Package 'CIM'

October 12, 2022

Date 2018-12-21

Title Compositional Impact of Migration

Version 1.0.0

Description Produces statistical indicators of the impact of migration on the socio-demographic composition of an area. Three measures can be used: ratios, percentages and the Duncan index of dissimilarity. The input data files are assumed to be in an origin-destination matrix format, with each cell representing a flow count between an origin and a destination area. Columns are expected to represent origins, and rows are expected to represent destinations. The first row and column are assumed to contain labels for each area. See Rodriguez-Vignoli and Rowe (2018) <doi:10.1080/00324728.2017.1416155> for technical details.

Depends R (>= 3.4.0)

License GPL-2

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Date/Publication 2019-01-02 13:10:19 UTC

NeedsCompilation no

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Repository CRAN

R topics documented:

CIM   *Compositional Impact of Migration*

Description

produce statistical indicators of the impact of migration on the socio-demographic composition of
an area. Three measures can be used: ratios, percentages and the Duncan index of dissimilarity. The
input data files are assumed to be in an origin-destination matrix format, with each cell representing
a flow count between an origin and a destination area. Columns are expected to represent origins,
and rows are expected to represent destinations. The first row and column are assumed to contain
labels for each area. See Rodríguez-Vignoli and Rowe (2018) for technical details.

Usage

```
CIM(..., calculation, numerator, denominator, DuncanAll = TRUE,
  rest = TRUE)
```

Arguments

...	2 or more data frames, each containing an origin-destination migration matrix by population attribute (i.e. age, sex, education, ethnicity, etc.). Columns are expected to represent origins, and rows are expected to represent destinations. The first row and column are assumed to contain labels for each area.
calculation	a character, indicating the migration impact indicator selected to measure the socio-demographic composition of an area. Users can type one of three options: "ratio", "percentage" or "duncan".
numerator	a number, indicating the index number of the data frame to be used as the numerator for the calculation. Type 1 to use the first data frame included in the function. Type 2 to use the second data frame included in the function, and so on.
denominator	a number, indicating the index number of the data frame to be used as the denominator for the calculation. Type 1 to use the first data frame included in the function. Type 2 to use the second data frame included in the function, and so on. Note the numerator data frame must differ from the denominator data frame.
DuncanAll,	a logical argument. If calculation = "Duncan", this logical argument must be specified. The Duncan index measures the dissimilarity in the spatial distribution of a chosen group (first data frame in the function) against a reference category as specified by the "DuncanAll" argument. If TRUE, the reference category is the sum of all data frames, except for the first data frame included in the function (i.e. chosen group). If FALSE, a specific data frame must be specified to be the reference group. See Duncan and Duncan (1955) for details on

the Duncan index, and Rodríguez-Vignoli and Rowe (2017a, b) for an empirical application of the CIM using the Duncan index.

rest,   a logical argument. If calculation = "Duncan", this argument must be specified. It enables a special calculation of the CIM, for a particular area (e.g. the Greater London Metropolitan Area), and the rest of spatial units comprising a country. To correctly compute the CMI, these spatial units need to be amalgamated and included as a single column/row in the matrix - labelled "Rest of the country" (e.g. Rest of the UK). If TRUE, the column/row of the "Rest of the country" is considered for the calculation and is excluded from the denominator of the duncan index. If FALSE, the "Rest of the country" column/row is included in the denominator, producing the wrong results.

Value

an object containing:

for the "ratio" and "percentage" calculation options:

num_results: a data frame containing nine area-level indicators: the Factual Value (FV), Counterfactual Value (CFV), Compositional Impact of Migration (CIM), Compositional Impact of Migration Percentage Change (CIM_PC), Diagonal Cell Indicator (DIAG), Compositional Impact of Migration for Inflows (CIM_I), Compositional Impact of Migration for Outflows (CIM_O), CIM_I as a percentage of CMI (CIM_I_PC), and CIM_O as a percentage of CMI (CIM_O_PC)

for the "duncan" calculation option:

duncan_results: a data frame, containing the Factual Value of the Area-Specific Share (ASFVShare_cg), and the Counterfactual Value of the Area-Specific Share (ASCFVShare_cg) for the chosen group; the Factual Value of the Area-Specific Share (ASFVShare_ref) and the Counterfactual Value of the Area-Specific Share (ASCFVShare_ref) for the reference group; the Area-Specific Share Factual Value Difference between the ASFVShare_cg and ASFVShare_ref (ASShareFV_diff); and the Area-Specific Share Counterfactual Value Difference between the ASCFVShare_cg and ASCFVShare_ref (ASShareCFV_diff). The chosen group corresponds to the first data frame in the function. See above the argument "DuncanAll" to specify the reference category.

duncan_index: a numeric value, indicating the Duncan Index of dissimilarity for the chosen group.

References

Duncan, O.D. and Duncan, B., 1955. A methodological analysis of segregation indexes. American sociological review, 20(2), pp.210-217.

Rodríguez-Vignoli, J.R. and Rowe, F., 2017a. ¿Contribuye la migración interna a reducir la segregación residencial?: el caso de Santiago de Chile 1977-2002. Revista Latinoamericana de Población, (21), pp.7-46.

Rodríguez-Vignoli, J.R. and Rowe, F., 2017b. The Changing Impacts of Internal Migration on Residential Socio-Economic Segregation in the Greater Santiago. 28th International Population Conference of the International Union for the Scientific Study of Population (IUSSP), Cape Town, South Africa.

Rodríguez-Vignoli, J. and Rowe, F., 2018. How is internal migration reshaping metropolitan populations in Latin America? A new method and new evidence. Population studies, 72(2), pp.253-273. doi.org/10.1080/00324728.2017.1416155

Examples

```
## Read in the two data.frames included in the package
m <- male
f <- female

## Run the function using "ratio" calculation
CIM.ratio <- CIM(m, f, calculation = "ratio", numerator = 1, denominator = 2)
## Print the resulted data.frame
CIM.ratio

## Run the function using "percentage" calculation
CIM.percentage <- CIM(m, f, calculation = "percentage", numerator = 1, denominator = 2)
## See the resulted data.frame
CIM.percentage

## For the Duncan index, we compute impact of internal migration on the spatial pattern of
## residential age segregation of people age 65 and over in the
## local authority districts of Greater London using 2011 census data.
## Chosen group: people aged 65 and over.
## Reference category: the rest of age groups.
## For this example, this group is people aged pop1-14, 15-29, 30-14 and 45-64).
CIM.duncan <- CIM(pop65over, pop1_14, pop15_29, pop30_44, pop45_64,
calculation = "duncan", numerator = 1, DuncanAll= TRUE)
CIM.duncan$duncan_results
CIM.duncan$duncan_index
```

---

  female   *OD matrix, female, 2008-2013.*

Description

4x4 origin-destination migration data matrix, female, 2008-2013, Chile.

Usage

```
female
```

Format

A data frame of 4 rows by 4 columns containing a 3x3 origin-destination migration data matrix for females, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Greater.Santiago Population, female

Rest.of.the.Metropolitan.region Population, female

Rest.of.the.country Population, female

Source

<https://www.tandfonline.com/doi/suppl/10.1080/00324728.2017.1416155?scroll=top>

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male	*OD matrix, male, 2008-2013.*

Description

4x4 origin-destination migration data matrix, male, 2008-2013, Chile.

Usage

```
male
```

Format

A data frame of 4 rows by 4 columns containing a 3x3 origin-destination migration data matrix for males, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Greater.Santiago Population, male

Rest.of.the.Metropolitan.region Population, male

Rest.of.the.country Population, male

Source

<https://www.tandfonline.com/doi/suppl/10.1080/00324728.2017.1416155?scroll=top>

---

pop15_29	*OD matrix, people aged 15-29, 2010-2011.*

Description

34x34 origin-destination migration data matrix, population aged 15-29, 2010-2011, UK.

Usage

```
pop15_29
```

Format

A data frame of 34 rows by 34 columns containing a 33x33 origin-destination migration data matrix for people aged 15-29, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Barking and Dagenham Population, aged 15 to 29

Barnet Population, aged 15 to 29

Bexley Population, aged 15 to 29

Brent Population, aged 15 to 29

Bromley Population, aged 15 to 29

Camden Population, aged 15 to 29

Croydon Population, aged 15 to 29

Ealing Population, aged 15 to 29

Enfield Population, aged 15 to 29

Greenwich Population, aged 15 to 29

Hackney Population, aged 15 to 29

Hammersmith and Fulham Population, aged 15 to 29

Haringey Population, aged 15 to 29

Harrow Population, aged 15 to 29

Havering Population, aged 15 to 29

Hillingdon Population, aged 15 to 29

Hounslow Population, aged 15 to 29

Islington Population, aged 15 to 29

Kensington and Chelsea Population, aged 15 to 29

Kingston upon Thames Population, aged 15 to 29

Lambeth Population, aged 15 to 29

Lewisham Population, aged 15 to 29

Merton Population, aged 15 to 29

Newham Population, aged 15 to 29

Redbridge Population, aged 15 to 29

Richmond upon Thames Population, aged 15 to 29

Southwark Population, aged 15 to 29

Sutton Population, aged 15 to 29

Tower Hamlets Population, aged 15 to 29

Waltham Forest Population, aged 15 to 29

Wandsworth Population, aged 15 to 29

City of London-Westminster Population, aged 15 to 29

Rest of the UK Population, aged 15 to 29

Source

2011 Census for England and Wales

---

pop1_14	*OD matrix, people aged 1-14, 2010-2011.*

Description

34x34 origin-destination migration data matrix, population aged 1-14, 2010-2011, UK.

Usage

pop1_14

Format

A data frame of 34 rows by 34 columns containing a 33x33 origin-destination migration data matrix for people aged 1-14, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Barking and Dagenham Population, aged 1 to 14

Barnet Population, aged 1 to 14

Bexley Population, aged 1 to 14

Brent Population, aged 1 to 14

Bromley Population, aged 1 to 14

Camden Population, aged 1 to 14

Croydon Population, aged 1 to 14

Ealing Population, aged 1 to 14

Enfield Population, aged 1 to 14

Greenwich Population, aged 1 to 14

Hackney Population, aged 1 to 14

Hammersmith and Fulham Population, aged 1 to 14

Haringey Population, aged 1 to 14

Harrow Population, aged 1 to 14

Havering Population, aged 1 to 14

Hillingdon Population, aged 1 to 14

Hounslow Population, aged 1 to 14

Islington Population, aged 1 to 14

Kensington and Chelsea Population, aged 1 to 14

Kingston upon Thames Population, aged 1 to 14

Lambeth Population, aged 1 to 14

Lewisham Population, aged 1 to 14

Merton Population, aged 1 to 14

Newham Population, aged 1 to 14

Redbridge Population, aged 1 to 14

Richmond upon Thames Population, aged 1 to 14

Southwark Population, aged 1 to 14

Sutton Population, aged 1 to 14

Tower Hamlets Population, aged 1 to 14

Waltham Forest Population, aged 1 to 14

Wandsworth Population, aged 1 to 14

City of London-Westminster Population, aged 1 to 14

Rest of the UK Population, aged 1 to 14

Source

2011 Census for England and Wales

---

pop30_44   *OD matrix, people aged 30-34, 2010-2011.*

Description

34x34 origin-destination migration data matrix, population aged 30-34, 2010-2011, UK.

Usage

pop30_44

Format

A data frame of 34 rows by 34 columns containing a 33x33 origin-destination migration data matrix for people aged 30-34, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Barking and Dagenham Population, aged 30 to 44

Barnet Population, aged 30 to 44

Bexley Population, aged 30 to 44

Brent Population, aged 30 to 44

Bromley Population, aged 30 to 44

Camden Population, aged 30 to 44

Croydon Population, aged 30 to 44

Ealing Population, aged 30 to 44

Enfield Population, aged 30 to 44

Greenwich Population, aged 30 to 44

Hackney Population, aged 30 to 44

Hammersmith and Fulham Population, aged 30 to 44

Haringey Population, aged 30 to 44

Harrow Population, aged 30 to 44

Havering Population, aged 30 to 44

Hillingdon Population, aged 30 to 44

Hounslow Population, aged 30 to 44

Islington Population, aged 30 to 44

Kensington and Chelsea Population, aged 30 to 44

Kingston upon Thames Population, aged 30 to 44

Lambeth Population, aged 30 to 44

Lewisham Population, aged 30 to 44

Merton Population, aged 30 to 44

Newham Population, aged 30 to 44

Redbridge Population, aged 30 to 44

Richmond upon Thames Population, aged 30 to 44

Southwark Population, aged 30 to 44

Sutton Population, aged 30 to 44

Tower Hamlets Population, aged 30 to 44

Waltham Forest Population, aged 30 to 44

Wandsworth Population, aged 30 to 44

City of London-Westminster Population, aged 30 to 44

Rest of the UK Population, aged 30 to 44

Source

2011 Census for England and Wales

pop45_64	*OD matrix, people aged 45-64, 2010-2011.*

Description

34x34 origin-destination migration data matrix, population aged 45-64, 2010-2011, UK.

Usage

pop45_64

Format

A data frame of 34 rows by 34 columns containing a 33x33 origin-destination migration data matrix for people aged 45-64, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Barking and Dagenham Population, aged 45 to 64

Barnet Population, aged 45 to 64

Bexley Population, aged 45 to 64

Brent Population, aged 45 to 64

Bromley Population, aged 45 to 64

Camden Population, aged 45 to 64

Croydon Population, aged 45 to 64

Ealing Population, aged 45 to 64

Enfield Population, aged 45 to 64

Greenwich Population, aged 45 to 64

Hackney Population, aged 45 to 64

Hammersmith and Fulham Population, aged 45 to 64

Haringey Population, aged 45 to 64

Harrow Population, aged 45 to 64

Havering Population, aged 45 to 64

Hillingdon Population, aged 45 to 64

Hounslow Population, aged 45 to 64

Islington Population, aged 45 to 64

Kensington and Chelsea Population, aged 45 to 64

Kingston upon Thames Population, aged 45 to 64

Lambeth Population, aged 45 to 64

Lewisham Population, aged 45 to 64

Merton Population, aged 45 to 64

Newham Population, aged 45 to 64

Redbridge Population, aged 45 to 64

Richmond upon Thames Population, aged 45 to 64

Southwark Population, aged 45 to 64

Sutton Population, aged 45 to 64

Tower Hamlets Population, aged 45 to 64

Waltham Forest Population, aged 45 to 64

Wandsworth Population, aged 45 to 64

City of London-Westminster Population, aged 45 to 64

Rest of the UK Population, aged 45 to 64

Source

2011 Census for England and Wales

---

pop65over   *OD matrix, people aged 65+, 2010-2011.*

Description

34x34 origin-destination migration data matrix, population aged 65+, 2010-2011, UK..

Usage

pop65over

Format

A data frame of 34 rows by 34 columns containing a 33x33 origin-destination migration data matrix for people aged 65+, including counts for the non-migrant population in the diagonal. The first row and column correspond to the area names. Rows correspond to destinations and columns represent origins.

Barking and Dagenham Population, aged 65 plus

Barnet Population, aged 65 plus

Bexley Population, aged 65 plus

Brent Population, aged 65 plus

Bromley Population, aged 65 plus

Camden Population, aged 65 plus

Croydon Population, aged 65 plus

Ealing Population, aged 65 plus

Enfield Population, aged 65 plus

Greenwich Population, aged 65 plus

Hackney Population, aged 65 plus

Hammersmith and Fulham Population, aged 65 plus

Haringey Population, aged 65 plus

Harrow Population, aged 65 plus

Havering Population, aged 65 plus

Hillingdon Population, aged 65 plus

Hounslow Population, aged 65 plus

Islington Population, aged 65 plus

Kensington and Chelsea Population, aged 65 plus

Kingston upon Thames Population, aged 65 plus

Lambeth Population, aged 65 plus

Lewisham Population, aged 65 plus

Merton Population, aged 65 plus

Newham Population, aged 65 plus

Redbridge Population, aged 65 plus

Richmond upon Thames Population, aged 65 plus

Southwark Population, aged 65 plus

Sutton Population, aged 65 plus

Tower Hamlets Population, aged 65 plus

Waltham Forest Population, aged 65 plus

Wandsworth Population, aged 65 plus

City of London-Westminster Population, aged 65 plus

Rest of the UK Population, aged 65 plus

Source

2011 Census, England and Wales

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