The (Very) Fast Growth of Cities in Poor Countries

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(George Washington University)

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Two Papers on the Topic

"**Demography, Urbanization and Development: Rural Push, Urban Pull... and Urban Push?**"

with Luc Christiaensen (World Bank) and Marina Gindelsky (GWU)

"**Malthusian Dynamics and the Rise of the Poor Megacity**"

with Dietrich Vollrath (UH)

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Research Question

- **Fast urban growth in many parts of the developing world:**
  Africa, Central America, South Asia, South-East Asia, etc.
- **Explosion of poor mega-cities:**
  Addis Ababa, Dhaka, Karachi, Kinshasa, Manila, etc.

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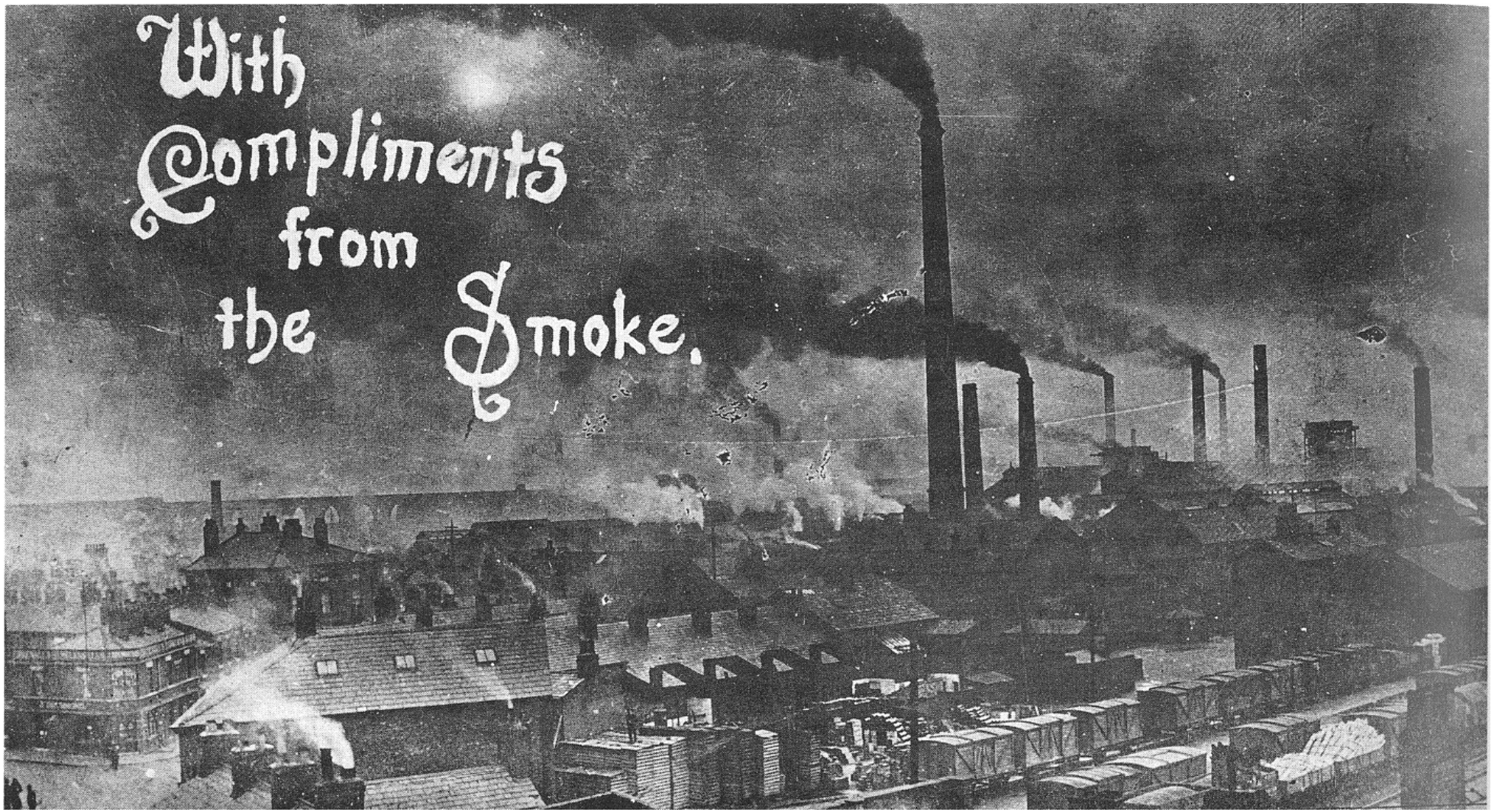
$\Rightarrow$ Where do these cities come from?

$\Rightarrow$ Did these cities grow as a result of migration only?

$\Rightarrow$ Did these cities grow too fast?

London grew by 2% a year in 1800-1910 (pop. x2 every 35 yrs)

Liverpool grew by 3% a year in 1800-1910 (pop. x2 every 24 yrs)



(Source: Postcard of Widnes, close to Liverpool).

New York grew by 4% per year in 1800-1910 (pop. x2 every 18 yrs)

Nairobi grew by 5% a year in 1950-2010 (pop. x2 every 14 yrs)

Dhaka grew by 6% a year in 1950-2010 (pop. x2 every 12 yrs)

Kigali grew by 7% a year in 1950-2010 (pop. x2 every 10 yrs)

Research Question

- **Fast urban growth: migration or urban natural increase?**

What we do:

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What we do:

1. Cities of today's developing world (vs. Industrial Europe):
   High fertility and low mortality $\Rightarrow$ high natural increase
2. Urban natural increase has accelerated the speeds of urban growth and urbanization in developing countries post-1960.
3. This has implications for economic development.
   The fast speed of urban growth leads to urban congestion.

Outline

- Conceptual Framework
- Additional motivating evidence
- Econometric Results
- Discussion

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Conceptual Framework

- Rural-to-urban migration if expected urban wage $>$ rural wage
- **Rural push factors**:
  - **Green revolution**:
    Matsuyama 1992, Gollin, Parente & Rogerson 2002
  - **Rural poverty**:
    Climate shocks: Barrios, Bertinelli & Strobl 2006, Henderson & Storeygard & Deichmann 2013
- **Urban pull factors**:
  - **Industrial revolution**:
    Lewis 1954, Hansen & Prescott 2002, Lucas 2009
  - **Urban bias**:
    Lipton 1977, Ades & Glaeser 1995
  - **Resource Exports, Food Imports**:
    Gollin, Jedwab & Vollrath 2013, Glaeser 2013

Conceptual Framework: Urban Natural Increase

- **Previous (econ) literature**:
  - Rural push or urban pull
  - Urban growth due to migration
  - No role for urban natural increase (except Rogers 1978, Preston 1979, Keyfitz 1980 and Rogers & Williamson 1982)

Conceptual Framework: Urban Natural Increase

- **Previous (econ) literature**:
  - Rural push or urban pull
  - Urban growth due to migration
  - No role for urban natural increase (except Rogers 1978, Preston 1979, Keyfitz 1980 and Rogers & Williamson 1982)
- **Industrial Europe in the 19th century**:
  - **Killer cities:** low fertility, high mortality
  - No urban growth without migration
  - Higher income for the survivors
- **Developing world post-1960**:
  - **Mushroom cities:** high fertility, low mortality
  - Multiplier effect: high rate of urban natural increase
  - This **urban push** accelerates urban growth and produces urban congestion

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- **Additional motivating evidence**
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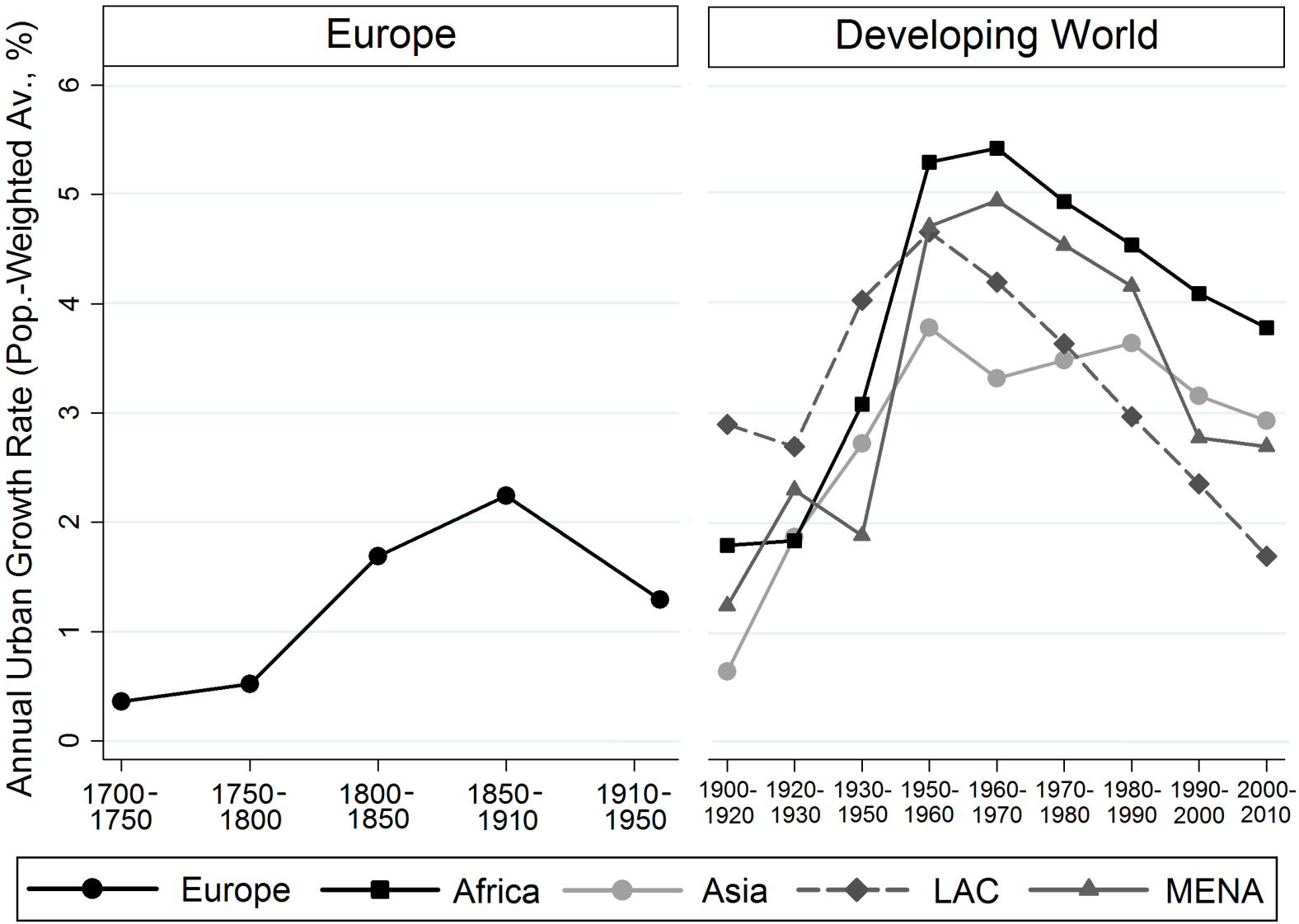
Annual Urban Growth Rates (%) for Europe and the Developing World



Data for 20 Western European countries (incl. the U.S.) and 119 developing countries.

Additional Motivating Evidence

- Equation of urban population growth ($\triangle UPOP$):

$$\Delta UPOP_t = UNI_t * UPOP_t + MIG_t$$

  - UNI = *urban natural increase* (urban birth rate $>$ death rate)
  - MIG = *residual migration* (rural-to-urban and international-to-urban migration, urban reclassification)

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- New historical demographic data compiled for 40 countries:
  - Industrial Europe: 7 countries (1700-1950, every 50 years)
  - Developing world: 33 countries (1960-2010, every 10 years)

    10 in Africa, 11 in Asia, 8 in LAC, 4 in MENA
  - Use census reports (e.g., Ghana 1960), demographic surveys

Urban demographic data for 7 countries of Industrial Europe (1700-1950)

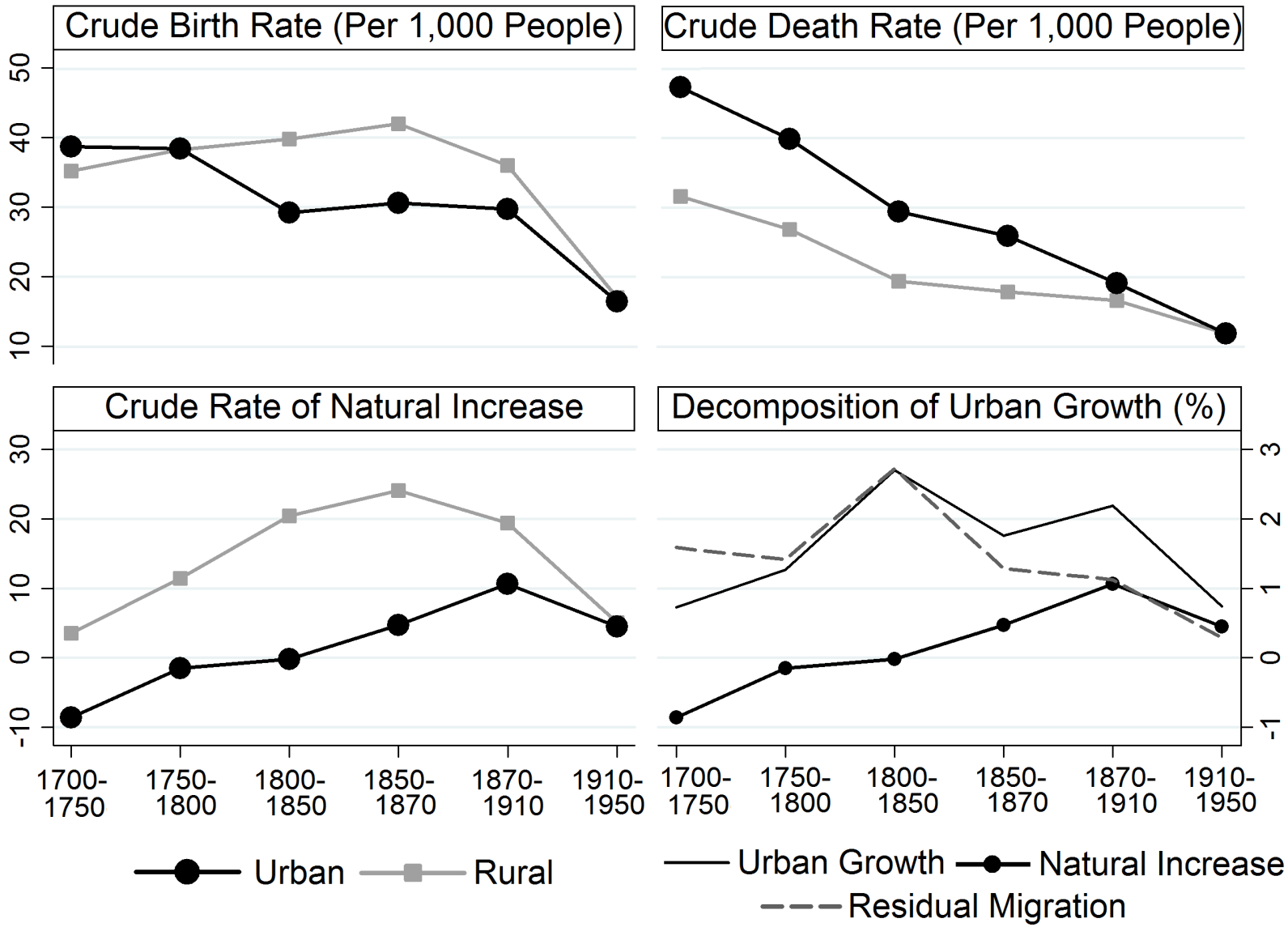
Country	Years	Main Sources
Belgium	1866-1905	(i) *Annuaires Statistiques de la Belgique. Belgium. Ministere de l'Interieur.* Various volumes.
England	1700-1950	(i) Newsholme, A. (1911), *The Declining Birth Rate, Its National and International Significance*. London: Cassell & Company Limited; (ii) Friedlander, D. (1969). Demographic Responses and Population Change, *Demography* 6 (4): 359-381; (iii) Williamson, J. (1990). *Coping with City Growth During the British Industrial Revolution*. Cambridge: Cambridge University Press.
France	1852-1910	(i) *Statistique Annuelle du Mouvement de la Population. France. Statistique Generale.* Various volumes.
Germany	1851-1912	(i) Weber, A. (1899). *The Growth of Cities in the 19th Century.* New York: The MacMillan Company; (ii) Stedman, T. (1904). *Medical Record.* New York: William Wood and Company; (iii) Pollock, H., and W. Morgan (1913). *Modern Cities: Progress of the Awakening for Their Betterment Here and in Europe.* New York: Funk & Wagnalls Company; (iv) Holmes, S. (1921). *A Study of Present Tendencies in the Biological Development of Civilized Mankind.* New York: Harcourt, Brace and Company; (v) Vogele, J. (2000). Urbanization and the Urban Mortality Change in Imperial Germany. *Health & Place* 6: 41-55.
Netherlands	1815-1909	(i) Margaret Sanger (1917). *The Case for Birth Control.* Modern Art Printing Company; (ii) Wintle, M. (2004). *An Economic and Social History of the Netherlands, 1800-1920: Demographic, Economic and Social Transition.* Cambridge: Cambridge University Press.
Sweden	1800-1910	(i) Dyson, T. (2011), The Role of the Demographic Transition in the Process of Urbanization. *Population and Development Review*, 37: 34-54.
United States	1825-1910	(i) Various Census Reports; (ii) Duffy J. (1968). *A History of Public Health in New York City, 1625-1866*. New York: Russell Sage; (iii) Rosenwaike, I. (1972). *Population History of New York City*. Syracuse:

Urban demographic data for 33 developing countries (1960-2010)

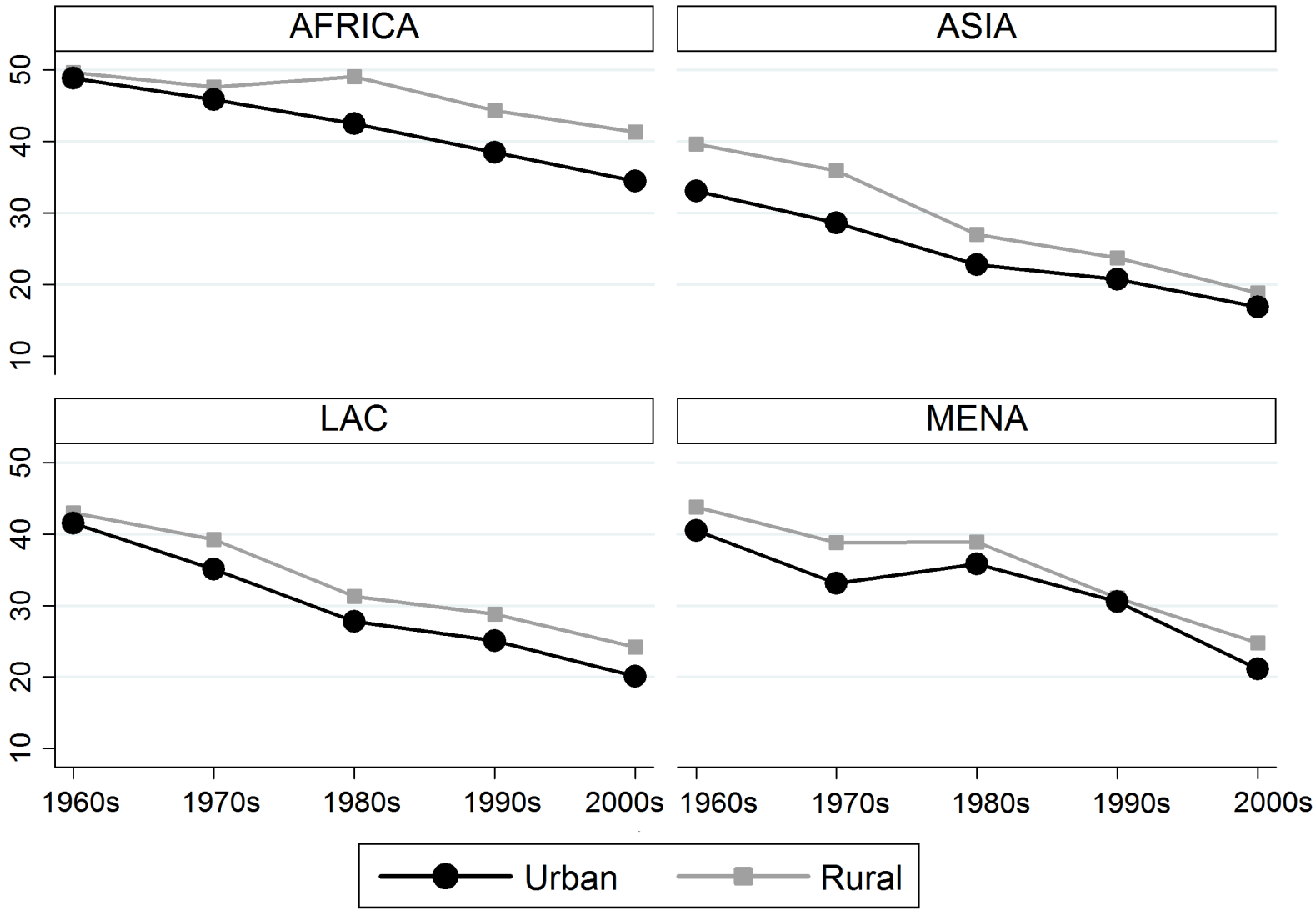
Country	Years	Main Sources
Bangladesh	1965, 1974, 1985, 1991, 2004	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report), CICRED Monograph
Burkina Faso	1960, 1975, 1985, 1996, 2006	Population and Housing Census (Report), Demographic and Health Survey (Report)
CAR	1960, 1975, 1988, 1994-1995, 2003	Population and Housing Census (Report), Demographic and Health Survey (Report), Fertility Survey (Report)
Chile	1960, 1970, 1983, 1995, 2006	UN Statistical Yearbook, Population and Housing Census (Report), CICRED Monograph
China	1965, 1975, 1985, 1995, 2000	UN Statistical Yearbook, Population and Housing Census (Report), CICRED Monograph
Colombia	1965, 1973, 1985, 1990, 2000	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report), CICRED Monograph
Côte d'Ivoire	1965, 1975, 1988, 1994, 1999	Population and Housing Census (Report), Demographic and Health Survey (Report), Fertility Survey (Report)
Ecuador	1968, 1974, 1985, 1993, 2005	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report)
Egypt	1962, 1975, 1985, 1996, 2006	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report), CICRED Monograph
El Salvador	1965, 1975, 1985, 1996, 2006	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report)
Ethiopia	1967, 1974, 1984, 1994, 2000	Population and Housing Census (Report), Demographic and Health Survey (Report), Fertility Survey (Report)
Ghana	1960, 1970, 1984, 1992, 2000	Population and Housing Census (Report), Demographic and Health Survey (Report), CICRED Monograph
Guatemala	1965, 1975, 1980, 1992, 1999	UN Statistical Yearbook, Population and Housing Census (Report), Demographic and Health Survey (Report)

Decomposition of Urban Growth for England (1700-1950)

(Similar results for France, Germany, US, Belgium, Netherlands and Sweden)

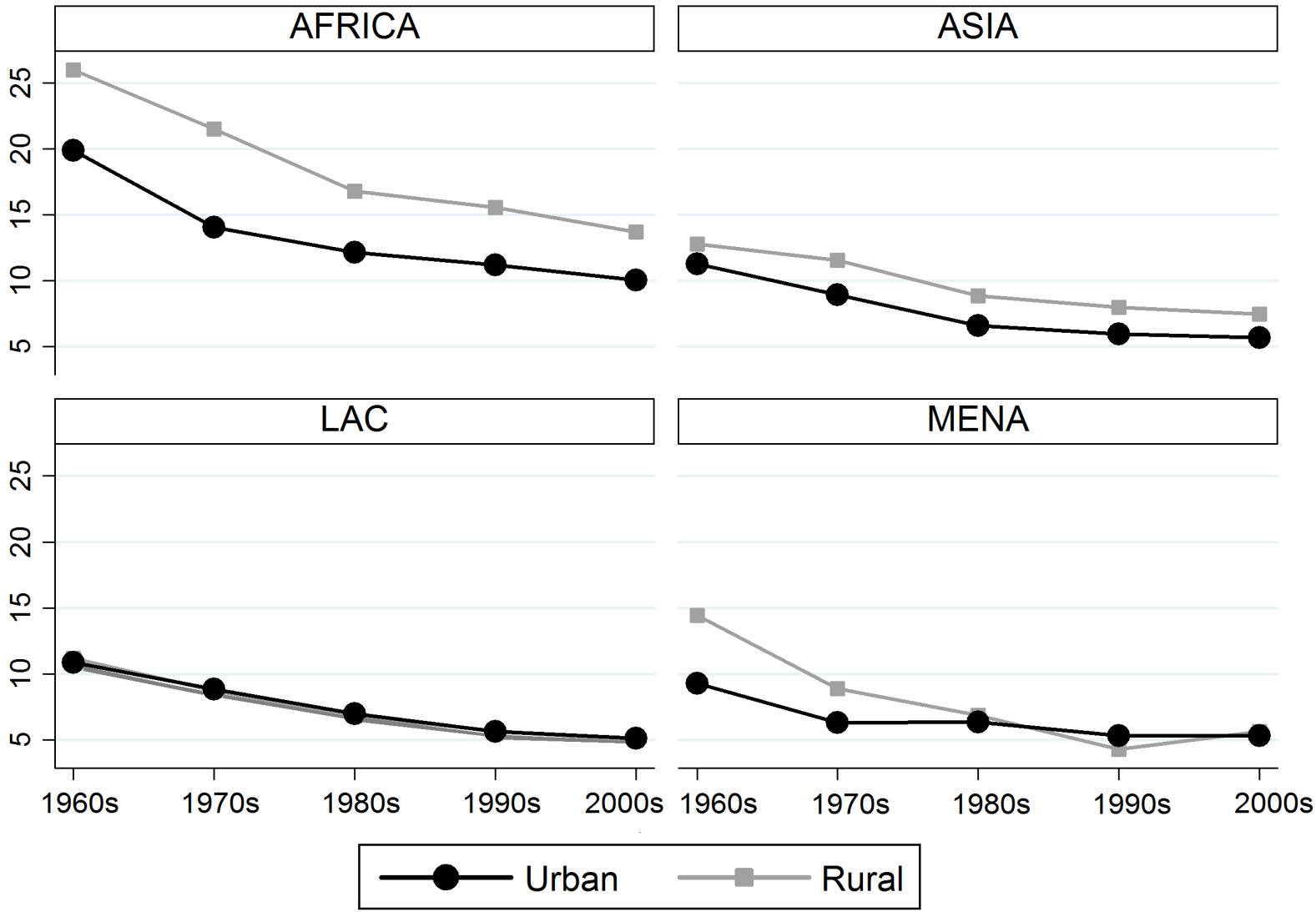


Crude Birth Rates for the Developing World (1960-2010)



LAC = Latin America and the Caribbean, MENA = Middle-East and North Africa

Crude Death Rates for the Developing World (1960-2010)



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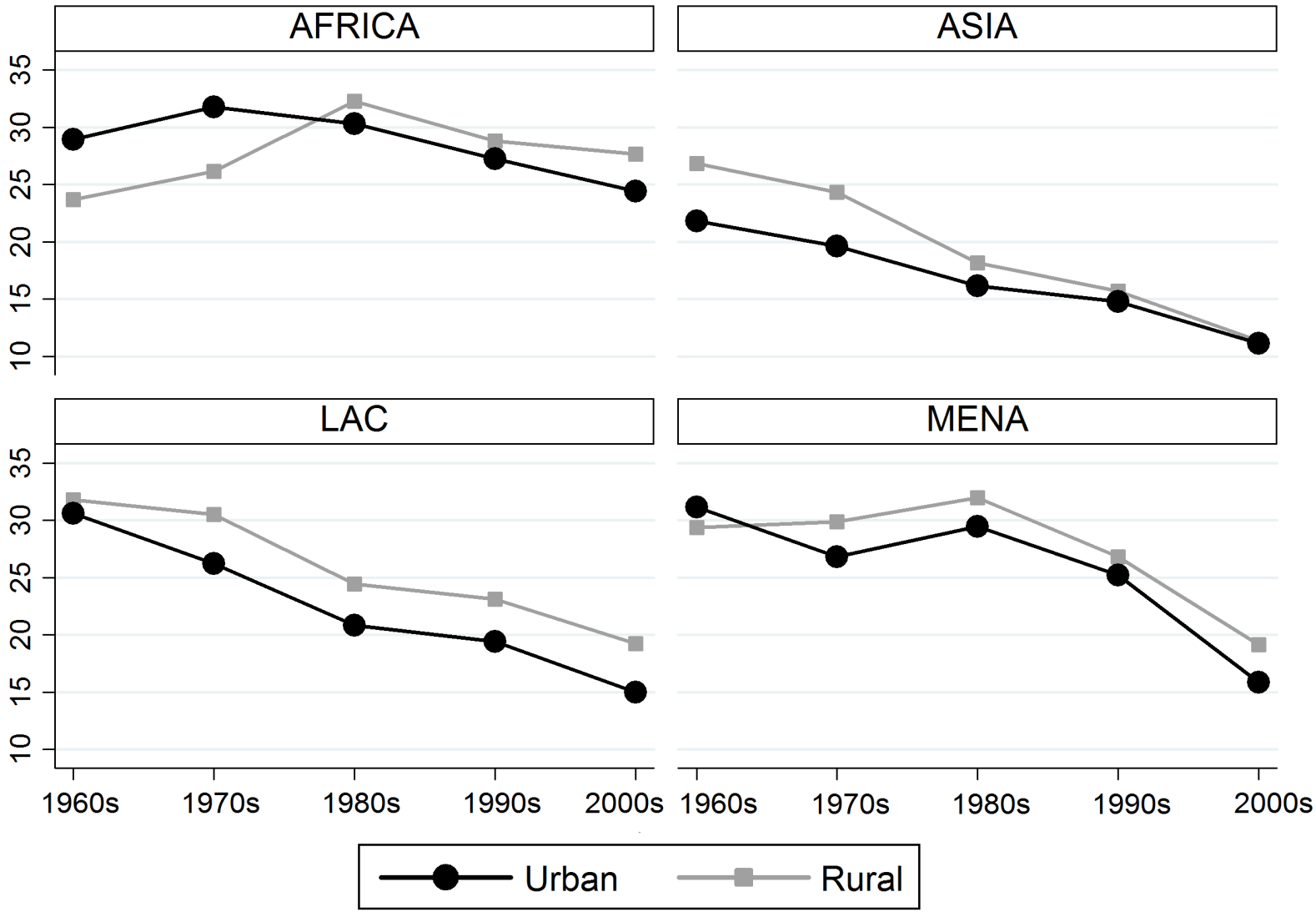
Crude Rates of Natural Increase for the Developing World (1960-2010)



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Natural increase 3% in Africa: What does this really mean?

1950

A family of 5 migrants in 1950...

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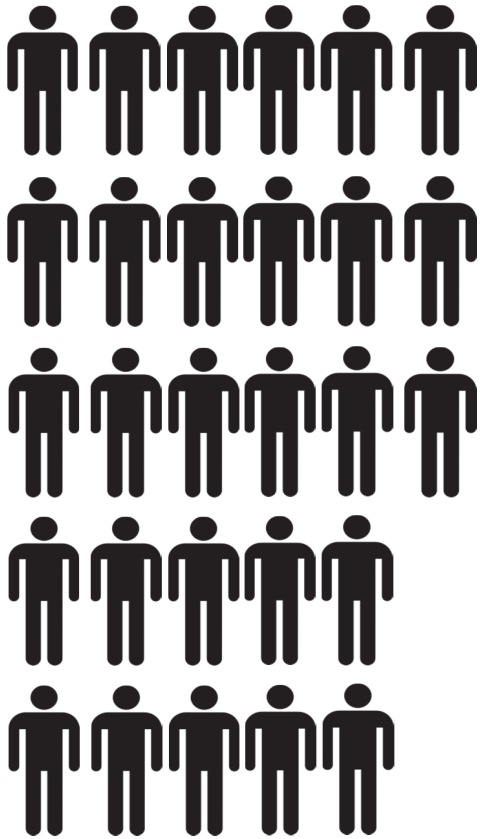
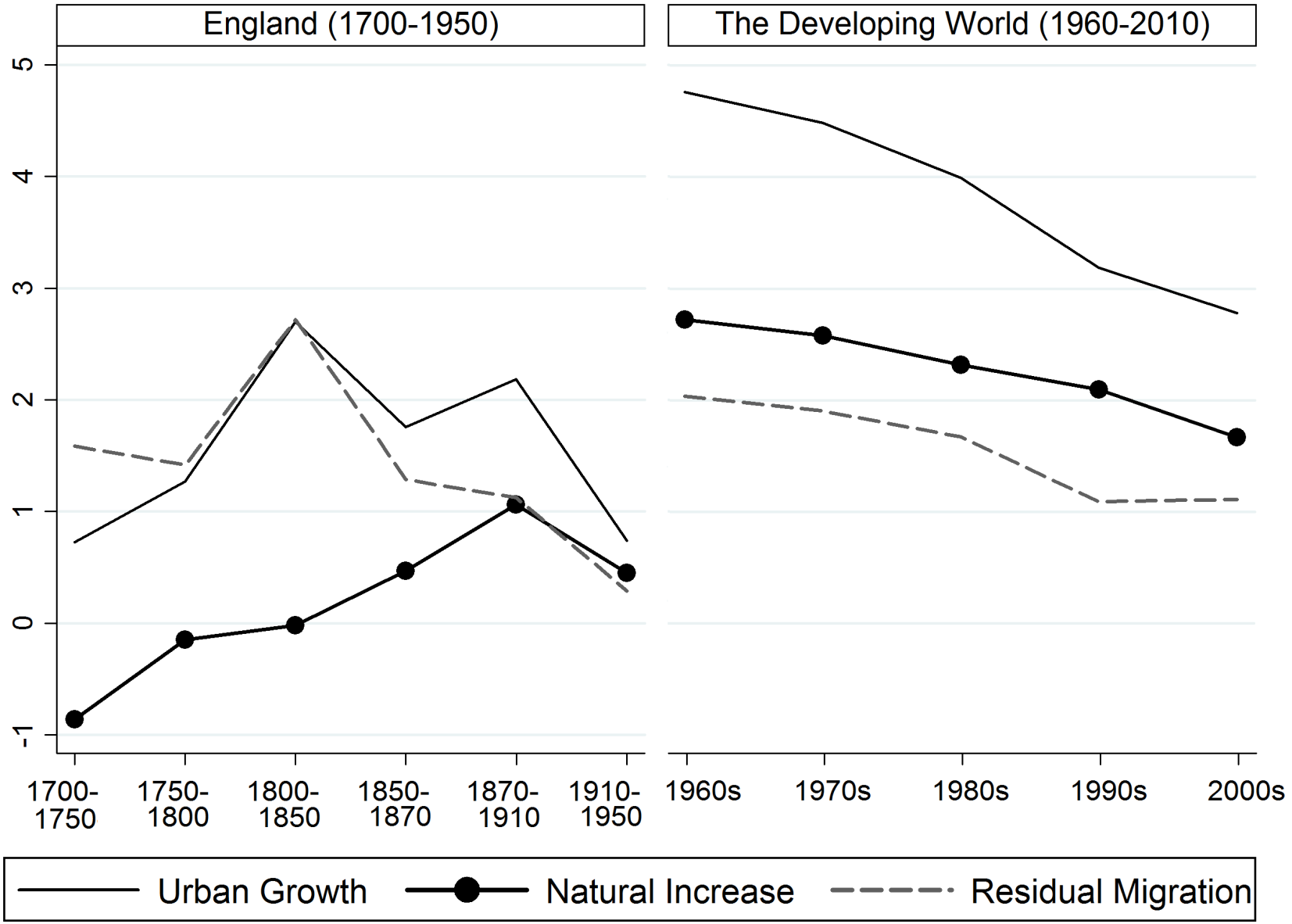
A family of 5 migrants in 1950...

... becomes a family of 28 urban residents in 2010.

2010



Decomposition of Urban Growth for the Two Developing Worlds



Additional Motivating Evidence: Summary

- **Killer cities** of Industrial Europe:
  - Annual urban growth: 2%
  - Residual migration 1.5%, natural increase 0.5%
  - The urban population doubles every **35** years
- **Mushroom cities** of the Developing World:
  - Annual urban growth: 4%
  - Residual migration 1.5%, natural increase 2.5%
  - The urban population doubles every **17** years

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  - Annual urban growth: 4%
  - Residual migration 1.5%, natural increase 2.5%
  - The urban population doubles every **17** years
- **Urbanization rate** increases if urban growth $>$ rural growth:
  - Urban growth: absolute growth. Urbanization: relative growth.
  - Europe: fast rural growth, low urban natural increase.
  - Developing world: fast rural growth, high urban natural increase

Econometric Considerations

- **Decomposition analysis:**

$$\frac{\Delta UPOP_t}{UPOP_t} = \beta UNI_t + \alpha \frac{MIG_t}{UPOP_t}$$

Coefficient of UNI $\beta = 1$ (1 urban newborn $\rightarrow$ 1 urban resident)

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Coefficient of UNI $\beta = 1$ (1 urban newborn $\rightarrow$ 1 urban resident)

- **Econometric analysis (panel for 33 countries x 5 decades):**
- Test of adjustment mechanisms ($\beta < 1$?): (i) natural increase reduces migration; (ii) migration reduces natural increase?
- Add country and decade fixed effects, controls
- Test for causality using two identification strategies
- Regressions for other outcomes: change in urbanization rate, urban congestion

Preview of the Results

- Urban natural increase has a effect of exactly 1 on the speed of urban growth (we observe no reduction in migration or urban fertility as a result of urban natural increase)
- Urban natural increase increased urbanization rates, conditional on income. This leads to "urbanization without growth".
- Urban natural increase, not migration, is associated with urban congestion (higher slum share and dependency ratios).

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TABLE 1: WORLD'S LARGEST MEGACITIES (MILLIONS), 1700-2015

Rank	1700		1900		1950	
1	Istanbul	0.7	London	6.5	New York	12.3
2	Tokyo	0.7	New York	4.2	Tokyo	11.3
3	Beijing	0.7	Paris	3.3	London	8.4
4	London	0.6	Berlin	2.7	Paris	6.3
5	Paris	0.5	Chicago	1.7	Moscow	5.4
6	Ahmedabad	0.4	Vienna	1.7	Buenos Aires	5.1
7	Osaka	0.4	Tokyo	1.5	Chicago	5.0
8	Isfahan	0.4	St. Petersburg	1.4	Kolkata	4.5
9	Kyoto	0.4	Manchester	1.4	Shanghai	4.3
10	Hangzhou	0.3	Philadelphia	1.4	Osaka	4.1
11	Amsterdam	0.2	Birmingham	1.2	Los Angeles	4.0
12	Naples	0.2	Moscow	1.1	Berlin	3.3
13	Guangzhou	0.2	Beijing	1.1	Philadelphia	3.1
14	Aurangabad	0.2	Kolkata	1.1	Rio de Janeiro	3.0
15	Lisbon	0.2	Boston	1.1	St. Petersburg	2.9
16	Cairo	0.2	Glasgow	1.0	Mexico	2.9
17	Xian	0.2	Osaka	1.0	Mumbai	2.9
18	Seoul	0.2	Liverpool	0.9	Detroit	2.8
19	Dacca	0.2	Istanbul	0.9	Boston	2.6
20	Ayutthaya	0.2	Hamburg	0.9	Cairo	2.5
21	Venice	0.1	Buenos Aires	0.8	Tianjin	2.5
22	Suzhou	0.1	Budapest	0.8	Manchester	2.4
23	Nanking	0.1	Mumbay	0.8	Sao Paulo	2.3
24	Rome	0.1	Ruhr	0.8	Birmingham	2.2
25	Smyrna	0.1	Rio de Janeiro	0.7	Shenyang	2.1
26	Srinagar	0.1	Warsaw	0.7	Roma	1.9
27	Palermo	0.1	Tientsin	0.7	Milano	1.9
28	Moscow	0.1	Shanghai	0.6	San Francisco	1.9
29	Milan	0.1	Newcastle	0.6	Barcelona	1.8
30	Madrid	0.1	St. Louis	0.6	Glasgow	1.8

Sources: Chandler (1987) and United Nations (2014).

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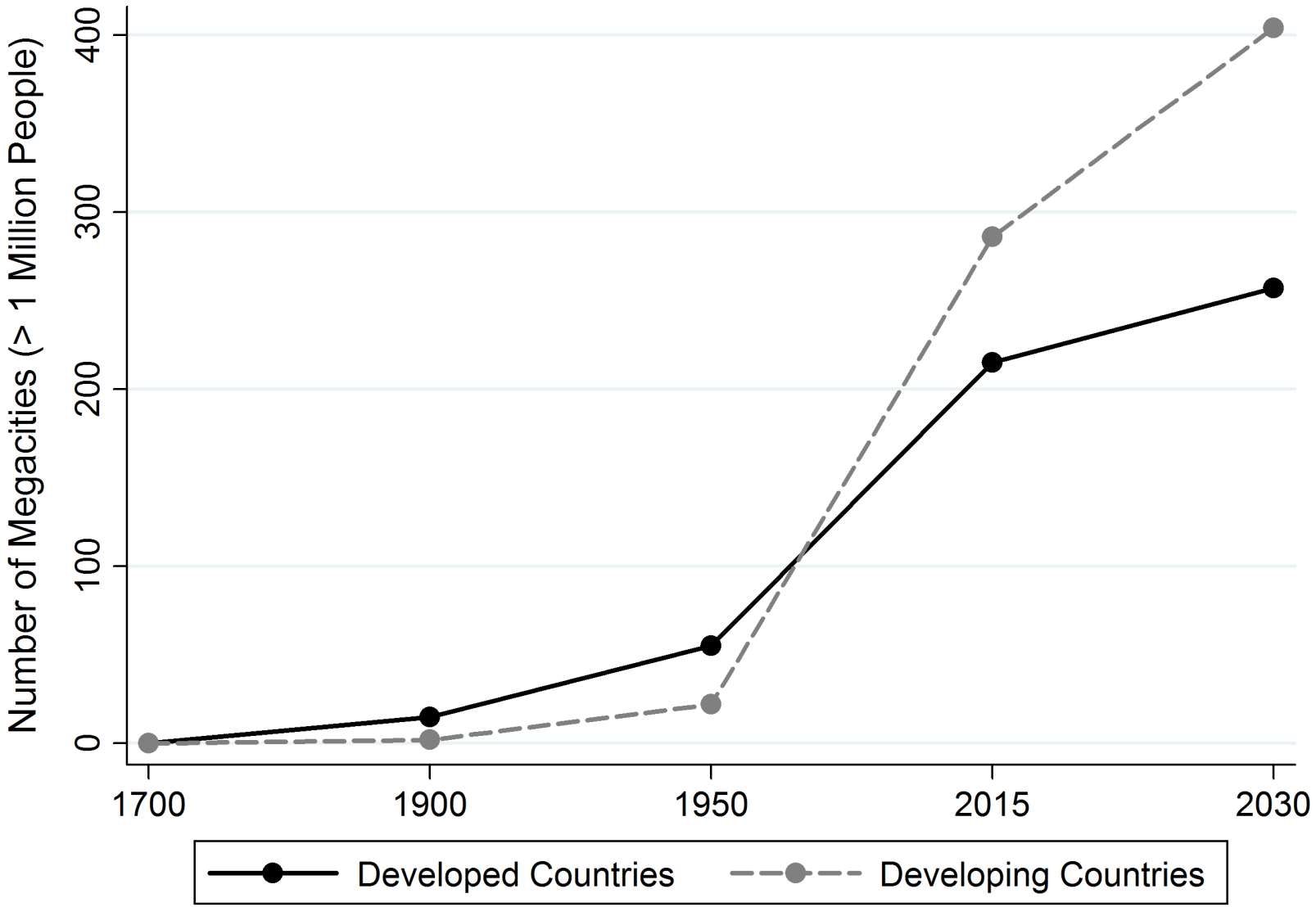
Rank	1700		1900		1950		2015	
1	Istanbul	0.7	London	6.5	New York	12.3	Tokyo	38.0
2	Tokyo	0.7	New York	4.2	Tokyo	11.3	Delhi	25.7
3	Beijing	0.7	Paris	3.3	London	8.4	Shanghai	23.7
4	London	0.6	Berlin	2.7	Paris	6.3	Sao Paulo	21.1
5	Paris	0.5	Chicago	1.7	Moscow	5.4	Mumbay	21.0
6	Ahmedabad	0.4	Vienna	1.7	Buenos Aires	5.1	Mexico	21.0
7	Osaka	0.4	Tokyo	1.5	Chicago	5.0	Beijing	20.4
8	Isfahan	0.4	St. Petersburg	1.4	Kolkata	4.5	Osaka	20.2
9	Kyoto	0.4	Manchester	1.4	Shanghai	4.3	Cairo	18.8
10	Hangzhou	0.3	Philadelphia	1.4	Osaka	4.1	New York	18.6
11	Amsterdam	0.2	Birmingham	1.2	Los Angeles	4.0	Dhaka	17.6
12	Naples	0.2	Moscow	1.1	Berlin	3.3	Karachi	16.6
13	Guangzhou	0.2	Beijing	1.1	Philadelphia	3.1	Buenos Aires	15.2
14	Aurangabad	0.2	Kolkata	1.1	Rio de Janeiro	3.0	Kolkata	14.9
15	Lisbon	0.2	Boston	1.1	St. Petersburg	2.9	Istanbul	14.2
16	Cairo	0.2	Glasgow	1.0	Mexico	2.9	Chongqing	13.3
17	Xian	0.2	Osaka	1.0	Mumbai	2.9	Lagos	13.1
18	Seoul	0.2	Liverpool	0.9	Detroit	2.8	Manila	12.9
19	Dacca	0.2	Istanbul	0.9	Boston	2.6	Rio de Janeiro	12.9
20	Ayutthaya	0.2	Hamburg	0.9	Cairo	2.5	Guangzhou	12.5
21	Venice	0.1	Buenos Aires	0.8	Tianjin	2.5	Los Angeles	12.3
22	Suzhou	0.1	Budapest	0.8	Manchester	2.4	Moscow	12.2
23	Nanking	0.1	Mumbay	0.8	Sao Paulo	2.3	Kinshasa	11.6
24	Rome	0.1	Ruhr	0.8	Birmingham	2.2	Tianjin	11.2
25	Smyrna	0.1	Rio de Janeiro	0.7	Shenyang	2.1	Paris	10.8
26	Srinagar	0.1	Warsaw	0.7	Roma	1.9	Shenzhen	10.7
27	Palermo	0.1	Tientsin	0.7	Milano	1.9	Jakarta	10.3
28	Moscow	0.1	Shanghai	0.6	San Francisco	1.9	London	10.3
29	Milan	0.1	Newcastle	0.6	Barcelona	1.8	Bangalore	10.1
30	Madrid	0.1	St. Louis	0.6	Glasgow	1.8	Lima	9.9

Sources: Chandler (1987) and United Nations (2014).

Number of Megacities in Developed and Developing Countries



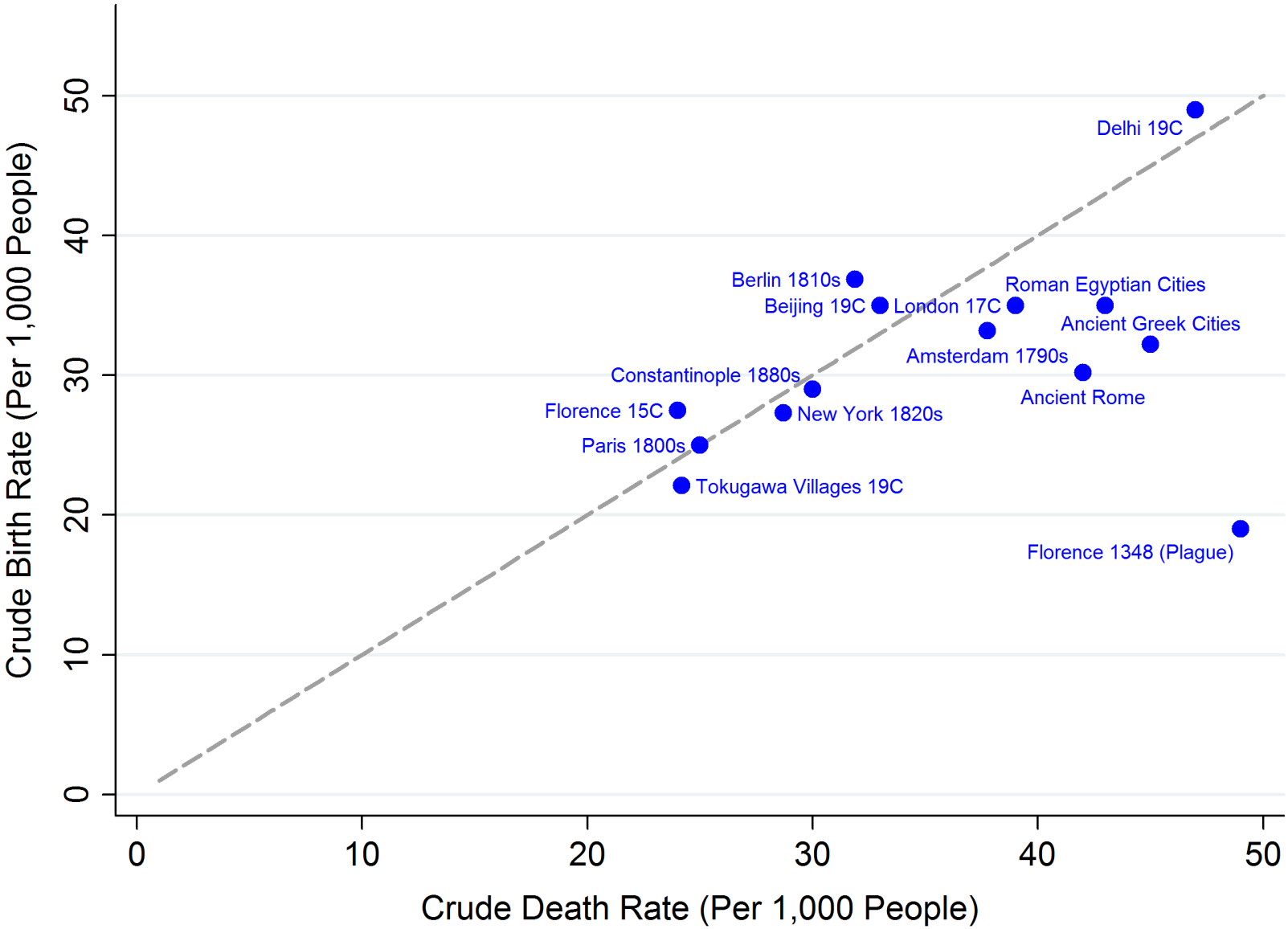
Developed countries = PCGDP (PPP cst 2011 intl \$) > \$12,476 in 2013

TABLE 2: PROJECTED ANNUAL GROWTH RATES FOR MEGACITIES (%), 2015-2030

Rank	(1) Among Top 30 Cities in 2015		(2) Among All Cities $\geq$ 5 Millions in 2015	
1	Lagos	4.2	Dar es Salaam	5.1
2	Kinshasa	3.7	Luanda	4.4
3	Dhaka	3.0	Lagos	4.2
4	Karachi	2.7	Kinshasa	3.7
5	Bangalore	2.6	Abidjan	3.2
6	Guangzhou	2.3	Khartoum	3.1
7	Delhi	2.3	Dhaka	3.0
8	Beijing	2.1	Surat	2.9
9	Jakarta	2.0	Karachi	2.7
10	Mumbay	1.9	Lahore	2.7
11	Tianjin	1.8	Suzhou	2.6
12	Chongqing	1.8	Bangalore	2.6
13	Cairo	1.8	Baghdad	2.6
14	Manila	1.8	Ahmadabad	2.4
15	Shanghai	1.8	Hyderabad	2.4
16	Kolkata	1.7	Pune	2.3
17	Lima	1.4	Guangzhou	2.3
18	Shenzhen	1.1	Chennai	2.3
19	Istanbul	1.1	Delhi	2.3
20	Mexico	0.9	Ho Chi Minh	2.3
21	Buenos Aires	0.7	Hangzhou	2.2
22	London	0.7	Kuala Lumpur	2.2
23	Sao Paulo	0.7	Beijing	2.1
24	Rio de Janeiro	0.6	Yangon	2.1
25	Paris	0.6	Jakarta	2.0
26	Los Angeles	0.5	Chengdu	2.0
27	New York	0.5	Nanjing	2.0
28	Moscow	0.0	Mumbai	1.9
29	Osaka	-0.1	Xian	1.9
30	Tokyo	-0.1	Cairo	1.8

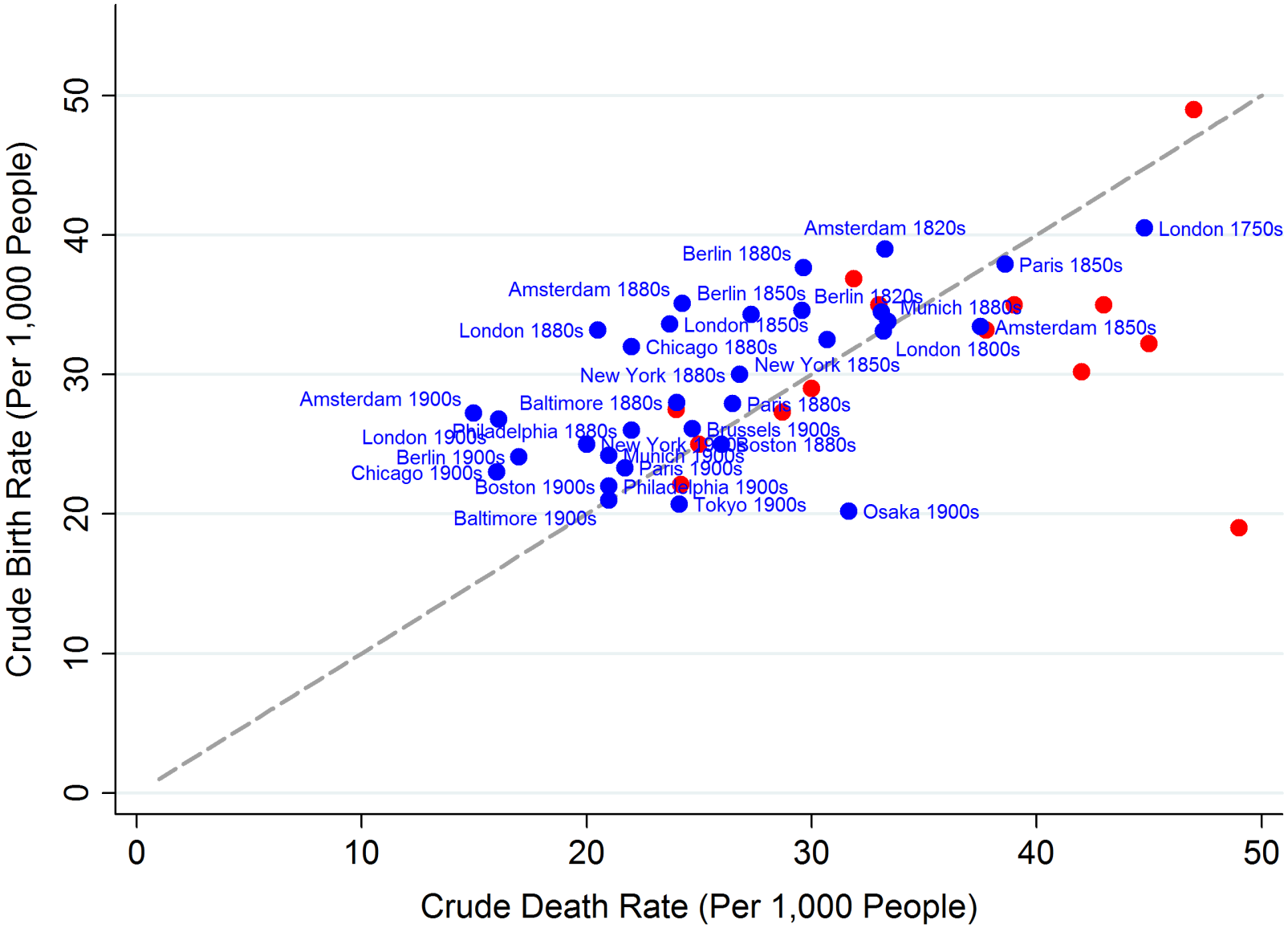
Notes: This table shows the fastest-growing megacities among: (1) the top 30 cities in 2015, and (2) the cities of at least 5 million inhabitants in 2015. *Sources:* Chandler (1987) and United Nations (2014).

Pre-Industrial Cities (Pre-20th Century)



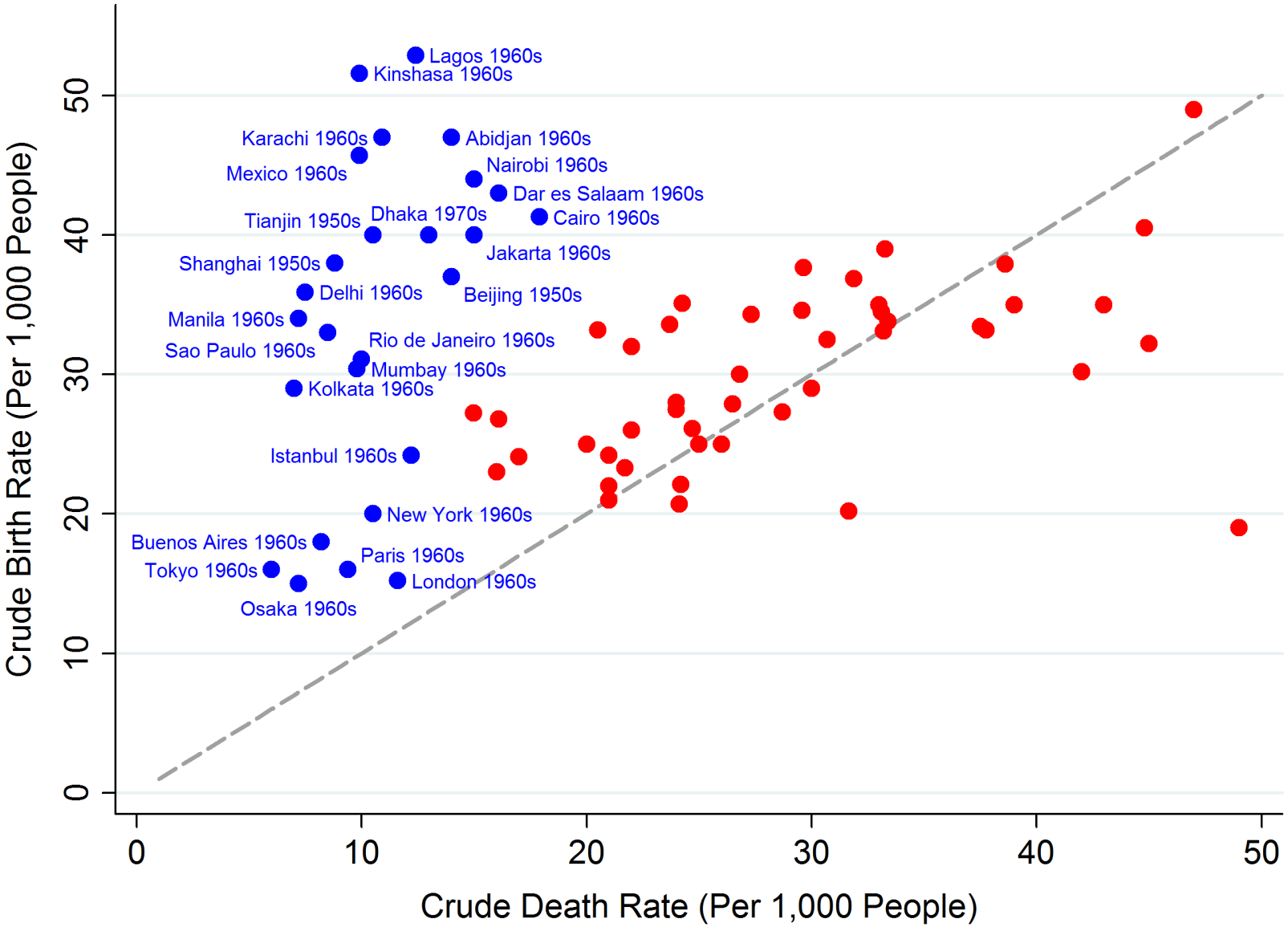
Data for 14 cities

Industrial Cities (18th-19th Century)



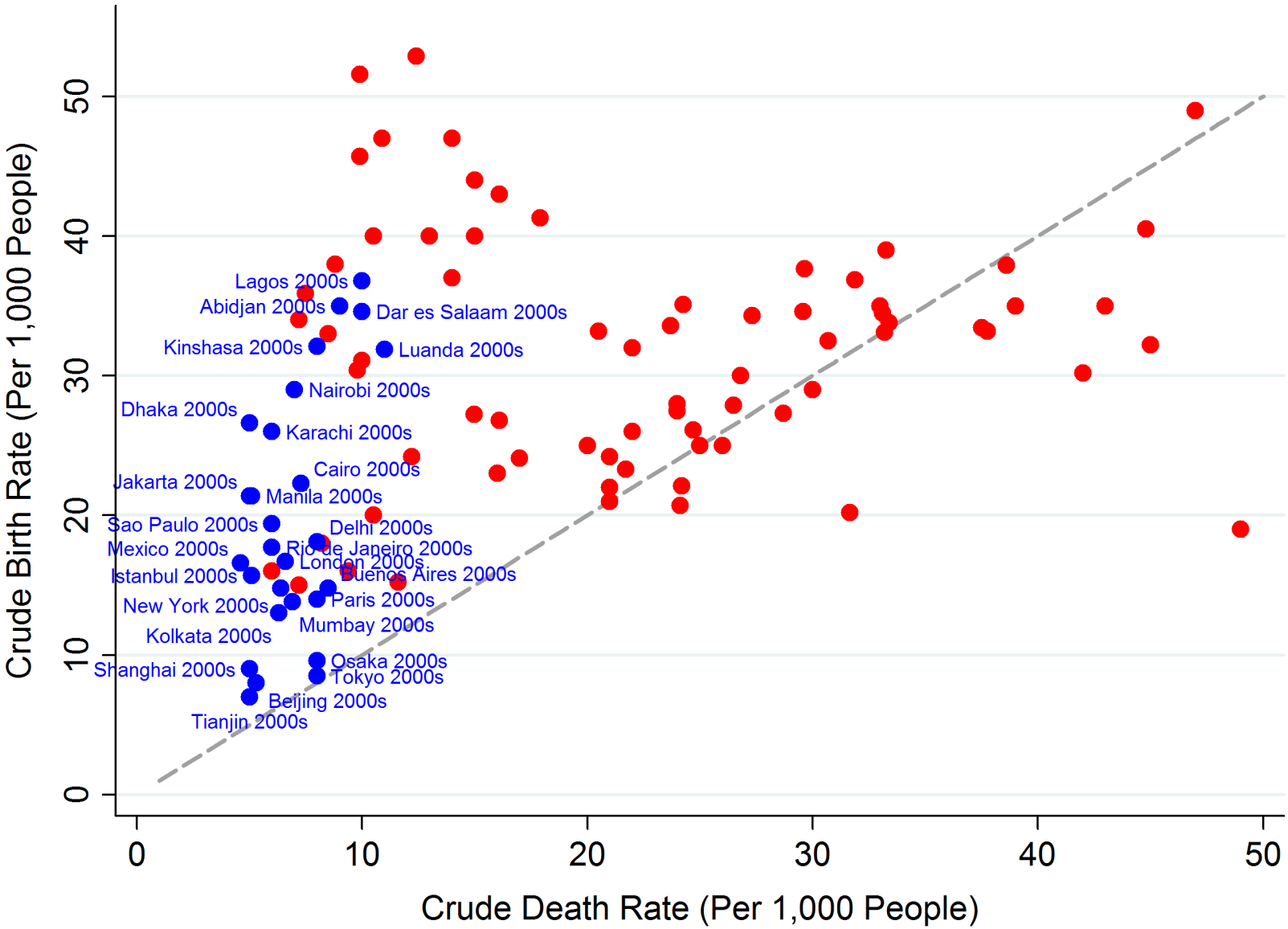
Data for 33 city-decade observations

Megacities for the 1960s



Data for 26 megacities

Megacities for the 2000s



Data for 27 cities

Theory

- We combine models of urban agglomeration and congestion (a la Duranton & Puga 2004) with models of endogenous population (a la Galor & Weil 1999).

- Multiple equilibria:

  Megacities in developed and successful developing countries, where agglomeration effects may dominate congestion effects

  Megacities in poor countries, where small agglomeration effects and large congestion effects, but cities keep growing because fertility remains high (due to low income)

Discussion

- Urban natural increase has strongly accelerated urban growth and produced urbanization *without* growth post-1960.

- No adjustment mechanisms even if urban congestion:

  Migration remains positive

  $\rightarrow$ Fast rural natural increase, rural congestion effects too (not shown). What matters is the urban-rural utility gap

  Urban fertility remains high

  $\rightarrow$ Trade-off between child quantity and quality

- If these cities grew too fast, what can be done about it?

  Less an issue if high economic growth (NYC in 19th century: 4% per year, but economic resources to minimize congestion)

Slum in the Lower East Side (NYC), Early 20th Century

Discussion - Public Policy

- Many cities will keep growing at a fast pace in the future.

  $\Rightarrow$ Reduce urban fertility: urban family planning.

  $\Rightarrow$ Promote urban planning (but limited fiscal resources and institutional failures: see Glaeser 2013):

  - Authoritarian approach (Baron Haussmann in Paris, China)
  - Creative destruction (Great fires: Chicago 1871, Boston 1872)
  - Decentralized approach - housing promoters in the U.S.
  - Resettlement programs - expensive, prone to corruption
  - Development of secondary towns