Case No. 2023-1663

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

STUPP CORPORATION, A DIVISION OF STUPP BROS., INC., IPSCO TUBULARS INC., MAVERICK TUBE CORPORATION,

Plaintiffs,

WELSPUN TUBULAR LLC USA,

Plaintiff-Appellee

v.

UNITED STATES,

Defendant-Appellee,

HYUNDAI STEEL COMPANY,

Defendant,

SEAH STEEL CORP.,

Defendant-Appellant

On Appeal from the United States Court of International Trade in Case Nos. 1:15-CV-00334-CRK, 1:15-CV-00336-CRK, and 1:15-CV-00337-CRK, Judge Claire R. Kelly

BRIEF OF THE GOVERNMENT OF CANADA; CANFOR CORPORATION; CANADIAN FOREST PRODUCTS, LTD.; CANFOR WOOD PRODUCTS MARKETING, LTD.; J.D. IRVING LIMITED; RESOLUTE FP CANADA INC.; TOLKO INDUSTRIES LTD.; TOLKO MARKETING AND SALES LTD.; AND WEST FRASER MILLS LTD. AS *AMICI CURIAE* IN SUPPORT OF DEFENDANT-APPELLANT AND URGING REVERSAL

August 1, 2023

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UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. United States

Filing Party/Entity Government of Canada

Instructions:

1. Complete each section of the form and select none or N/A if appropriate.
2. Please enter only one item per box; attach additional pages as needed, and check the box to indicate such pages are attached.
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4. Please do not duplicate entries within Section 5.
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I certify the following information and any attached sheets are accurate and complete to the best of my knowledge.

Date: 08/01/2023

Signature: /s/ Eric S. Parnes

Name: Eric S. Parnes

1. Represented Entities. Fed. Cir. R. 47.4(a)(1).	**2. Real Party in Interest.** Fed. Cir. R. 47.4(a)(2).	**3. Parent Corporations and Stockholders.** Fed. Cir. R. 47.4(a)(3).
Provide the full names of all entities represented by undersigned counsel in this case.	Provide the full names of all real parties in interest for the entities. Do not list the real parties if they are the same as the entities. ☑ None/Not Applicable	Provide the full names of all parent corporations for the entities and all publicly held companies that own 10% or more stock in the entities. ☑ None/Not Applicable
Government of Canada		

☐ Additional pages attached

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☑ None/Not Applicable ☐ Additional pages attached

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. US

Filing Party/Entity Canfor Corporation, Canadian Forest Products, Ltd., and Canfor Wood Products Marketing, Ltd.

Instructions:

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Date: 08/01/2023 Signature: /s/ R. Will Planert

Name: R. Will Planert

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Canfor Corporation		None/Not Applicable
Canadian Forest Products, Ltd.		Canfor Corporation is a publicly traded company that owns 10% or more of Canadian Forest Products, Ltd.
Canfor Wood Products Marketing, Ltd.		Canadian Forest Products, Ltd. is a parent corporation of Canadian Wood Products Marketing, Ltd.

☐ Additional pages attached

4. Legal Representatives. List all law firms, partners, and associates that (a) appeared for the entities in the originating court or agency or (b) are expected to appear in this court for the entities. Do not include those who have already entered an appearance in this court. Fed. Cir. R. 47.4(a)(4).

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Morris, Manning & Martin, LLP	Jordan L. Fleischer	Eugene Degnan
Ryan R. Migeed		

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. United States

Filing Party/Entity J.D. Irving, Limited

Instructions:

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Date: 08/01/2023

Signature: /s/ Jay C. Campbell

Name: Jay C. Campbell

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J.D. Irving, Limited	N/A	J.K. Irving, Limited

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UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. United States

Filing Party/Entity Resolute FP Canada Inc.

Instructions:

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Signature: /s/ Elliot J. Feldman

Name: Elliot J. Feldman

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Resolute FP Canada Inc.		Resolute Forest Products Inc.

☐ Additional pages attached

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. United States

Filing Party/Entity Tolko Industries Ltd. and Tolko Marketing and Sales Ltd.

Instructions:

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Date: 08/01/2023

Signature: /s/ Henry D. Almond

Name: Henry D. Almond

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Tolko Industries Ltd.		None/Not Applicable
Tolko Marketing and Sales Ltd.		Tolko Industries Ltd.

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1663

Short Case Caption Stupp Corporation v. United States

Filing Party/Entity West Fraser Mills Ltd.

Instructions:

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I certify the following information and any attached sheets are accurate and complete to the best of my knowledge.

Date: 08/01/2023

Signature: 

Name: Donald Harrison

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West Fraser Mills Ltd.		West Fraser Timber Co. Ltd.

☐ Additional pages attached

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INTEREST OF *AMICI CURIAE*[1]

Amicus curiae[2] the Government of Canada ("Canada") is a signatory to the United States-Mexico-Canada Agreement ("USMCA"), a party to the WTO Anti-Dumping Agreement, and one of the United States' largest trading partners. Canada has a broad interest in the fidelity and predictability of the application of U.S. antidumping law by the U.S. Department of Commerce ("Commerce"). Imports from Canada are subject to antidumping duties in a number of cases, including with respect to softwood lumber from Canada, which is one of the largest and longest-running trade disputes in the world.[3] *Amici curiae* Canfor Corporation; Canadian Forest Products, Ltd.; Canfor Wood Products Marketing, Ltd.; J.D. Irving, Limited; Resolute FP Canada Inc.; Tolko Industries Ltd.; Tolko

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[1] SeAH Steel Corporation has consented to, and the United States and Welspun Tubular LLC USA do not oppose, the filing of this *amicus* brief.

[2] No counsel for a party authored this brief in whole or in part. No party or a party's counsel contributed money that was intended to fund preparing or submitting this brief. No person other than *amici* or its counsel has contributed money that was intended to fund preparing or submitting this brief.

Amici note that counsel for Tolko Industries Ltd. and Tolko Marketing and Sales Ltd. is also counsel to Hyundai Steel Company, which was a defendant-intervenor in the case below, but has not appeared in this appeal.

[3] *See, e.g.*, *Certain Softwood Lumber Products From Canada: Final Affirmative Determination of Sales at Less Than Fair Value and Affirmative Final Determination of Critical Circumstances*, 82 Fed. Reg. 51,806 (Dep't Commerce Nov. 8, 2017).

Marketing and Sales Ltd.; and West Fraser Mills Ltd. (together, with Canada "*Amici*") are Canadian producers and exporters of softwood lumber that were respondents in Commerce's antidumping investigation concerning softwood lumber and are subject to the annual reviews through which Commerce sets both retrospective duties and prospective cash-deposit rates.

Amici have experienced Commerce's unwarranted and unlawful imposition of antidumping duties as a result of an unreasonable interpretation of the law exempting Commerce from the preferred "average-to-average" method for calculating dumping margins in cases involving so-called targeted dumping. Commerce purports to find targeted dumping under its differential pricing methodology ("DPM") based on the application and interpretation of the statistical test, Cohen's *d*, without regard to the fundamental assumptions required for the test to yield coherent, meaningful results. This practice leads to hundreds of millions of dollars in duties on products that are not, in fact, being dumped under any reasonable construction of the term.

Commerce's interpretation of the law also prevents interested parties from structuring their conduct to avoid such adverse consequences. Whether and to what extent Commerce will find that a company is engaged in targeted dumping depends on statistical idiosyncrasies of datasets selected by Commerce for comparison rather than on actual pricing behavior.

Amici have challenged Commerce's misuse of Cohen's *d* in other proceedings, including most recently by submitting critical analysis from one of the world's leading experts in statistical methods and measurement of effect size.[4] Various aspects of the DPM have also been disputed in proceedings before this Court,[5] before the U.S. Court of International Trade,[6] and—in proceedings in which *amici* are parties—before binational panels convened under the North American Free Trade Agreement and the USMCA.[7] The Court's holdings in this case may affect the outcomes of those challenges.

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[4] Larry V. Hedges, *Review and Analysis of the Cohen's* d *Test as Used in the U.S. Department of Commerce's Differential Pricing Methodology* (Dec. 27, 2022), Exh. 1 to Government of Canada Submission of Factual Information (Dec. 27, 2022) (*Certain Softwood Lumber Products From Canada; 2021* (A-122-857)); Exh. 9 to Resolute FP Canada's Substantive Response to U.S. Department of Commerce's Notice of Initiation in Five-Year (Sunset) Review of AD Order on Softwood Lumber from Canada (Jan. 5, 2023).

[5] *E.g.*, *Mid Continent Steel & Wire, Inc. v. United States*, 31 F.4th 1367 (Fed. Cir. 2022); *NEXTEEL v. United States*, 28 F.4th 1226 (Fed. Cir. 2022). Certain of the *Amici* have also requested leave to file an *Amicus* brief in another case raising similar issues before this Court. *See Marmen Inc. v. United States*, No. 2023-1877.

[6] *E.g.*, *NEXTEEL Co., Ltd. v. United* States, 633 F. Supp. 3d 1190 (Ct. Int'l Trade 2023); *Mid Continent Steel & Wire, Inc. v. United States*, 628 F. Supp. 3d 1316 (Ct. Int'l Trade 2023).

[7] *See, e.g.*, *Certain Softwood Lumber Products From Canada: Final Results of Antidumping Duty Administrative Review and Final Determination of No Shipments; 2020*, USMCA No. USA-CDA-2022-10.12-02 (awaiting briefing); *Certain Softwood Lumber Products from Canada: Final Results of Antidumping Duty Administrative Review; 2019*, USMCA No. USA-CDA-2021-10.12-04 (in briefing); *Softwood Lumber from Canada, Final Results of the Antidumping Duty*

This Court has characterized the Cohen's *d* test, at issue in this case, as the "foundation" of Commerce's DPM.[8] This brief focuses on the characteristics of the Cohen's *d* test that render it unsuitable, as deployed by Commerce, for use in antidumping cases. Because the CIT endorsed a holistic view of the DPM as insulating outcomes from the consequences of Commerce's unprincipled application of Cohen's *d*, this brief also addresses the relationship between Cohen's *d* and the other tests that Commerce applies as part of its DPM.

Administrative Review; 2017–2018, USMCA No. USA-CDA-2020-10.12-02 (briefing complete, awaiting Panel establishment); *Softwood Lumber from Canada: Final Affirmative Determination of Sales at Less Than Fair Value and Affirmative Final Determination of Critical Circumstances*, NAFTA No. USA-CDA-2017-1904-03 (argued, awaiting decision).

[8] *Mid Continent*, 31 F.4th at 1381.

INTRODUCTION AND SUMMARY OF ARGUMENT

Commerce has chosen to rely on Cohen's *d* as a test for "significant difference" as the term is used in 19 U.S.C. § 1677f-1(d)(1)(B). Commerce has adopted this test, and the threshold for when it is satisfied, based on the premise that Cohen's *d* is a well-established measure of effect size that provides meaningful information about the differences between groups. However, the academic literature describing the use of Cohen's *d* makes clear its results have the meaning articulated by Cohen only when the assumptions that he articulated are met.[9] Commerce steadfastly refuses to confront that fact and its implications. Instead, Commerce persists in treating the outputs of the Cohen's *d* formula as having fixed and immutable meaning, regardless of the nature of the inputs. This is unreasonable and yields results that are arbitrary and capricious.

Cohen described his *d* coefficient as a measure that defines the nonoverlap between two groups of values when the values within those groups are (1) normally distributed, (2) equally variable (*i.e.*, having equal standard deviations),[10] and (3) equally and sufficiently numerous. These are the

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[9] *See, e.g.*, *Stupp Corp. v. United States*, 5 F.4th 1341, 1357–58 (Fed. Cir. 2021).

[10] The terms "variance" and "standard deviation" are sometimes used interchangeably when colloquially referring to the variability, or spread, of data points within a group relative to the mean, or average. The two measures have a

assumptions upon which the utility and efficacy of Cohen's *d* depend. The assumptions are not incidental. They provide the foundation for the meaning of Cohen's *d* and the interpretations it can support. The assumed characteristics of the groups subject to comparison provide the mathematical underpinnings for deriving and interpreting values of Cohen's *d*. If Cohen's *d* is applied to groups that do not have the assumed characteristics, the resulting value, on its own, provides very little useful information about the groups being compared. A Cohen's *d* so calculated cannot reliably communicate whether the groups differ significantly from one another.

This Court has expressed skepticism towards Commerce's application of a 0.8 threshold to values of Cohen's *d* calculated without regard to the assumptions that make the threshold meaningful. The Court has given Commerce the opportunity to explain itself. Instead, Commerce has muddled together irrelevant and tangential statistical concepts in a futile effort to obscure what should now be clear: Commerce is not really using Cohen's *d*, at least not in any coherent sense. Commerce plugs numbers into the Cohen's *d* formula, but the numbers do not fit the criteria under which the results of the formula—the *d* coefficients—provide

---

defined mathematical relationship. Variance is the average squared deviation from the mean, while standard deviation is the square root of the variance.

meaningful information. When Commerce uses the wrong inputs, it nonetheless insists that the outputs mean the same thing as when the right inputs are used. That is not reasonable. There is no explanation that could make it so.

Contrary to the CIT's decision in this case, the other steps in the DPM—the ratio and meaningful-difference tests—cannot launder the tainted results of Commerce's unprincipled Cohen's *d* test. As the foundation for the DPM, Commerce's Cohen's *d* test is supposed to identify prices that differ significantly among purchasers, regions, or time periods. When Commerce calculates *d* coefficients for groups of prices that do not satisfy the underlying assumptions, its test does not identify significant differences in those prices. Without identification of prices that differ significantly—the exclusive function of the Cohen's *d* test—the statutory conditions for departing from the preferred average-to-average method can never be met. The ratio test cannot identify a pattern of prices that differ significantly. And the meaningful-difference test cannot explain why the average-to-average method fails to account for prices that differ significantly. Neither of those tests has a referent without the results of a reasonable test for significant price differences.

Commerce's insistence that mechanical application of the DPM produces legally relevant results regardless of the reliability of Cohen's *d* only highlights how far afield the DPM has strayed from the language and intent of the statute. As

reflected in the Statement of Administrative Action accompanying the Uruguay Agreements Act,[11] Congress expected that Commerce would identify targeted dumping on a case-by-case basis, drawing on an understanding of the particular industry and product at issue. Commerce has instead opted to avoid any consideration of context. Commerce's DPM, with the flawed application of Cohen's *d* at its foundation, does not reasonably interpret the statutory conditions for applying an average-to-transaction dumping methodology.

ARGUMENT

Commerce uses Cohen's *d*, a statistical measure of effect size used in the social sciences, to test for "significant difference" in prices among purchasers, regions, or time periods.[12] As the first step in its DPM, Commerce calculates a value for Cohen's *d* for each comparison between test-group and comparison-group prices, and finds the differences between those two groups of prices to be significant whenever Cohen's *d* equals or exceeds 0.8.[13] This threshold is based on the work of Cohen, who observed that a Cohen's *d* of 0.8, when calculated as to two groups of measurements that share certain characteristics, corresponds with

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[11] H.R. Doc. No. 103-316, vol. 1, at 843 (1994).

[12] *See* Appx0038; 19 U.S.C. § 1677f-1(d)(1)(B)(i).

[13] *See* Appx0043–Appx0045.

differences—described by Cohen as "nonoverlap"—that seem "grossly perceptible and therefore large."[14] Touting Cohen's *d* as a "recognized measure of effect size" and the 0.8 threshold for "large" as "derived from real-world observations," Commerce calculates Cohen's *d* for groups of observations without regard to whether they share the characteristics (*i.e.*, assumptions) described by Cohen.[15]

Below, we elaborate the statistical rationale behind Cohen's *d* and the thresholds that Cohen described. We then counter each of Commerce's primary arguments in defense of its free-form application of Cohen's *d*. Finally, we address the argument, embraced by the CIT, that subsequent steps of the DPM alleviate this Court's concerns regarding Commerce's Cohen's *d* test.

I. Cohen's *d* and Thresholds for Effect Size

Cohen's *d* is a measure of "effect size," which is the difference between two groups in terms of some observed (or measured) value.[16] The observed values could be just about anything: the heights or IQs of every person in two different groups, as in two of the examples referenced by Cohen;[17] or test scores of every

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[14] *See* Jacob Cohen, *Statistical Power Analysis for the Behavioral Sciences* at 27 (2d ed. 1988) ("*Cohen*") (Appx3770).

[15] *See* Appx0045.

[16] *See Cohen*, at 20–22 (Appx3763–Appx3765); Appx0038.

[17] *Cohen*, at 26–27 (Appx3769–Appx3770).

student in two different classes, as discussed by Coe;[18] or the prices charged in two different time periods, to two sets of customers, or in two sets of regions, as in the case of Commerce's use of Cohen's *d*. Effect size measures the "effect" that being in one group rather than the other has on the observed value and expresses that measurement in units of standard deviation.[19]

As a measure of effect size, Cohen's *d* is derived using the formula:[20]

$$d = \frac{m_A - m_B}{\sigma}$$

[18] Robert Coe, *It's the Effect Size, Stupid: What effect size is and why it is important*, presented at the Annual Conference of the British Educational Research Association at 2–3 (Sept. 2002) ("*Coe*") (Appx4332–Appx4333).

[19] Effect size is sometimes referred to as a "standard mean difference" because it contextualizes the difference between the means of two groups and expresses that difference in terms of a common unit—standard deviation. *Coe*, at 3 (Appx4333). When the assumptions are met, effect sizes can be compared regardless of the units in which the original measurements were taken. *See id* at 5 (Appx4335). If the groups being compared do not meet the assumptions, then their effect sizes are not functionally comparable. In such cases, comparing effect sizes is akin to the incoherent task of divining "whether a particular line is longer than a particular rock is heavy." *See Bendix Autolite Corp. v. Midewsco Enters.*, 486 U.S. 888, 897 (1988) (Scalia, J., concurring in the judgment).

[20] *Mid Continent*, 31 F.4th at 1371 (referencing *Cohen*, at 20 (Appx3763)).

Where m_A represents the mean of the comparison/experimental group, m_B is the mean of the test/control group and σ is "the standard deviation of either *population* (since they are *assumed equal*)."[21]

Cohen's *d*, therefore, expresses the difference in the means of two groups in units of the variability of those groups (*i.e.*, standard deviation). Its utility as a measure of effect size is in providing meaningful information about how large the differences are between two groups and how much larger one difference is than another.[22] Cohen explained:

> If we maintain the *assumption* that the ***populations*** being compared are *normal* and with *equal variability*, and conceive them further as *equally numerous*, it is possible to define measures of nonoverlap (**U**) associated with **d** which are intuitively compelling and meaningful.[23]

Cohen went on to describe the three measures of nonoverlap (U_1, U_2, and U_3) that can be mathematically derived for two populations from any particular value of Cohen's *d* when the three assumptions are met.

For two groups (or "populations" in Cohen's explication), the measurements of nonoverlap can be described and depicted as follows:

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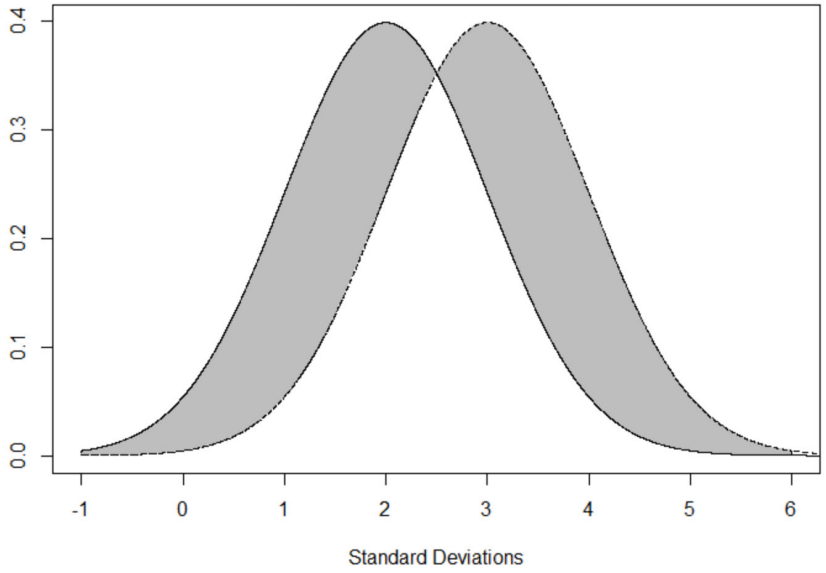
[21] *Cohen*, at 20 (Appx3763) (emphasis added).

[22] *See id.* at 21 (Appx3764).

[23] *Id.* (Appx3764) (emphases added).

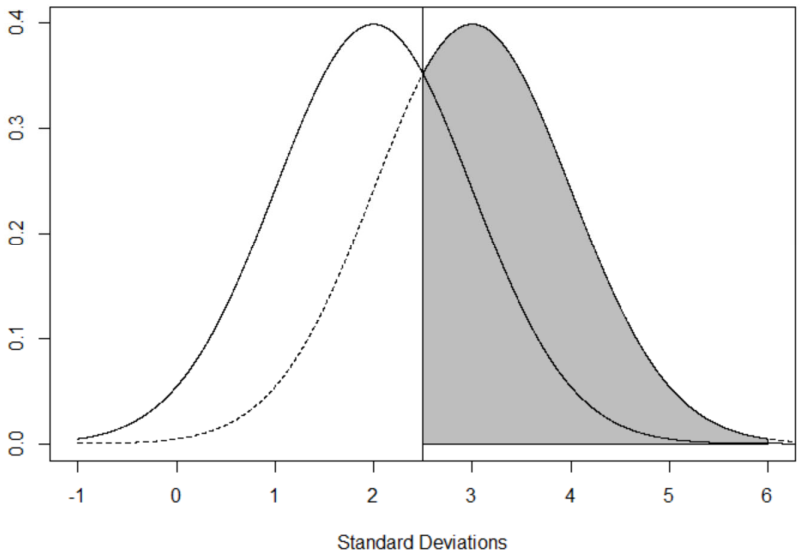
U_1: The percentage of all observations in the two groups, combined, that do not overlap with each other.

Figure 1: U_1



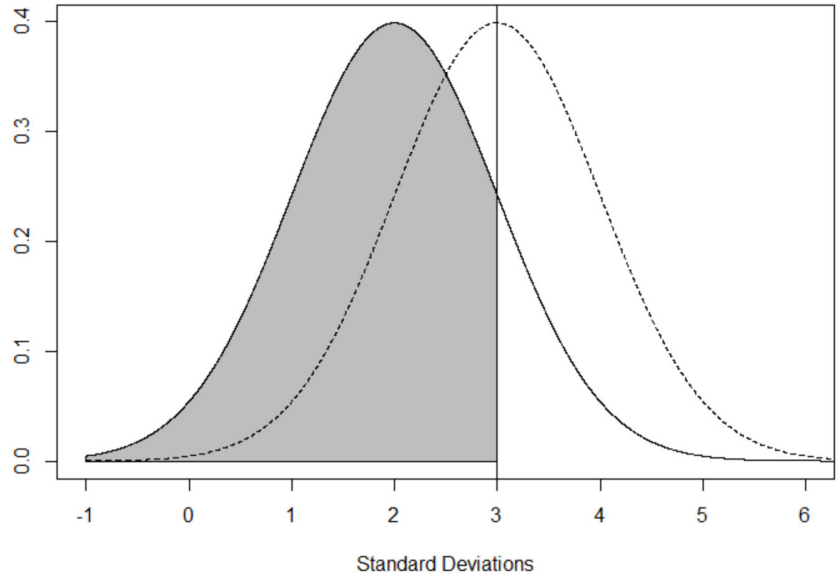
U_2: The percentage of observations in group B (on the right) that exceeds the same percentage of observations in group A (on the left).

Figure 2: U_2



> U_3: The percentage of observations in group A (on the left) that are exceeded by the upper half of the observations in group B (on the right). In other words, the share of the group A observations that are below the mean/median value of group B.

Figure 3: U_3



Cohen provides a table in which he has calculated each of these measurements of nonoverlap for each value of Cohen's *d* in 0.1 increments.[24]

Importantly, when Cohen describes his numerical thresholds for small, medium, and large effect sizes, he does so by reference to these measures of nonoverlap for populations. For example:

> **LARGE EFFECT SIZE: d = .8.** When our two populations are so separated as to make d = .8, almost half (U_1 = 47.4%) of their areas are not overlapped. U_2 = 65.5%, i.e., the highest 65.5% of the B population exceeds the lowest 65.5% of the A population. As a third measure, the

[24] *Id.* at 22 (Appx3765) (Table 2.2.1).

> mean or upper half of the B population exceeds the lower 78.8% (= U_3) of the A population.[25]

Two points are worth emphasizing. First, when Cohen describes *d* as a measure of effect size and the corresponding measures of nonoverlap, he does so with express reference to populations, rather than to samples. Second, the relationship between Cohen's *d* and the corresponding measures of nonoverlap is mathematical and depends entirely on the assumptions that Cohen articulates: "that the populations being compared are normal and with equal variability, and . . . equally numerous."[26]

Cohen's calculations of the nonoverlap measures depend on unique properties of normal distributions.[27] A normal distribution is completely determined (and therefore all of its properties are determined) by its mean and its standard deviation together. For instance, in a normal distribution, by definition, approximately 68% of observations fall within one standard deviation on either side of the mean (*i.e.*, 34.14% on each side of the mean), while approximately 95%

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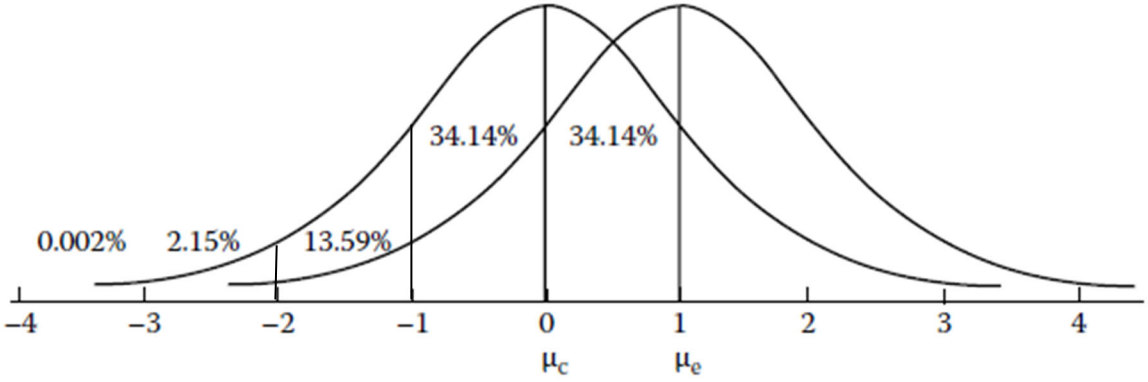
[25] *Id.* at 26 (Appx3769).

[26] *Id.* at 21 (Appx3764).

[27] *Id.* at 23 (Appx3766) ("{The *U* measures} are simply related to *d* and each other through the cumulative normal distribution."); Larry V. Hedges, Ingram Olkin, *Overlap Between Treatment and Control Group Distributions as an Effect Size Measure in Experiments*, 21 Psychological Methods 61, 62 (2016) ("*Hedges*") (only the first page of this source is included in the appendix, *see* Appx6381).

of observations fall within 2 standard deviations on either side (*i.e.*, 47.73% on each side of the mean).[28] This feature of normal distributions can be visualized in Figure 4, which plots two overlapping normal distributions:

Figure 4[29]



Groups that are not normally distributed do not share these properties. Although one can calculate a value for any two groups of data using the formula for Cohen's *d*, if they are not normally distributed (and with equal standard deviations and sufficient size), the value of Cohen's *d* will not correspond to the same measures of nonoverlap.

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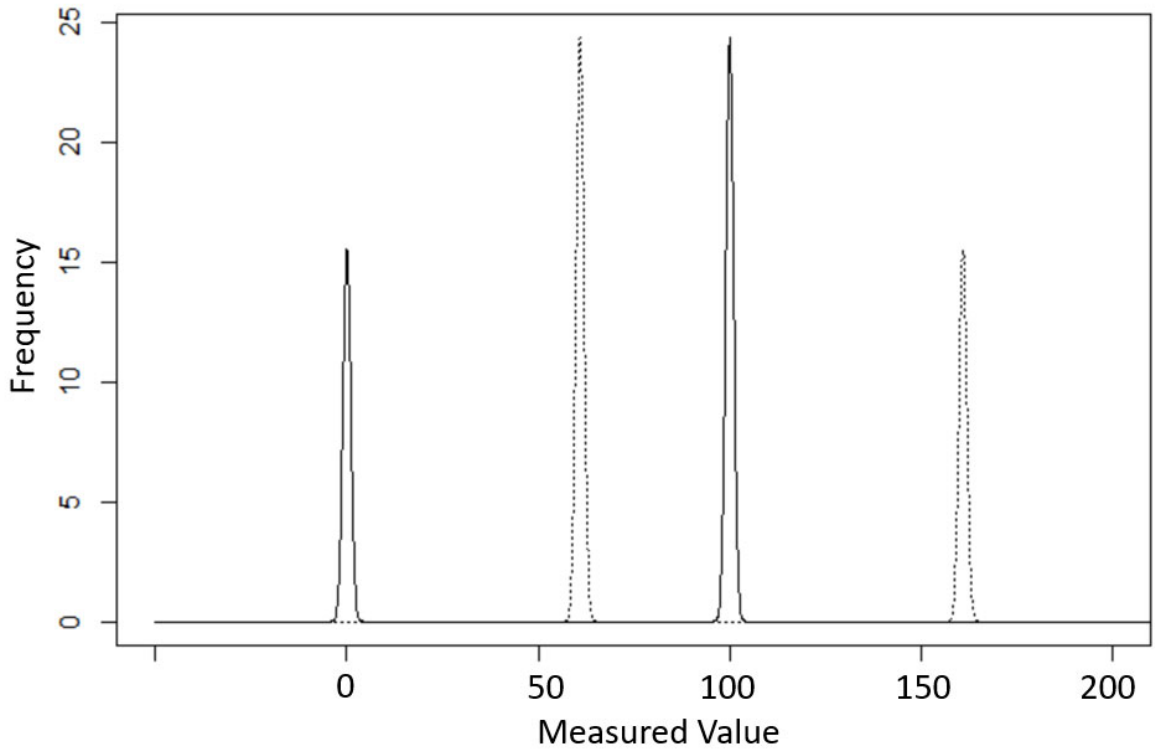
[28] *See generally Hedges* at 61–68 (Appx6381). Note that the mean, median, and mode all have the same value in a normal distribution, which allows these mathematical inferences.

[29] Robert J. Grissom and John J. Kim, *Effect Sizes for Research, Univariate and Multivariate Applications* at 62 (2nd ed. 2012) ("*Grissom*") (Appx4313) (vertical lines added at standard deviations -1 and -2 for clarity).

Consider two nonnormal population distributions, each of which has only two measured values (called the Bernoulli distribution), as follows:

Figure 5



Population A (the solid lines in Figure 5): 39.1% of measurements equal 0; 60.9% of measurements equal 100. The mean equals 60.9, and the standard deviation equals 48.8.

Population B (the dotted lines in Figure 5): 60.9% of measurements equal 61; 39.1% of measurements equal 161. The mean equals 100.1, and the standard deviation equals 48.8.

One could calculate a *d* coefficient for these two groups: the difference in means, (100.1 minus 60.9 = 39.2), divided by the standard deviation (48.8), equals a *d* of 0.8.

When the groups being compared meet the assumptions of normality, equal variance, and equal size, a Cohen's *d* of 0.8 indicates, for example, a U_3 measure of nonoverlap of 78.8,[30] meaning that 78.8% of observations in population A are exceeded by the largest half of observations in population B. However, that U_3 measure does not accurately describe the nonoverlap in the nonnormal populations represented by Figure 5. Only 39% (instead of 78.8%) of observations in population A are actually exceeded by the largest half of observations in population B. This is a significantly smaller degree of nonoverlap than the calculated *d* coefficient would indicate if the assumptions were met. Indeed, the actual U_3 measure for these populations (39%) corresponds to a Cohen's *d* coefficient of -0.28, which Cohen would have considered "small" in absolute terms. Yet the application of Cohen's *d* to this nonnormal distribution indicates a "large" (d=0.8) difference between these populations.

When the assumptions are not met, any given *d* coefficient will not describe the same relationship between groups on which the thresholds articulated by Cohen are based. The assumptions are not, therefore, incidental or hyper-technical statistical conditions the absence of which merely reduces the precision of Cohen's *d*. The assumptions are fundamental to the interpretive function of the *d*

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[30] *Cohen*, at 22 (Appx3765) (Table 2.2.1).

coefficient. The properties of the groups—the shape of the distribution, the commonality of variance, and the relative group sizes—are no less important to assessing the difference between the two groups than are the means and standard deviation from which Cohen's *d* is calculated. For all practical purposes, a Cohen's *d* calculated without the assumptions being met is not a Cohen's *d* at all.

II. There is No Merit to Commerce's Arguments That the Assumptions Underlying Cohen's *d* Do Not Apply

A. Commerce's Emphasis on a Distinction Between Populations and Samples is a Red Herring

Much of Commerce's effort to defend its reliance on Cohen's *d* without regard to the underlying assumptions flows from the following proposition:

> {T}hese assumptions relate to measuring the statistical significance of the difference in the means when using samples, whereas Commerce utilizes the Cohen's *d* test to measure the practical significance of the difference in the means when using the entire population of data rather than samples.[31]

According to Commerce, it "*does not estimate* the Cohen's *d* coefficient in the Cohen's *d* test, but *calculates the actual* Cohen's *d* coefficient based on the entire population of sale prices, not on a limited sample of sale price data."[32] This, Commerce's principal defense of its test, is complete nonsense.

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[31] Appx0046.

[32] Appx0052 (emphasis in original).

Distinctions between populations and samples—and subsidiary distinctions between practical and statistical significance or between estimates and actual calculations—have no bearing on the question at hand: is it reasonable to treat values of Cohen's *d* that are calculated without regard to the assumptions of normal distribution, equal variance, and sufficient size as having the same meaning as values of Cohen's *d* calculated under those assumptions? The answer is the same regardless of whether one accepts Commerce's premise that it is using populations rather than samples, that it is concerned with practical rather than statistical significance, and that it is calculating an actual rather than an estimated value for *d*.

When comparing two groups of observations, the value of Cohen's *d* is demonstrably sensitive to the assumptions of normality, equal variance, and equal size. A *d* coefficient of 0.8 provides meaningful information about the difference between two groups when the assumptions are met. The same coefficient does not describe the same differences when the groups do not meet the assumptions.

As the exposition of Cohen's *d* in Part I above shows, nothing about these facts depends on whether the groups being compared are samples or populations. Indeed, with one noteworthy exception, the above discussion of the fundamental role of the assumptions to interpreting Cohen's *d* does not refer to samples or populations at all.

The exception, of course, is in Cohen's own description of Cohen's *d*, which bears repeating:

> If we maintain the *assumption* that the ***populations*** being compared are *normal* and with *equal variability*, and conceive them further as *equally numerous*, it is possible to define measures of nonoverlap (**U**) associated with ***d*** which are intuitively compelling and meaningful.[33]

Commerce never explains Cohen's reference to populations as the groups for which the assumptions must be maintained in order to define intuitively compelling and meaningful measures of overlap associated with particular values of *d*. Commerce instead attempts to sidestep the issue.

Commerce claims that the description of the assumptions arises when "Dr. Cohen is considering the extent that two compared sets of sampled data do not overlap one another," and argues that Commerce has a different use for Cohen's *d*.[34] This argument makes no sense.

Commerce acknowledges that "to quantify the amount of non-overlap, one must know the areas under each bell curve, which requires the statistical criteria cited by Dr. Cohen and questioned by the CAFC."[35] But Commerce then insists

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[33] *Cohen*, at 21 (Appx3764) (emphases added).

[34] Appx0047.

[35] Appx0047. Commerce is incorrect that these criteria must be met to determine the areas under the distribution curves. The nonoverlap *can* be calculated for distributions that do not meet the assumptions, but Cohen did not do so in deriving

that "these measurements of non-overlap in statistical analysis *involving sampled data* do not define the real-world observed differences used by Dr. Cohen to define the small, medium and large thresholds."[36] The qualification, "involving sampled data," however, is directly contradicted by Cohen's own explanation of his analysis, which specifically refers to "populations" rather than "sampled data."[37]

Moreover, Commerce has previously acknowledged the intrinsic relationship between the degree of overlap (or nonoverlap) between two groups and the practical significance of the difference between the two groups.

> The idea behind the Cohen's *d* coefficient is that *it indicates the degree by which the distribution of prices within the test and comparison groups* overlaps or, conversely, how significant the difference is between the prices in the test and comparison groups. . . . When the difference in the weighted-average sale prices between the two groups is measured relative to the pooled standard deviation, then this value is expressed in standardized units (*i.e.*, the Cohen's *d* coefficient) *based on the dispersion of the prices within each group, and quantity of the overlap* or, conversely, the significance of the differences, in the prices within the two groups.[38]

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his thresholds and the results will differ, sometimes dramatically, from those obtained when the assumptions are met.

[36] Appx0047 (emphasis added).

[37] *Cohen*, at 21 (Appx3764).

[38] *Certain Frozen Warmwater Shrimp From the Socialist Republic of Vietnam: Final Results of Antidumping Duty Administrative Review*, 2014–2015, 81 Fed. Reg. 62,717 (Dep't Commerce Sept. 12, 2016), and accompanying Issues and Decision Memorandum at 9 (emphasis added); *Certain Frozen Warmwater Shrimp From India: Final Results of Antidumping Duty Administrative Review; 2012–*

They are two ways of describing the same thing. Commerce's newfound arguments to the contrary have the merit of neither coherence nor consistency.

Commerce's efforts to distinguish or refute the work of expert statisticians likewise cannot withstand scrutiny. As this Court has observed, Grissom explained that "nonnormality can greatly influence the value of a standardized-mean-difference effect size and its estimate."[39] Commerce insists that this concern "does not impact Commerce's application of the Cohen's *d* test" because Commerce uses the full universe of real-world data in computing the *d* coefficient, whereas the concern about nonnormality and equal variances articulated by Grissom applies only to estimates of effect size based on sampling.[40] Similarly, Commerce dismisses another passage from Grissom that explains:

> {I}f the two populations that are being compared are assumed to have equal variances, then a better estimate of the denominator of a standardized difference between population means can be made if one pools the data from both samples to estimate the common σ instead of using s_b that is based on the data of only one sample.[41]

2013, 79 Fed. Reg. 51,309 (Dep't Commerce Aug. 28, 2014), and accompanying Issues and Decision Memorandum at 24 (emphasis added).

[39] *Stupp*, 5 F.4th at 1357–58 (quoting *Grissom*, at 68 (Appx4319)).

[40] Appx0047–Appx0048.

[41] *Grissom*, at 68 (Appx4319); *see also* Appx0047–Appx0048.

Commerce argues that this passage merely demonstrates that Grissom was proposing "an alternative approach to calculate the denominator of the '*d*' coefficient" when dealing with sampling.[42]

Although Grissom does refer to estimates and samples (as well as to populations), those references do not circumscribe the relevance of their observations. Indeed, Grissom urges the use of the common population standard deviation (or an estimate thereof) as the denominator when calculating Cohen's *d* precisely because of the sensitivity of the coefficient to violations of the assumption of equal variances.[43] This sensitivity does not depend on whether the groups being compared are populations or samples.[44] This Court should not be distracted by Commerce's attempt to focus on immaterial references to samples in discussions of the importance of the assumptions to interpreting Cohen's *d*.

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[42] Appx0048.

[43] *See Grissom*, at 66 (Appx4317).

[44] There is one difference between populations and samples that affects the calculation of Cohen's *d*: the formula for calculating standard deviation differs slightly depending on whether the distribution is considered a population or a sample. *See generally id.* at 68 (Appx4319) (observing that Cohen used the formula for population, rather than sample, standard deviation to derive the denominator for *d*). That difference, however, is immaterial to the role that the assumptions play in the interpretation of Cohen's *d*.

Likewise, Commerce seeks to play its "we're using populations" card to evade Coe's explanation that measures of effect size are sensitive to violations of the assumption of nonnormality.[45] Commerce claims that Coe's explanation applies only to sampled data.[46] However, his explanation applies mathematically to the interpretation of Cohen's *d* when comparing two groups, regardless of whether those groups are populations or samples.

The same is true of Commerce's response to the passage from Li cited by this Court.[47] Li explained that violating the assumptions of normality and roughly equal variances "severely affect{s} the accuracy of *d* in evaluating the true {effect size}."[48] Commerce describes this concern as "not germane to the results of Commerce's Cohen's *d* test" because Commerce calculates the actual *d* coefficient using the full universe of data, and Li's concern applies only to estimating the *d* coefficient using samples of data.[49] But estimates have nothing to do with the

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[45] Appx0049–Appx0050; *see Coe*, at 14 (Appx4344).

[46] Appx0049–Appx0050.

[47] *See Stupp*, 5 F.4th at 1358.

[48] Appx0051 (second alteration in original) (quoting Johnson Ching-Hong Li, *Effect size measures in a two-independent-samples case with nonnormal and nonhomogeneous data*, 48 Behavioral Research 1560 (2016) (Appx4560)).

[49] Appx0052.

issue. A given value of Cohen's *d* cannot be interpreted to mean the same thing when it is calculated without regard to the assumptions as when the assumptions are met.

B. References to "Real-World" Observations Have No Bearing on the Materiality of the Assumptions Underlying Cohen's *d*

As another recurring—and misguided—response to this Court's admonitions that Cohen's interpretive thresholds for effect size depend on underlying assumptions being met, Commerce claims that:

> Dr. Cohen's thresholds are operational and not based on a statistical analysis, the concerns about the statistical criteria do not impact the usefulness of the thresholds. These thresholds are derived from real-world observations and, thus, are not tied to any particular statistical criterion such as normality of distribution or approximately equal variances.[50]

According to Commerce, Cohen based his thresholds for effect size—in his book called *Statistical Power Analysis for the Behavioral Sciences*—not on any sort of "statistical analysis," but instead on "real-world observations."[51] This is both wrong (of course Cohen used statistical analysis) and unsupportive of Commerce's position (the real-world observations noted by Cohen involve data that appear to meet his assumptions).

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[50] Appx0044–Appx0045.

[51] Appx0045; *see also* Appx0047.

The specific observations from which Commerce claims Cohen derived his 0.8 threshold for "large" effect size were "the difference in IQ of a PhD graduate and a college freshman, the difference in IQ between a college graduate and a student with only a 50-50 chance of passing high school, or the difference in height between 13 and 18 year-old girls."[52] Commerce is correct that Cohen notes these observations in his description of 0.8 as an intuitively "large" effect size.[53] However, to conclude that Cohen derived the 0.8 threshold from these observations in lieu of statistical analysis, one must ignore pages of analysis leading up to Cohen's description of the threshold, as well as the description itself.

In describing each of his three operational thresholds for effect size, Cohen begins by discussing the mathematical measures of nonoverlap (U_1, U_2, and U_3) corresponding with each effect size.[54] Commerce ignores that discussion when it baldly declares that Cohen abandoned statistical analysis to propose his effect-size thresholds. Only after describing the measures of nonoverlap for each threshold does Cohen refer to the "real-world observations" as familiar examples of

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[52] Appx0045.

[53] *Cohen*, at 27 (Appx3770).

[54] *Id.* at 26 (Appx3769).

differences that seem small, medium, or large.[55] The fact that each of the differences between the groups in these familiar examples correspond to particular *d* coefficients serves to corroborate his selection of those intuitive operational threshold.

The examples do not displace or render superfluous the quantitative descriptions of the relationship between particular values of *d* and measures of nonoverlap. Nor does Cohen's reference to real-world observations that correspond to a *d* of 0.8 support abandonment of the conditions under which he described the *d* coefficient as associated with measures of nonoverlap "which are intuitively compelling and meaningful."[56]

Whether one views the examples cited by Cohen as corroborative (as seems the obvious intent) or fundamental (as Commerce posits), it is not reasonable to conclude that any *d* coefficient of 0.8, no matter how calculated, signifies a "large difference."

Cohen does not document the calculation of the *d* coefficient for each of the three comparisons that constitute his "real-world observations." There is no reason to assume, however, that he eschewed the assumptions described several pages

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[55] *Id.* at 27 (Appx3770).

[56] *Id.* at 21 (Appx3764).

earlier as fundamental to calculate *d* coefficients for these observations. There is every reason to assume the opposite: the measurements that the observations reflect—IQ and height—have long been regarded as characteristics that tend towards normal distribution in populations.[57] If references to such observations have any relevance, they only reinforce that Cohen assumed normality, equal variance, and equal size when proposing his thresholds.

C. Violating the Assumption of Normality Does Not Increase the Likelihood of Finding That Prices Do Not Differ Significantly

In its *Stupp* decision, this Court referenced several examples drawn from "extensive literature describing the problems associated with applying the Cohen's *d* test to data that are not normally distributed or that are lacking equal variances."[58] These sources confirm the fundamental, logical, and mathematically necessary conclusion that a *d* coefficient calculated using data that differ in

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[57] *See, e.g.*, Edward L. Thorndike, *et al.*, *The Measurement of Intelligence* at 271–93 (1927) (describing IQ as normally distributed); Stephen Stigler, *The History of Statistics* at 281, 287–302, 451 (Harvard University Press 1986) (discussing heights as the subject of some of the earliest statistical analyses of normal distributions).

[58] *See Stupp*, 5 F.4th at 1357–59.

distribution, variance, or size will not be the same as a Cohen's *d* calculated using data that is normally distributed, with equal variance, and equal size.[59]

Rather than grappling with that conclusion, Commerce focuses on the fact that some of the examples show violations of the assumptions leading to *d* coefficients that are smaller than would be the case if the assumptions had been met. Commerce suggests that these examples demonstrate that its application of Cohen's *d* without regard to the underlying assumptions systematically minimizes "false positives" and "makes it less likely that Commerce's methodology will result in finding prices that differ significantly among purchasers, regions or time periods."[60] Here too, Commerce has embraced an erroneous interpretation of the statistics literature and drawn conclusions that even the erroneous interpretation cannot support.

Commerce is incorrect that the referenced literature demonstrates a systematic tendency for Cohen's *d* to understate effect size when the assumptions are violated.[61] Recall that $d = (m_A - m_B)/\sigma$.[62] As a matter of arithmetic, if (m_A –

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[59] *See generally id.* at 1358.

[60] Appx0049.

[61] *See* Appx0049–Appx0050, Appx0052–Appx0060, Appx0081–Appx0087.

[62] Where m_A is the mean of population A, m_B is the mean of population B, and σ is the population standard deviation. *Cohen*, at 20 (Appx3763).

m_B) is the same for two pairs of distributions, but σ is different, then *d* must be different. On the one hand, if σ is larger (than in the normal distribution) then *d* will be smaller than when computed from normal distributions. On the other hand, if σ is smaller (than in the normal distribution) then *d* will be larger than when computed from normal distributions. This is a function of the fact that the standard deviation provides the denominator for the *d* coefficient. While the examples from Coe, Li, and Algina happen to reflect violations of the assumptions that lead to smaller *d* coefficients,[63] the Grissom analysis shows larger *d* coefficients associated with smaller sample sizes.[64]

When *d* is calculated using data that violate the assumptions of normality, equal variance, and equal size, the *d* coefficient will not describe the degree of nonoverlap in the same way that Cohen's *d* describes the nonoverlap measures underlying the thresholds for small, medium, and large effect sizes. That is the fundamental flaw in Commerce's practice and arguments. As the Court recognized in *Stupp*, "{v}iolating these assumptions can subvert the usefulness of the interpretive cutoffs, transforming what might be a conservative cutoff into a

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[63] *See* Appx0049–Appx0052.

[64] *See* Appx0052.

meaningless comparator."[65] Relying on a meaningless comparator to determine whether prices differ significantly under the antidumping law is unreasonable, arbitrary and capricious.

III. Subsequent Steps in Commerce's DPM Cannot Cure Its Unreasonable Foundation

The Court's analysis need proceed no further than recognizing that it is unreasonable for Commerce to rely on its Cohen's *d* test to identify significant price differences without regard to the assumptions that give Cohen's *d* interpretive meaning. It is not reasonable for Commerce to rely on a test that does not measure what it purports to measure. The Court should remand on that basis.

Commerce, however, has persuaded the CIT in this case that, whatever concern this Court may have about Commerce reliance on Cohen's *d*, that "test does not operate in a vacuum, but as part of the differential pricing analysis as a whole."[66] The court below accepted that, when Commerce applies its Cohen's *d* test to datasets that do not meet its underlying assumptions, the operation of the ratio test and the meaningful-difference test ensure "reasonable passing rates" or

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[65] *Stupp*, 5 F.4th at 1360.

[66] *Stupp Corp. v. United States*, 619 F. Supp. 3d 1314, 1324 (Ct. Int'l Trade 2023) (Appx0017).

"relatively few determinations of targeted dumping."[67] Setting aside the questionable (and unsupported) empirical claim that Commerce's Cohen's *d* test results in few "false positive" findings of targeted dumping, the holistic defense of Commerce's test ignores the statutory language that Commerce purports to apply.

Each of the three tests that form part of the DPM addresses a discrete condition for departing from the average-to-average method for calculating dumping margins:

- **Cohen's *d* test:** determines whether ***prices differ significantly*** among purchasers, regions, or periods of time.[68]
- **Ratio test:** determines whether there is a ***pattern*** of prices that differ significantly.[69]
- **Meaningful-difference test:** determines whether "such differences" in prices ***cannot be taken into account using the average-to-average method***.[70]

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[67] *Id.* at 1327 (Appx0023).

[68] 19 U.S.C. § 1677f-1(d)(1)(B)(i); *see Differential Pricing Analysis: Request for Comments*, 79 Fed. Reg. 26,720, 26722 (Dep't Commerce May 9, 2014) (Commerce will find "that the difference is significant . . . if the calculated Cohen's d coefficient is equal to or exceeds the large threshold").

[69] 19 U.S.C. § 1677f-1(d)(1)(B)(i); *see* 79 Fed. Reg. at 26,722.

[70] 19 U.S.C. § 1677f-1(d)(1)(B)(ii); *see* 79 Fed. Reg. at 26,723.

The three tests do not operate as an amalgamated whole. Each serves a distinct function.[71] The Cohen's *d* test serves as the foundation because its identification of significant price differences is a necessary prerequisite and input to the ratio and meaningful-difference tests.

Each of the three tests is required, under Commerce's articulation of the DPM, to establish the statutory conditions for Commerce to depart from the average-to-average method.[72] If the Cohen's *d* test does not actually identify significant price differences—as in cases where it is applied to data that do not meet its assumptions—then the subsequent tests do not perform any statutory function. Without identification of significant price differences, the ratio test cannot find a pattern of significant price differences and the meaningful-difference

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[71] Commerce seems to agree. *See* Appx0029–Appx0030.

[72] *Amici* do not suggest endorsement of the ratio and meaningful-difference tests as reasonable to determine whether the statutory conditions are met. For example, by design, Commerce applies the meaningful-difference test without regard to the nature of the significant differences identified using Cohen's *d*. When Commerce identifies significant price differences among periods of time, as it often does particularly in cases involving seasonal goods, it does not consider whether "such differences" can be taken into account using the average-to-average method adjusted for time periods. Yet Commerce's own regulations allow application of the average-to-average method using time periods that account for price differences over time. 19 C.F.R. §351.414(d)(3). Given this flexibility, it is difficult to see how Commerce would ever be unable to account for differences among periods of time using the average-to-average method.

test cannot determine whether the average-to-average method accounts for such significant price differences.

IV. Conclusion

This Court has articulated serious concerns about the reasonableness of Commerce's use of the Cohen's *d* test and its mechanical application of the threshold for identifying large differences in prices when the prices being compared do not satisfy the fundamental assumptions underlying Cohen's *d* and the thresholds for effect size. Those concerns are well-founded. Commerce's Cohen's *d* test is not a reasonable test to identify significant difference between groups of prices, because it does not reliably measure what it purports to measure. Its outcomes are driven as much by the extent to which the groups that Commerce compares defy the assumptions as by the extent to which the prices in those groups differ.

Commerce has never offered a coherent defense of its practice. It has instead doubled down and insisted that its use of Cohen's *d* is not subject to the same constraints to which every other use of the effect size measure described in the literature is subject. What Commerce's defiance-as-explanation has made clear is that Commerce's Cohen's *d* test is not, in any meaningful sense, a Cohen's *d* test at all. Feeding the results of that test into the subsequent steps of Commerce's DPM does not resolve the problem. To the contrary, Commerce's Cohen's *d* is the

first step and foundation of the DPM, and applying it without regard to its underlying assumptions severs any connection between the results of the DPM and the statutory conditions it purports to establish.

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CERTIFICATE OF COMPLIANCE

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Stupp Corp. v. United States

The foregoing filing complies with the relevant type-volume limitation of the Federal Rules of Appellate Procedure and Federal Circuit Rules because it contains 6,990 words, which does not exceed the maximum authorized by Federal Circuit Rule 29(b).

Date: August 1, 2023

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CERTIFICATE OF SERVICE

Stupp Corp. v. United States
CAFC Court No. 2023-1663

The undersigned hereby certifies that on, August 1, 2023, the foregoing Brief of The Government of Canada; Canfor Corporation; Canadian Forest Products, Ltd.; Canfor Wood Products Marketing, Ltd.; J.D. Irving, Limited; Resolute FP Canada Inc.; Tolko Industries Ltd.; Tolko Marketing and Sales Ltd.; and West Fraser Mills Ltd. as *Amici Curiae* In Support Of Defendant-Appellant and Urging Reversal, was filed using the Court's CM/ECF System, which will serve via e-mail notice of filing to all counsel registered as CM/ECF users, including the following counsel for the parties:

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