegemeyer, *How Extended High Heat Disrupts Corn Pollination*, U. NEBRASKA-LINCOLN: CROPWATCH (Aug. 1, 2011), http://cropwatch.unl.edu/how-extended-high-heat-disrupts-corn-pollination-0.

[59] *Id.*

[60] David Lobell et al., *The Critical Role of Extreme Heat for Maize Production in the United States*, 3 NATURE CLIMATE CHANGE 497, 497–99 (2013).

[61] *Id.*

sensitive to heat stress, with American corn production "fac[ing] a notable decrease [in production] in all scenarios."[62] Using a crop model that combines historical climate and yield data with fifteen different global temperature models, researchers estimated that aggregate yields in the U.S. Corn Belt are projected to decrease by an average of 18% by 2030–2050 relative to 1980–2000.[63] Perhaps even more disturbing is the extreme volatility of yields under these future climate scenarios, with the coefficient of variation of yield increasing by an average of 47%.[64] Even if increased atmospheric CO_2 levels could offset some of these losses in the near-term in some model scenarios—for example, as corn, in the presence of high CO_2, reduces water transpiration losses by narrowing the stomatal pores on their leaf surfaces, making them more resistant to water stress—by the end of the century, especially under high emission scenarios, the negative effects still predominate.[65]

Heat is of course related to drought, and the two working together pose added dangers to crop production in the central growing regions of the United States. Looking at field data on corn and soybean yields from 1995 through 2012, it appears that even though overall yields have increased, the *sensitivity* of yields to drought stress associated with high vapor pressure deficits has increased.[66] Essentially, "as farmers become more adept at removing all nonwater constraints to crop production, the sensitivity to drought generally increases."[67] Indeed, one result is that climate change effects may be more severe than predicted by models, with corn and soybean yields potentially being reduced by 15% to 30% over the next fifty years.[68]

We need look no further than recent history to see the devastating effects of drought, which in extreme cases can lead to crop losses well in excess of the model predictions cited above. In 2011, for example, Texas suffered the driest—and until then the hottest—year on record.[69] Agricultural losses that year were estimated to be $7.62 billion (out of

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[62] Delphine Deryng et al., *Global Crop Yield Response to Extreme Heat Stress Under Multiple Climate Change Futures*, 9 ENVTL. RES. LETTERS 1, 5 (2014), http://iopscience.iop.org/article/10.1088/1748-9326/9/3/034011/pdf.

[63] Daniel Urban et al., *Projected Temperature Changes Indicate Significant Increase in Interannual Variability of U.S. Maize Yields*, 112 CLIMATIC CHANGE 525, 531 (2012).

[64] *Id.*

[65] Daniel W. Urban et al., *The Impacts of Future Climate and Carbon Dioxide Changes on the Average and Variability of U.S. Maize Yields Under Two Emission Scenarios*, 10 ENVTL. RES. LETTERS 1, 2 (2015), http://iopscience.iop.org/article/10.1088/1748-9326/10/4/045003/pdf.

[66] David Lobell et al., *Greater Sensitivity to Drought Accompanies Maize Yield Increase in the U.S. Midwest*, 344 SCIENCE 516, 516 (2014). Vapor pressure deficit "is a widely used measure of atmospheric water demand that depends on air temperature and humidity and has a strong influence on plant growth rates in these systems." *Id.* at 517. Essentially, a high vapor pressure deficit means that the air outside the plant is much dryer than the air inside the plant, leading the plant to lose moisture at an increasing rate. *See Vapor Pressure Deficit–The Hidden Force on your Plants*, JUST 4 GROWERS: TEMPERATURE HUMIDITY & CO2, http://www.just4growers.com/stream/temperature-humidity-and-c02/vapor-pressure-deficit-the-hidden-force-on-your-plants.aspx (last visited Aug. 31, 2017).

[67] Lobell et al., *supra* note 66, at 519.

[68] *Id.*

[69] David P. Anderson, Professor & Extension Specialist, Dep't of Agric. Econ., Tex. A&M AgrilLife Extension, & Andy Vestal, Professor & Extension Specialist, Dep't of Agric. Leadership, Tex. A&M AgrilLife Extension, 2010-2014 Texas Agriculture: The Economic Impact of Drought, Presentation at the National EDEN Annual Meetings (Oct. 23, 2014),

$16 billion in annual agricultural cash receipts), which is likely a conservative estimate because it includes only major crops.[70] Production of wheat, cotton, and corn fell by over 50% relative to the five-year average.[71] Similarly, the California drought was estimated to cause $2.7 billion in economic losses in 2015, and led to an almost 50% reduction in surface water resources.[72] California was fortunately able to make up for some of its surface water resources by pumping more groundwater,[73] but this is likely a temporary measure, as groundwater is much slower to recharge and is not considered a "renewable" resource in the same way that surface water is.[74]

Globally, researchers have estimated that from 1964 to 2007, losses of major cereal crops (maize, rice, and wheat) due to extreme drought events averaged about 10.1% and losses due to extreme heat events averaged about 9.1%.[75] Moreover, the problem appears to be getting worse over time, as "more recent droughts (1985–2007) caused cereal production losses averaging 13.7%, greater than the estimated 6.7% during earlier droughts (1964–1984)."[76] Interestingly, crop losses were also worse among developed countries. "Cereals in the more technically developed agricultural systems of North America, Europe and Australasia suffered most from droughts, facing on average a 19.9% production deficit compared to 12.1% in Asia, 9.2% in Africa, and no significant effect in Latin America and the Caribbean."[77] One explanation for this difference in drought sensitivity is that the developed countries have more large-scale monocultures that are more drought-sensitive, whereas there is "a tendency among lower-income countries to encompass diverse crops and management across many small fields, which may allow for some fields to resist drought better than others."[78]

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http://eden.lsu.edu/Conferences/EDENAM/2014/Documents/Plenary/2014_Impact%20of%20Drought%20in%20Texas_NationalEDEN.pdf.

[70] *Id.*; Blair Fannin, *Updated 2011 Texas Agricultural Drought Losses Total $7.62 Billion*, AGRILIFE (Mar. 21, 2012), http://today.agrilife.org/2012/03/21/updated-2011-texas-agricultural-drought-losses-total-7-62-billion/.

[71] *Id.*; Anderson & Vestal, *supra* note 69.

[72] RICHARD HOWITT ET AL., CTR. FOR WATERSHED SCIS., U.C. DAVIS, ECONOMIC ANALYSIS OF THE 2015 DROUGHT FOR CALIFORNIA AGRICULTURE ES-1 (2015), https://watershed.ucdavis.edu/files/biblio/Final_Drought%20Report_08182015_Full_Report_WithAppendices.pdf.

[73] *Id.*

[74] Unfortunately, when (and if) the rains do eventually return in a climate-changed world, they come with a vengeance. Increasingly, we see a "see-sawing" between extreme weather events that itself poses severe challenges for agriculture, with an increased incidence (rather than magnitude) of flooding across the central United States. *See* Iman Mallakpour & Gabriele Villarini, *The Changing Nature of Flooding Across the Central United States*, 5 NATURE CLIMATE CHANGE 250, 250–54 (2015). For example, in 2015, on the heels of the 2011 Texas drought, came flood conditions that threatened many Texas farms with total losses of their crops. *See* Robert Ferris, *Texas Floods and Commodities: Farms Face 'Total Loss for Year,'* CNBC (May 29, 2015), http://www.cnbc.com/2015/05/29/texas-floods-and-commodities-farms-face-total-loss-for-year.html.

[75] Corey Lesk et al., *Influence of Extreme Weather Disasters on Global Crop Production*, 529 NATURE 84, 84 (2016).

[76] *Id.* at 86.

[77] *Id.* at 85.

[78] *Id.*

2. Pestilence

It is this same issue of increased sensitivity that makes non-diverse monocrops also vulnerable to pests. "A pathogen that attacks the predominant commercial variety of a food crop can inflict immense costs on society. The classic example of this is the Irish potato famine of the 19th century."[79] Other more recent examples include "the loss of a significant fraction of the Asian rice crop to the grassy stunt virus;" the southern corn leaf blight epidemic of 1970 that "resulted in enormous losses" and was "caused by excessive homogeneity of the USA's tremendous maize hectarage;" "the tropical maize rust epidemic in Africa in the 1950s and the blue mould epidemic on tobacco in the USA and Europe in the 1960s."[80] Even the conventional banana is not immune. In the 1950s, the "Panama disease" fungus wiped out the most-exported variety of banana in the world, the Gros Michel, causing the Gros Michel to be replaced by the Cavendish, a banana that was immune to the disease.[81] The problem lies in the fact that practically all bananas grown for export are clones of the first Cavendish plant, and now the fungus has evolved to destroy that variety, while efforts to develop resistance to the disease have so far failed.[82]

Genetic homogeneity not only raises the costs of an epidemic should it occur, but it also increases the probability of such an outbreak in the first place by creating a large-scale susceptible environment for a pathogen that can overcome resistance.[83] Put another way, the genetic and spatial concentration of crops creates a target rich environment for pathogens. If the pathogen can destroy a few such crops, it can destroy them all.

Climate change may itself be exacerbating this vulnerability. Generally warmer conditions have allowed pests to migrate further north than they otherwise would. For example, the western corn rootworm has steadily moved further north in Europe since 1992,[84] and has also migrated extensively throughout the United States, causing over $1 billion of crop damage per year and defying efforts to control it.[85] On average, crop pests are migrating northward at a rate of 1.7 miles per year, with two of the most destructive pathogens—fungi and blight-causing oomycetes—moving northward at closer to four

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[79] Geoffrey Heal et al., *Genetic Diversity and Interdependent Crop Choices in Agriculture*, 26 RESOURCE & ENERGY ECON. 175, 177 (2004).
[80] *Id.* at 177–78.
[81] *See* Duncan Leatherdale, *The Imminent Death of the Cavendish Banana and Why it Affects Us All*, BBC NEWS (Jan. 24, 2016), http://www.bbc.com/news/uk-england-35131751.
[82] *Id.*; *see also* Mike Peed, *We Have No Bananas*, NEW YORKER (Jan. 10, 2011), http://www.newyorker.com/magazine/2011/01/10/we-have-no-bananas.
[83] Heal et al., *supra* note 79, at 178. *See also* Rhoades, *supra* note 47, at 84 ("By relying on a few crop strains instead of many, farmers open themselves to disaster [because] the entire crop [is] vulnerable to a single pest or disease.")
[84] *See Spread of the Western Corn Rootworm in Europe*, EUR. ENVTL. AGENCY (Nov. 12, 2009), https://www.eea.europa.eu/data-and-maps/figures/spread-of-the-western-corn-rootworm-in-europe; *see also* Tom Hundley, *Stowaway U.S. Corn Rootworm Eats its Way Across Europe*, NAT'L GEOGRAPHIC (Sept. 24, 2001), http://news.nationalgeographic.com/news/2001/08/0829_wirecornworm.html (discussing that the rootworm was unknown in Europe until the early 1990s, when it spread from the United States to Belgrade, likely by way of international air travel).
[85] *See* Michael Gray et al., *Adaptation and Invasiveness of Western Corn Rootworm: Intensifying Research on a Worsening Pest*, 54 ANN. REV. ENTOMOLOGY 303, 304 (2009).

miles per year.[86] Rising CO_2 levels themselves can also create favorable conditions for pests.[87]

3. Counter-arguments

Thus far, this Paper has outlined the vulnerabilities of geographically and genetically concentrated crop production. But it is worth noting the counter-argument: that this outline fails to account for the bigger picture, and that the gains from concentrated crop production outweigh the risks. It is certainly true that, both in the United States and worldwide, crop yields have risen tremendously since World War II and the price of staple crops has fallen.[88] However, in recent years, as yields suffer from adverse weather events and other factors, the price of staple crops has trended upward and has seen several sizeable price spikes.[89]

Overall, food commodity prices began rising in 2002, reversing a decades-long trend of lower prices.[90] The overall trend of rising prices can be attributed to factors such as rising worldwide demand, slower yield growth, and the increased use of biofuels.[91] However, there have also been notable price spikes around adverse weather events. For example, in 2010 and 2011, there was a severe drought in Russia and other parts of Eastern Europe that reduced production of wheat, hot and dry conditions in the U.S. Corn and Wheat Belts followed by heavy rains, and heavy rains in Canada and Europe.[92] These weather-related factors caused overall global food prices to rise 60% from the previous low, while corn prices alone rose 86%.[93]

One might nonetheless argue that these price spikes would have occurred even if the food supply had not been so concentrated geographically or genetically, and indeed more empirical work needs to be done on the extent to which such factors contributed to the crop losses. Nonetheless, it remains the case that a more disbursed food production system would certainly be less vulnerable to adverse weather. While the global climate is

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[86] *See* Stephanie Paige Ogburn, *Crop Pests on the Move Due to Climate Change*, SCI. AM. (Sept. 3, 2013), http://www.scientificamerican.com/article/crop-pests-on-the-move-due-to-climate-change.

[87] *See* Ray Cannon, The Food & Env't Research Agency, *Will Climate Change Result in More Pest and Disease Problems for Agriculture?* (Dec. 1, 2010), https://www.slideshare.net/FarmingFutures/ray-5995926 (stating soybeans grown at elevated CO2 concentrations attract more pests than ones grown at current conditions).

[88] *See* DAVID LOBEL & MARSHALL BURKE, ADVANCES IN GLOBAL CHANGE RESEARCH 19 (2010) (describing increasing crop yields); MILTON C. HALLBERG, ECONOMIC TRENDS IN U.S. AGRICULTURE AND FOOD SYSTEMS SINCE WORLD WAR II 47–49 (2001) (describing same); *see also* TRADE & MKTS. DIV., FOOD & AGRIC. ORG. OF THE U.S., THE STATE OF AGRICULTURAL COMMODITY MARKETS: HIGH FOOD PRICES AND THE FOOD CRISIS–EXPERIENCES AND LESSONS LEARNED 12 (2009), http://www.fao.org/3/a-i0854e.pdf (describing historic price drops).

[89] *See* TRACY CARTY, OXFAM, EXTREME WEATHER, EXTREME PRICES 2–4 (2012), https://www.oxfamamerica.org/static/media/files/Extreme-Weather-Extreme-Prices.pdf; TRADE & MKTS. DIV., *supra* note 88, at 12–14.

[90] *See* RONALD TROSTLE ET AL., ECON. RESEARCH SERV., U.S DEP'T. OF AGRIC., WHY HAVE FOOD COMMODITY PRICES RISEN AGAIN? 3–4 (2011), http://www.ethanolrfa.org/wp-content/uploads/2015/09/USDA-food-prices.pdf.

[91] *Id.*

[92] *Id.*

[93] *Id.* at 5.

changing, it does not change the same way everywhere at the same time. The simple fact remains that weather patterns will be different in different localities. An adverse weather event in one crop-growing area does not necessarily have an impact on other crop-growing areas elsewhere. And the more crop-growing areas there are, the less likely it is that an adverse weather event will destroy a major proportion of a given crop.

Other counter-arguments also do not seem convincing. One might argue that geographic concentration is a positive development because it means that crops are growing only in the "best" places and that genetic narrowing means that only the "hardiest" varieties remain, such that crops will be more, not less, resistant to climate-related and other stressors. Both of these arguments, however, fail to account for the unpredictable nature of the stressors crops face. In a climate-changing world with more extreme weather events, there is no such thing as a "best" place—there are only better and worse places for growing crops *in that season*. Similarly, what a "hardy" crop means differs depending on whether the crop is facing drought or excess rain, or whether the relevant pathogen is a fungus or an insect or something else entirely.

One of the most insidious and unappreciated aspects of climate change is how increasingly unpredictable it makes weather and other climate patterns from year to year. And it is this very unpredictability that makes crop concentration—both geographic and genetic—so dangerous. Recent attempts to predict the relationship between extreme weather events and crop price spikes in a changing climate have suggested "a strong upward trend in world market prices of the main traded staple crops over the next twenty years, with a significant portion of the increase caused by climate change."[94] Most climate models project increasing drought in summer and precipitation in winter in the northern hemisphere, but along with drought, "there is an increased chance of intense precipitation and flooding due to the greater water-holding capacity of a warmer atmosphere."[95] By 2030, extreme weather scenarios in the crop-growing regions of North America, for example, could depress maize and wheat yields by 18–25%,[96] leading to price shocks of anywhere from 33% for wheat to 140% for maize relative to an assumed 2030 baseline average world market export price.[97]

Obviously, such future projections are freighted with assumptions regarding land allocations across crops (which are assumed to be fixed) and elasticities of supply and demand. Nonetheless, they highlight the real risks of extreme weather on crop production—risks that not only threaten to raise prices, but also threaten to lower food consumption, especially in places such as several African countries where the average person spends a relatively high percentage of their income on food.[98]

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[94] DIRK WILLENBOCKEL, OXFAM, EXTREME WEATHER EVENTS AND CROP PRICE SPIKES IN A CHANGING CLIMATE 4 (2012), https://www.oxfam.org/sites/www.oxfam.org/files/rr-extreme-weather-events-crop-price-spikes-05092012-en.pdf.
[95] *Id.* at 7.
[96] *Id.* at 19.
[97] *Id.* at 27.
[98] *Id.* at 31.

III. THE ROLE OF FREE TRADE

Thus far, this Paper has outlined the potential problem of concentrated farm acreage and crop genetics in a world where extreme weather events or unusual pathogens may wipe out a given crop growing region. The next logical question, then, is whether there is anything that might be done to mitigate the concentration in a way that might mitigate the risk.

There are many causes of such concentration. Economies of scale have put tremendous pressure on farms to increase in size, especially given the increased capital costs of mechanization.[99] Government subsidies, concentrated in only a few crops, themselves encourage farmers to plant such crops. And consolidation in the seed and fertilizer industries has also encouraged consolidation on the farm.

But here I would like to focus on the role of international and interstate trade. In particular, such trade has placed a high degree of price pressure on commodity crops such as corn, wheat, soybeans, and rice. This is especially true in a country, and world, where free trade regimes allow more agricultural subsidies than tariffs.[100] Even in theory, such trade would encourage production of crops to concentrate in high-yielding areas and on fast-growing hybrid varieties, in order to capture any comparative advantage.[101] The fact that this has actually occurred should be a surprise to no one.

Indeed, there is a case to be made that the welfare gains from specialization and trade in agriculture are precisely what has allowed such high crop yields. "Because ideal growing conditions and crop sensitivity to deviations from optimal conditions vary by crop, different regions enjoy comparative advantage in different crops."[102] In fact, it may be the case that re-localizing crop production would only serve to raise crop prices, increase the use of fertilizer and other inputs, and increase the land area devoted to crop production.[103] In other words, there is the danger that locally grown food means inefficiently grown food, and that without large-scale technologically sophisticated farms, the environmental cost of the same output would be far higher than it is today.[104] Indeed, there is a robust debate about whether locally grown food even has a lower carbon "footprint" than food grown in far-flung centralized growing regions, given the economies of scale involved and the fact that transportation only accounts for a relatively

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[99] *See Concentration in Agriculture: Hearing Before the U.S. S. Comm. on Appropriations, Subcomm. on Agric., Rural Dev. & Related Agencies* (2001) (statement of Keith Collins, Chief Economist, U.S. Dep't of Agric.).

[100] *See* JENNIFER CLAPP, FOOD & AGRIC. ORG. OF THE UNITED NATIONS, FOOD SECURITY AND INTERNATIONAL TRADE: UNPACKING DISPUTED NARRATIVES 8 (2015), http://www.fao.org/3/a-i5160e.pdf (noting that the latest Agreement on Agriculture included in the Uruguay Round of GATT talks, completed in 1994, "allowed numerous subsidy programmes to continue in industrialized countries" while "[a]t the same time, many developing countries were obliged to open their markets to imports even though they could not afford subsidy programmes of the type that industrialized countries had developed").

[101] *See id.* at 9–10 (discussing comparative advantage in food production).

[102] *See* Steven Sexton, *Does Local Production Improve Environmental and Health Outcomes?*, 13 AGRIC. & RESOURCE ECON. UPDATE 5, 6 (2009).

[103] *Id.*

[104] *See* Jayson Lusk, *Why Industrial Farms are Good for the Environment*, N.Y. TIMES (Sept. 23, 2016), https://www.nytimes.com/2016/09/25/opinion/sunday/why-industrial-farms-are-good-for-the-environment.html?mcubz=0 (noting that while U.S. crop production is now twice what it was in 1970, "[a]griculture is using nearly half the labor and 16 percent less land than it did in 1970").

small percentage (anywhere from 3% to 16%) of the lifecycle carbon emissions of food and only about 11% of the total carbon emissions associated with food production itself.[105]

These are all serious questions that deserve to be addressed. In this Paper, however, I focus not on carbon mitigation, but rather on adaptation—how best to adapt the food production system to the climate change that is already occurring and will certainly occur in the future. And it is precisely the adaptation element that is left out of the mitigation analysis above: that in a climate-changing world, centralized crop production is vulnerable in ways that diversified production is not. In other words, while centralized crop production might well be better both for consumers and the environment if we hold climate constant, such a condition appears increasingly unrealistic. Another way of putting this is to reiterate what was stated in the last Part, namely that the "best" places for growing certain crops may no longer be the best, and in fact there may not be a single "best" place anymore. There may only be, year to year, better or worse places, and the unpredictability of the climate may make it impossible to know ahead of time which is which.

The real question, then, is whether any relaxing of free trade rules would help mitigate the geographic and genetic concentration of crops in such a way as to mitigate the risk of crop wipeouts. An empirical examination of this question is beyond the scope of this Paper. It may well be the case that, for example, farm subsidies are the dominant cause of such concentration and that relaxing free trade rules would have only a negligible effect. However, it is undeniable that relaxing free trade rules would at least have some effect at the margins, and may also be necessary even if subsidies are reduced. Relaxing free trade rules would allow states to either encourage or actively protect local production in order to provide at least some of the geographic, and likely also genetic, diversity currently lacking. Moreover, this local production could be encouraged *even if* the current concentrated food production areas remain more or less the same. In other words, one does not have to believe that local production would have to *replace* the current concentrated production. It may well be the case that the two systems could co-exist. Again, this is an empirical question beyond the scope of this Paper, but given the surging demand for food in the coming decades—some experts think more food will have to be produced worldwide over the next fifty years than has been produced during the past 10,000 years combined—it certainly seems like augmented local production could serve as a plausible, and perhaps even necessary, outgrowth of the current production system.[106]

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[105] *See* WAYNE WAKELAND ET AL., GREEN TECHNOLOGIES IN FOOD PRODUCTION AND PROCESSING 212 (2012) (citing estimates that in the typical household food basket, aggregate transportation accounts for just 11% of total carbon emissions of food production); *id.* at 225 (for animal products, transportation costs account for only 3% of total lifetime carbon emissions, including production and processing, cooking, and waste disposal); *id.* at 226 (for plant-based products, transportation accounts for about 16% of lifetime carbon emissions).

[106] *See* Ian Sample, *Global Food Crisis Looms as Climate Change and Population Growth Strip Fertile Land*, GUARDIAN (Aug. 31, 2007), https://www.theguardian.com/environment/2007/aug/31/climatechange.food ("To keep up with the growth in human population, more food will have to be produced worldwide over the next 50 years than has been during the past 10,000 years combined, the experts said.").

IV. THE DORMANT COMMERCE CLAUSE BARRIER

One way to conceive of distributed production is to take the current political divisions of the United States—namely the fifty states—and to try to foster local production within each state. Of course, a division along state lines is neither compelled by a distributional objective, nor necessarily superior to other ways we might slice the United States. For example, there may be geographic reasons for distributing food production in other ways that do not necessarily correspond with state borders.[107] However, given that state borders are often placed where they are because of some relevant geographic feature such as a river, and because a distribution along state lines is certainly the simplest and most realistic option, I will analyze that as a basis for achieving diversity in food production.

Assuming we desire to distribute food production among the several states, we must face the restrictions of the Dormant Commerce Clause, which prevents states from discriminating against out-of-state products as a means of fostering in-state production.[108] Two questions immediately arise. First, what, if any, state efforts to bolster local production are possible under current Dormant Commerce Clause jurisprudence? And second, if such efforts are insufficient, is there any limited way the Dormant Commerce Clause should be changed or "softened" to foster diversity?

a. States Acting as Market Participants

The most plausible current avenue for states to bolster local production comes from the "market participant" exception to the Dormant Commerce Clause. The market participant exception was first recognized by the United States Supreme Court in *Hughes v. Alexandria Scrap Corp*.[109] Essentially, "[t]he market participant doctrine distinguishes between a state's role as a regulator, on the one hand, and its role as a market participant, on the other."[110] Thus, "a state or state subdivision that acts as a market participant, rather than a market regulator, is not subject to the restraints of the Commerce Clause."[111] "Put roughly, the market participant doctrine protects states when they are acting as parties to a commercial transaction rather than (as, for example, when adopting a tax scheme) they are acting as market regulators."[112] Under this market participant exception, the Supreme Court has upheld state policies to confine the sale of cement by a state-operated cement plant to residents of the state,[113] and an executive order by the Mayor of Boston which

[107] One example might be to conceive of the Unites States as a set of crop-growing regions that span multiple states.
[108] *See supra* notes 6–7.
[109] 426 U.S. 794, 807–09 (1976).
[110] *See* Engine Mfrs. Ass'n. v. S. Coast Air Quality Maintenance Dist., 498 F.3d 1031, 1040 (2007).
[111] Swin Resource Sys., Inc. v. Lycoming Cty., 883 F.2d 245, 249 (3d. Cir. 1989) (citation and internal quotations omitted).
[112] Trojan Techs., Inc. v. Pennsylvania, 916 F.2d 903, 910 (3d. Cir. 1990) (upholding a Pennsylvania law requiring suppliers contracting with a public agency in Pennsylvania in connection with a public works project to provide products whose steel is American-made).
[113] *See* Reeves Inc. v. Stake, 447 U.S. 429, 440 (1980).

required that all construction projects funded by city funds be performed by a work force comprised of at least half Boston residents.[114]

There is ample room, then, for states to purchase only in-state or local crops for use in state programs, and there is some evidence that this is beginning to happen. Woodbury County, Iowa, for example, has enacted a policy that mandates the county "shall purchase, by or through its food service contractor, locally produced organic food" for the Woodbury County jail, work release center, and juvenile detention facilities.[115] There has also been a proposal in Cleveland to give a 2% bid preference to local farmers when contracting with the city.[116] Each of these policies would seem to fall squarely within the market participant exception, because in each case the state is simply acting as a normal purchaser in the food market and not as a regulator of the market itself.[117]

Needless to say, these are relatively small-scale programs. But some states do have considerable purchasing power in the food market, whether it be for school lunch programs, poverty assistance, or state universities. In 2014–2015, for example, the State of Pennsylvania, under its State Food Purchase Program alone, which largely goes to feed needy residents, purchased over $15.6 million worth of food.[118] The Pennsylvania program provides cash grants to counties for the wholesale purchase of food at competitively bid prices and is one of the largest programs of its kind across the country.[119]

In addition to purchasing food for their needy residents, states also purchase food for K–12 lunch programs and state universities. K–12 schools in Michigan, for example, spend about $200 million on food,[120] and several school districts have pushed to increase their purchases of local food.[121] Similarly, colleges and universities in Michigan spend about $53 million on their annual food budgets,[122] and some universities such as the University of Michigan and Grand Valley State University have initiated local food purchase programs as part of their sustainability drives.[123] Other states have enacted similar "farm to school" programs, which could provide an important market for local

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[114] *See* White v. Mass. Council of Constr. Emp'rs., Inc., 460 U.S. 204, 214 (1983).
[115] *See* Brannon P. Denning et al., *Laws to Require Purchase of Locally Grown Food and Constitutional Limits on State and Local Government: Suggestions for Policymakers and Advocates,* 1 J. AGRIC., FOOD SYSTEMS, & COMMUNITY DEV., 139, 143 (2010).
[116] *Id.*
[117] *See generally* MEGHAN SCULLY, COLO. DEP'T OF PUB. HEALTH & ENV'T, GOVERNMENT PURCHASING PREFERENCES THAT SUPPORT LOCAL FARMERS: A 50 STATE REVIEW (2012), http://coloradofarmtoschool.org/wp-content/uploads/downloads/2012/11/State-food-procurement-report-FINAL.pdf.
[118] *See* PA. DEP'T OF AGRIC., THE STATE FOOD PURCHASE PROGRAM ACT: REPORT TO THE PENNSYLVANIA GENERAL ASSEMBLY 4 (2016), http://www.agriculture.pa.gov/Encourage/food/State%20Food%20Purchase%20Program/Documents/SFPP%20Annual%20Report.pdf.
[119] *Id.* at 3.
[120] *See* COLLEEN MATTS ET AL., C.S. MOTT GRP. FOR SUSTAINABLE FOOD SYS., MICH. STATE UNIV., INSTITUTIONAL FOOD PURCHASING: MICHIGAN GOOD FOOD WORK GROUP REPORT SERIES 2 (report no. 3 of 5) (2010), http://www.michiganfood.org/uploads/files/inst_food_purchasing_report.pdf.
[121] *Id.* at 4.
[122] *Id.* at 17.
[123] *Id.* at 13–14.

food production.[124] The USDA Farm to School census estimates that $789 million is currently spent on local farm to school programs.[125] And some states hope to increase that number in the years to come. Michigan Good Food, for example, has as its goal that Michigan institutions will source 20% of their food products from Michigan growers, producers, and processors by 2020.[126]

Moreover, when a state purchases *unprocessed* local food for school lunch programs, there is no Dormant Commerce Clause barrier at all. This is because in 2008, Congress amended the National School Lunch Act, 42 U.S.C. 1758(j), to allow institutions to use a geographic preference in favor of locally grown unprocessed food. In 2011, the USDA enacted regulations allowing schools to use a "geographic preference" to favor local growers of unprocessed food.[127]

Yet significant barriers remain. Putting aside the Dormant Commerce Clause issues, which range, as noted, from minimal to nonexistent in this area, there are several reasons why state institutional purchases to encourage local food production have not made greater inroads in encouraging local production. Some of these barriers are institutional. Michigan surveys, for example, reveal that institutional purchasers are concerned about the seasonal availability of local food, the lack of local producers, and food safety.[128] Perhaps the largest concern, though, stems from the tight budgets of school food services.[129]

Budgetary concerns raise the issue of costs more generally. While local food may not always cost more, states may be legitimately concerned that purchasing local food in large quantities may raise food purchasing costs for the state.[130] Some states simply may

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[124] *See* TRICIA KOVACS ET AL., A SCHOOL'S GUIDE TO PURCHASING WASHINGTON-GROWN FOOD 1 (2012), http://www.wafarmtoschool.org/content/documents/schoolguideflowresguidenoresources-1.pdf; *see also Overview: Farm to School Census 2015*, U.S. DEP'T AGRIC.: FARM TO SCH. CENSUS, https://farmtoschoolcensus.fns.usda.gov/overview-farm-school-census-2015 (last visited Sept. 24, 2017) ("42% of districts surveyed by USDA say they participate in farm to school activities.").

[125] *See Farm to School Act of 2017*, NAT'L FARM TO SCH. NETWORK, http://www.farmtoschool.org/F2SAct (last visited Sept. 9, 2017).

[126] *About: The Vision and Goals of the Michigan Good Food Charter*, MICH. GOOD FOOD, http://www.michiganfood.org/about (last updated Apr. 1, 2014). The Michigan Good Food organization does not have good data on the extent to which current school food purchases come from local farmers. *See* COLLEEN MATTS ET AL., *supra* note 120, at 12.

[127] *See* Geographic Preference Option for the Procurement of Unprocessed Agricultural Products in Child Nutrition Programs, 76 Fed. Reg. 22603 (Apr. 22, 2011) (amending 7 C.F.R. § 220.16, among other provisions, to include the following language: "School food authorities participating in the Program, as well as State agencies making purchases on behalf of such school food authorities, may apply a geographic preference when procuring unprocessed locally grown or locally raised agricultural products. When utilizing the geographic preference to procure such products, the school food authority making the purchase or the State agency making purchases on behalf of such school food authorities have the discretion to determine the local area to which the geographic preference option will be applied").

[128] COLLEEN MATTS ET AL., *supra* note 120, at 6.

[129] *See id.*

[130] *See* Phaedra Hise, *Why Does a Strawberry Grown Down the Road Cost More Than One Grown in California?*, WASH. POST (June 21, 2016), https://www.washingtonpost.com/lifestyle/food/why-local-food-costs-more-a-strawberry-case-study/2016/06/20/c7177c56-331f-11e6-8ff7-7b6c1998b7a0_story.html?utm_term=.f06d89181521. Note that there is some controversy here, as sometimes local food might cost less. *See* RICH PIROG & NICK MCCANN, LEOPOLD CTR., IS LOCAL FOOD MORE EXPENSIVE?: A CONSUMER PRICE PERSPECTIVE ON LOCAL AND NON-LOCAL FOODS PURCHASED IN

not be able to afford the higher cost. There may also be a more subtle drawback in the sense that the benefit of disbursed production is one that accrues to the nation as a whole, while the cost would be localized in the state itself. In other words, a state may pay higher food prices in order to encourage local production, but that local production could in theory be shipped anywhere. This would in turn benefit residents of multiple states, especially if the state inducements are sufficient to grow the local production base, such that economies of scale drive costs down to a level that is competitive with the market at large. Thus, while the state might pay a premium for local production, the state might not capture the full benefit of such a move, while bearing the full cost. Moreover, in some cases, such as the Woodbury policy cited above, it is not even clear that only in-state growers would benefit, because the policy defines locally grown food as that which is "'grown and processed within a 100-mile radius of the Woodbury County courthouse' in Sioux City, Iowa."[131] Because Sioux City is on the border, the 100-mile radius likely extends into neighboring South Dakota and Nebraska.[132] Thus, the state would bear the full cost of higher prices, but in-state growers would not capture the full benefit of the policy.

b. State Subsidies

Another possible avenue for encouraging disbursed production along state lines is to have state governments directly subsidize in-state growers. Under current Dormant Commerce Clause jurisprudence, in-state subsidies are generally less likely to trigger strict scrutiny than tax breaks for in-state businesses, despite the argument that they are economically indistinguishable.[133] In *New Energy Co. of Indiana v. Limbach*, for example, the Supreme Court expressly distinguished an Indiana subsidy for local ethanol while invalidating an Ohio tax credit against the state fuel sales tax for Ohio-produced ethanol.[134] The Court noted that:

> [t]he Commerce Clause does not prohibit all state action designed to give its residents an advantage in the marketplace, but only action of that description in connection with the State's regulation of interstate commerce. Direct subsidization of domestic industry does not ordinarily run afoul of that prohibition; discriminatory taxation of out-of-state manufacturers does.[135]

After *Limbach*, then, it seemed that subsidies would generally pass Dormant Commerce Clause muster even if economically indistinguishable from tax breaks. However, several years later, the issue became more muddied, as in *West Lynn Creamery*,

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IOWA 13 (2009),
http://www.agmrc.org/media/cms/Is_Local_Food_More_Expensive_0DEEF5B9A5323.pdf.

[131] *See* Denning et al., *supra* note 115, at 144 (quoting the policy).

[132] *Id.* at 144 n.4.

[133] *See* Dan T. Coenen, *Business Subsidies and the Dormant Commerce Clause*, 107 YALE L.J. 965, 967–68 (1998).

[134] *See* 486 U.S. 269, 278 (1988).

[135] *Id.* (emphasis omitted).

Inc. v. Healy, the Court noted that "[w]e have never squarely confronted the constitutionality of subsidies, and we need not do so now."[136] In that case, the Court struck down a combination tax-subsidy scheme, where the state taxed all fluid milk sold by dealers to Massachusetts retailers, and then returned the tax as a subsidy only to Massachusetts dairy farmers.[137] But what exactly made the scheme infirm: the tax or the subsidy? The answer was not clear, which led some commentators to question whether subsidies themselves might run afoul of the Dormant Commerce Clause, despite the fact that the Court in *West Lynn Creamery* itself made clear that "[a] pure subsidy funded out of general revenue ordinarily imposes no burden on interstate commerce, but merely assists local business."[138]

Not surprisingly, in the wake of *West Lynn Creamery*, there has arisen a good deal of academic literature regarding the extent to which subsidies can, and should, escape strict scrutiny under the Dormant Commerce Clause.[139] While a subsidy given out of a state's general revenues would appear to be the most likely to survive challenge, and a subsidy given out of a segregated fund that is funded by tax revenues on both in-state and out-of-state producers would appear to fail under *West Lynn Creamery*, there is no clear consensus regarding the scope of "proper" versus "improper" subsidies, and indeed whether there should be any such thing as a "proper" discriminatory subsidy in the first place.[140]

Still, subsidies do offer a promising avenue for states to bolster local food production, especially if the subsidies are paid out of general revenues. Subsidies might take the form of producer subsidies—aiding local farmers directly—or consumer subsidies—aiding grocers or consumers for their purchase of locally grown food. The point of consumer subsidies would be to make locally grown food price-competitive (although there is no reason why in theory it could not also be used to make locally grown food actually cheaper than the distant, mass-produced variety). The point of producer subsidies would likely be the same, but it need not be, as producer subsidies might also subsidize food grown only for household consumption—i.e., food that is not part of the market at all—especially if states decide that food marketing itself imposes certain climate-related costs, such as transportation emissions and packaging costs. Subsidies might also be tailored to factors such as plot size, what the crop area is

[136] 512 U.S. 186, 199 n.15 (1994).
[137] *Id.* at 188.
[138] *See id.* at 199. *See* Peter Enrich, *Saving the States from Themselves: Commerce Clause Constraints on State Tax Incentives for Business*, 110 HARV. L. REV. 377, 431 n.295 (1996) ("The Court left open the question whether a subsidy restricted to in-state businesses is constitutional if funded in a manner that does not burden out-of-state competitors . . . ."); William L. Oemichen, *Milk, State Taxes, State Subsidies, and the Commerce Clause: When States Cannot Tax an Agricultural Commodity To Fund a Subsidy for Its Struggling Industries*, 18 HAMLINE L. REV. 415, 428 (1995) (arguing that *West Lynn Creamery* "places in constitutional jeopardy the ability of states to subsidize domestic industries").
[139] *See, e.g.*, Coenen, *supra* note 133.
[140] *Id.* at 1038–53 (analyzing various scenarios to propose a distinction between proper and improper subsidies); *see also* Edward A. Zelinsky, *Restoring Politics to the Commerce Clause: The Case for Abandoning the Dormant Commerce Clause Prohibition on Discriminatory Taxation*, 29 OHIO N.U. L. REV. 29, 46 (2002) (claiming there is "no persuasive basis" for the Court's distinction "between state taxation (subject to constitutional review under the nondiscrimination principle) and direct government subsidies ('ordinarily' not subject to such review)").

displacing (e.g., there could be no subsidy for crops that displace forest areas on the theory that such displacement actually exacerbates climate change by removing a carbon sink), and higher subsidies for crops that displace less desirable land uses such as vacant lots, or are located in urban areas or even rooftops. The possibilities are virtually endless, which makes subsidies at the state level particularly attractive, as states could serve as laboratories for experimentation with different approaches.

The problem with subsidies, of course, is the same problem that plagues the market participant ideas noted above, namely that they require states to spend money, which many states are unwilling or simply unable to do, especially on the scale that is required. States would also face the problem of bearing the full costs of the subsidy while not capturing the full benefit, as noted above, given that producers remain free to sell their goods elsewhere. Indeed, part of the point of encouraging subsidies is to develop a resilient production system where production in one state can make up for shortfalls elsewhere. But states might be reluctant to embark on such subsidies if they felt they could simply "free ride" on other states—relying on production in other states during adverse climate events without having to pay subsidies out of their own coffers for production in their state. How, then, to ensure what in takings law is famously termed an "average reciprocity of advantage," where each state is both benefitted and burdened in roughly equal measure? States would have to either feel that the subsidies carried added benefits—such as being advantageous to a politically powerful sector of the state economy—or had fewer costs—such as if the subsidies originated from outside the state, namely from the federal government.

Finally, to the extent there remains some question whether state subsidies—even those out of general revenue—would survive Dormant Commerce Clause scrutiny, this Paper offers another reason to resolve such a question in favor of allowing subsidies.[141] While on the surface there appears to be little economic distinction between a subsidy and a tax—as favoring in-state producers and disfavoring out-of-state producers amounts to the same thing—there are good reasons to believe, in the food production context, that state subsidies are superior to taxes and should be allowed even if taxes are not.

c. Discriminatory Taxes

The third broad category of state action is obviously the most problematic under current Dormant Commerce Clause jurisprudence: states levying taxes or fees on out-of-state crops. Even putting aside the Dormant Commerce Clause issues, it is not clear how effective such a strategy would be in fostering local production. The reasons are several-fold. First, for a state tax of this sort to be effective, it would have to promote in-state production, either by shielding current in-state producers from outside crops that would undercut them on price, or by spurring new in-state production that suddenly becomes competitive due to the tax. However, for this to occur, there must be a viable equivalent or substitute crop that can be grown in-state. For example, a tax on out-of-state corn might help local farmers if passed by New Mexico or Florida—states with minor corn production—but not if passed by Alaska, a state with no real corn production and little

[141] For the larger case in favor of allowing subsidies, *see generally* Coenen, *supra* note 133.

current prospect for such production.[142] The response, of course, is that Alaska would be unlikely to tax corn if it did not benefit local farmers, although the state may have other reasons for doing so, such as pure revenue generation or even an attempt to depress demand for corn for other reasons, such as the interests of the fossil fuel industry.[143]

Second, taxes on out-of-state food are likely to disproportionately affect crops that are shipped across state lines and sold as food, and not crops that are used as inputs to other food production or industrial processes. For example, North Carolina might tax out-of-state apples in order to protect local orchards, but it is less likely to tax apple juice, apple sauce, or any of the other products made from apples. Depending on the relative share of fresh versus processed products, this means that local producers might still be uncompetitive in the primary market for the crop.

Third, taxes on out-of-state food might help local farmers compete in the in-state market, but they would not necessarily help local farmers compete in markets in other states, where their goods would still be non-competitive. In other words, a tax is meant to encourage local consumption of local goods, but it will not help local goods become consumed elsewhere, which might be a problem if the primary consumption markets are elsewhere. Indeed, one longstanding danger of discriminatory taxes is that they would lead other states to impose their own taxes, making every state's products less competitive in other states.[144] This might lead to a situation where, in the case of a climate wipe-out in one state, other states' goods might be less available to that states' consumers to make up the shortfall.

In the end, it appears that discriminatory taxes, while perhaps the easiest kind of measure for states to pass politically, would both be the most vulnerable to Dormant Commerce Clause challenge and the least likely to succeed from a policy perspective. While Congress could certainly overcome the Dormant Commerce Clause issue by passing a law allowing states to implement such discriminatory taxes—and courts could overcome it on their own by "softening" the doctrine—it remains the fact that such a policy is not as well-suited to the goal of distributed production as the subsidy scheme described previously.

The question becomes, then, whether states should be able to enact discriminatory taxes if subsidies are unrealistic. Discriminatory taxation may be inferior to subsidies, but may be superior to doing nothing. While a discriminatory tax scheme would essentially raise average food prices, it would, to the extent it is effective, represent a trade-off

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[142] *See 2016 U.S. Corn Production by State*, WORLD OF CORN, http://www.worldofcorn.com/#us-corn-production-by-state (last visited Sept. 8, 2017). *See also* Suzanna Caldwell, *Rare, Successful Alaska Corn Harvest Gives Fairbanks Farmers Hope*, ALASKA DAILY NEWS (Aug. 21, 2012), https://www.adn.com/alaska-news/article/rare-successful-alaska-corn-harvest-gives-fairbanks-farmers-hope/2012/08/22/ (detailing experiments in Alaskan corn production and the reasons why Alaska is currently unsuited for corn production).

[143] The notion here is that a state might seek to reduce food corn demand, and hence food corn prices, in order to encourage farmers to switch away from food corn and instead plant corn used for ethanol. This would increase the supply of ethanol corn, lowering the price of ethanol, and hence would lower the price of the gasoline blended with ethanol.

[144] *See, e.g.*, Okla. Tax Comm'n v. Jefferson Lines, Inc., 514 U.S. 175, 179–80 (1995) (stating that "the Commerce Clause's purpose [is] preventing a State from retreating into economic isolation or jeopardizing the welfare of the Nation as a whole").

between such higher average prices and some insulation from price shocks.[145] In other words, the fact that it raises prices is not itself a reason to disfavor a discriminatory tax scheme.

Elsewhere, Professor David Dana and I have argued for viewing Dormant Commerce Clause cases through a climate change "lens"—noting how seemingly like products can be quite unlike when climate change is taken into account in their production processes.[146] In the course of that Paper, we explored the idea of local production fostering climate resiliency in the context of energy production.[147] We argued that "for any given mix of energy production, local sources will always be more climate-resilient than distant sources."[148] A discriminatory taxation scheme might also be viewed through a climate change lens to the extent that a local food product is not "like" a more distantly produced one given the transportation costs and the climate vulnerabilities engendered by such distant production.[149] In other words, California might conclude that a California tomato and a Florida tomato are not "like" products, and hence might be justified in taxing the Florida tomato, if the California tomato is grown with a smaller climate footprint or might be a useful element of the state's climate resilience strategy.

V. MAKING SUBSIDIES WORK

Putting aside the issue of whether states should be allowed to enact discriminatory taxes, there may be ways to make subsidies work that would make them more politically and economically palatable to states.[150] As noted previously, one of the greatest hurdles faced by subsidies would appear to be the fact that they cost the states money. Another hurdle is that the granting state does not capture the full benefits.

Both of these hurdles, and any Dormant Commerce Clause issues, can be overcome if such subsidies are paid for by the federal government. Of course, the federal government already provides tremendous subsidies to farmers on its own, and a small amount of such subsidies are already tailored to local production in such places as the

[145] For a discussion of recent attempts by countries to insulate their markets from international food price shocks, *see* Will Martin et al., *Did Trade Policy Responses to Food Price Spikes Reduce Poverty?*, WORLD BANK BLOG (Aug. 21, 2013), http://blogs.worldbank.org/developmenttalk/did-trade-policy-responses-food-price-spikes-reduce-poverty.

[146] *See* Michael Barsa & David Dana, *A Climate Change Lens on the Dormant Commerce Clause, Lifecycle GHG Taxes, and In-State RPSS Requirements*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 69, 69–93 (2014).

[147] *Id.*

[148] *Id.* at 85–86.

[149] *See* Gen. Motors Corp. v. Tracy, 519 U.S. 278, 298–99 (1997) ("Conceptually, of course, any notion of discrimination assumes a comparison of substantially similar entities . . . [and] when the allegedly competing entities provide different products, as here, there is a threshold question whether the companies are indeed similarly situated for constitutional purposes.").

[150] Subsidies are also likely to be superior to a state simply relying on its own market power. States have unequal market power in terms of food production, and it is not clear that the states with the *most* market power are the states where we also wish to encourage the most food production. It is also unclear how much market power states really do have. With that said, there is no reason why state subsidies couldn't be *combined* with state market participation. The two strategies are not mutually exclusive.

farm to school grant program.[151] But if we wish to encourage local production on the scale that is required, at least some large proportion of overall farm subsidies could be transferred to the states as block grants for the purpose of having the states foster in-state food production. The "block grant" idea is one that political conservatives have recently favored in areas such as health care,[152] and indeed the idea, to the extent that it comports with conservative notions of federalism, might provide a politically plausible way to changing farm subsidies in a way that also fosters climate resilience. In this way, the subsidies could be spread out geographically instead of concentrated in the major food production areas. Politically, this means that some states with current high concentrations of farm subsidies might become net losers while other states would become net winners.

The block grants could also be tailored to foster a greater diversity of food crops, either diversity within a crop—such as different varieties of corn—or diversity among crops. Indeed, one of the appealing aspects of a subsidy scheme is the fact that it could be tailored to express a wide range of policy goals and could be changed year-to-year, or even more frequently if they are in the hands of an agency. This of course could also be a danger—that the block grants would be hijacked for other purposes—but at the very least they would help foster *some* greater geographic and genetic diversity in order to help withstand the unpredictable nature of the climate events that threaten food security.

Moreover, it is worth reiterating that federal subsidies given to states for purposes of fostering local production would face no Dormant Commerce Clause issues at all, as the federal government is not subject to that doctrine's strictures.[153] It is only when states initiate their own subsidy programs that there is even a question concerning the doctrine.[154] And to the extent that there is any doubt concerning the viability of such state subsidies, the Dormant Commerce Clause can certainly be "clarified"—or indeed "softened"—to make room for such policy choices.

VI. CONCLUSION

There are obviously many critical issues that need to be addressed before building a truly climate-resilient agricultural system. Such issues include: rethinking federal farm subsidies, international trade rules, and antitrust issues among seed and processing companies. In this Paper, I have attempted to illuminate one aspect of this daunting challenge: the importance of geographic and genetic diversity and the extent to which such diversity can be fostered by states giving preferential treatment to local farms, and how different forms of such treatment might be viewed by courts under the Dormant Commerce Clause, either as that clause is currently construed or under a "softened"

[151] *See Farm to School Act of 2017*, *supra* note 125 (noting that "[i]n the Healthy, Hunger-Free Kids Act of 2010, Congress established mandatory funding of $5 million annually for a farm to school competitive grant and technical assistance program").
[152] *See, e.g.*, Aaron E. Carroll, *How Would Republican Plans for Medicaid Block Grants Actually Work?*, N.Y. TIMES (Feb. 6, 2017), https://www.nytimes.com/2017/02/06/upshot/how-would-republican-plans-for-medicaid-block-grants-actually-work.html?_r=0.
[153] *See* Trailer Marine Transp. Corp. v. Vazquez, 977 F.2d 1, 8 (1st Cir. 1992) (noting that "a doctrine designed to safeguard federal authority against usurpation has no role when the federal government itself is effectively the actor").
[154] *Id.*

version. The diversity issue is critical given the multitude of unpredictable climate threats faced by our agricultural system, and there is a great deal the states can do to foster such diversity, most notably to subsidize local agriculture. While such local subsidies are likely to withstand scrutiny, even under current interpretations of the Dormant Commerce Clause—and certainly the doctrine should be clarified to erase any lingering doubts—the federal government can overcome this and other challenges to local subsidy schemes by transforming at least part of its farm subsidy program into a "block grant" program that would allow states to subsidize in-state food production. This might actually be politically plausible given the current Republican preference for block grants, and it would certainly be a useful first step in fostering the climate resilience that is currently lacking in the U.S. agricultural sector.