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Migration Data and Concepts

Guy J. Abel

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Migration Concepts

- Migration involves a change in place of abode, or place of "usual" residence-a taking-up of life in a new or different place - United Nations Department of Economic and Social Affairs Population Division (1983)
- Could apply to a range of demographic units, such as a person, a family or a household
- Tend to excludes nomads, movement of population groups with no fixed place of residence, seasonal movements of persons who live in two or more places during the course of a year.
- Both a spatial (place) and temporal (change) dimension are required in the definition of migration

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Place of Residence

The *Principles and Recommendations for Population and Housing Censuses* (UN Statistics Division 2008: 102, para. 1.463) defines usual residence as follows:

"It is recommended that countries apply a threshold of 12 months when considering place of usual residence according to one of the following two criteria:

1. The place at which the person has lived continuously for most of the last 12 months (that is, for at least six months and one day), not including temporary absences for holidays or work assignments, or intends to live for at least six months

2. The place at which the person has lived continuously for at least the last 12 months, not including temporary absences for holidays or work assignments, or intends to live for at least 12 months."

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Place of Residence

- Typically no restriction is placed on the distance involved in a relocation - see Lee (1966).
  - Could include move from one apartment to another in the same building, or it may be a move to another country.
- In the past, some researchers have drawn a distinction between moves between local communities (cities, labour markets) and moves within local communities
  - Labelled as 'migration' and 'local mobility'.
  - Many have argued that this distinction is problematic and no spatial constraints on the definition of migration should be used.

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Place of Residence

- If address information on points of origin and points of destination, the tabulation of moves by distance covered could be obtained.
  - Usually, not possible in countries without population registers
  - Time consuming and of little policy relevance
- Census or survey results are necessarily tabulated for the administrative or political units into which the country is divided.
- A migration is then operationally defined as a change of residence from one civil division to another, and the volume of migration is to a considerable degree a function of the size of areas chosen for compilation.

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Courgeau (1979)
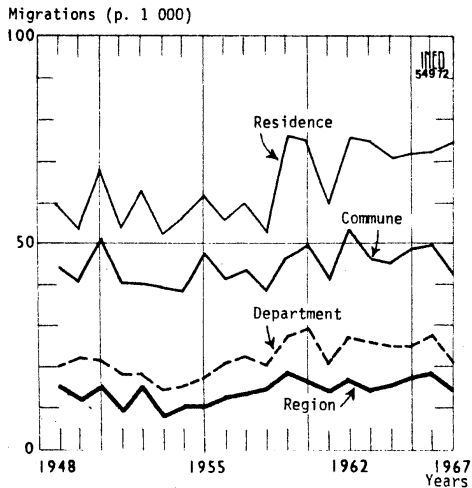
Graph 2. — Annual migration rates of the different geographical subdivisions.

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Place of Origin

- Typologies of migration data can be stratified by differing places of origin. Most commonly used:

Origin	Data Type
Previous place of residence	Migration event (movement) data
Place of residence *n* years ago	Migrant transition data

- Lifetime migration data could be considered as a form of transition data where *n* changes based on the age of each individual
  - Migrant stock data are an aggregation over all persons lifetime migration flow.
  - Given at specific point of time without an interval.
  - Migration data literature often distinguishes between stock and flow data.
- Other types of migration data occasionally collected are
  - Duration at residence (combined with place of previous residence can derive a migration transitions)
  - Number of moves over a given interval (event data)
  - Country of citizenship (sometimes used as a proxy for place of birth)

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Migrant Transition Data

- Migrant transition data are typical collected in national censuses which identify migrants by comparing their place of usual residence at the time of enumeration (t) with that at a specified earlier date ($t - n$).
  - Time period is usually either 1 year (e.g. UK) or 5 years (e.g. USA)
  - Some countries have time periods as the interval between current and last census or significant time point in countries history.
- Transition data fail to identify multiple and return moves, and migrants who are born or who die during the measurement period.
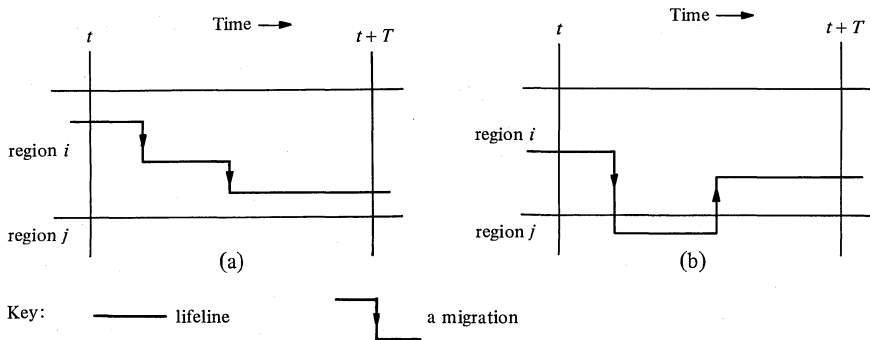
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Migrant Transition Data - Rees 1970

Figure 2. Two situations in which 'nonmigrants' make migrations.

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Migrants and Migration

- Transition data are counts of migrants
- A migrant is a person who has in some specified period in the past experienced one or more migrations.
- Persons who moved during the interval and died before its end should, strictly speaking, be counted as migrants and their moves should be counted as migrations.
  - Likely to be excluded as information on migrants is usually obtained after the end of the interval and with reference to persons still living at that time.

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Migration Event Data

- Event data record every move that is made by each individual
  - Include multiple and return migrations as well as moves by the newborn and those immediately before death.
  - Typically collected in population registers
  - Represent a more complete record of migration over time
- Geographical units for which the data are available are generally coarser and registers often fail to capture information on within-region moves.
- Less information about characteristics of migrants is usually available
  - Some groups may be omitted from altogether (e.g. prisoners, military personnel)

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Migration Event Data

- There are important distinctions between the play (migration) and the actor (migrant).
- For a given migration interval, the number of migrants is rarely, if ever, as large as the number of migrations.
  - Unless the interval is very short (a day, or perhaps a week) some persons are certain to move more than once.
  - The longer the migration interval the more the count of migrants will understate the amount of migration.
  - Conversely, the shorter the migration interval, the count of migrants will approach the number of migrations.
- Shown by Courgeau (1979) . . .

Migration Event Data - Courgeau (1979)
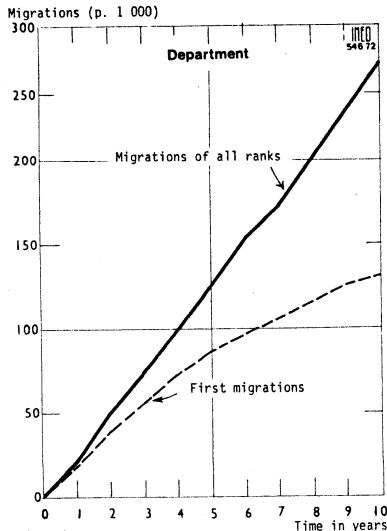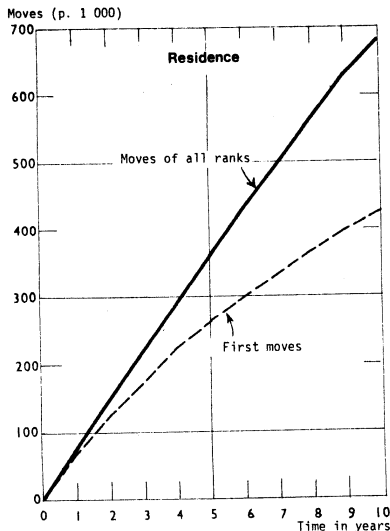
Graphs 3 to 6. — Time distribution of first migrations and migrations of all ranks combined, by type of migration or move.

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Migration Event Data

Graphs 3 to 6. — Time distribution of first migrations and migrations of all ranks combined, by type of migration or move.

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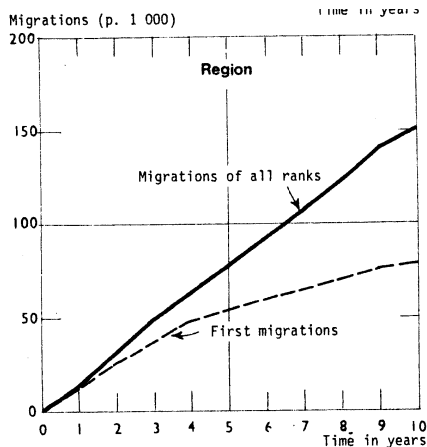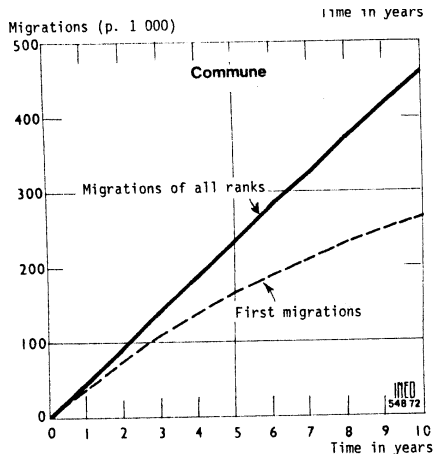
Migration Interval

- Migration occurs continuously over time. In order to study its incidence, data have to be compiled with reference to specified periods of time.
- The interval can be
  - Definite, e.g., one year, five years, ten years, the intercensal period
  - Indefinite, e.g., the lifetime of the population alive at a given date.
- Definite interval data typically called fixed-term or period migration (or surviving migrants in the example on the next slide)
- Lifetime migration or data based on place of last residence lack a definite time reference.

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Migration Interval - Rees (1977)
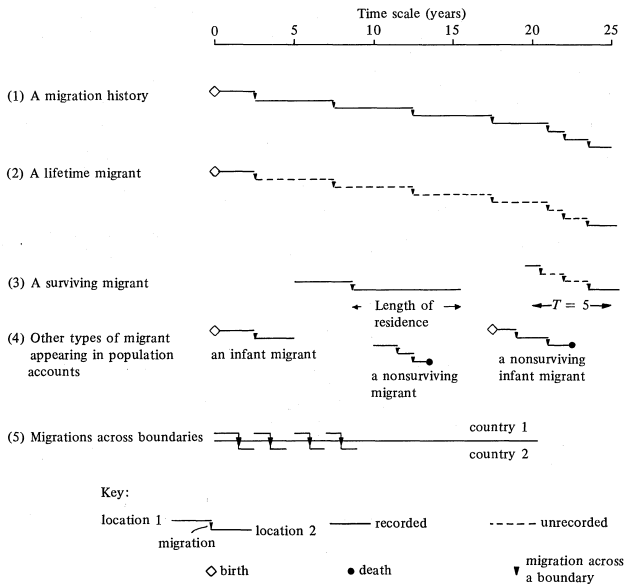
Figure 1. Examples of the different sources for migration indicators.

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One-Year Five-Year Problem

- Migration data is commonly collected over a one or five year interval.
- In places where both intervals are used, the number of migrants recorded over a five-year interval is far less than five times the number recorded over a one-year interval
  - Seen in Courgeau (1979) plots or Rees(1970) tables - see next slides
- Rogerson (1990) no straightforward algebraic solution to comparing one-year and five-year migration probabilities.
- Event data has similar patterns to transition data for the same period, however
  - Width of the interval influences the intensity of migration and also the geographic pattern of captured migration flows.

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One-Year Five-Year Problem - Rees 1970

Table 1. Five-year migrants, one-year migrants and five-year/one-year ratios for interregional migration, 1971 census (source: OPCS, 1974–1975; 1975).

Origin at start of period	Destination at end of period									
	1 N	2 YH	3 NW	4 EM	5 WM	6 EA	7 SE	8 SW	9 W	10 S
a. Five-year migrants (1966–1971)										
1 N	—	32460	21880	14460	13250	6480	47530	10660	3850	14820
2 YH	36300	—	40220	40460	18760	10810	62570	17360	7030	11270
3 NW	18740	34850	—	19060	29580	8540	84270	27100	33620	14710
4 EM	9570	35010	16280	—	25850	16180	57370	19320	6040	8450
5 WM	10230	15230	32110	35660	—	8540	76350	40720	21120	9780
6 EA	3390	7820	5220	12820	5510	—	53370	10020	3120	4030
7 SE	33720	47600	64890	73430	62750	109920	—	193920	36540	46140
8 SW	8010	10250	14930	12240	22840	9170	133950	—	14290	10800
9 W	3610	5590	17790	6740	18450	3470	42790	20400	—	4340
10 S	16110	13600	21640	14150	13820	5870	64150	13260	3990	—
11 RW	29320	60330	85110	51900	78020	51060	525190	71070	21900	62380

Key: N ≡ North, YH ≡ Yorkshire and Humberside, NW ≡ North West, EM ≡ East Midlands, WM ≡ West Midlands, EA ≡ East Anglia, SE ≡ South East, SW ≡ South West, W ≡ Wales, S ≡ Scotland, RW ≡ Rest of the World

One-Year Five-Year Problem – Rees 1970

Table 1. Five-year migrants, one-year migrants and five-year/one-year ratios for interregional migration, 1971 census (source: OPCS, 1974–1975; 1975).

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	1 N	2 YH	3 NW	4 EM	5 WM	6 EA	7 SE	8 SW	9 W	10 S
b. One-year migrants (1970–1971)										
1 N	—	9290	7370	3630	3790	2190	15040	3870	1220	4910
2 YH	12790	—	13290	13190	5970	4320	21580	5610	2570	3470
3 NW	6790	10650	—	6320	9750	2980	29210	8950	10370	5200
4 EM	4200	12170	5300	—	9610	6030	19110	6680	2330	3100
5 WM	3550	5400	9750	12600	—	3040	25630	12590	6350	3340
6 EA	1150	2510	1970	4490	2540	—	20460	3820	1170	1650
7 SE	12070	16570	22920	26390	21410	35410	—	66570	12050	7610
8 SW	2970	4600	4860	4230	8680	3390	49030	—	4730	4810
9 W	1450	2040	6390	2420	5650	1280	13160	7000	—	1650
10 S	5540	4810	7220	4910	4630	2070	23790	5330	1700	—
11 RW	14570	19360	27330	16650	23140	20280	197220	29390	8840	28160

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One-Year Five-Year Problem – Rees 1970

Table 1. Five-year migrants, one-year migrants and five-year/one-year ratios for interregional migration, 1971 census (source: OPCS, 1974–1975; 1975).

Origin at start of period	Destination at end of period									
	1 N	2 YH	3 NW	4 EM	5 WM	6 EA	7 SE	8 SW	9 W	10 S

c. *Ratio (five year/one year)*

Origin	1 N	2 YH	3 NW	4 EM	5 WM	6 EA	7 SE	8 SW	9 W	10 S
1 N	—	3·50	2·97	3·98	3·50	2·96	3·16	2·75	3·15	3·02
2 YH	2·84	—	3·03	3·07	3·14	2·50	2·90	3·10	2·73	3·25
3 NW	2·76	3·27	—	3·01	3·03	2·87	2·88	3·03	3·25	2·82
4 EM	2·28	2·87	3·07	—	2·69	2·68	3·00	2·89	2·59	2·72
5 WM	2·88	2·82	3·29	3·72	—	2·81	2·98	3·24	3·32	2·92
6 EA	2·95	3·12	2·65	2·86	2·17	—	2·61	2·62	2·67	2·44
7 SE	2·79	2·87	2·83	2·79	2·79	2·93	—	2·92	3·03	2·62
8 SW	2·70	2·23	3·07	2·89	2·63	2·70	2·73	—	3·02	2·25
9 W	2·49	2·74	2·79	2·79	3·27	2·71	3·25	2·92	—	2·63
10 S	2·91	2·82	2·99	2·88	2·99	2·83	2·70	2·49	2·35	—
11 RW	2·01	3·08	3·12	3·12	3·37	2·52	2·66	2·42	2·48	2·22

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Migration measures

- There are a range of migration measures over differing levels of details
  - Region to region
  - Region totals
  - System totals (or index measures)
- Measure might have multiple interchangeable names for the same terms.

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Region to region measures

- *Streams* or *bilateral flow* or *origin-destination flow* is the total number of moves made during a given migration interval that have a common area of origin and a common area of destination.
- Data on migrations, or migrants, can be cross-classified by area of origin and area of destination.
  - Forms matrix of $n \times (n-1)$ streams, from area i to area j usually written as m_{ij}
- Contains a set of $\frac{n(n-1)}{2}$ pairs of streams, each pair representing movements in opposite directions (m_{ij} and m_{ji})

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Region to region measures

- For a pair of streams that are of unequal size there exists a *dominant* streams and *counter-stream* or *reverse* stream
- Sum of the two members of a pair of streams is called *gross interchange*
- Differences between streams and counter-streams for individual pairs of streams, the balances are *net streams*.

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Region totals

- Every move is an out-migration (emigration) with respect to the area of origin and an in-migration (immigration) with respect to the area of destination.

- Places of origin and destination dictate how describe migrants and migration

Scale	Area	Event Term	Migrant Term
Internal	Origin	out-migration	out-migrant
	Destination	in-migration	in-migrant
International	Origin	emigration	emigrant
	Destination	immigration	immigrant

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Region totals

- Typically in- or out-migration are evaluated for each region
- Data collected or aggregated without reference to place of origin for in-migration totals, or destination for out-migration totals
- Beyond gross migration totals for each region other measures, other summary measures can also be derived

Term	Definition
Gross migration	All moves or all migrants
Turnover	Sum of in-migration and out-migration, or of in-migrants and out-migrants.
Net migration	Balance of movements in opposing directions from difference between in-migration and out-migration for a specific area

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Region totals

- Never met a net-migrant
- Rogers (1990) *Requiem for net migration*
  - Net migration mis-specifies the spatial dynamics generating observed settlement patterns.
  - Obscure regularities in age profiles of migration
  - Net migration rates confound changing migration propensities with changing population stocks.

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Rate measures

- Out-migration or emigration rates calculated by dividing events in a period by exposure population:

$$e^{[t,t+1]} = \frac{E^{[t,t+1]}}{P}k$$

where $e^{[t,t+1]}$ is the out or emigration rate, E is the number of out-migrants or emigrants during the period, P is the population exposed to the likelihood of migration during the period and k is a constant, usually 1000.
- Exposure population is typically either the
  - Population at the mid-interval, under the assumption that migration is uniformly distributed across the interval.
  - Population at the start or end of the interval under the assumption that migration has a negligible effect on population change.
- Can be decomposed by a subset of the population such age and/or sex

$$e_i^{[t,t+1]} = \frac{E_i^{[t,t+1]}}{P_i}k$$

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Rates

- In-migration or immigration, the population exposed to the risk of migrating into a region is the entire population of the world living elsewhere.

- However, rates calculated by dividing events by the exposure time of the current residents (the population group **not** exposed to risk).

$$i^{[t,t+1]} = \frac{I^{[t,t+1]}}{P} k$$

- Net migration rates, like in-migration rates, are calculated by dividing events by the exposure time of the current residents (the population group **not** exposed to risk).

$$m^{[t,t+1]} = \frac{M^{[t,t+1]}}{P} k$$

Rates

- In-migration and net migration rates are unlike other demographic rates.
  - Not using the true population at risk in the denominator
- However, using the resident population satisfies the needs of the demographic balancing equation, since rates of gain and loss are measured relative to the same population.

$$P^{t+1} = P^t + B^{[t,t+1]} - D^{[t,t+1]} + M^{[t,t+1]}$$
$$P^{t+1} = P^t \left(1 + b^{[t,t+1]} - d^{[t,t+1]} + m^{[t,t+1]}\right)$$
$$= P^t \left(1 + b^{[t,t+1]} - d^{[t,t+1]} + i^{[t,t+1]} - e^{[t,t+1]}\right)$$

where we can substitute net migration $M^{[t,t+1]}$ with difference of in- and out-migration over the period $(I^{[t,t+1]} - O^{[t,t+1]})$

$$P^{t+1} = P^t + B^{[t,t+1]} - D^{[t,t+1]} + I^{[t,t+1]} - O^{[t,t+1]}$$
$$= P^t \left(1 + b^{[t,t+1]} - d^{[t,t+1]} + i^{[t,t+1]} - o^{[t,t+1]}\right)$$

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