

Dividing Turns a Move in the Denominator into an Event

— Of **6946** cases where the ratio snapped back, **86.3** per cent were the yardstick changing rather than the object moving — the raw moves are larger in the wide hours, yet the ratio is **1.276** to **1.487** times larger in the narrow ones — [Paper 424]

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— *From thinking to syncing.* —

Abstract

To make quantities comparable, one divides by something. This paper shows that dividing makes a move in the denominator look like an event in the numerator—and that the proportion can be measured. No new theorem or law is claimed. First, this is the core of the paper. Of **6946** cases where the ratio snapped back, **86.3** per cent were the yardstick changing rather than the object moving (Section 2). Second, the object actually moved in only **13.7** per cent, **952** cases (Section 2). Third, in raw terms the moves are larger in the wide hours (**3.8--4.1** against **2.95**) (Section 3). Fourth, in the ratio the direction reverses, and the narrow hours read **1.276** to **1.487** times larger (Section 3). Fifth, synthetically, dividing the same moves by widths **28.2** and **52.0** gives **1.8146** against the inverse ratio of widths **1.8440** (Section 3). Sixth, the separator is whether the numerator moved or the denominator did (Section 4).

Scope of this paper (scope note): No new theorem or law is claimed—non-dimensionalisation, standardisation and the statistics of ratios are all standard. Normalisation is not rejected—dividing is useful and this is not a call to stop. Only reading the ratio as an event in the object is at issue. No particular field is discussed—the figures come from observations of a time series, but neither the subject nor any method is. No best denominator is proposed—what to divide by is not the subject. The distribution of ratios is not treated—that the mean of ratios differs from the ratio of means is used as known, without developing the theory. Causes are not discussed—why the denominator varies by hour is not the subject. Relation to earlier papers: Paper 423 showed that a right table still loses—there correct parts gave an incorrect conclusion; here a correct division gives an incorrect reading. Paper 300 showed that common root and distinct root can be decided—“the numerator moved” and “the denominator moved” are distinct roots by that criterion. Paper 412 showed that “nearest” is not defined until the distance is—here “moved a lot” is not defined until the denominator is. Paper 411 showed that a transformation preserving nothing still has an invariant—there the way a quantity was assembled protected it; here the way it is assembled manufactures it. What is added is splitting the cases into 86.3 against 13.7, giving numbers for the reversal between raw and divided quantities, making explicit that the median of ratios and the ratio of medians disagree, checking synthetically that the ratio matches the inverse ratio of widths, and placing the separator at “numerator or denominator”.

1. Notation and the Question

Setting: Form the dimensionless quantity $z = x/w$ by dividing x by the width w of an interval. The width w is set by the situation and is exchanged as time passes.

$$\Delta z = \frac{\Delta x}{w} - \frac{x \Delta w}{w^2}$$

The second term appears when w is exchanged, even if x does not move.

Observation 1.1

One divides to remove differences of scale between situations. Wide situations and narrow ones are to be placed on one scale—which is a sound motive in itself.

Observation 1.2

But the denominator is not a constant. Change the situation and w changes—and z moves even when x does not.

Question: Of the large moves in z , how many are moves in x .

2. 86.3 Per Cent Was the Yardstick Changing

Computation 2.1: Split the 6946 cases where z snapped back from outside to inside.

Category	Share	Cases
The yardstick was exchanged	86.3%	5994
The object actually moved	13.7%	952

Observation 2.2

The two shares sum to exactly 1.Nothing is left over—a confirmation that the split is exhaustive.

Observation 2.3

Most of it is exchange.86.3 per cent—of the dramatic events recorded in z , nothing at all happened on the side of the object.

Observation 2.4

Even on the exchange side the object moves a little.A median of 2.4 units—against 13.2 units where the object really moved. More than fivefold apart.

Observation 2.5

So “ z moved a lot” is a mixture of two situations.Both are recorded in the same shape—and from the record alone they cannot be told apart.

3. The Direction Reverses Between Raw and Divided

Computation 3.1: Set the width and the move per unit time for two hours of the day.

Hours	Width	Move per unit time
Narrow	28.2	2.95
Wide	50.0–54.0	3.8–4.1

Observation 3.2

In raw terms the wide hours move more. 3.8–4.1 against 2.95—the direction is clear.

Computation 3.3: Now take the divided quantity.

Hours	Divided quantity
Narrow	0.10461
Wide	0.07037–0.08200

The ratio is **1.276** to **1.487**, and the direction reverses.

Observation 3.4

Same object, same period, same record. Only the yardstick changed—and the answer to “which hours move more” comes out the other way.

Observation 3.5

Measured case by case the ratio is 1.6. It does not match the 1.276–1.487 obtained from aggregates—because the median of ratios and the ratio of medians are different quantities, so the disagreement is itself correct. Both point the same way and differ only in size.

Computation 3.6: Check synthetically. Divide moves from one distribution by widths 28.2 and 52.0.

The ratio is 1.8146, close to the inverse ratio of widths, $52.0/28.2 = 1.8440$.

Observation 3.7

So the reversal is a consequence of geometry. Nothing special is happening—a smaller denominator gives a larger quotient. That is all.

4. The Separator

The separator: did the numerator move, or the denominator.

Observation 4.1

The record of z does not distinguish them. Both are stored as “ z moved a lot”—to distinguish them one must record the numerator and denominator separately.

Observation 4.2

And the denominator is usually not recorded. Often only the normalised quantity is kept—so a later attempt to separate them has nothing to work with.

Observation 4.3

These are distinct roots by the criterion of Paper 300. Both are called “a change in z ”—one a change in the object, one a change in the yardstick.

Observation 4.4

Stratifying is sometimes not enough. Stratify by the size of the denominator and, if the denominator is exchanged within a situation, both kinds remain mixed inside a stratum—stratification levels the denominator, not its changes.

Observation 4.5

Normalisation is not neutral. The act of making things comparable moves part of what is to be measured into the denominator—and there it becomes invisible to the normalised quantity.

Observation 4.6

To be honest—the figure 86.3 per cent depends on how the split is defined. Define the exchange differently and it moves—what does not move is that exchange is not a minority.

Observation 4.7

One last thing—this is not a call to stop dividing. Dividing is useful—what is said is only that the ratio must not be read as something that happened to the object. Keep the numerator and denominator together and they can be separated later.

5. Roll Call and Closing

1. Exchange accounts for **86.3%** (Computation 2.1): **5994** cases.
2. Real movement is **13.7%** (Computation 2.1): **952** cases.
3. The shares sum to exactly **1** (Observation 2.2): **nothing** left over.
4. **2.4** against **13.2** units (Observation 2.4): **more than fivefold**.
5. Raw: the wide hours move more (Observation 3.2): **3.8–4.1** against **2.95**.
6. Divided: the narrow hours read larger (Computation 3.3): **1.276–1.487** times.
7. Case by case the ratio is **1.6** (Observation 3.5): **a different statistic**.
8. The synthetic ratio is **1.8146** (Computation 3.6): **inverse widths give 1.8440**.
9. The reversal is geometry (Observation 3.7): **a smaller denominator, a larger quotient**.
10. The separator is numerator or denominator (Observation 4.3): **distinct roots by Paper 300**.

Closing: To remove differences of scale between situations, one divides a quantity by something—the motive, placing wide and narrow situations on one scale, is sound in itself. But the denominator is not a constant: change the situation and it changes, and the quotient then moves even when the object does not. How often that happens can be measured—of the 6946 cases where the divided quantity snapped back from outside to inside, **86.3** per cent, **5994**

cases, were the yardstick being exchanged, and the object actually moved in only **13.7** per cent, 952 cases. The two shares sum to exactly 1, so nothing is left over. Even on the exchange side the object moves by a median of 2.4 units, against 13.2 where it really moved—more than fivefold apart—and both are recorded in the same shape, so from the record alone they cannot be told apart. And the direction itself reverses—in raw terms the wide hours move more (3.8–4.1 against **2.95**), yet in the divided quantity the narrow hours read **1.276** to **1.487** times larger. Same object, same period, same record; only the yardstick changed. Measured case by case the ratio is 1.6, which does not match the aggregate figure—but the median of ratios and the ratio of medians are different quantities, so the disagreement is itself correct, and both point the same way. Synthetically, dividing moves from one distribution by widths 28.2 and 52.0 gives **1.8146** against the inverse ratio of widths **1.8440**: the reversal is a consequence of geometry, and a smaller denominator simply gives a larger quotient. One thing separates them—did the numerator move, or the denominator. The record of the divided quantity does not distinguish them, and the denominator is usually not kept—often only the normalised quantity is stored, so a later attempt to separate them has nothing to work with. They are distinct roots by the criterion of Paper 300, one a change in the object and one a change in the yardstick. Stratifying by the size of the denominator is sometimes not enough either, since stratification levels the denominator but not its changes. To be honest—the figure 86.3 per cent depends on how the split is defined and moves with that definition. What does not move is that exchange is not a minority. One last thing—this is not a call to stop dividing, which is useful. What is said is only that the ratio must not be read as something that happened to the object. Keep the numerator and the denominator together and they can be separated later.

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