ETHANOL AS MITIGATION MEASURE IN THE TRANSPORT SECTOR: COUNTERVAILING PERVERSE EFFECTS OF UNCOORDINATED BIOFUEL STANDARDS IN THE U.S. AND BRAZIL

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Synopsis: Blending ethanol in existing fuels can be a realizable mitigation measure in the transport sector, where GHG emission cuts seem highly necessary, yet far from evident. To incentivize this, subsidies to ethanol production have been introduced in Brazil and the United States. There are, however, important differences, and in Brazil subsidies to sugarcane-based ethanol are limited to a regional equalization and competitiveness allowance, while the U.S. ARC-CO and PLC mechanisms also take into account international ethanol price evolutions. As the level of subsidies also seems higher in the United States, problems can arise if low-priced U.S. corn-ethanol (which has been found less sustainable than Brazilian sugar-cane ethanol) is brought on the Brazilian market. This peril is increased by the more stringent ethanol-use mandates in the United States, and particularly in California. While it is encouraging that an increasing legal link is being made between sustainability and ethanol use targets, there is a lack of coordination with the targets in Brazil. Seeing the expanding demand for advanced biofuels in the U.S., it will be attractive to import sugarcane-based ethanol from Brazil (which qualifies as an advanced biofuel), rather than foster new developments in advanced biofuels. The targets in Brazil do not make a distinction between advanced and common biofuels, and subsidized U.S. corn-based ethanol becomes a cheap, yet less 'green' option to meet the targets. By consequence, different environmental standards can achieve the objective of renewable fuel policies. To prevent this, coordination between the different standards, and a full integration of the life-cycle approach seems necessary.

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I. INTRODUCTION

Transport is one of the most demanding sectors to regulate within climate change law. Being responsible for 23% of CO_2 emissions worldwide, it is crucial to mitigate transport emissions.[1]

In the International Panel on Climate Change's (IPCC) Fifth Assessment report, policies to reduce the carbon intensity of fuels are listed. Amongst possible mitigation strategies, partially switching from fossil-based fuels to ethanol can be an interesting pathway with immediate results, since ethanol has the potential to be blended in existing fuel mixes.[2] In the United States, the use of corn-based ethanol instead of gasoline has been estimated to lead to reductions of GHG emissions by 13-48%.[3] In Brazil, where most ethanol is sugarcane-based, the avoided emissions compared to gasoline is estimated to be an 85% reduction of GHG emissions.[4]

Both the United States and Brazil can be seen as ground-breaking players in the ethanol market. Brazil requires an astonishing 27% of ethanol to be blended in fuels, which has since 2003 led to an estimated reduction of 350 million tons of CO_2 emissions.[5] In the United States, recent data from the U.S. Department of Energy shows that gasoline consumed in twenty-five states already contains more than 10% ethanol on average.[6]

Besides this ambitious ethanol-use, the production of ethanol in the United States and Brazil also dominates, as their joint production of ethanol accounts for around 70% of the world's ethanol production.[7]

The efforts of the United States and Brazil to produce and consume ethanol-based fuels, however, also comes with criticism. It has been argued that the whole

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1. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FIFTH ASSESSMENT REPORT 46-47 (2014), [hereinafter IPCC FIFTH ASSESSMENT REPORT] http://goo.gl/0N5ECH; UNICA, *The Role of Cleaner Fuels After COP21*, BIOFUELS INT'L MAG. (Jan. 22, 2016), at 1, http://www.unica.com.br/columns/24913111920310875715/the-role-of-cleaner-fuels-after-cop21/.

2. IPCC FIFTH ASSESSMENT REPORT, *supra* note 1, at 101.

3. DAVID L. GREENE & ANDREAS SCHAFER, PEW CENTER ON GLOBAL CLIMATE CHANGE, REDUCING GREENHOUSE GAS EMISSIONS FROM U.S. TRANSPORTATION 40, 54 (2003).

4. Searchinger et. al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change*, 319 SCIENCE 1238, 1240 (2007).

5. *Ethanol – Sugarcane*, UNICA, http://sugarcane.org/sugarcane-products/ethanol (last visited Feb. 11, 2017).

6. Renewable Fuels Association, *DOE Data: Half of United States Broke Through So-Called 'Blend-Wall' in 2015*, http://ethanolrfa.org/2016/12/doe-data-half-of-united-states-broke-through-so-called-blend-wall-in-2015/ (last visited Feb. 11, 2017).

7. Soybean & Corn Advisor, Inc., *Brazil vs. United States Ethanol Industries*, http://www.soybeansandcorn.com/Brazil-US-Ethanol-Production (last visited Feb. 11, 2017)

process of ethanol production is not always so "green" as it seems.[8] This risk is being tackled by recent fine-tuned regulation. Separate targets for advanced and second generation biofuels are increased in the United States; and in both Brazil and the United States, measures have been taken to integrate life-cycle approaches in biofuel policies. In general, subsidies have been aiming to target the most sustainable produced biofuel. Nevertheless, such regulation has been integrated differently in Brazil and in the United States.

As ethanol has shifted from a domestic to an international trading product, uncoordinated environmental requirements can be problematic. It is thinkable that a biofuel considered non-sustainable in the United States can be used to meet the targets in Brazil and vice versa. This can be particularly problematic if the import of a subsidized, less sustainable biofuel impedes the domestic production of sustainable biofuels.

In order to address this potential risk, a double comparison between the legal framework of Brazil and the United States seems highly relevant: the comparison of subsidies on the production level (II) and the comparison on the ethanol-use level (III). In the first part, direct subsidies to the ethanol production sector will be analyzed; then it will look into more indirect subsidies, such as favorable loans and guarantees, as well as the Brazilian and U.S. tax regimes. In the second part, on a consumption level, the ethanol use mandates of Brazil's targets and the U.S. fuel standards are compared and linked to a different form of life-cycle approach. Analysis of these differences will point out very different targets, with far-reaching trade effects. To mediate this, a proposal will be made and a conclusion will be presented.

II. LEGAL SUPPORT FRAMEWORK OF DOMESTIC ETHANOL PRODUCTION

Both in Brazil and in the United States, the first legal instruments date back to the oil crisis of the mid-seventies.[9] As a result of the oil embargo of the Organization of Arab Petroleum Exporting Countries, oil prices quadrupled between 1973 and 1974.[10]

For Brazil, this increase occurred at a time where 70% of oil was imported.[11] In response to the surge of oil prices, Brazil drastically increased its incentives for biofuels. With the "Proalcool" Program of 1975, a nation-wide subsidies program was launched in order to shift from fossil fuel production to sugarcane-based ethanol.[12]

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8. JISUNG PARK, *Bio-ethanol Not as Green as It May Seem*, CONSILIENCE J. (Aug. 5, 2008), http://www.consiliencejournal.org/blog/2008/08/05/bio-ethanol-not-as-green-as-it-may-seem/; Searchinger, *supra* note 4.

9. ARNALDO WALTER & LUIS CORTEZ, *An Historical Overview of the Brazilian Bioethanol Program*, 11 RENEWABLE ENERGY 2 (1999).

10. NELSON MAJARRO, OXFORD INST. FOR ENERGY STUD., ETHANOL AND OIL FIRMS: THE BEGINNING OF A NEW ROLE FOR ALTERNATIVE FUELS? 12 (Feb. 2014).

11. *Id*.

12. Art. 2, Decreto No. 76.593, de 13 de Novembro de 1975, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 14.11.1975 (Braz).

Also, in the United States, ethanol promotion programs were launched around this time. The 1978 U.S. Energy Tax Act started by granting an ethanol tax credit.[13]

Nowadays, ethanol production is still subsidized in different forms. The support schemes of Brazil and the United States will now be compared, starting with the direct subsidies.

A. Direct Subsidies

In Brazil, subsidies take the form of equalization and competitiveness allowances. Equalization allowances are granted to ethanol producers in the least developed regions, when they are confronted with excessive production costs.[14] Ethanol production costs in developed growing areas are hereby set as a baseline. If —upon comparison of this baseline with costs in other regions—ethanol production costs in a region are disproportionally high, producers within this region are eligible for a subsidy equal to the difference in production costs. Equalization allowances are thus limited to situations of national disparities between producers of certain regions.

In addition, all ethanol producers are eligible for a general competitiveness allowance of R$ 0.0450 (0.01 USD) per liter.[15] This allowance ensures overall competitiveness of ethanol within the Brazilian fuel market.[16]

The two Brazilian allowances strictly guarantee that all ethanol remains domestically competitive; the first with regards to the regions where it is produced, the second with regards to fossil fuels. Such techniques are limited in scope, preventing overcompensation. The fact that they only take into account domestic parameters, however, imposes some risks if, e.g., the U.S. ethanol fuels are traded at low prices.[17]

In the United States, since the Agricultural Act of 2014, direct payments have been abolished for corn-based ethanol production.[18]

Yet, allowances are granted to corn as a crop, when the market price or revenue for this stock decreases below a certain reference level. Two guaranteed price mechanisms exist: the Agriculture Risk Coverage-County (ARC-CO) and the Price Loss Coverage (PLC).[19]

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13. Energy Tax Act of 1978, Pub. L. 95-618, § 221, 92 Stat. 3174.

14. Art. 5, Resolucão CIMA, No. 10 de 1.2.1999, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 5.3.1999 (Braz.); Lei No. 12.999, de 18 de Junho de 2014, Presidência da República (Braz.). A financial subsidy of 187 million Real is granted to the northeastern states as of 2014; USDA, BR15006, BRAZIL BIOFUELS ANNUAL: BIOFUELS - ETHANOL AND BIODIESEL, 9 (2015).

15. Art. 1, Resolucão CIMA No. 10 de 1.2.1999, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 5.3.1999.

16. *Id*.

17. Câmara dos Deputados, Comissão de minas e energia, Requerimento de 2013 (realização de auditoria), http://www.camara.gov.br/proposicoesWeb/prop_mostrarintegra;jsessionid=421B59A6C96EB15B192E0ACBAF5DAE80.proposicoesWeb1?codteor=1108868&filename=REQ+249/2013+CME.

18. Agricultural Act of 2014, Pub. L. 113-79, § 1101, 128 Stat. 658.

19. *Id*.

In ARC-CO, the State pays a guaranteed price when such guaranteed price exceeds the crop revenue.[20] Government payments are made if revenue for the current year at the county level for a specific crop is below the guarantee for that crop in the benchmark years.[21]

With respect to the PLC, the difference between the sales price and a reference price is subsidized away.[22] PLC payments are calculated as the difference between the reference price and the national marketing year average price multiplied by the payment yield.[23]

While ARC-CO thus provides farmers with a revenue safety net and effectively covers revenue shortfalls, the PLC system foresees price protection if marketing prices fall below legislated reference prices.[24] Farmers were required to opt for one of the regimes for the entire 2014-2018 crop years period. Under these two regimes, U.S. corn is deemed more generously subsidized than it was in the previous system of direct payments.[25] Different than the Brazilian techniques, the U.S. guaranteed and reference price also reflect international price evolutions.[26]

For non-corn based ethanol, ethanol generators can still be granted direct payments if the ethanol qualifies as an advanced biofuel.[27] This requires that the ethanol produced has a GHG reduction potential of at least 50%.[28] For "advanced ethanol," two grants are foreseen. Firstly, under the Advanced Biofuel Production program (ABP), producers are eligible for a grant which reflect the net renewable energy content of such ethanol.[29] Secondly, the Biomass Crop Assistance Program (BCAP) provides landowners with a reimbursement of 50% of the cost of establishing feedstock crops cultivated for advanced biofuel production.[30] An additional grant is foreseen for the ethanol infrastructure.[31] These programs provide

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20. USDA Farm, ARC/PLC PROGRAM (2014), https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/arc-plc/pdf/2015%20arc%20plc%20payments%20feb%202017.pdf.

21. Bradley D. Lubben, *The Economics of ARC vs. PLC*, CORNHUSKER ECON. (2015).

22. USDA, FARM SERVICES AGENCY, ARC-COUNTY YIELDS, REVENUE, AND PAYMENT RATES AS OF FEB 2, 2016 (2015); USDA Farm, *supra* note 20.

23. Lubben, *supra* note 21.

24. *Id*.

25. The effective price equals the higher of the market year average price or the national average loan rate for the covered commodity. This results in corn being the most heavily subsidized agricultural product in the United States. David Rogers, *Bigger Subsidies Under New Farm Bill Program*, POLITICO (Mar. 9, 2015), http://www.politico.com/story/2015/03/farm-bill-subsidies-115907.

26. For example, they are raised if the international corn price is higher, or if other crops compete internationally with corn. Carl Zulauf, *Agricultural Risk Coverage – County (ARC-CO) vs. Price Loss Coverage (PLC)* (Ohio State University, 2014).

27. Energy Independence and Security Act of 2007, Pub L. 110-140, § 207, 121 Stat. 1531.

28. See e.g., Sugarcane based ethanol qualifies as an advanced biofuel. Energy Independence and Security Act of 2007, Pub. L. 110-140, § 201, 121 Stat 1519; Clean Air Act, 42 U.S.C. §§ 211(o), (B) (2013).

29. Agricultural Act of 2014, Pub. L. 113-79, § 9011, 128 Stat. 933; USDA, *USDA Announces Support for Producers of Advanced Biofuels*, USDA (Dec. 2, 2014), https://www.usda.gov/wps/portal/usda/usdahome?contentid=2014/12/0259.xml; U.S. Dep't of Energy, *Alternative Fuels Data Center: Federal Laws and Incentives for Ethanol*, http://www.afdc.energy.gov/fuels/laws/ETH/US (last visited Feb. 11, 2017).

30. The BCAP is limited to non-corn based ethanol, since § 9011(6)(C) of the Agricultural Act of 2016 *excludes* whole grains (explicitly including corn) from eligibility of the scheme. Agricultural Act of 2014, Pub L. 113-79 (emphasis added).

31. 7 U.S.C. § 8103; Agricultural Act of 2014, Pub. L. 113-79, § 6407, 128 Stat. 857.

for a very considerable amount of subsidies, greatly exceeding the Brazilian schemes.

B. Loans and Guarantees

Besides direct grants, indirect subsidies are relevant, e.g. in the form of state-loans or guaranties. In Brazil, the role of the Brazilian Development Bank (BNDES) is critical. This wholly state-owned, but private law governed, bank grants specific credit lines to the ethanol production sector.[32] Within the BNDES Support Program to Renew and Develop New Sugarcane program (BNDES Prorenova program), which aims at encouraging the renewal and expansion of sugarcane farms in order to reduce the industrial idleness of sugar and ethanol production, credit lines of R$ 1.5 billion (400,000 USD) are available for investments in sugarcane fields.[33] Additionally, within the ethanol stock program (PASS), loans of up to R$ 2 billion (530,000 USD) are reserved for ethanol infrastructure investments.[34]

Loan takers to these programs need to comply with preliminary criteria.[35] An applicant loan-taker must present a valid environmental license,[36] and the BNDES will actively control if sugarcane projects are only carried out in permitted areas.[37] Ethanol companies applying for a loan must prove that all used sugarcane origins from such areas.[38] The BNDES thus acts as a government agency, controlling government set standards, which are essential in Brazil's life-cycle approach policy.[39]

In the United States, no development bank is in place. However, within the Rural Energy for America Program, the U.S. Government provides loan guarantees (up to $25 million USD) for ethanol infrastructure investments.[40] A loan guaranty can also be provided for biorefinaries regarding their ethanol investments.[41] These U.S. loan guarantees differ from the Brazilian BNDES loans, since they only facilitate loans from commercial banks.

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32. Art. 1 Decreto No. 4.418, de 10 de Outubro de 2002, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 14.10.2002 (Braz.); USDA, BR15006, *supra* note 14, at 9.

33. USDA, BR15006, *supra* note 14, at 10; BNDES, BNDES PRORENOVA PROVIDES SUPPORTS R$4 BILLION FOR RENOVATION AND IMPLEMENTATION OF SUGARCANE FARMS (2012).

34. USDA, BR15006, *supra* note 14; BNDES, *Programa BNDES de Apoio ao Setor Sucroalcooleiro - BNDES PASS*, http://www.bndes.gov.br/wps/portal/site/home/onde-atuamos/agropecuaria/agropecuaria/ (last visited Feb. 16, 2016).

35. BNDES, DIRETRIZES E CRITÉRIOS AMBIENTAIS PARA APOIO AO SETOR DE AÇÚCAR E ÁLCOOL, http://www.bndes.gov.br/wps/portal/site/home/financiamento/financiamentos.

36. *Id.*

37. Which is relevant for Brazil's Indirect Land Use Change Policy, *cf.* below 3.2.1; Decreto No. 6961 de 17 de Setembro de 2009, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 18.09.2009 (Braz.); RESOLUÇÕES DO CONSELHO MONETÁRIO NACIONAL [C.M.N.] No. 3.813 e 3.814 de 26 de Novemro de 2009, DSF 06.10.2011; BNDES, DIRETRIZES E CRITÉRIOS AMBIENTAIS PARA APOIO AO SETOR DE AÇÚCAR E ÁLCOOL, http://www.bndes.gov.br/wps/portal/site/home/financiamento.

38. Therefore, the burden of proof is not insurmountable and it suffices that a simple statement is given by the company representatives. *Id*.

39. *Cf. infra* 3.2.1, b).

40. U.S. Dep't of Energy, *supra* note 29.

41. 7 U.S.C. § 8103; U.S. Dep't of Energy, *supra* note 29.

C. A Favorable Tax Regime

While it is easily understandable how ethanol may be subsidized by direct grants or favorable loans or guarantees, tax advantages are an even more indirect subsidy. Both in Brazil and in the United States, incentives to ethanol are integrated in the tax regimes.

Brazil's tax scheme is extremely fragmented. Within the various taxes, fuels are taxed heavily, both at the federal and regional levels. The ethanol sector is however often (partly) excluded from the very specific fuel taxes.

At a federal level, the Law of 19 December 2001 imposes the Contribuição sobre Intervenção do Domínio Econônomico (CIDE), a specific tax for the intervention in the economic domain.[42] The CIDE is an important tax levied on some specific products in order to provide funds for associated costs of the designated economic activity.[43] For fuels—which are subject to CID—contributions finance environmental and transport infrastructure projects, as well as fuel price subsidies.[44]

For ethanol however, the rate of the CIDE has been set on zero by the Decree of 30 April 2004.[45] The Decree of 28 January 2015 further increased the CIDE on gasoline and diesel, resulting in a rise of fuel prices, and an advantage for the ethanol sector.[46]

At a state level, the Imposto sobre Circulação de Mercadorias e Serviços (ICMS) has to be paid for all commercialization or importation of any good.[47] For fuels, states generally subject ethanol to a lower ICMS rate. The ICMS for ethanol ranges from 12% to 27%, which is on average 9% lower than the ICMS for other fuels. [48]

Furthermore, operators must normally pay a specific social security tax per liter of produced fuel.[49] The Tariff Decree of 28 January 2015 applies to diesel and gasoline fuels, but ethanol fuels are subject to the lower tariffs of the Law of

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42. Lei No. 10.336, Art. 1, § 1º , I, de 19 de Dezembro de 2001, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 20.12.2001 (Braz.).

43. Art. 149 CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] de 1988, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 5.10.1988; Rebeca Duran, *Introduction to CIDE,* , THE BRAZIL BUSINESS (Feb. 26, 2014), http://the-brazilbusiness.com/article/introduction-to-cide.

44. Rebeca Duran, *supra* note 43.

45. Decreto No. 5.060 de 30 de Abril de 2004, DIAIO OFICIAL DA UNIÃO [D.O.U.] de 30.4.2004 (Braz.).

46. Decreto No. 8.395, de 28 de Janeiro de 2015, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 29.1.2015 (Braz.).

47. Lei Complementar No. 87, de 13 de Setembro de 1996, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 26.10.1996 (Braz.); Júlio César Zanluca, *Imposto Sobre Circulação de Mercadorias e Prestação de Serviços*, PROTAL TRIBUÁRIO (2015), http://www.portaltributario.com.br/tributos/icms.html.

48. USDA, BR15006, *supra* note 14, at 7-8.

49. Lei Complementar No. 70, de 30 de Dezembro de 1991, DIAIO OFICIAL DA UNIÃO [D.O.U.] de 31.12.1991; Lei Complementar No. 7, de 7 de Setembro de 1970, D.O.U. de 8.9.1970, retificado em 10.9.1970; Lei Complementar No. 8, 3 de Dezembro de 1970, D.O.U. de 4.12.1970.

10 September 2013,[50] which are even set at zero by the provisional measure of 7 May 2013.[51]

While the subsidy tax aspect is noticeable, no general income tax exemption is in place for ethanol producers. The latter thus remain fully taxable on generated profits. This used to be very different in the United States, where the primary federal incentive for ethanol in the United States was the Volumetric Ethanol Excise Tax Credit, which granted ethanol producers and blenders an income tax credit**.** In 2011, because of overcompensation risks, it was decided not to extend this system.[52] A tax credit can still be found under the Second Generation Biofuel Producer Tax Credit scheme (SGBPTC), whereby producers can apply for a credit of $1.01 per gallon on their income tax for second generation biofuels.[53] To qualify as such a biofuel, ethanol needs to be derived from qualified crops, in line with Section 211 of the Clean Air Act, derivable from a narrow group of matters such as e.g. algae.[54]

As in Brazil, there are also ethanol exemptions under specific fuel taxes. In the United States, such taxes are entirely regulated by the states, within their excise and sales taxation powers. While the approaches vary from state to state, most states use lower tariffs for ethanol.[55] Additionally, particular exemptions are in place, like the Cellulosic Ethanol Investment Tax Credit in Minnesota[56] or the Ethanol Promotion Tax Credit in Iowa.[57]

D. The Consequences of Different Subsidies

When examining government incentives in Brazil and in the United States, similar patterns and important differences come up. Both subsidy techniques and subsidy levels differ.

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50. Art. 1 Decreto No. 8.395, *supra* note 46; Art. 1 Lei No. 12.859, de 10 de Setembro de 2013, DIAIO OFICIAL DA UNIÃO [D.O.U.] de 11.9.2013.

51. For ethanol, no contributions are due, in any case until the end of 2016, when the law is up for revision. Art. 1 §1 Lei No. 12.859, *supra* note 50; Medida Provisória No. 613, de 7 de Maio de 2013, [D.O.U.] 8.5.2013, retificado em 16.5.2013.

52**.** Under the ancient U.S. VEETC, there were risks that the U.S. ethanol industry was overcompensated; the Congressional Research Service estimated that the sole effects of Renewable Fuels Standard ('RFS', *cf*. *infra* § 3.2.1.) sufficed as an incentive for the ethanol sector. Volumetric Ethanol Excise Tax Credit Repeal Act, H.R.1075, 112th Cong. (2011); Hanna Autumn, *Policy Brief: The Volumetric Ethanol Excise Tax Credit: History and Current Policy*, TAXPAYERS FOR COMMON SENSE (2011), http://www.taxpayer.net/library/article/the-volumetric-ethanol-excise-tax-credit-history-and-current-policy.

53. 26 U.S.C. § 40 (2009).

54. A qualified feedstock is any lignocellulosic or hemicellulosic matter that is available on a renewable or recurring basis; any cultivated algae, cyanobacteria, or lemna, which does not include any fuel if more than 4% of the fuel is any combination of water and sediment, the ash content of the fuel is more than one, or the fuel has an acid number greater than twenty-five. Alcohol with a proof of less than 150, fuel with a water or sediment content of more than 4%, and fuel with an ash content of more than 1% are not considered second generation biofuels. U.S. Dep't of Energy, *supra* note 29; DEPARTMENT OF THE TREASURY, INSTRUCTIONS FOR FORM 6478 BIOFUEL PRODUCER CREDIT (2015).

55. CAL. ENERGY COMM. STAFF REPORT, ETHANOL FUEL INCENTIVES APPLIED IN THE U.S.: REVIEWED FROM CALIFORNIA'S PERSPECTIVE 13 (Jan. 2004), http://www.energy.ca.gov/reports/2004-02-03_600-04-001.PDF.

56. MINN. STAT. § 116J.8737 (2016).

57. IOWA CODE § 422.11N (2007).

First of all, there are important differences in subsidy techniques. Both Brazil and the United States encourage their ethanol sector via direct subsidies. The way they do it though, diverges considerably. In Brazil, subsidies to ethanol (usually sugarcane-based) are limited to a regional equalization and competitiveness allowance. The U.S. ARC-CO and PLC mechanisms are broader, taking into account international price evolutions, guaranteeing a very competitive price for corn.[58]

For ethanol qualifying as advanced biofuel, direct payments to farmers and distilleries are provided in the United States. For indirect subsidies, in Brazil, loans are granted directly by the BNDES. This differs from the U.S. guaranty scheme. Still, both techniques achieve a similar effect: a favorable loan, guaranteed by the government. Concerning tax regimes, both in Brazil and in the United States, tax exemptions on specific fuel taxes are in place, but only in the United States does a (limited) income tax credit apply.

Secondly, the levels of subsidies also vary. The 2014 Agricultural Act repealed direct payments in the United States other than for "advanced ethanol" biofuels. However, this did not decrease the level of subsidies. On the contrary, the PLC and ARC-CO are estimated to allocate to the corn and beans sector—corn being United States' most subsidized agricultural product[59]—$4.8 billion in 2017, nearly double the previous direct payments for this crop.[60] As a result, the amount of U.S. subsidies considerably exceeds the Brazilian subsidy level.

While for advanced and second generation biofuels, the higher subsidies and generous tax treatment may be necessary to switch to more carbon friendly biofuels, such reasoning cannot be upheld for mature, corn-based ethanol.[61] The corn subsidies result in a reality where, despite the fact that production costs of sugarcane ethanol are normally lower than those of corn-based ethanol, the United States can trade ethanol very competitively.[62] This led in the past to dumping prices abroad. In the EU, anti-dumping measures within Article 6 of the GATT are imposed on U.S. ethanol for this reason.[63]

It seems highly unlikely that Brazil would impose similar anti-dumping measures on U.S. ethanol. Anti-dumping measures within Article 6 of the GATT can only be undertaken in circumstances where significantly lower prices on the exporter's domestic market are seriously threatening the industry of the importing country, which seems not to be the case for the cross-trade relationship between Brazil and the United States.[64] Imposing anti-dumping measures would also be a politically perilous option, as the risk on market foreclosure from the other State would foreclose markets which are equally important for both Brazil and the United States.

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58. Agriculture Act of 2014, Pub. L. 113-79, §§1113, 1114 (2014).

59. USDA, *supra* note 22; USDA Farm, *supra* note 20.

60. David Rogers, *supra* note 25.

61. *Cf. infra* § 3.1.2., b.

62. Aurélie Méjean & Chris Hope, '*Modelling the Costs of Energy Crops: A Case Study of US Corn and Brazilian Sugarcane'*, 38 ENERGY POL'Y 547 (2010).

63. Holly Jessen, *EU Tariff on US Ethanol Officially in Place for Five Years*, ETHANOL PRODUCER MAG. 1 (2013).

64. Aurélie Méjean & Chris Hope, *supra* note 62

Nevertheless, the risks of low prices of corn-based ethanol for Brazilian sugarcane ethanol producers were sporadically identified by the Tribunal de Contas, which is constitutionally competent for state audits in Brazil, of which the outcome is used as input for the fine-tuning of subsidy legislation.[65]

At grant application nr. 249/2013, the report of the Tribunal de Contas identified a lack of suitability of the Brazilian ethanol subsidy system, to take into account the effects of imports of corn-based ethanol from the United States. However, the Tribunal de Contas did not transpose this concern in a concrete recommendation, and the issue was not further taken into account for the adjustment of the legislative framework.[66]

As to date, the Brazilian equalization and competiveness allowances remain purely national in scope, and do not reflect international price evolutions. Broadening Brazilian equalization and competiveness with an added international component could mediate the identified peril, while also being a first step towards more coordination of the subsidy schemes of the United States and Brazil.[67]

Not only is coordination of support schemes at the production level required; aligning the consumption side is possibly even more crucial. In the next section, the ethanol use mandates in Brazil and in the United States are compared and evaluated.

III. THE ETHANOL FUEL MANDATES: BINDING TARGETS FOR ETHANOL USE

While the production side is important, GHG emission reductions are mostly the result of increased ethanol use. The different types of ethanol used in the United States and in Brazil have varying GHG-reducing effects over fossil fuel uses.

In the United States, the most used ethanol is corn-based, which has—over fossil fuel use—a GHG reduction potential of 13% to 48%.[68] The Brazilian sugarcane-based ethanol performs better, with a projected GHG reduction of around

65. Article 70 of the Brazilian Constitution qualifies supervision on budgets and on the administration as a prerogative of the National Congress, which needs to exercise its powers 'by means of external control and through the internal control system of each Branch'. With regards to this 'external control', article 71 of the Constitution grants an important government role to Tribunal de Contas da União which provides considerable assistance to the Congress by way of audits of 'a budgetary and patrimonial nature', such as subsidies. Seção IX, Art. 70 Constituição da República Federativa do Brasil de 1988, DOU 5.10.1988; Art. 71, IV Constituição da República Federativa do Brasil de 1988, DOU 5.10.1988.

66. Acórdão Tribunal de Contas da União, TC 021.936/2013-7, 8.10.2014, < https://goo.gl/m9ucm6>, nr. 9.2.6 ; Câmara dos Deputados, Comissão de minas e energia, Requerimento de 2013 (realização de auditoria).

67. In the United States, an international component is already included in the U.S. ARC-CO and PLC subsidy techniques. *See* USDA Farm, *supra* note 20.

68. Daniel Sperling & Deborah A. Gordon, Two Billion Cars: Driving Toward Sustainability, OXFORD UNIVERSITY PRESS, 98–99 (2009); Jeffrey Goettemoeller & Adrian Goettemoeller, *Sustainable Ethanol: Biofuels, Biorefineries, Cellulosic Biomass, Flex-fuel Vehicles, and Sustainable Farming for Energy Independence* 40 (2007); Michael Wang, *Updated Energy and Greenhouse Gas Emission Results of Fuel Ethanol*, ARGONNE CENTER FOR TRANSPORTATION RESEARCH 16 (2005).

85%.[69] This brightens the contrast between Brazil and the United States, where different ethanol blending requirements are set.

A. Ethanol Use Mandate: A Minimum Blend of Renewable Fuels

In Brazil, the Conselho Interministerial do Açúcar e do Álcool (CIMA), a specific inter-ministerial ethanol committee, sets the compulsory minimum blend of ethanol in gasoline fuels.[70] Its resolutions need to be ratified by the federal government.[71] However, the CIMA is not bound to predefined volumes, and freely proposes minimum ethanol blending percentages, which have traditionally varied between 20% and 25%

Provisional measure 647/14 opened the way to a further increase of the minimum blend.[72] Such an increase originates in proposals made in the Chamber of Deputies, as approved by the National Congress, in order to support the double motive of combating the ethanol crisis and climate change.[73] Upon the CIMA resolution of 4 March 2015, the government ratified an increase of the minimum blend from 25% to 27%, an all-time high.[74]

To reach this ambitious target, no distinction is made amongst ethanol subcategories. Sugarcane, soya and corn-based ethanols can equally satisfy the ethanol use targets.

In the United States, the Renewable Fuels Standards (RFS) are integrated in section 211 (2)(o)(B) of the Clean Air Act (CAA).[75] Within the CAA, the U.S. Government integrates volume-based ethanol use targets that must be reached in the coming years. It is then up to the Environmental Protection Agency (EPA) to translate these government-set volume targets into practice, by providing concrete compliance obligations for blenders.[76] This is the reverse of what is done in Brazil, where the CIMA sets standards and the government only ratifies.

The discretion the EPA has to set these targets used to be disputed. However, in *NPRM v. EPA*, the U.S. Court of Appeals for the District of Columbia Circuit held that the EPA is fully legally bound to the wording and the objective of the CAA.[77] The EPA must set these targets annually, together with the regulations

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69. Dep't for Transport, *Carbon and Sustainability Reporting Within the Renewable Transport Fuel Obligation Requirements and Guidance Government Recommendation*, OFFICE OF THE RENEWABLE FUELS AGENCY 39 (2008).

70. Resolucão CIMA, No. 1 de 4.3.2015, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 6.3.2015 (Braz.); Decreto No. 3.546, de 17 de Julho de 2000, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 18.7.2000.

71. Decreto No. 3.546, *supra* note 70.

72. Medida Provisória No. 647, de 28 de Maio de 2014, [D.O.U.] 29.5.2014.

73. Câmara dos Deputados, *Propostas aprovadas pelo Congresso Nacional foram sancionadas sem vetos* (2014), Jornal Da Câmara 30.09.2014, 4.

74. Resolucão CIMA, No. 1 de 4.3.2015, *supra* note 70; UNICA, *Aumento da Mistura de Etanol à Gasolina Beneficia Setor Sucronergetico*, (2015)..

75. Energy Independence and Security Act of 2007, Pub. L. 110-140, § 202, 121 Stat. 1521.

76. The EPA determines for each producer and importer of fossil-based fuels, renewable fuel obligations, which represent the ratio of renewable fuel volume to projected non-renewable fuel volume. Final Rulemaking, Environmental Protection Agency, Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-Based Diesel Volume for 2017, 80 Fed. Reg. 77422, 77428 (2015).

77. NPRM v. EPA, 630 F.3d 145, 152 (2010).

which are required to ensure that the volume levels of the CAA are met.[78] While in principle, the EPA must provide these targets timely, its legal obligation does not cease to exist when the deadline has passed. The wording of the CAA—"shall act"—allows interventions of the EPA after the due date.[79] Contrary to the discretionary power of the Brazilian CIMA, the EPA is stringently bound by the CAA.

Both within the volume targets of the CAA and within the EPA determined targets, a legal distinction must be made between common and advanced biofuels. For 2016, the EPA set a minimum blending target of 10.1% for common biofuels and one of 2.01% for advanced biofuels.[80] To reach the targets, blenders must obtain sufficiently different biofuels. Ethanol is the most commonly used biofuel. Corn-based ethanol qualifies as a common biofuel, contrary to sugarcane ethanol, which is an advanced biofuel.[81]

This distinction recognizes divergent GHG reduction potentials, assessed on a life-cycle basis.

B. A Life-Cycle Approach of GHG Emissions

A life-cycle approach takes into account not only direct emissions of ethanol fuels burned in vehicles, but also externalities. While implemented in both Brazil and in the United States, the life-cycle approach is integrated very differently in their legal frameworks.

The Brazilian life-cycle approach is not linked to targets as such, but is present within two instruments: the sugarcane burning and zonal planning regulations.

Traditionally, sugarcane harvesting was done by way of burning fields. Side-effects of this process are considerable releases into the atmosphere of CO_2, CO, NO_X and $PM_{2.5}$, which partly offset the GHG reductions of ethanol use.[82]

To remediate this, within a life-cycle approach, the Law of 19 September 2002 sets a moratorium on the burning of sugarcane.[83] To avoid impeding the only practice available to farmers in non-mechanized areas, the State Decree of 11 March 2003 only gradually implements this ban, but a binding timeframe is added.[84]

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78. *Id.* at 152-53; 80 Fed. Reg. at 77430; *NPRM*, 630 F.3d.

79. Irrespective of the impacts this can have in the current year. Monroe Energy v. EPA, 750 F. 3d 909 (D.C. Cir. 2014); *NPRM*, 630 F. 3d, at 152-53; Barnhart v. Peabody Coal, 537 U.S. 149, 158 (2003); 80 Fed. Reg. at 77,430.

80. 80 Fed. Reg., at 77,428.

81. Environmental Protection Agency & Office of Transportation & Air Quality*, EPA Finalizes Regulations for the National Renewable Fuel Standard Program for 2010 and Beyond - Regulatory Announcement*, EPA-420-F-10-007 (2011); 80 Fed. Reg., at 77,465; Roland A. Jansen, *Second Generation Biofuels and Biomass: Essential Guide for Investors*, John Wiley 13 (2012).

82. Daniela de Azeredo França, *et al.*, *Pre-Harvest sugarcane burning: Determination of emission factors through laboratory measurements*, ATMOSPHERE, 164-66 (2012).

83. Lei No. 11.241, de 18 de Setembro de 2002, DIÁIO OFICIAL DA UNIÃO [D.O.U.] de 20.09.2002 (Braz.).

84. For example, where the soil structure does not allow full mechanization. A State Decree identifies plantations on land with soil structure that impede the adoption of the usual techniques of mechanized cutting of sugarcane. Decreto Estadueal No. 47.700 de 11 de Março 2003, Art. 2 § 1 (2) (2003).

By the end of 2016, a maximum of 20% of sugarcane fields can be burned.[85] Allowed burnings require a permit, whereby strict proportionality is controlled.[86] By 2021, stalk burning as a harvesting method will be entirely banned.[87]

Besides this regulation, most shaping for its broad, non-integrated life-cycle approach, are Brazil's zoning laws. Zoning laws are used to reconcile sugarcane expansion with prevention of land use and deforestation emissions—Brazil's main source of CO_2 emissions.[88]

Through the Zoneamento Agroecologico da Cana (ZAE Cana), the government assigns areas for sugarcane cultivation where the fewest land-use GHG impacts are estimated to occur.[89] Sugarcane can therefore not be cultivated in forests or protected areas, which are automatically off-limits for ethanol crops.[90]

Also indirect Land Use Change (iLUC) is accounted for within ZAE Cana. Assigned areas cannot be used for other agricultural purposes, preventing relocations of farmers to new (potentially forested or protected) areas.[91] In permitted areas, ethanol producers must always minimize competition with food production.[92]

While the connection between climate change and zonal planning—also controlled by the BNDES—is progressive, a lack of linkage to ethanol use targets can cause coordination issues.[93] This is most problematic for foreign-produced ethanol. Such foreign ethanol may not meet Brazilian sustainability requirements but can still be used under the ethanol use mandate, which calls into question ethanol's expected GHG-reducing impact.

In the United States, contrary to Brazil, the life-cycle approach is integrated in the targets. Within the RFS, types of ethanol are linked to a projected lifecycle mitigation potential, compared to a 2005 baseline.[94] Ethanol capable of reducing 20% of GHG emissions is qualified as a common biofuel, while advanced ethanol

85. *Id.* at Art. 2.

86. On the basis of article 4 of the State Decree, burnings of straw sugarcane are prohibited in the neighborhood of urban areas, areas occupied by indigenous people and areas that are ecological valuable. Also, the perimeter and the width of firebreaks is strictly regulated. *Id.* at Art. 2-5, 9.

87. *Id.* at Art. 2.

88. David Heres, Ramon Ortiz, & Anil Markandya, *Deforestation in Private Lands in Brazil and Policy Implications for REDD Programs: An Empirical Assessment of Land Use Changes Within Farms Using an Econometric Model*, 169 INT'L FORESTRY REV. 15 (2013); José Féres, Eustáquio Reis, & Juliana Speranza, *Climate Change, Land Use Patterns and Deforestation in Brazil*, IPEA (2010); Richard Adams, *Global Climate Change and Agriculture: An Economic Perspective*, 71 AM. J. AGRICULTURAL ECON. 1272 (1989).

89. Decreto No. 6961, de 17 de Setembro de 2009, DIAIO OFICIAL DA UNIÃO [D.O.U.] de 18.09.2009.

90. PEDRO NINÔ DE CARVALHO, *'Sugarcane Agro- ecological Zoning: Greening the Expansion of Ethanol the Challenge of Sustainably Expanding Ethanol Production Areas'* 1 (Ella Area: Environmental Management, 2013).

91. MINISTÉRIO DA AGRICULTURA, *'Cana Agro-Ecológica Zoneamento, Zoneamento - para expandir a produção, preservar a vida e garantir a um Futuro'* (Jacqueline Silva Rezende Mattos, 2009).

92. *Id.*; DE CARVALHO, *supra* note 90.

93. As seen above, also the BNDES controls the areas loan-takers invest in. *Cf. supra* 2.2.1.

94. Energy Independence and Security Act of 2007, § 201(C); Clean Air Act, § 211(o), (C).

biofuels have a reduction factor of at least 50%.[95] In order to enforce these diversified targets, the EPA created the Renewable Identification Numbers (RINs).[96] These RINs are attributed at the production of renewable fuels such as ethanol. Upon blending of ethanol with non-renewable fuels, the renewable fuel attributed RINs are separated from the blend and can be traded. In order to meet the renewable volume obligation set by the government, obligated parties must surrender the required RINs for the amount of marketed fuel. The RINs are tradable certificates, used to satisfy the RFS.[97] They can be sold in separated form, no longer assigned to a batch of fuel, or together with the associated batch of renewable fuel, and are described by the EPA as the "currency" of the RFS program.[98]

Within the RFS program, the extent of the federal life-cycle approach is however limited; it does not include transportation or iLUC emissions. A broader life-cycle approach is integrated in the state of California by the Global Warming Solutions Act created Low Carbon Fuel Standards (LCFS).[99]

In the LCFS, all stages of production are included and coupled with specific targets.[100] A carbon intensity score helps incorporate all transport and iLUC externalities.[101] Through the carbon intensity score, the distance ethanol is transported into California impacts its qualification under the LCFS targets.[102] Out-of-state corn-based ethanol is attributed a higher score, leading to a less favorable LCFS qualification.[103]

This makes the LCFS challengeable, since it may lead to preferential treatment of Californian produced ethanol.[104] The Supreme Court controls such discriminatory effects within the dormant Commerce Clause.[105] In cases of discrimination, the strict scrutiny test applies, requiring a legitimate local purpose to

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95. *Id*.

96. W. Thompson, S. Meyer, & P. Westhoff, *The New Markets for Renewable Identification Numbers,* 32 APPLIED ECON. PERSP. & POL'Y 588, 589 (2010).

97. While RINs certify origin, they can be traded, carried over to the following year and used by blenders to *p*rove compliance with the RFS. Douglas A. Durante & Todd Sneller*, The RIN Fact Sheet: Understanding the EPA's Flexible System for Obligated Parties to Meet the Renewable Fuel Standard (RFS)* 1 CLEAN FUELS DEVELOPMENT COALITION 1 (2015); U.S. Dep't of Energy, *Alternative Fuels Data Center: Renewable Identification Numbers*, http://www.afdc.energy.gov/laws/RIN.html.

98. ENVTL. PROT. AGENCY, RENEWABLE IDENTIFICATION NUMBERS (RINS) UNDER THE RENEWABLE FUEL STANDARD PROGRAM, https://www.epa.gov/renewable-fuel-standard-program/renewable-identification-numbers-rins-under-renewable-fuel-standard (last visited Feb. 22, 2017).

99. California Global Warming Solutions Act of 2006, Cal Health & Safety Code § 38500 (2016).

100. Kirk Tracy, Note, Rocky Mountain Farmers Union v. Goldstene*: Low Carbon Fuel Standards, Lifecycle Greenhouse Gases, and California's Continued Struggle to Lead the Way*, 24 TUL. ENVTL. L.J. 173, 174 (2010).

101. Kathryn Abbot, Note, *The Dormant Commerce Clause and California' s Low Carbon Fuel Standard,* 3 MICH. J. ENVTL. & ADMIN. L. 179, 186 (2013).

102. *Id.*; Tracy, *supra* note 100.

103. Abbott, *supra* note 101.

104. U.S. CONST. art. I, § 8; United Haulers Association v. Oneida-Herkimer Solid Waste Management Authority, 550 U.S. 330, 342–343 (2007); Abbot, *supra* note 101.

105. Am. Bev. Ass'n v. Snyder, 700 F.3d 796, 807 (6th Cir. 2012); Healy v. Beer Inst., 491 U.S. 324, 336 (1989).

uphold the state statute.[106] While the courts were traditionally hesitant to accept environmental local purposes,[107] in *Massachusetts v EPA*, vehicle GHG emissions were accepted under the strict scrutiny test.[108] The chances of the LCFS of 16 November 2015 being upheld are, therefore, considerable.[109] For the first time, a very complete life-cycle approach is set.

Following this comparison of ethanol use standards and life-cycle approaches in the United States and Brazil, the next and fourth chapter analyze the sort of needed coordination between the two countries.

C. Different Ethanol-Use Mandates and the Risk of Cross-Trade

The different levels of subsidies which apply in the ethanol production sector of Brazil and the United States have been previously described. In addition, ethanol use targets in Brazil and the United States diverge greatly. In Brazil, the overall ethanol targets impressively exceed the blending requirements in the United States. Also the profound iLUC-based zoning policy in Brazil is notable. Other than in the revolutionary Californian LCFS, iLUC is entirely absent in the U.S. standards. On these points, Brazil's ethanol use mandate is the more progressive one.

However, as a key concept, the U.S. system illustrates a legal link between sustainability and ethanol use targets. The GHG-reducing potential of ethanol is integrated in the RFS and LCFS, by classifying it as an advanced or common biofuel. The Brazilian ethanol use target does not make this distinction. In Brazil, emissions are taken into account in the production, but not in the consumption, phase.

While it is not disputed in this article that, in biofuels policy, each State has its own margin of appreciation, these subtle differences between Brazilian and U.S. policies can however create perverse trade effects. In the United States, sugarcane ethanol (an advanced biofuel) does not truly compete directly with corn-based ethanol (a common biofuel). Evolutions of the U.S. advanced biofuel targets, however, do impact Brazilian sugarcane ethanol.

For 2016, the RFS advanced biofuel volume target was raised 44% to 5.6 billion gallons.[110] To meet these new standards, blenders must provide much more advanced biofuels than before. Additionally, sugarcane ethanol demand has also risen since the LCFS of 16 November 2015 attributed a very low carbon intensity score to this specific type of ethanol.[111] Since advanced biofuel generation in the United States is still in its infancy, importing Brazilian ethanol is deemed a very economical option.

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106. Maine v. Taylor, 477 U.S. 131, 138 (1986); Ziffrin, Inc. v. Reeves, 308 U.S. 132, 138 (1939); Kenneth R. Thomas, *The Constitution of the United States of America: Analysis & Interpretation, Analysis of Cases* 2248 (Larry M. Eig ed, 2014); Abbot, *supra* note 101.

107. C & A Carbone, Inc. v. Clarkstown, 511 U.S. 383, 386 (1994).

108. Massachusetts v. EPA, 549 U.S. 497 (2007); Abbot, *supra* note 101.

109. CAL. CODE REGS. tit. 17, § 95481.

110. Associação dos Fornecedores de Cana de Pernambuco, *Etanol brasileiro ganha maior mercado em 2016 graças a mandado de uso de biocombustíveis nos EUA* (2016).

111. CAL. CODE REGS. tit. 17, § 95481; Abbot, *supra* note 101; Associação dos Fornecedores de Cana de Pernambuco, *supra* note 110.

While there is an increased demand for advanced biofuels in the United States, for common corn-based ethanol, the U.S. industry has more capacity than needed domestically.[112] Brazilian exports of even more ethanol—which thus arrive in the United States as advanced biofuel—add to the domestic ethanol supply.[113] As a result, domestic corn-based ethanol demand decreases and domestic corn prices drop, causing the U.S. subsidy schemes to be activated. The price allowances of the ARC-CO or the PLC are then paid, keeping the price of corn low. Then, very cheap ethanol can be generated.

Low-priced U.S. corn-based ethanol risks to easily find its way to Brazil where a considerable demand for ethanol exists, especially following the all-time high blending mandate of 27%.[114] Subsidized excess U.S. corn ethanol can thus flow to Brazil, where it is used to reach the no-distinction ethanol use targets.[115] As happened in 2011 and 2013, corn-based and sugarcane based ethanol are then cross-traded.[116]

This cross-trade torpedoes ethanol's climate change function completely. While GHG reductions in the United States can be met by enhanced proportions of Brazilian sugarcane based ethanol, such favorable effects are offset by increased use of more GHG intensive corn-based ethanol in Brazil. This, together with the added transport of cross-traded fuels, adds to the life-cycle global emissions of ethanol. Cross-trade as a side effect of uncoordinated ethanol use mandates must be urgently addressed.

IV. PROPOSAL TOWARDS MORE COORDINATION BETWEEN BRAZIL AND THE U.S.

It seems necessary, in order to enhance the potential to combat ethanol cross-trade and its implications on GHG emissions, to coordinate the national ethanol use mandates. One way of doing this is to achieve more policy coordination between Brazil and the United States. On the level of production subsidies, on basis of 'life-cycle inclusive'[117] research, sugarcane ethanol production has been estimated to be in average 40% to 50% less GHG-intensive than corn-based ethanol generation.[118] If higher-subsidized, corn-based U.S. ethanol imports threaten domestic Brazilian ethanol production, this can negatively affect GHG emissions.

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112. Greg Meyer, *Ethanol: Logic of Circular Biofuel Trade Comes Into Question*, FIN. TIMES (May 16, 2013), https://www.ft.com/content/e4baefbe-b0d6-11e2-9f24-00144feabdc0.

113. *Id.*

114. Resolucão CIMA, No. 1 de 4.3.2015, *supra* note 70; UNICA, *supra* note 74.

115. Meyer, *supra* note 112.

116. In 2011, Brazil' s ethanol production was not covering domestic demand but still, it continued to export ethanol to the United States, where it was used to reach the RFS standards. Brazil then imported U.S. corn-based ethanol in return to make up for its own shortfall. Similarily, in 2013, overproduction of corn-based U.S. ethanol led to major exports to Brazil but the United States still imported ethanol to meet the RFS mandates. Jayson Beckman, *Biofuel Use in International Markets: The Importance of Trade*, USDA (Sep. 2015), https://www.ers.usda.gov/webdocs/publications/eib144/53706_eib144_summary.pdf; Yuki Yano, David Blandford, & Yves R. Surry, *From Ethanol Shuffle to Ethanol Tourism—Why the RFS Does Not Make Sense*, 4 CHOICES MAG. 1, 1-2 (2012), http://www.choicesmagazine.org/UserFiles/file/cmsarticle_264.pdf.

117. *Cf. supra* § 3.2.

118. Christine L. Crago et. al., *Competitiveness of Brazilian Sugarcane Ethanol Compared to US Corn Ethanol*, SSRN 1, 5 (2010), https://papers.ssrn.com/sol3/papers2.cfm?abstract_id=1622922; Daniel Sperling &

There are several options. Brazil and the United States could better harmonize subsidies, or Brazil could follow the EU's example and shield its market with anti-dumping measures. Brazil could, however, also mediate the peril purely domestically, by adapting the equalization and competitiveness allowances. These allowances—with a pure regional domestic focus—could be extended to include also international ethanol import effects—such as is done in the U.S. system.

On the ethanol-use mandate level, it seems necessary to also create a separate, advanced and common biofuel target in Brazil, in such a way that makes it obligatory that imported ethanol be controlled for sustainability. It is, therefore, crucial that the new categorical Brazilian ethanol use mandate be adequately linked to a broad life-cycle approach. To improve the life-cycle approach in the United States, the RFS could be revised and broadened to include all externalities—as is done in the LCFS—to incorporate transport emissions directly into the targets.

With this double measure, coordinated ethanol use targets will be more adequately linked to broad life-cycle approaches, guaranteeing that only ethanol imports that result in true GHG emission reductions on a global climate change level take place.

These law-refining steps could also be followed by a more drastic certification step, which would eliminate cross-trade between Brazil and the United States. If biofuel standards and subsidies are better coordinated, it may become possible to create a multilateral system of certificates whereby advanced and common ethanol biofuels are used in Brazil or in the United States to meet the ethanol use mandates.

While ethanol is domestically mixed, it can be accounted for in the diversified targets of either Brazil or the United States and be cancelled in the other country to avoid double counting. It seems in theory possible to extend the U.S. RINs to a Pan-American certificate system, whereby certificates are mutually recognized. This would facilitate target-reaching, and create a virtual market, free from perverse cross-trade effects on GHG transport emissions.

Such a Pan-American certification system would nevertheless bring with it some major challenges. The acceptance of foreign certificates to reach domestic targets requires far-fetching interferences in the national prerogatives of Brazil and the United States. Inter alia, it seems necessary that, to make the system work, some subsidy principles is required, as well as the introduction of control and enforcement mechanisms.

Despite this difficulty, multilateral and bilateral examples illustrate that such perilous balancing exercise can succeed. Similar to the proposed Pan-American certification system, the flexible mechanism system introduced by the Kyoto Protocol and the European Union system of guarantees of origin have a strong multilateral dimension.

Within the flexible mechanisms, the clean development mechanism and the joint implementation proved successful in cutting global emissions by measures abroad. Also the system of guarantees of origin, which are traded on a cross-

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Deborah A. Gordon, *supra* note 68, at 98; Jeffrey Goettemoeller & Adrian Goettemoeller, *supra* note 68, at 40; Dep't for Transport, *surpa* note 69, at 39; Farrell, *Ethanol Can Contribute to Energy and Environmental Goals*, 311 SCIENCE 506 (2006).

border basis distinct from the green electricity it is attributed for, is an excellent example of how cross-border trade of certificates can be a success story.

With the idea that the benefit of cutting emissions in the United States or in Brazil will be essentially the same, a Pan-American certificate system would align to the ratio of international climate change policy in the transport sector: reducing GHG emissions globally.

V. CONCLUDING REMARKS

As two separate national regimes, the ethanol frameworks in Brazil and the United States show few signs of coordination between themselves.

On the production level, the Brazilian equalization and competitiveness allowance are more curbed than the subsidies in the United States. While the effect of loans of the BNDES only differs slightly from the loan guarantees in the United States, tax differences are more considerable. Where the U.S. income tax incorporates an income tax credit for second generation biofuels, in Brazil, solely fuel tax exemptions are granted.

On the consumption level, ethanol mandates also deviate considerably. While in both systems there are minimum blending requirements, the Brazilian blending level is of an astronomical height compared to the U.S. targets. The United States however better links ethanol-use targets with the GHG-reducing potential of ethanol, distinguishing advanced ethanol biofuels from common ethanol biofuels.

Such distinction is directly linked with different life-cycle interpretations. Brazil reflects this approach in two separate regulations (the sugarcane burning ban and ZAE Cana). In the United States, a limited federal life-cycle approach is part of the ethanol-use mandate, in contrast to California's more complete life-cycle concept within the LCFS.

The exposed distinctions have extensive perverse trade effects. For diverging subsidies, a broadening of the Brazilian competiveness and equalization allowances can tackle such risks. This is however not so for the ethanol use mandates, where—since sugarcane ethanol is qualified as an advanced biofuel in the RFS and LCFS—cross-trade between Brazil and the United States remains perilous. To moderate this prospect, a coordination proposal includes the legal transplant of U.S.-like targets, broadening of life-cycle approaches, and a new multilateral RIN-based certification system. Without such alignment, cross-trade will increasingly occur.

Comparative analysis illustrated the possible adverse side-effects non-coordinated environmental requirements can have. Ironically enough, higher advanced biofuel targets in the United States and a higher general ethanol blend in Brazil can work against global GHG reductions. Legal coordination is thus indispensable for the credibility of biofuel and climate change policy in Brazil and the United States.

The success rate of the implementation of these proposed reforms depends on the receipt by ethanol lobby groups. Besides potential resistance to adaptations to a more absolute concept of life-cycle approach, the corn and ethanol production lobby in the United States, as well as the sugarcane-lobby in Brazil, might also

fear that in a more coordinated market, their national markets are impeded by competition from abroad. Yet, lobby groups might also see opportunities in a more coordinated Pan-American ethanol market, where costs for transport are reduced and ethanol can be traded on a global, virtual market. More coordination of ethanol products can thus also lead to the opportunity for the sector to act on price signals in a bigger market.