Picturing mobility: Transition probability color plots

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Income mobility

- Analysis of change over time in individual income and of the distribution thereof
  (see, e.g., *Changing Fortunes* by Jenkins (2011))
- Classic summary: the *transition matrix*
  - incomes at two points in time
  - partition population (or sample) into income groups –most often by quantile groups– at both periods
  - report probabilities p_{ij} of transition to group j conditional on starting in group i ($\sum_j p_{ij} = 1$)

Transition matrices

Quintile groups:

Origin	Destination 1	2	3	4	5
1	0.36	0.24	0.16	0.13	0.11
2	0.18	0.24	0.25	0.22	0.11
3	0.13	0.18	0.26	0.26	0.17
4	0.16	0.16	0.18	0.25	0.24
5	0.08	0.08	0.13	0.24	0.46

Misses details and/or difficult to read and compare

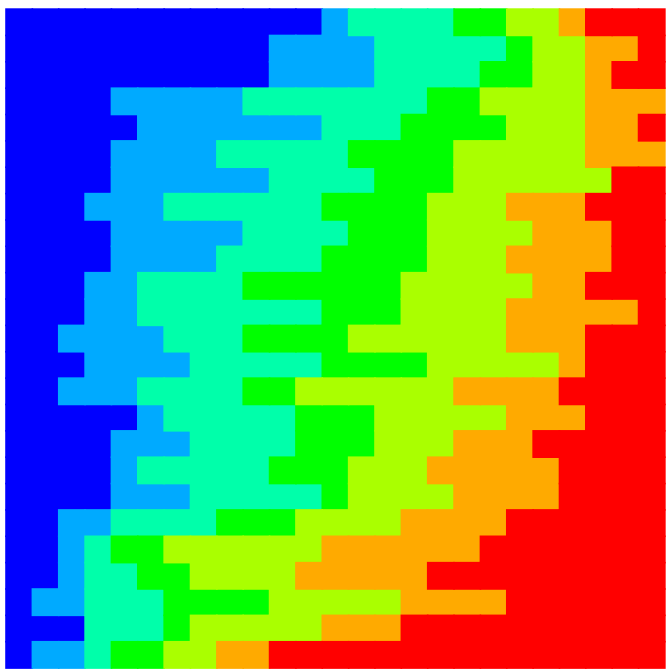
Decile groups:

Origin	Destination 1	2	3	4	5	6	7	8	9	10
1	0.25	0.19	0.07	0.10	0.08	0.07	0.06	0.05	0.08	0.04
2	0.13	0.15	0.16	0.15	0.08	0.10	0.08	0.07	0.06	0.03
3	0.07	0.10	0.15	0.10	0.14	0.12	0.15	0.10	0.04	0.03
4	0.08	0.10	0.11	0.12	0.11	0.13	0.09	0.10	0.10	0.06
5	0.05	0.07	0.09	0.10	0.12	0.14	0.13	0.13	0.11	0.05
6	0.07	0.07	0.06	0.11	0.12	0.12	0.16	0.10	0.12	0.07
7	0.08	0.10	0.06	0.09	0.12	0.09	0.13	0.10	0.12	0.10
8	0.10	0.04	0.05	0.11	0.06	0.10	0.12	0.16	0.12	0.14
9	0.05	0.04	0.06	0.04	0.05	0.10	0.11	0.20	0.16	0.20
10	0.04	0.04	0.03	0.03	0.07	0.05	0.07	0.10	0.15	0.42

The transition matrix pictured...

A visual representation of the transition matrix: the *Transition probability color plot*

Transition probability color plot



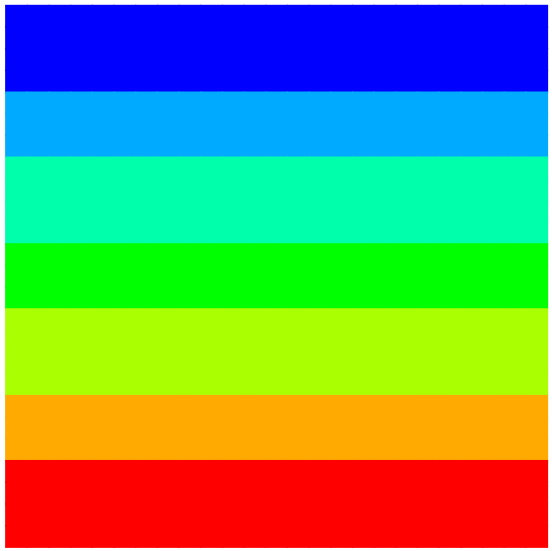
Each block is a (small) fraction of population/sample, arranged so that:

- Low income groups at top to high income groups at bottom (**origin**)
- Low income groups in blue to high income groups in red (**destination**)

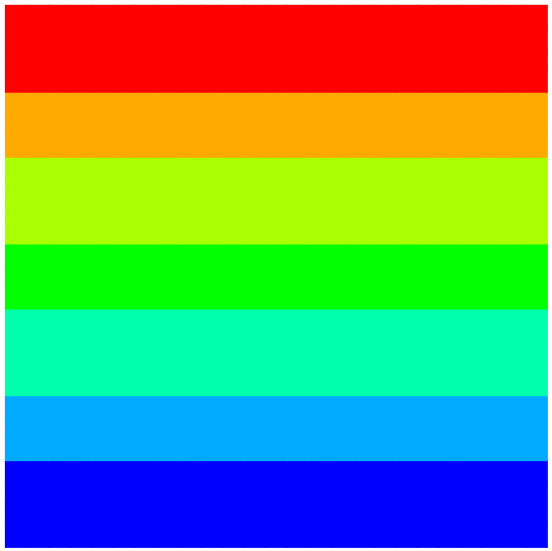
Benchmarks

Benchmark pictures: status quo (immobility), reversal (total mobility), independence

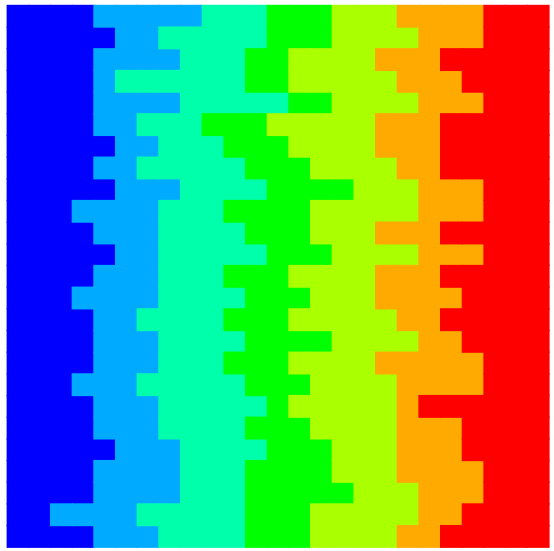
STATUS QUO



COMPLETE REVERSAL



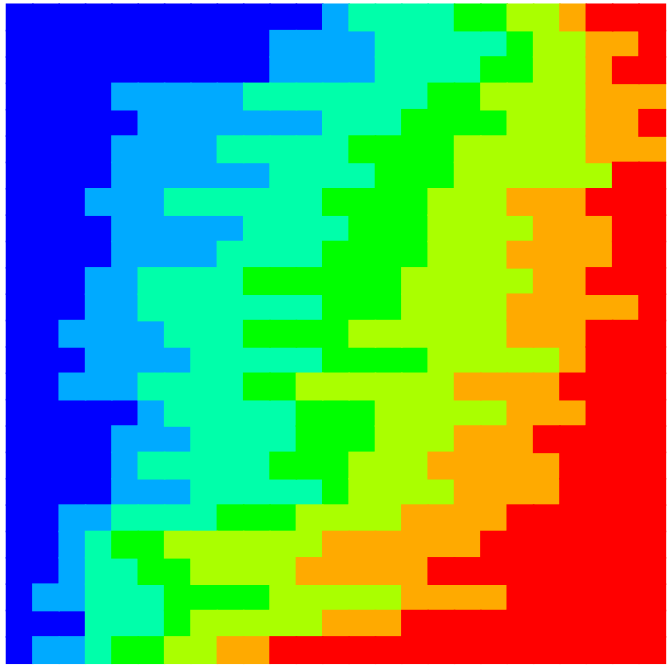
INDEPENDENCE



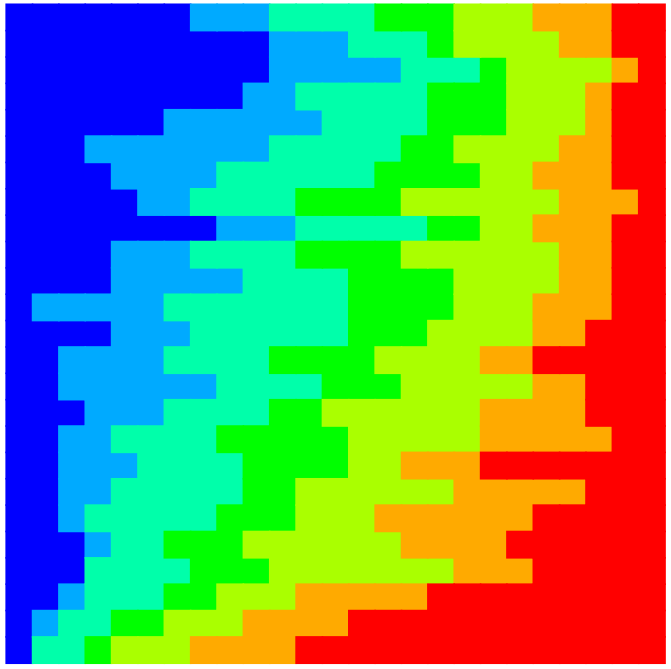
Reverse estimates

Alternative representation: Arrange from top to bottom according to **destination** income group and color according to **origin** income group:

Transition probability color plot



Transition probability color plot
(reversed plot)



Stata command: transcolorplot

The command transcolorplot will be available from the SSC archive

Syntax

```
transcolorplot varname1 varname2 [if] [in] [weight]
[, nquantiles(#) nbins(#) ncolors(#) reverse ... ]
```

where '...' are various options for (i) saving plot coordinates, (ii) for color rendition and (iii) miscellaneous additional graphical options

Implementation: Sitting on a giant's shoulders

`transcolorplot` sits on a giant's shoulders: the user-written commands `spmap` and `spgrid` by Maurizio Pisati (both available on SSC, see Pisati (Stata Journal, 2004)).

`transcolorplot` does relatively little:

1. arranges data into `nquantiles`×`nbins` cells and evaluates cell 'value' (according to origin and destination incomes)
2. calls `spgrid` to generate a two-dimensional grid (the 'chessboard')
3. calls `spmap` to colorize the chessboard according to cell values computed at step 1 and draw the picture

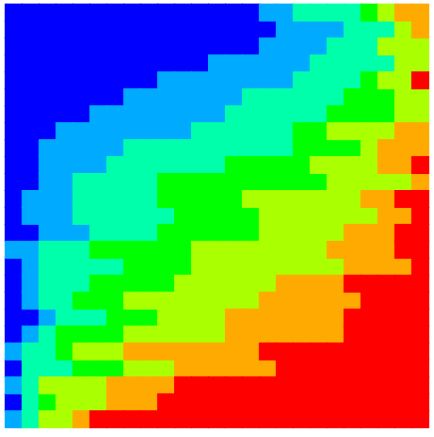
All drawing options are passed to `spmap`: control for color palette, labels and titles, added text, overlaid labels and points, *etc.*

Example 1: Individual income mobility in USA and Germany

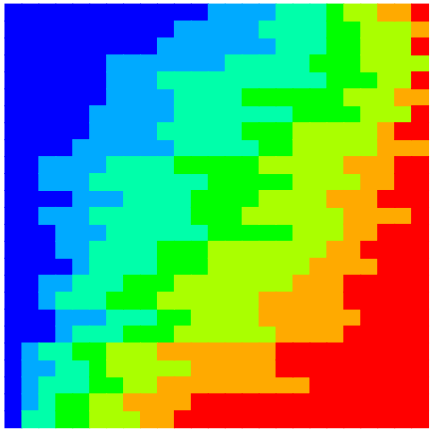
- Panel Study on Income Dynamics (USA) and German Socio-economic Panel survey (Western Germany)
- Data extracted from the Cross-National Equivalent data files –as used in Van Kerm (Economica, 2004)
- Panel data on household income in 1985, 1988, 1992 and 1997
- Approx. 6,000 observations in both countries (for balanced sample)
- After tax, total annual disposable household income adjusted for household size

Example 1: Individual mobility in USA and Germany

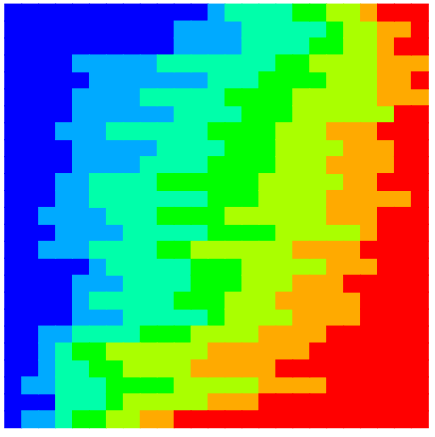
Western Germany
1985–1988



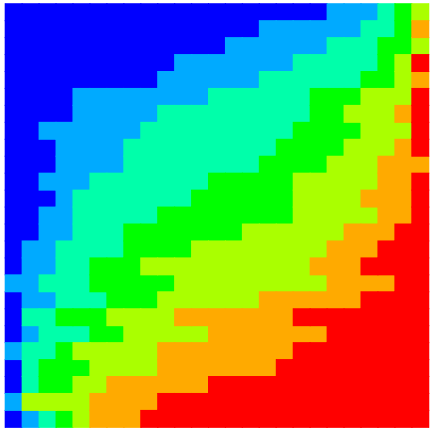
Western Germany
1985–1992



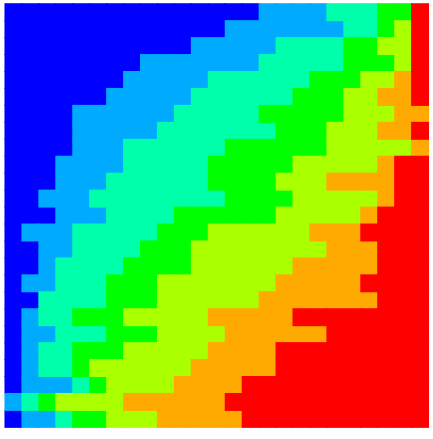
Western Germany
1985–1997



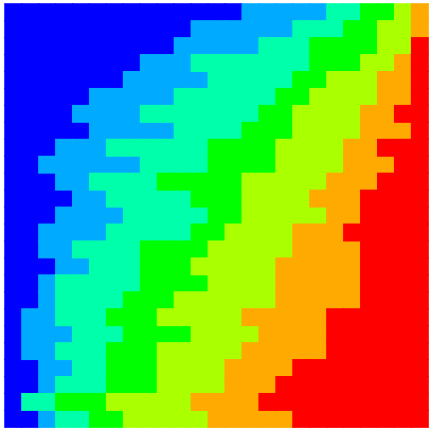
United States
1985–1988



United States
1985–1992



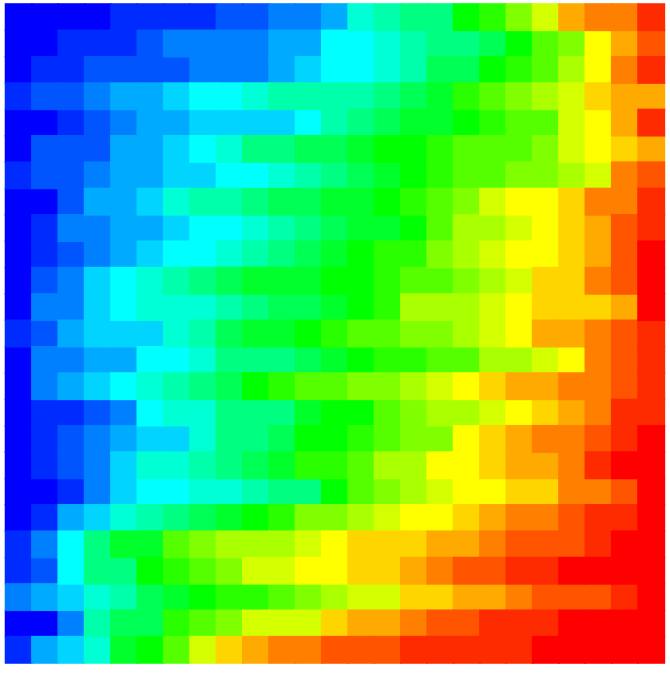
United States
1985–1997



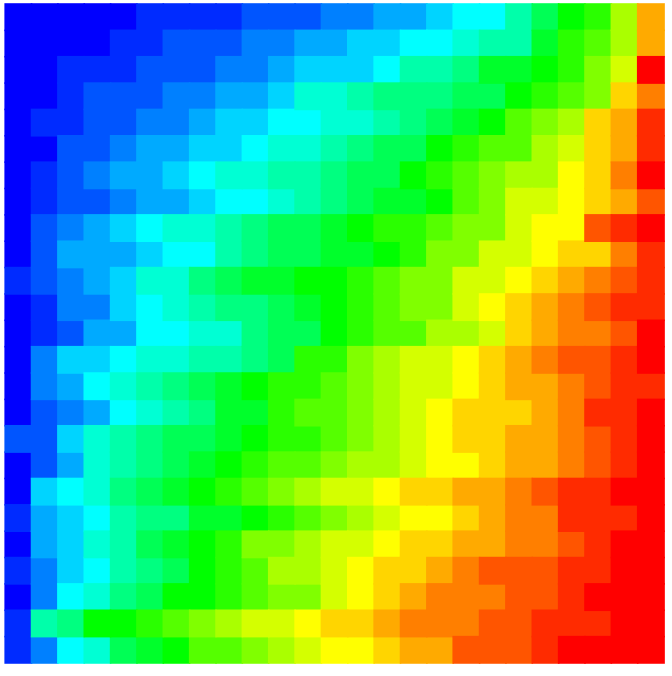
Some possible variations...

More detailed color palette

Western Germany
1985−1997



United States
1985−1997

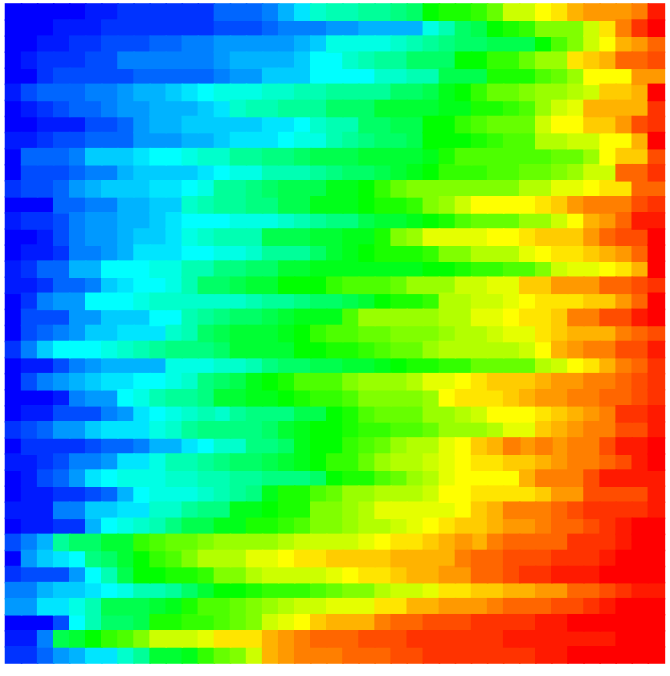


More informative?

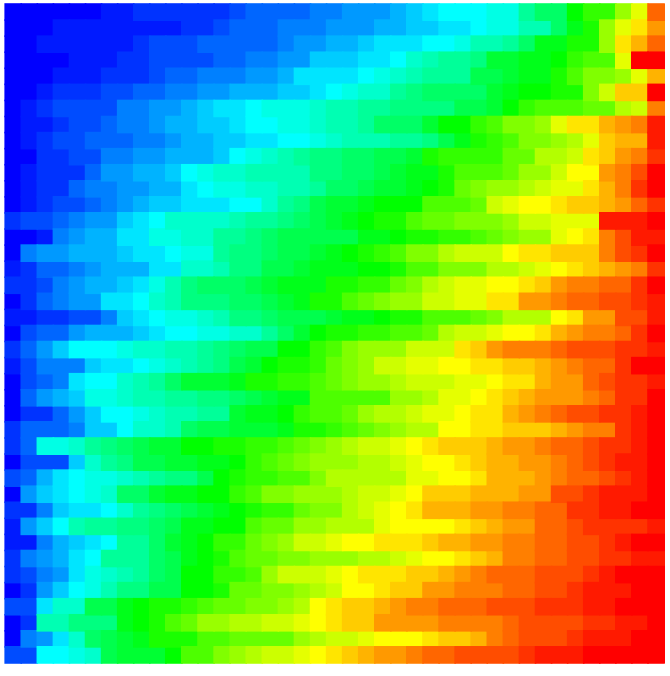
Some possible variations...

Finer grid

Western Germany
1985−1997



United States
1985−1997

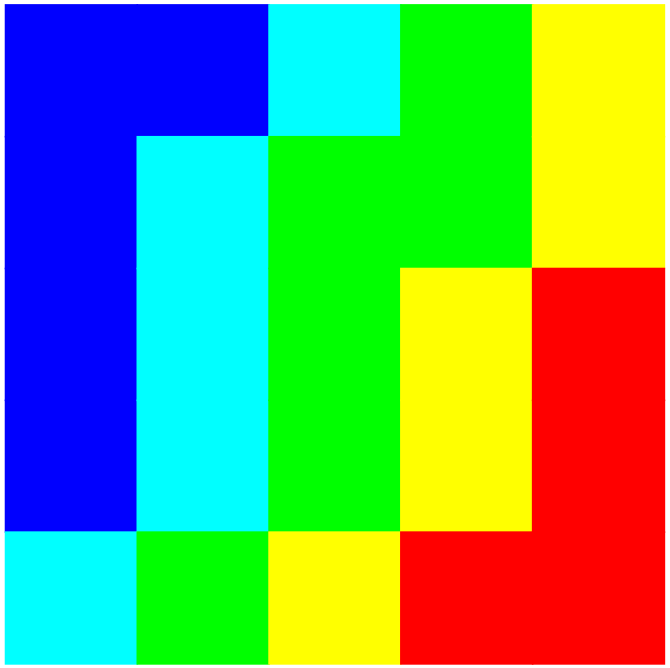


More informative?

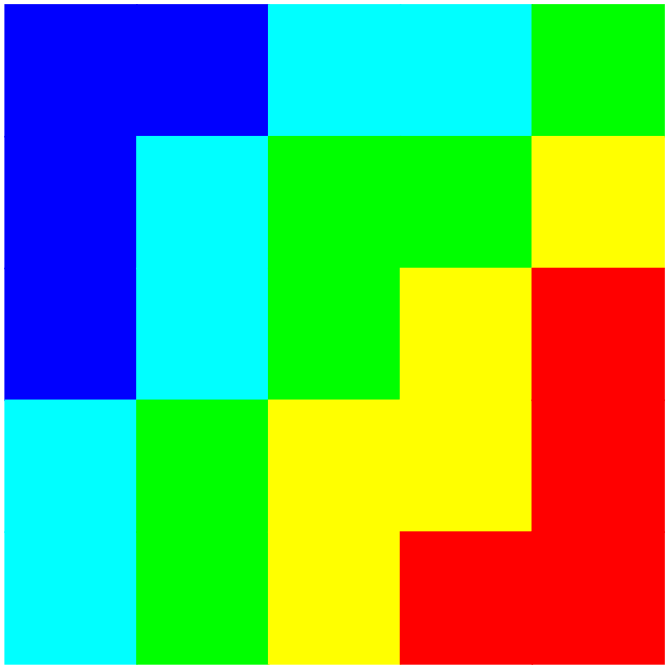
Some possible variations...

Less details!

Western Germany
1985−1997



United States
1985−1997

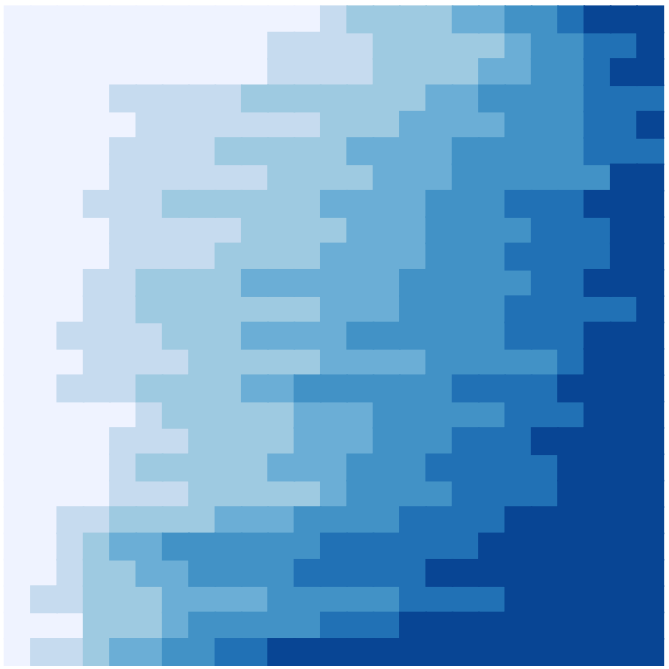


Notice rounding issues!

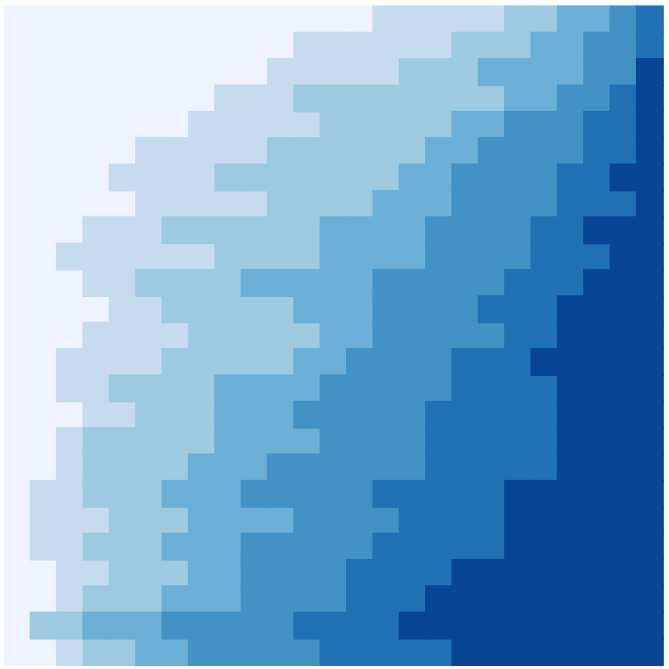
Some possible variations...

Alternative palettes

Western Germany
1985−1997



United States
1985−1997

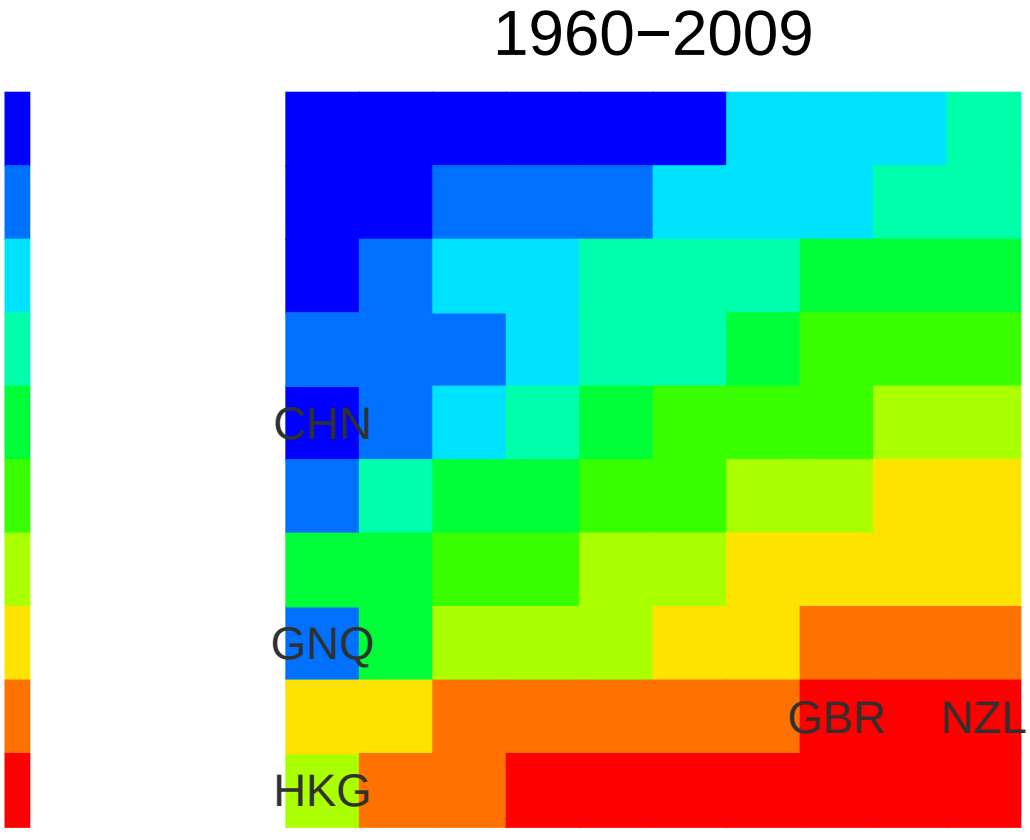


Color palettes provided by `spmap`
(default is ‘rainbow’, here ‘blues’)

Example 2: International mobility in GDP per capita over 50 years

- Data from the Penn World Tables
- GDP per capita adjusted to common prices with purchasing power parities
- 100 countries with complete data from 1960–2009 (as used in O'Neill & Van Kerm (Manchester School, 2008))

Mobility in GDP per capita over 50 years



- 10×10 grid: each cell is just one country
- 'reverse' plot: countries ordered from top to bottom by destination (2009) GDP with color based on origin (1960) GDP

Mobility in GDP per capita over 50 years

How did we get there? Some animated plots...

(click on ‘play’ button to run!)

Mobility in GDP per capita over 50 years

Mobility in 1970–1989 vs. 1990–2009

(click on ‘play’ button to run!)

Acknowledgements

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