Case No. 2023-1877

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

MARMEN INC., MARMEN ENERGIE INC., MARMEN ENERGY CO.,
Plaintiffs-Appellants

v.

UNITED STATES, WIND TOWER TRADE COALITION,
Defendants-Appellees,

On Appeal from the United States Court of International Trade
in Case No. 1:20-CV-00169-JCG, Judge Jennifer Choe-Groves

CORRECTED

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

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FORM 9. Certificate of Interest

Form 9 (p. 1)
March 2023

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2023-1877

Short Case Caption Marmen Inc. v. US

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.
3. In answering Sections 2 and 3, be specific as to which represented entities the answers apply; lack of specificity may result in non-compliance.
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: 07/17/2023

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

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).

☑ None/Not Applicable ☐ Additional pages attached

5. Related Cases. Other than the originating case(s) for this case, are there related or prior cases that meet the criteria under Fed. Cir. R. 47.5(a)?

☐ Yes (file separate notice; see below) ☐ No ☑ N/A (amicus/movant)

If yes, concurrently file a separate Notice of Related Case Information that complies with Fed. Cir. R. 47.5(b). **Please do not duplicate information.** This separate Notice must only be filed with the first Certificate of Interest or, subsequently, if information changes during the pendency of the appeal. Fed. Cir. R. 47.5(b).

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☑ None/Not Applicable ☐ Additional pages attached

FORM 9. Certificate of Interest — **Form 9 (p. 1) March 2023**

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CORRECTED

CERTIFICATE OF INTEREST

Case Number 2023-1877

Short Case Caption Marmen Inc. v. US

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

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Date: 07/27/2023

Signature: /s/ R. Will Planert

Name: R. Will Planert

FORM 9. Certificate of Interest

Form 9 (p. 2)
March 2023

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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

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☐ None/Not Applicable ☐ Additional pages attached

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 2023-1877

Short Case Caption Marmen Inc. v. US

Filing Party/Entity Resolute FP Canada Inc.

Instructions:

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Date: 07/17/2023

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 2023-1877

Short Case Caption Marmen Inc. v. US

Filing Party/Entity Tolko Industries Ltd. and Tolko Marketing and Sales 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: 07/31/2023

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.

☐ Additional pages attached

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☑ None/Not Applicable ☐ Additional pages attached

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

CORRECTED CERTIFICATE OF INTEREST

Case Number 2023-1877

Short Case Caption Marmen Inc. v. U.S.

Filing Party/Entity West Fraser Mills Ltd.

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

Date: 07/27/2023

Signature: [signature]

Name: Donald Harrison

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).
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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 beyond the one at bar. Those cases include antidumping investigations and administrative reviews with respect to softwood lumber from Canada,[3] which are

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[1] The United States and Marmen Inc., Marmen Energie Inc., and Marmen Energy Co. have consented to the filing of this *amicus* brief. The Wind Tower Trade Coalition has indicated that it takes no position on the filing of an *amicus* brief. *Amici* have separately submitted a motion seeking the Court's leave to file this 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.

[3] *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); *Certain Softwood Lumber Products from Canada: Final Results of Antidumping Duty Administrative Review; 2017–2018*, 85 Fed. Reg. 76,519 (Dep't Commerce Nov. 30, 2020); *Certain Softwood Lumber Products From Canada: Final Results of Antidumping Duty Administrative Review; 2019*, 86 Fed. Reg. 68,471 (Dep't Commerce Dec. 2, 2021); *Certain Softwood Lumber Products From Canada: Final*

part of one of the largest and longest-running trade disputes in the world. *Amici curiae* Canfor Corporation; Canadian Forest Products, Ltd.; Canfor Wood Products Marketing, Ltd.; Resolute FP Canada Inc.; Tolko Industries Ltd.; Tolko Marketing and Sales Ltd.; and West Fraser Mills Ltd. (collectively, the "Lumber Producers") 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 methodology for calculating dumping margins in cases involving so-called targeted dumping. Commerce finds 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 material consequences in the form of hundreds of

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Results of Antidumping Duty Administrative Review and Final Determination of No Shipments; 2020, 87 Fed. Reg. 48,465 (Dep't Commerce Aug. 9, 2022).

millions of dollars in unlawful duties charged on products that are not, in fact, being dumped under any reasonable construction of the term.

Various aspects of the DPM have been disputed in proceedings before this Court,[4] before the U.S. Court of International Trade,[5] and—in proceedings in which *amici* are parties—before binational panels convened under the North American Free Trade Agreement and the USMCA.[6] The Court's holdings in this case may affect the outcomes of those challenges.

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[4] *E.g.*, *Stupp Corp. v. United States*, 619 F. Supp. 3d 1314 (Ct. Int'l Trade 2023), *appeal docketed* No. 2023-1663 (Mar. 27, 2023); *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); *Stupp Corp. v. United States*, 5 F. 4th 1341 (Fed. Cir. 2021) (remanded).

[5] *E.g.*, *NEXTEEL Co., Ltd. v. United* States, No. 18-00083, 2023 WL 3017973 (Ct. Int'l Trade Apr. 19, 2023) (on remand); *Mid Continent Steel & Wire, Inc. v. United States*, 628 F. Supp. 3d 1316 (Ct. Int'l Trade 2023).

[6] *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 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 (awaiting decision).

This Court has characterized the Cohen's *d* test, at issue in this case, as the "foundation" of Commerce's DPM.[7] 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. The status of Cohen's *d* as the DPM's foundation provides important context for the Court's consideration of this appeal and underscores the interest of *amici* in its outcome.

Companies that export to the United States should be able to structure their conduct to avoid dumping. However, when Commerce uses Cohen's *d* to test differences between groups of sales without regard to whether they satisfy the assumptions underlying Cohen's *d*, the outcome of the test becomes arbitrary. Whether and to what extent Commerce will find that a company is engaged in targeted dumping depends more on statistical idiosyncrasies of datasets selected by Commerce for comparison than on actual pricing behavior. Commerce's interpretation of the law thus prevents interested parties from reliably predicting how the law will apply to their conduct such that they might change course to avoid adverse government action. Such an interpretation falls far below the reasonableness threshold. It is arbitrary and capricious.

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

Amici have dealt firsthand with Commerce's use of Cohen's *d* as part of its DPM and engaged with the underlying statistical science. That engagement has included commissioning a report on Commerce's use of Cohen's *d* by one of the world's leading experts in statistical methods and measurement of effect size.[8] In those proceedings, as here, Commerce purports to rely on "widely accepted" thresholds articulated by Professor Cohen to test for "significant difference" between groups of sales. However, as *amici* explain, those thresholds for Cohen's *d* have neither widespread acceptance nor coherent meaning when they are unmoored from their fundamental assumptions.

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[8] 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), filed as Exh. 1 to Letter from McDermott Will & Emery LLP to U.S. Department of Commerce, 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).

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, as this Court has observed, the academic literature describing the use of Cohen's *d* makes clear its results have the meaning articulated by Professor 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.

Professor 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*, 5 F.4th at 1357–58.

[10] The terms "variance" and "standard deviation" are sometimes used interchangeably when colloquially referring to the variability, or spread, of data

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.

Commerce raises several specious arguments to defend reliance on fixed thresholds for Cohen's *d* without regard to its underlying assumptions. *First*, Commerce insists that the fundamental assumptions of Cohen's *d* apply only when comparing samples rather than when comparing populations. However, Professor Cohen articulated the assumptions specifically with reference to comparing *populations*, *not samples*. The assumptions are what give Cohen's *d* interpretive value for comparing groups, regardless of whether those groups are populations or samples. While differences between samples and populations may be relevant to

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points within a group relative to the mean, or average. The two measures have a defined mathematical relationship. Variance is the average squared deviation from the mean, while standard deviation is the square root of the variance.

issues related to statistical significance, study design, or other questions in statistics, such differences do not affect interpretation of Cohen's *d* as a measure of the difference between groups. Commerce's argument on this point is obfuscation.

Second, Commerce insists that the thresholds articulated by Professor Cohen are not based on statistical analysis, but are instead derived from "real-world observations." But Professor Cohen articulated his thresholds in express reliance on the mathematical calculations of nonoverlap that follow from different values of Cohen's *d* when—and only when—the underlying assumptions are met. Professor Cohen did not derive the thresholds he describes from so-called "real-world observations." Instead, he offered *d* coefficients calculated from real-world examples as corroboration that his thresholds are "intuitively meaningful." In any event, those real-world observations involve the application of Cohen's *d* to data (height and IQ) that are generally understood to be normally distributed.

Third, in the face of illustrations in the statistics literature showing that values of Cohen's *d* are highly sensitive to violations of its fundamental assumptions, Commerce selectively focuses on examples of Cohen's *d* calculations that understate effect size to infer that violating the assumptions produces Cohen's *d* values that systematically understate differences between groups. Commerce's inference is both counterfactual and beside the point. Just as there are numerous ways to understate effect size, there are numerous ways to overstate effect size.

Violating the assumptions causes both. Moreover, an arbitrary test is still arbitrary, even if the arbitrary results might sometimes skew more towards false negatives than false positives.

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 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.

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.[11] As the first step in its DPM, Commerce calculates a

[11] *See* Appx4864; 19 U.S.C. § 1677f-1(d)(1)(B)(i).

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* exceeds 0.8.[12] This threshold is based on the work of Professor 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 differences—described by Cohen as "nonoverlap"—that seem "grossly perceptible and therefore large."[13] 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 Professor Cohen.[14]

In the discussion below, we begin by elaborating the statistical rationale behind Cohen's *d* and the thresholds that Professor Cohen described. We then address Commerce's principal arguments in defense of its free-form application of Cohen's *d*.

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[12] *See* Appx4840–41.

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

[14] *See* Appx4835.

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.[15] 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;[16] or test scores of every student in two different classes, as discussed by Professor Coe;[17] 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.[18]

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[15] *See* Cohen, *Statistical Power Analysis* at 20–22; Appx4835.

[16] Cohen, *Statistical Power Analysis* at 26–27.

[17] 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, *It's the Effect Size, Stupid*")

[18] 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, *It's the Effect Size, Stupid* at 3. A measure of effect size is, as this Court described it, a "pure (unitless) number." *Mid Continent*, 31 F.4th at 1372. When the assumptions are met, effect sizes can be compared regardless of the units in which the original measurements were taken. *See* Coe, *It's the Effect Size, Stupid* at 5. 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

As a measure of effect size, Cohen's *d* is derived using the formula:[19]

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

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*)."[20]

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.[21] Professor 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.[22]

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rock is heavy." *See Bendix Autolite Corp. v. Midewsco Enters., Inc.*, 486 U.S. 888, 897 (1988) (Scalia, J. concurring in the judgment).

[19] *Mid Continent*, 31 F.4th at 1371 (referencing Cohen, *Statistical Power Analysis* at 20).

[20] Cohen, *Statistical Power Analysis* at 20 (emphasis added).

[21] *See id.* at 21.

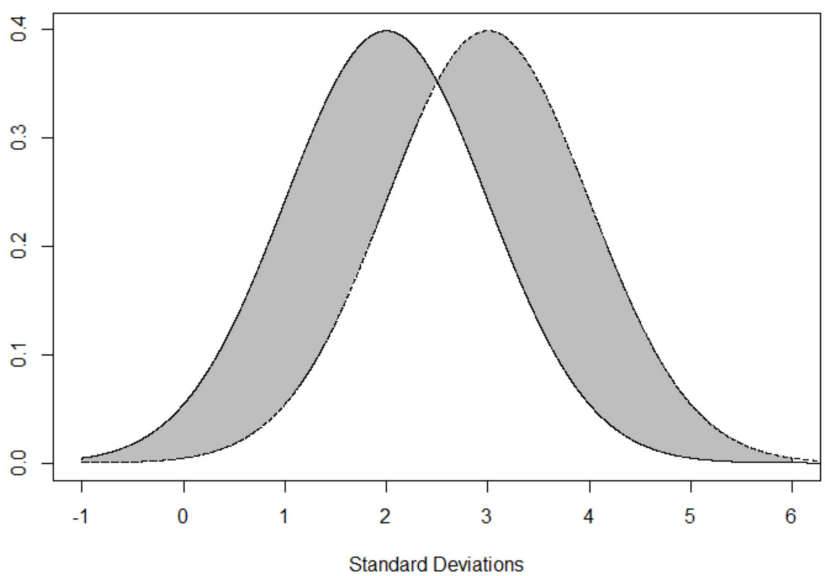
[22] *Id.* (emphases added).

Professor 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 Professor Cohen's explication), the measurements of nonoverlap can be described and depicted as follows:

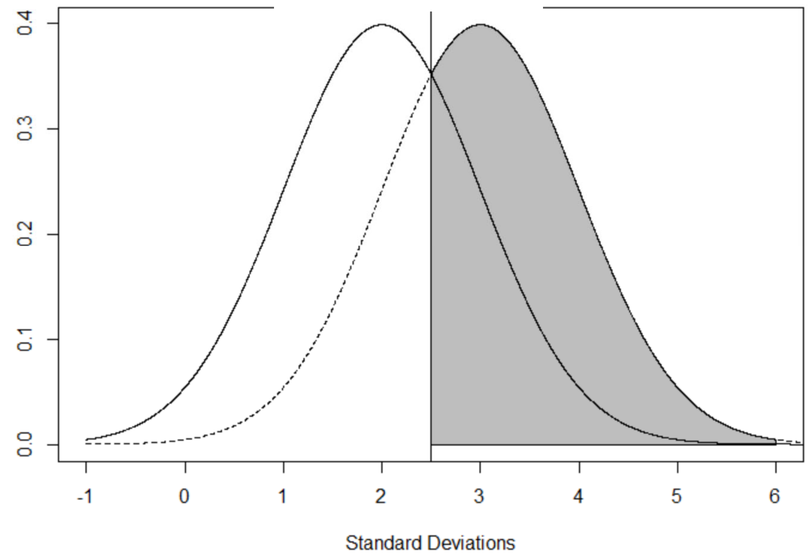
> U_1: The percentage of all observations in the two groups, combined, that do not overlap with each other.

<u>Figure 1: U_1</u>



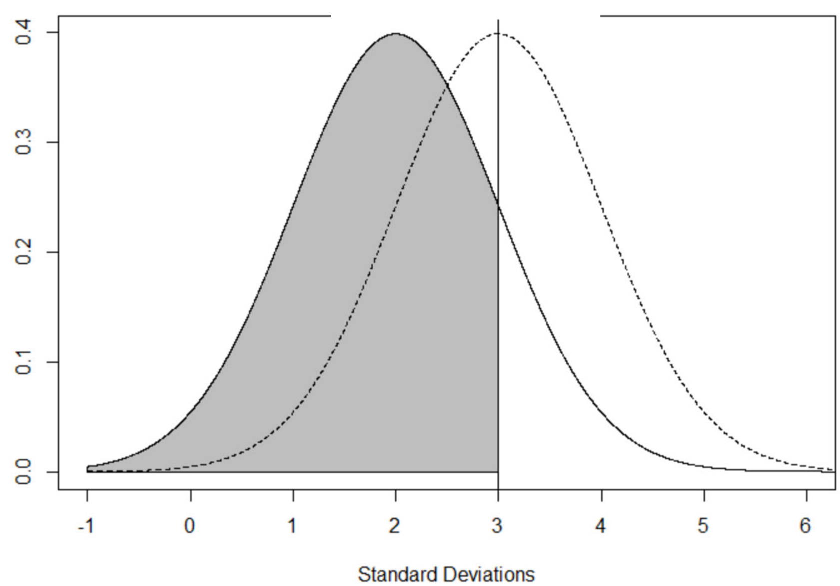
U_2: The percentage of observations in group B (on the right) that exceeds the same percentage of observations in group A (on the left).

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



Professor 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.[23]

When Professor 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 mean or upper half of the B population exceeds the lower 78.8% (= U_3) of the A population.[24]

Two points are worth emphasizing here. First, when Professor 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 Professor Cohen articulates: "that the populations being compared are normal and with equal variability, and . . . equally numerous."[25]

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[23] *Id.* at 22 (Table 2.2.1).

[24] *Id.* at 26.

[25] *Id.* at 21.

Professor Cohen's calculations of the nonoverlap measures depend on unique properties of normal distributions.[26] 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% of observations fall within 2 standard deviations on either side (*i.e.*, 47.73%, or 34.14% + 13.59%, as shown in Figure 4, on each side of the mean).[27] This feature of normal distributions can be visualized Figure 4, which plots two overlapping normal distributions:

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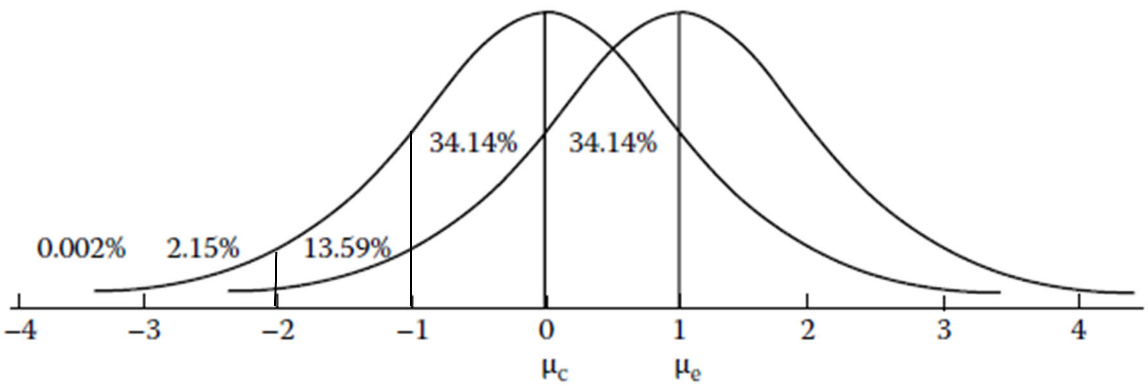
[26] *Id.* at 23 ("{The *U* measures} are simply related to *d* and each other through the cumulative normal distribution."); Larry V. Hedges, Ingram Olkin, *Overlap Between Treatment and Control Group Distributions as an Effect Size Measure in Experiments*, 21 Psychological Methods 61, 62 (2016) ("Hedges & Olkin, *Overlap Between Treatment and Control Group Distributions*").

[27] *See generally* Hedges & Olkin, *Overlap Between Treatment and Control Group Distributions* at 61–68. Note that the mean, median, and mode all have the same value in a normal distribution, which allows these mathematical inferences.

Figure 4[28]

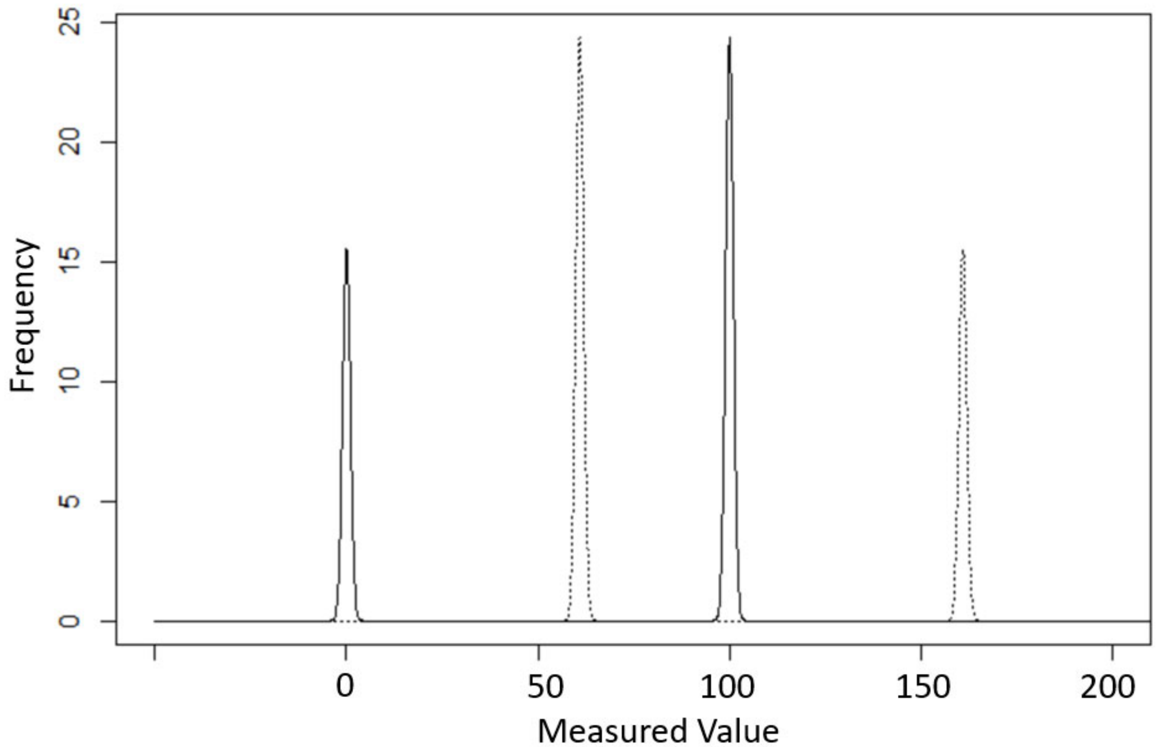


Groups that are not normally distributed do not share these properties. Although one can calculate a value for any two groups of data using the formula for Cohen's *d*, if they are not normally distributed (and with equal standard deviations and size), the value of Cohen's *d* will not correspond to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

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

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

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). That results in a *d* coefficient 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,[29] 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 assumption of normality were met. Indeed, the actual U_3 measure for these populations (39%) corresponds to a Cohen's *d* coefficient of -0.28, which Professor 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 Professor 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* coefficient. The properties of the groups—the shape of the

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[29] Cohen, *Statistical Power Analysis* at 22 (Table 2.2.1).

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. 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.[30]

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."[31] This argument has no merit.

Distinctions between populations and samples—and subsidiary distinctions between practical and statistical significance or between estimates and actual

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[30] Appx4842–43.

[31] Appx4848 (emphasis in original).

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 equal size as having the same meaning as values of Cohen's *d* calculated under those assumptions?

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. It is important to emphasize that 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 Professor 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.[32]

[32] Cohen, *Statistical Power Analysis* at 21 (emphases added).

Although it quotes this passage, Commerce never explains the reference to populations as the groups to 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*.[33] 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."[34] But Commerce then insists 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."[35] The qualification "involving sampled data," however, is directly contradicted by

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[33] Appx4843–44.

[34] Appx4844. If Commerce's reference to "the statistical criteria cited by Dr. Cohen" is to the assumptions of normality, equal variance, and equal size, then Commerce is incorrect that these criteria must be met to determine the areas under the distribution curves. The nonoverlap can be calculated, but the results will differ, sometimes dramatically, from those obtained when the assumptions are met.

[35] Appx4844 (emphasis added).

Professor Cohen's own explanation of his analysis, which specifically refers to "populations" rather than "sampled data."[36]

Moreover, Commerce has previously acknowledged the intrinsic relationship between the degree of overlap (or nonoverlap) between two groups and the 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.[37]

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

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[36] Cohen, *Statistical Power Analysis* at 21.

[37] *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; 2012–2013*, 79 Fed. Reg. 51,309 (Dep't Commerce Aug. 28, 2014), and accompanying Issues and Decision Memorandum at 24 (same; emphasis added).

Commerce's efforts to distinguish or refute the work of expert statisticians likewise cannot withstand scrutiny. As this Court has observed, Grissom and Kim explained that "nonnormality can greatly influence the value of a standardized-mean-difference effect size and its estimate."[38] 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 and Kim applies only to estimates of effect size based on sampling.[39] Similarly, Commerce attempts to dismiss the relevance of another passage from Grissom and Kim 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.[40]

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[38] *Stupp*, 5 F.4th at 1357–58 (quoting Grissom and Kim, *Univariate and Multivariate Applications* at 68).

[39] Appx4844.

[40] Grissom and Kim, *Univariate and Multivariate Applications* at 68; *see also* Appx4844–45.

Commerce argues that this passage merely demonstrates that Grissom and Kim were proposing "an alternative approach to calculate the denominator of the '*d*' coefficient" when dealing with sampling.[41]

Although Grissom and Kim do refer to estimates and samples (as well as to populations), those references do not circumscribe the relevance of their observations. Indeed, Grissom and Kim urge the use of a single 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.[42] This sensitivity is mathematically obvious, and does not depend on whether the groups being compared are populations or samples.[43] This Court should not be distracted by Commerce's attempt to focus on references to samples in discussions of the importance of the assumptions to interpreting Cohen's *d*.

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[41] Appx4845.

[42] *See* Grissom and Kim, *Univariate and Multivariate Applications* at 66.

[43] 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 (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" trump card to address Professor Coe's explanation that measures of effect size are sensitive to violations of the assumption of nonnormality.[44] Commerce claims that Professor Coe's explanation applies only to sampled data.[45] 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 Professor Li cited by this Court.[46] Professor 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}."[47] 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.[48] But estimates

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[44] Appx4845–46; *see* Coe, *It's the Effect Size, Stupid* at 14.

[45] Appx4845–46.

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

[47] Appx4848 (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) ("Li, *Effect Size Measure*").

[48] Appx4848.

have nothing to do with the 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 it is interpreted when the assumptions are met.

III. Professor Cohen's 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 Professor Cohen's interpretive thresholds for effect size depend on underlying assumptions being met, Commerce claims,

> Dr. Cohen established operational definitions of a small, medium, and large effect to describe the magnitude of the effect size based on the difference in the means. These are derived from real-world observations where the observed effect size is 0.2, 0.5, 0.8 and are not dependent on the statistical criteria cited by the CAFC in *Stupp II*. . . .
>
> Since, as discussed above, 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.[49]

According to Commerce, Professor Cohen based the thresholds for effect size that he describes—in his book called *Statistical Power Analysis for the Behavioral Sciences*—not on any sort of "statistical analysis," but instead on "real-world

[49] Appx4841–42.

observations."[50] This is both wrong (of course Professor Cohen used statistical analysis) and unsupportive of Commerce's position (the real-world observations noted by Professor Cohen involve data that appear to meet his assumptions).

The specific observations from which Commerce claims Professor 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."[51] Commerce is correct that Professor Cohen notes these observations in his description of 0.8 as an intuitively "large" effect size.[52] However, to conclude that Professor 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—small, medium, and large—Professor Cohen begins by discussing the mathematical

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[50] Appx4841–42; *see also* Appx4844; Appx4848.

[51] Appx4841.

[52] Cohen, *Statistical Power Analysis* at 27.

measures of nonoverlap (U_1, U_2, and U_3) corresponding with each effect size.[53] Only then does Professor Cohen refer to the observations as familiar examples of differences that "seem like grossly perceptible and therefore large differences."[54] The fact that each of the differences between the groups in these familiar examples correspond to a 0.8 *d* coefficient thus serves to corroborate his selection of 0.8 as an intuitive operational threshold for large effect size.

The examples of real-world observations do not displace or render superfluous the quantitative descriptions of the relationship between particular values of *d* and measures of nonoverlap. Nor does Professor 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."[55]

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

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[53] *Id.* at 26.

[54] *Id.* at 27.

[55] *Id.* at 21.

Professor 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 Professor Cohen eschewed the assumptions that he described as fundamental several pages earlier to calculate *d* coefficients for these observations. There is every reason to assume the opposite. Indeed, the measurements that the observations reflect—of IQ and height—have long been regarded as characteristics that tend towards normal distribution in populations.[56] Reference to these observations as examples of differences corresponding to a *d* coefficient of 0.8 does not undermine the importance of the assumptions to the interpretive meaning of Cohen's *d*. Were these references to have any relevance, they would reinforce the intuitively and mathematically obvious proposition that the meaning of any particular value of Cohen's *d* depends on the properties of the groups from which it is calculated.

IV. 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

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[56] *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).

d test to data that are not normally distributed or that are lacking equal variances."[57] These sources confirm the fundamental, logical, and mathematically necessary conclusion that a *d* coefficient calculated using data that differ in distribution, variance, or size will differ from Cohen's *d* calculated using data that is normally distributed, with equal variance, and equal size.[58]

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 approach will result in finding prices that differ significantly among purchasers, regions or time periods."[59] Here too, Commerce has embraced an erroneous interpretation of the

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[57] *See Stupp*, 5 F.4th at 1357–59 (discussing Coe, *It's the Effect Size, Stupid*; David M. Lane, et al., *Introduction to Statistics, Online Edition*, 645; James Algina, et al., *An Alternative to Cohen's Standardized Mean Difference Effect Size: A Robust Parameter and Confidence Interval in the Two Independent Group Cases*, 10 Psychological Methods 317, 317–18 (2005); Li, *Effect Size Measure* at 1571).

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

[59] Appx4846.

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.[60] Recall that $d = (m_A - m_B)/\sigma$.[61] As a matter of arithmetic, if $(m_A - m_B)$ 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) for a pair of distributions then *d* will be smaller than when computed from normal distributions. On the other hand, if σ is smaller (than in the normal distribution) for a pair of distributions 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,[62] the Grissom and Kim analysis shows larger *d* coefficients associated with smaller sample sizes.[63]

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[60] *See* Appx4847.

[61] 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, *Statistical Power Analysis* at 20.

[62] *See* Appx4846–48.

[63] *See* Appx4848–49.

When a *d* coefficient is calculated using data that violate the assumptions of normality, equal variance, and equal size, the *d* coefficient will not describe the degree of overlap 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 meaningless comparator."[64] Relying on a meaningless comparator to determine whether prices differ significantly under the antidumping law is unreasonable, arbitrary and capricious.

V. 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.

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

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. *Amici* respectfully suggest that this Court should make clear that Commerce cannot persist in its practice of relying on Cohen's *d* without regard to its underlying assumptions.

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CERTIFICATE OF COMPLIANCE

CAFC Court No. 2023-1877

Marmen Inc. 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 6858 words, which does not exceed the maximum authorized by Federal Circuit Rule 29(b).

Date: July 17, 2023

Signature: /s/ Eric S. Parnes

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CERTIFICATE OF SERVICE

Marmen Inc. v. US
CAFC Court No. 2023-1877

The undersigned hereby certifies that on, July 17, 2023, the foregoing Brief of The Government of Canada; Canfor Corporation; Canadian Forest Products, Ltd.; Canfor Wood Products Marketing, Ltd.; Resolute FP Canada Inc.; Tolko Industries Ltd.; Tolko Marketing and Sales Ltd.; and West Fraser Mills Ltd. as *Amici Curiae* In Support Of Plaintiffs-Appellants 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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