Package: migration.indices (via r-universe)

August 26, 2024

Maintainer Gergely Daróczi <daroczig@rapporter.net>

License AGPL-3

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

Title Migration indices

LazyData no

Type Package

Author Lajos Bálint <balint@demografia.hu> and Gergely Daróczi <daroczig@rapporter.net>

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.

Version 0.3.0

Imports calibrate

URL http://github.com/daroczig/migration.indices

Date 2013-06-18

Encoding UTF-8

Repository https://daroczig.r-universe.dev

RemoteUrl https://github.com/daroczig/migration.indices

RemoteRef HEAD

RemoteSha d7380c3a16e9b13b2223ec5d2cde1182a9a35486

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. http://hdr.undp.org/en/reports/global/hdr2009/papers/HDRP_2009_30.pdf

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. http://privatewww.essex.ac.uk/~ksg/code/srm_enhanced_code_v5.R 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. http://hdr.undp.org/en/reports/global/hdr2009/papers/HDRP_2009_30.pdf

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. http://data.worldbank.org/data-catalog/global-bilateral-migration-database

Index