Package 'migration.indices'

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BugReports https://github.com/daroczig/migration.indices/issues

Title Migration Indices

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Type Package

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Description Calculate various indices, like Crude Migration Rate, different Gini indices or the Coefficient of Variation among others, to show the (un)equality of migration.

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Contents

`migration.acv` *Aggregated System-wide Coefficient of Variation*

Description

The Aggregated System-wide Coefficient of Variation is simply the sum of the Aggregated In-migration (`migration.acv.in`) and the Aggregated Out-migration Coefficient of Variation (`migration.acv.out`).

Usage

```
migration.acv(m)
```

Arguments

`m`	migration matrix

Value

A number where a higher ($\neq 0$) shows more spatial focus.

References

- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

See Also

migration.cv.in migration.cv.out migration.acv.in migration.acv.out

Examples

```
data(migration.hyp)
migration.acv(migration.hyp)    # 0.3333333
migration.acv(migration.hyp2)   # 0.375
```

`migration.acv.in` *Aggregated In-migration Coefficient of Variation*

Description

The Aggregated In-migration Coefficient of Variation is the weighted average of the In-migration Coefficient of Variation (migration.cv.in).

Usage

```
migration.acv.in(m)
```

Arguments

m	migration matrix

Value

A number where a higher ($\neq 0$) shows more spatial focus.

References

- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

See Also

migration.cv.in migration.cv.out migration.acv.out migration.acv

Examples

```
data(migration.hyp)
migration.acv.in(migration.hyp)    # 0.3333333
migration.acv.in(migration.hyp2)   # 0.25
```

migration.acv.out *Aggregated Out-migration Coefficient of Variation*

Description

The Aggregated Out-migration Coefficient of Variation is the weighted average of the Out-migration Coefficient of Variation (migration.cv.out).

Usage

```
migration.acv.out(m)
```

Arguments

m	migration matrix

Value

A number where a higher ($\neq 0$) shows more spatial focus.

References

- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

See Also

migration.cv.in migration.cv.out migration.acv.in migration.acv

Examples

```
data(migration.hyp)
migration.acv.out(migration.hyp)    # 0
migration.acv.out(migration.hyp2)   # 0.125
```

migration.cmr *Crude Migration Rate*

Description

Crude Migration Rate

Usage

```
migration.cmr(m, PAR, k = 100)
```

Arguments

m	migration matrix
PAR	population at risk (estimated average population size)
k	scaling constant (set to 100 by default to result in percentage)

Value

percentage (when k=100)

References

- Philip Rees, Martin Bell, Oliver Duke-Williams and Marcus Blake (2000) Problems and Solutions in the Measurement of Migration Intensities: Australia and Britain Compared. *Population Studies* **54**, 207–222

Examples

```
data(migration.world)
migration.cmr(migration.world, 6e+9)
```

---

migration.connectivity

Migration Connectivity Index

Description

The Migration Connectivity Index measures "the proportion of the total number of potential inter-regional flows which are not zero":

$$I_{MC} = \sum_i \sum_{j \neq i} \frac{MC_{ij}}{n(n-1)}$$

where MC_{ij} is 0 if the flow from i to j is zero and let it be 1 otherwise.

Usage

```
migration.connectivity(m)
```

Arguments

m	migration matrix

Value

A number between 0 and 1 where zero shows no connections between regions.

References

- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

Examples

```
data(migration.hyp)
migration.connectivity(migration.hyp)
data(migration.world)
migration.connectivity(migration.world)
```

`migration.cv.in` *In-migration Coefficient of Variation*

Description

As "the coefficient of variation is defined as the standard deviation to mean ratio of a distribution", the In-migration Coefficient of Variation is computed by dividing the standard deviation (with the nominator being n instead of $n - 1$) of the in-migration flows by the mean.

Usage

```
migration.cv.in(m)
```

Arguments

`m`	migration matrix

Value

A numeric vector of standardized values where a higher ($\neq 0$) shows more spatial focus.

References

- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

See Also

`migration.cv.out` `migration.acv.in` `migration.acv.out` `migration.acv`

Examples

```
## Not run:
data(migration.hyp)
migration.cv.in(migration.hyp)    # 0.2000000 0.5000000 0.3333333
migration.cv.in(migration.hyp2)   # 0.2000000 0.0000000 0.4285714

## End(Not run)
```

`migration.cv.out` *Out-migration Coefficient of Variation*

Description

As "the coefficient of variation is defined as the standard deviation to mean ratio of a distribution", the Out-migration Coefficient of Variation is computed by dividing the standard deviation (with the nominator being n instead of $n - 1$) of the out-migration flows by the mean.

Usage

```
migration.cv.out(m)
```

Arguments

`m`	migration matrix

Value

A numeric vector of standardized values where a higher ($\neq 0$) shows more spatial focus.

References

- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

See Also

`migration.cv.in` `migration.acv.in` `migration.acv.out` `migration.acv`

Examples

```
## Not run:
data(migration.hyp)
migration.cv.out(migration.hyp)    # 0 0 0
migration.cv.out(migration.hyp2)   # 0.00 0.25 0.00

## End(Not run)
```

`migration.effectiveness` *Migration Effectiveness Index*

Description

The Migration Effectiveness Index "measures the degree of (a)symmetry or (dis)equilibrium in the network of interregional migration flows":

$$MEI = 100 \frac{\sum_i |D_i - O_i|}{\sum_i |D_i + O_i|}$$

where D_i is the total inflows to zone i and O_i is the total outflows from zone i.

Usage

```
migration.effectiveness(m)
```

Arguments

`m`	migration matrix

Value

A number between 0 and 100 where the higher number shows an efficient mechanism of population redistribution.

References

- Martin Bell and Salut Muhidin (2009) Cross-National Comparisons of Internal Migration. Research Paper. UNDP. https://hdr.undp.org/content/cross-national-comparisons-internal-migration

Examples

```
data(migration.hyp)
migration.effectiveness(migration.hyp)
data(migration.world)
migration.effectiveness(migration.world)
```

`migration.field.diagram` *Joint plot for in and out-migration fields*

Description

This migration field diagram makes easy to visualize both direction of migration. E.g. points above the diagonal "are outward redistributors, while those below that line are inward redistributors."

Usage

```
migration.field.diagram(
  m,
  method = c("gini", "acv"),
  title = "Migration field diagram",
  xlab = "Out-migration",
  ylab = "In-migration"
)
```

Arguments

`m`	migration matrix
`method`	measurement of in and out-migration
`title`	plot title
`xlab`	label for x axis
`ylab`	label for y axis

References

- Source code was adopted from Michael Ward and Kristian Skrede Gleditsch (2008) *Spatial Regression Models*. Thousand Oaks, CA: Sage. with the permission of the authors.
- Case study and use case: Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

Examples

```
## Not run:
data(migration.world)
par(mfrow = c(2, 1))
migration.field.diagram(migration.world)
migration.field.diagram(migration.world, method = 'acv')

## End(Not run)
```

`migration.gini` *Spatial Gini Indexes*

Description

This is a wrapper function computing all the following Gini indices:

- Total Flows Gini Index (`migration.gini.total`)
- Rows Gini Index (`migration.gini.row`)
- Standardized Rows Gini Index (`migration.gini.row.standardized`)
- Columns Gini Index (`migration.gini.col`)
- Standardized Columns Gini Index (`migration.gini.col.standardized`)
- Exchange Gini Index (`migration.gini.exchange`)
- Standardized Exchange Gini Index (`migration.gini.exchange.standardized`)
- Out-migration Field Gini Index (`migration.gini.out`)
- Migration-weighted Out-migration Gini Index (`migration.weighted.gini.out`)
- In-migration Field Gini Index (`migration.gini.in`)
- Migration-weighted In-migration Gini Index (`migration.weighted.gini.in`)
- Migration-weighted Mean Gini Index (`migration.weighted.gini.mean`)

Usage

```
migration.gini(m, corrected = TRUE)
```

Arguments

`m`	migration matrix
`corrected`	to use Bell et al. (2002) updated formulas instead of Plane and Mulligan (1997)

Value

List of all Gini indices.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262
- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

`migration.gini.col` `migration.gini.row` `migration.gini.exchange` `migration.gini.in` `migration.gini.out`

Examples

```
data(migration.hyp)
migration.gini(migration.hyp)
migration.gini(migration.hyp2)
```

---

migration.gini.col *Columns Gini Index*

Description

The Columns Gini index concentrates on the "relative extent to which the destination selections of in-migrations are spatially focused":

$$G_R^T = \frac{\sum_j \sum_{i \neq j} \sum_{g \neq i,j} |M_{ij} - M_{gj}|}{(2n(n-1) - 1) \sum_i \sum_{j \neq i} M_{ij}}$$

This implementation solves the above formula by computing the `dist` matrix for each columns.

Usage

```
migration.gini.col(m)
```

Arguments

`m`	migration matrix

Value

A number between 0 and 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

`migration.gini.row` `migration.gini.col.standardized`

Examples

```
data(migration.hyp)
migration.gini.col(migration.hyp)  # 0.05555556
migration.gini.col(migration.hyp2) # 0.04166667
```

`migration.gini.col.standardized` *Standardized Columns Gini Index*

Description

The standardized version of the Columns Gini Index (`migration.gini.col`) by dividing that with the Total Flows Gini Index (`migration.gini.total`):

$$G_C^{T*} = 100 \frac{G_C^T}{G^T}$$

As this index is standardized, it "facilitate comparisons from one period to the next" of the columns indices.

Usage

```
migration.gini.col.standardized(m, gini.total = migration.gini.total(m, FALSE))
```

Arguments

`m`	migration matrix
`gini.total`	optionally pass the pre-computed Total Flows Gini Index to save computational resources

Value

A percentage range from 0% to 100% where 0% means that the migration flows are uniform, while a higher value indicates spatial focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

`migration.gini.col` `migration.gini.row.standardized`

Examples

```
data(migration.hyp)
migration.gini.col.standardized(migration.hyp)     # 25
migration.gini.col.standardized(migration.hyp2)    # 22.22222
```

`migration.gini.exchange` *Exchange Gini Index*

Description

The Exchange Gini Index "indicates the contribution to spatial focusing represented by the $n(n-q)$ net interchanges in the system":

$$G^{T}_{RC,CR} = \frac{\sum_i \sum_{j \neq i} |M_{ij} - M_{ji}|}{(2n(n-1) - 1) \sum_i \sum_{j \neq i} M_{ij}}$$

This implementation solves the above formula by simply substracting the transposed matrix's values from the original one at one go.

Usage

```
migration.gini.exchange(m)
```

Arguments

`m`	migration matrix

Value

A number between 0 and 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

`migration.gini` `migration.gini.exchange.standardized`

Examples

```
data(migration.hyp)
migration.gini.exchange(migration.hyp)     # 0.05555556
migration.gini.exchange(migration.hyp2)    # 0.04166667
```

`migration.gini.exchange.standardized` *Standardized Exchange Gini Index*

Description

The standardized version of the Exchange Gini Index (`migration.gini.exchange`) by dividing that with the Total Flows Gini Index (`migration.gini.total`):

$$G^{T*}_{RC,CR} = 100 \frac{G^{T}_{RC,CR}}{G^{T}}$$

As this index is standardized, it "facilitate comparisons from one period to the next" of the exchange indices.

Usage

```
migration.gini.exchange.standardized(
  m,
  gini.total = migration.gini.total(m, FALSE)
)
```

Arguments

`m`	migration matrix
`gini.total`	optionally pass the pre-computed Total Flows Gini Index to save resources

Value

A percentage range from 0% to 100% where 0% means that the migration flows are uniform, while a higher value indicates spatial focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

`migration.gini` `migration.gini.exchange`

Examples

```
data(migration.hyp)
migration.gini.exchange.standardized(migration.hyp)  # 25
migration.gini.exchange.standardized(migration.hyp2) # 22.22222
```

`migration.gini.in` *In-migration Field Gini Index*

Description

The In-migration Field Gini Index is a decomposed version of the Columns Gini Index (`migration.gini.col`) representing "the contribution of each region's columns to the total index" () (`migration.gini.total`):

$$G_j^I = \frac{\sum_{i \neq j} \sum_{k \neq j,i} |M_{ij} - M_{kj}|}{2(n-2) \sum_{i \neq j} M_{ij}}$$

These Gini indices facilitates the direct comparison of different territories without further standardization.

Usage

```
migration.gini.in(m, corrected = TRUE)
```

Arguments

`m`	migration matrix
`corrected`	Bell et al. (2002) updated the formula of Plane and Mulligan (1997) to be $2(n-2)$ instead of $2(n-1)$ because "the number of comparisons should exclude the diagonal cell in each row and column, and the comparison of each cell with itself".

Value

A numeric vector with the range of 0 to 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262
- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

`migration.gini` `migration.gini.out` `migration.weighted.gini.in`

Examples

```
data(migration.hyp)
migration.gini.in(migration.hyp)         # 0.2000000 0.5000000 0.3333333
migration.gini.in(migration.hyp2)        # 0.2000000 0.0000000 0.4285714
migration.gini.in(migration.hyp, FALSE)  # 0.1000000 0.2500000 0.1666667
migration.gini.in(migration.hyp2, FALSE) # 0.1000000 0.0000000 0.2142857
```

---

migration.gini.out *Out-migration Field Gini Index*

Description

The Out-migration Field Gini Index is a decomposed version of the Rows Gini Index (migration.gini.row) representing "the contribution of each region's row to the total index" () (migration.gini.total):

$$G_i^O = \frac{\sum_{j \neq i} \sum_{l \neq i,j} |M_{ij} - M_{il}|}{2(n-2) \sum_{j \neq k} M_{ij}}$$

These Gini indices facilitates the direct comparison of different territories without further standardization.

Usage

```
migration.gini.out(m, corrected = TRUE)
```

Arguments

m	migration matrix
corrected	Bell et al. (2002) updated the formula of Plane and Mulligan (1997) to be $2(n-2)$ instead of $2(n-1)$ because "the number of comparisons should exclude the diagonal cell in each row and column, and the comparison of each cell with itself".

Value

A numeric vector with the range of 0 to 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262
- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

migration.gini migration.gini.in migration.weighted.gini.out

Examples

```
data(migration.hyp)
migration.gini.out(migration.hyp)         # 0 0 0
migration.gini.out(migration.hyp2)        # 0.000 0.25 0.000
migration.gini.out(migration.hyp, FALSE)  # 0 0 0
migration.gini.out(migration.hyp2, FALSE) # 0.000 0.125 0.000
```

---

migration.gini.row *Rows Gini Index*

Description

The Rows Gini index concentrates on the "relative extent to which the destination selections of out-migrations are spatially focused":

$$G_R^T = \frac{\sum_i \sum_{j \neq i} \sum_{h \neq i,j} |M_{ij} - M_{ih}|}{(2n(n-1) - 1) \sum_i \sum_{j \neq i} M_{ij}}$$

This implementation solves the above formula by computing the `dist` matrix for each row.

Usage

```
migration.gini.row(m)
```

Arguments

m	migration matrix

Value

A number between 0 and 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

migration.gini.col migration.gini.row.standardized

Examples

```
data(migration.hyp)
migration.gini.row(migration.hyp)  # 0
migration.gini.row(migration.hyp2) # 0.02083333
```

`migration.gini.row.standardized` *Standardized Rows Gini Index*

Description

The standardized version of the Rows Gini Index (`migration.gini.row`) by dividing that with the Total Flows Gini Index (`migration.gini.total`):

$$G_R^{T*} = 100 \frac{G_R^T}{G^T}$$

As this index is standardized, it "facilitate comparisons from one period to the next of the rows" indices.

Usage

```
migration.gini.row.standardized(m, gini.total = migration.gini.total(m, FALSE))
```

Arguments

`m`	migration matrix
`gini.total`	optionally pass the pre-computed Total Flows Gini Index to save computational resources

Value

A percentage range from 0% to 100% where 0% means that the migration flows are uniform, while a higher value indicates spatial focusing.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262

See Also

`migration.gini.row` `migration.gini.col.standardized`

Examples

```
data(migration.hyp)
migration.gini.row.standardized(migration.hyp)     # 0
migration.gini.row.standardized(migration.hyp2)    # 11.11111
```

`migration.gini.total` *Total Flows Gini Index*

Description

The Total Gini Index shows the overall concentration of migration with a simple number computed by comparing each cell of the migration matrix with every other cell except for the diagonal:

$$G^T = \frac{\sum_i \sum_{j \neq i} \sum_k \sum_{l \neq k} |M_{ij} - M_{kl}|}{(2n(n-1) - 1) \sum_i \sum_{j \neq i} M_{ij}}$$

This implementation solves the above formula by a simple loop for performance issues to compare all values to the others at one go, although smaller migration matrices could also be addressed by a much faster `dist` method. Please see the sources for more details.

Usage

```
migration.gini.total(m, corrected = TRUE)
```

Arguments

`m`	migration matrix
`corrected`	Bell et al. (2002) updated the formula of Plane and Mulligan (1997) to have $2n(n-1) - 1$ instead of $2n(n-1)$ in the denominator to "ensure that the index can assume the upper limit of 1".

Value

A number between 0 and 1 where 0 means no spatial focusing and 1 shows that all migrants are found in one single flow.

References

- David A. Plane and Gordon F. Mulligan (1997) Measuring Spatial Focusing in a Migration System. *Demography* **34**, 251–262
- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

`migration.gini.col` `migration.gini.row` `migration.gini.exchange` `migration.gini.in` `migration.gini.out`

Examples

```
data(migration.hyp)
migration.gini.total(migration.hyp)           # 0.2666667
migration.gini.total(migration.hyp2)          # 0.225
migration.gini.total(migration.hyp, FALSE)    # 0.2222222
migration.gini.total(migration.hyp2, FALSE)   # 0.1875
```

`migration.hyp` *Hypotetical Migration Matrix*

Description

A small (3x3) hypotetical migration matrix.

Format

migration matrix

References

- David A. Plane and Gordon F. Mulligan (1997): Measuring Spatial Focusing in a Migration System. *Demography* **34**, pp. 253
- Andrei Rogers and Stuart Sweeney (1998) Measuring the Spatial Focus of Migration Patterns. *The Professional Geographer* **50**, 232–242

`migration.indices` Migration indices

Description

This package provides various indices, like Crude Migration Rate, different Gini indices or the Coefficient of Variation among others, to show the (un)equality of migration.

migration.inequality *Migration Inequality Index*

Description

Measures the distance from an expected distribution:

$$I_{MI} = \frac{\sum_i \sum_{j \neq i} |M_{ij} - M'_{ij}|}{2}$$

Usage

```
migration.inequality(m, expected = c("equal", "weighted"))
```

Arguments

m	migration matrix
expected	type of expected distribution

Value

A number between 0 and 1 where 1 shows greater inequality.

References

- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

Examples

```
data(migration.hyp)
migration.inequality(migration.hyp)
migration.inequality(migration.hyp, expected = 'weighted')
data(migration.world)
migration.inequality(migration.world)
```

migration.rate *Aggregate net migration rate*

Description

$$ANMR = 100 \frac{\sum_i |D_i - O_i|}{\sum_i P_i}$$

where D_i is the total inflows to zone i and O_i is the total outflows from zone i.

Usage

```
migration.rate(m, PAR)
```

Arguments

m	migration matrix
PAR	population at risk

References

- Martin Bell and Salut Muhidin (2009) Cross-National Comparisons of Internal Migration. Research Paper. UNDP. https://hdr.undp.org/content/cross-national-comparisons-internal-migration

Examples

```
data(migration.world)
migration.rate(migration.world, 6e+9)
```

---

migration.weighted.gini.in

Migration-weighted In-migration Gini Index

Description

The Migration-weighted In-migration Gini Index is a weighted version of the In-migration Field Gini Index (migration.gini.in) "according to the zone of destination's share of total migration and the mean of the weighted values is computed as":

$$MWG^I = \frac{\sum_j G_j^I \frac{\sum_j M_{ij}}{\sum_{ij} M_{ij}}}{n}$$

Usage

```
migration.weighted.gini.in(m, mgi = migration.gini.in(m))
```

Arguments

m	migration matrix
mgi	optionally passed (precomputed) Migration In-migration Gini Index

References

- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

migration.gini migration.gini.in migration.weighted.gini.out migration.weighted.gini.mean

Examples

```
data(migration.hyp)
migration.weighted.gini.in(migration.hyp)   # 0.1222222
migration.weighted.gini.in(migration.hyp2)  # 0.05238095
```

`migration.weighted.gini.mean`

Migration-weighted Mean Gini Index

Description

The Migration-weighted Mean Gini Index is simply the average of the Migration-weighted In-migration (migration.weighted.gini.in) and the Migration-weighted Out-migration (migration.weighted.gini.out) Gini Indices:

$$MWG^A = \frac{MWG^O + MWG^I}{2}$$

Usage

```
migration.weighted.gini.mean(m, mwgi, mwgo)
```

Arguments

m	migration matrix
mwgi	optionally passed (precomputed) Migration-weighted In-migration Gini Index
mwgo	optionally passed (precomputed) Migration-weighted Out-migration Gini Index

Value

This combined index results in a number between 0 and 1 where 0 means no spatial focusing and 1 shows maximum focusing.

References

- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

migration.weighted.gini.in migration.weighted.gini.out

Examples

```
data(migration.hyp)
migration.weighted.gini.mean(migration.hyp)  # 0.06111111
migration.weighted.gini.mean(migration.hyp2) # 0.03660714
```

`migration.weighted.gini.out`

Migration-weighted Out-migration Gini Index

Description

The Migration-weighted Out-migration Gini Index is a weighted version of the Out-migration Field Gini Index (`migration.gini.out`) "according to the zone of destination's share of total migration and the mean of the weighted values is computed as":

$$MWG^O = \frac{\sum_i G_i^O \frac{\sum_j M_{ij}}{\sum_{ij} M_{ij}}}{n}$$

Usage

```
migration.weighted.gini.out(m, mgo = migration.gini.out(m))
```

Arguments

`m`	migration matrix
`mgo`	optionally passed (precomputed) Migration In-migration Gini Index

References

- M. Bell, M. Blake, P. Boyle, O. Duke-Williams, P. Rees, J. Stillwell and G. Hugo (2002) Cross-National Comparison of Internal Migration. Issues and Measures. *Journal of the Royal Statistical Society. Series A (Statistics in Society)* **165**, 435–464

See Also

`migration.weighted.gini.in` `migration.weighted.gini.mean`

`migration.gini` `migration.gini.out` `migration.weighted.gini.in` `migration.weighted.gini.mean`

Examples

```
data(migration.hyp)
migration.weighted.gini.out(migration.hyp)   # 0
migration.weighted.gini.out(migration.hyp2)  # 0.02083333
```

`migration.world` *Global Bilateral Migration Database (2000)*

Description

Global (country-to-country) matrix of bilateral migrant stocks in 2000 with 226 economies involved.

Format

migration matrix

References

- World Bank (2010): Global Bilateral Migration Database.

Index