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FACE - Faculdade de Ciências Econômicas
Cedeplar - Centro de Desenvolvimento e Planejamento Regional

Explosão Populacional no Brasil e no Mundo: mito ou realidade?

Eduardo L.G. Rios-Neto

Campinas, 27 de setembro de 2013

- **ESQUEMA DA APRESENTAÇÃO:**

I. Conceitos Básicos

II. A Transição Demográfica

III. Efeitos de "r" sobre o Tamanho Populacional

IV. Efeitos de "r" sobre a Estrutura Etária

V. Algumas incógnitas sobre o futuro demográfico e implicações com o desenvolvimento

- Equação Balanceadora:

$$P_n = P_0 + B_t - D_t + I_t - E_t$$, onde:

P_n : população num instante n;

P_0 : população inicial, instante 0;

B_t : nascimentos no período t (t = n – 0);

D_t : óbitos no período t (t = n – 0);

I_t : imigrantes no período t;

E_t : emigrantes no período t;

O conceito de população fechada:

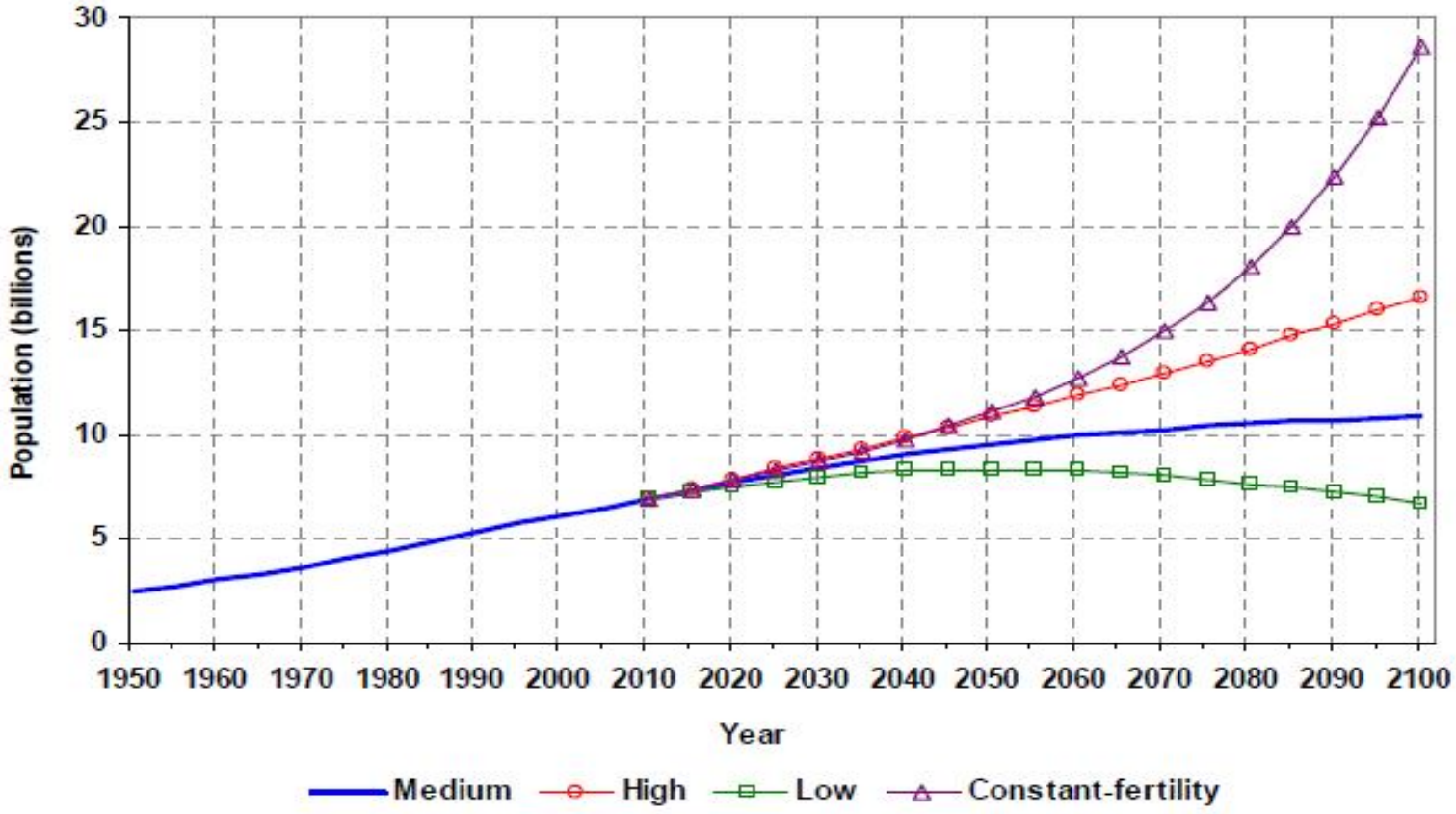
It e Et são iguais a zero.

- Ao se dividir os dois lados da Balanceada Fechada por P_0 e tirar o logaritmo natural temos...
- Equação Balanceadora Fechada em crescimento entre t e t-1:
- **r = TBN – TBM**
- **TBN = Taxa Bruta de Natalidade** = Nascimentos/População – Indicador puro é a Taxa de Fecundidade Total
- **TBM = Taxa Bruta de Mortalidade**= Mortes/População – Indicador puro é a Expectativa de Vida ao Nascer

- **TAXA DE FECUNDIDADE TOTAL – TFT**

- **EXPECTATIVA DE VIDA AO NASCER – e_0**

Figure 1. Population of the world, 1950-2100, according to different projections and variants



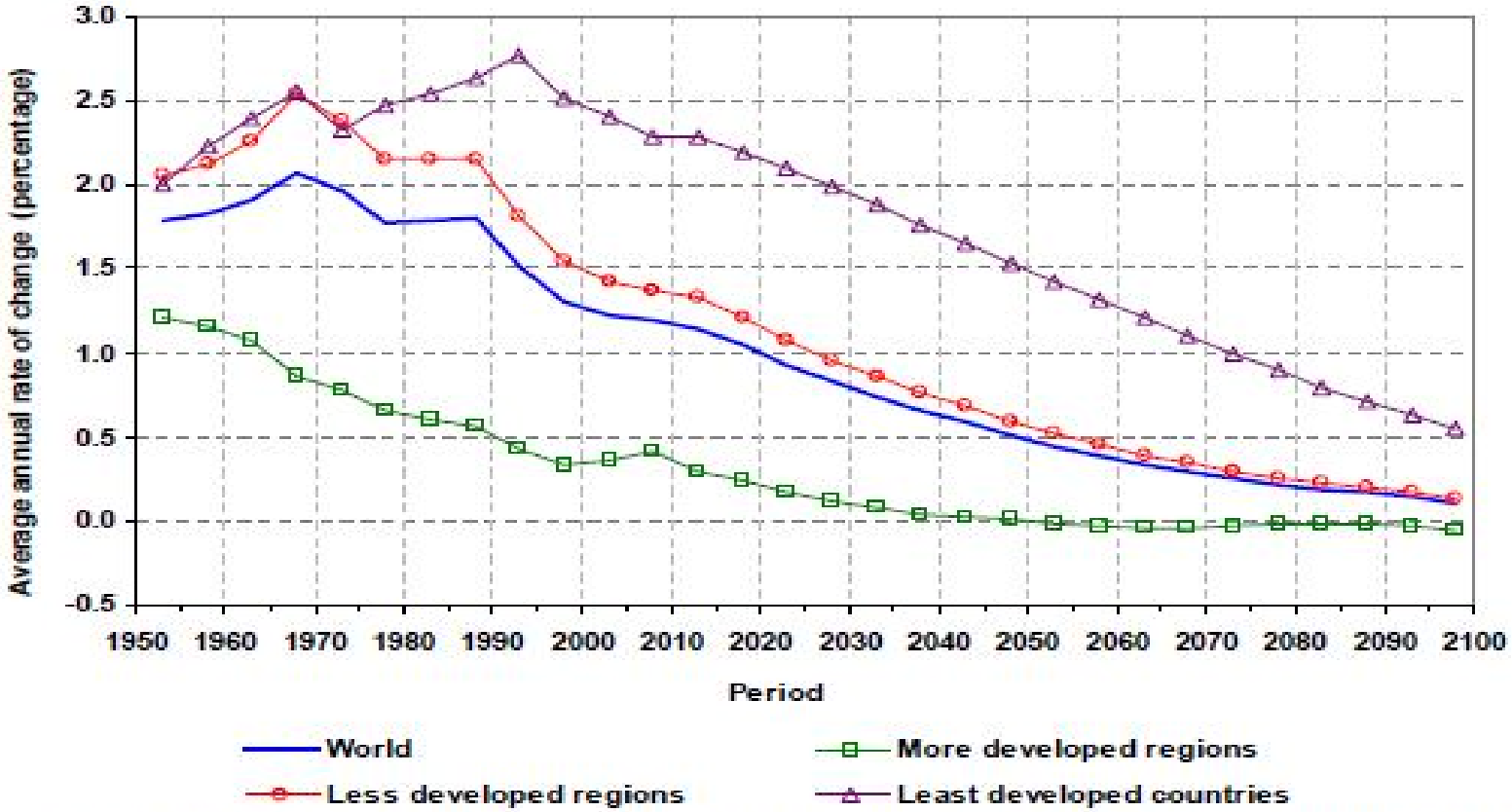
Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

TABLE I.1. POPULATION OF THE WORLD, DEVELOPMENT GROUPS AND MAJOR AREAS, 1950, 1980, 2013. 2050 AND 2100, ACCORDING TO DIFFERENT VARIANTS

	Population (millions)			*Population in 2050 (millions)*				*Population in 2100 (millions)*			
Development group or major area	*1950*	*1980*	*2013*	*Low*	*Medium*	*High*	*Constant-fertility*	*Low*	*Medium*	*High*	*Constant-fertility*
World	2 526	4 449	7 162	8 342	9 551	10 868	11 089	6 750	10 854	16 641	28 646
More developed regions	813	1 083	1 253	1 149	1 303	1 470	1 268	801	1 284	1 960	1 152
Less developed regions	1 713	3 366	5 909	7 193	8 248	9 398	9 821	5 949	9 570	14 682	27 494
Least developed countries	195	393	898	1 594	1 811	2 043	2 552	1 944	2 928	4 266	13 590
Other less developed countries	1 518	2 973	5 011	5 599	6 437	7 355	7 269	4 005	6 642	10 416	13 904
Africa	229	478	1 111	2 119	2 393	2 686	3 210	2 826	4 185	6 007	17 221
Asia	1 396	2 634	4 299	4 482	5 164	5 912	5 805	2 739	4 712	7 558	8 971
Europe	549	695	742	622	709	804	673	383	639	1 005	508
Latin America and the Caribbean	168	364	617	674	782	902	885	420	736	1 215	1 298
Northern America	172	255	355	395	446	500	453	335	513	754	535
Oceania	13	23	38	50	57	64	62	46	70	102	114

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

Figure I.1. Average annual rate of population change for the world and development groups, 1950-2100



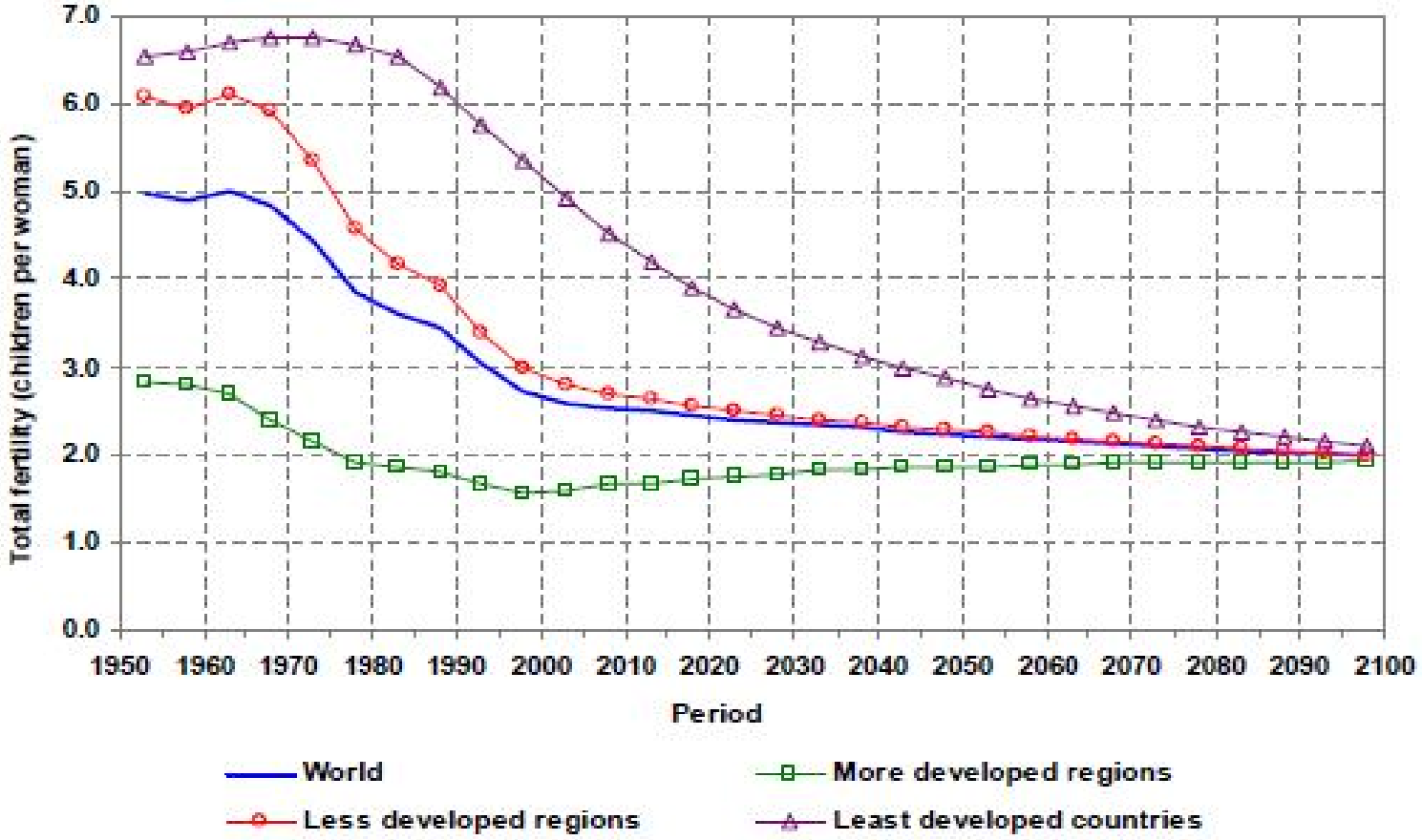
Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

TABLE I.3. AVERAGE ANNUAL RATE OF POPULATION CHANGE FOR THE WORLD, DEVELOPMENT GROUPS AND MAJOR AREAS, FOR SELECTED PERIODS AND DIFFERENT VARIANTS (PERCENTAGE)

				2013-2050				2050-2100			
Development group or major area	*1950-2013*	*1950-1980*	*1980-2013*	*Low*	*Medium*	*High*	*Constant-fertility*	*Low*	*Medium*	*High*	*Constant-fertility*
World	1.65	1.89	1.44	0.41	0.78	1.13	1.18	-0.69	0.26	1.11	2.20
More developed regions	0.69	0.96	0.44	-0.23	0.11	0.43	0.03	-0.97	-0.03	0.82	-0.25
Less developed regions	1.97	2.25	1.71	0.53	0.90	1.25	1.37	-0.65	0.30	1.15	2.41
Least developed countries	2.42	2.33	2.51	1.55	1.89	2.22	2.82	0.14	0.96	1.71	4.03
Other less developed countries	1.90	2.24	1.58	0.30	0.68	1.04	1.01	-0.95	0.06	0.96	1.54
Africa	2.51	2.46	2.55	1.75	2.07	2.39	2.87	0.33	1.12	1.84	3.95
Asia	1.79	2.12	1.48	0.11	0.50	0.86	0.81	-1.27	-0.18	0.76	1.10
Europe	0.48	0.78	0.20	-0.48	-0.12	0.22	-0.26	-1.23	-0.21	0.70	-0.67
Latin America and the Caribbean	2.07	2.58	1.60	0.24	0.64	1.03	0.98	-1.24	-0.12	0.88	1.01
Northern America	1.16	1.32	1.01	0.29	0.62	0.93	0.66	-0.57	0.28	1.05	0.36
Oceania	1.76	1.98	1.55	0.74	1.07	1.38	1.31	-0.42	0.41	1.17	1.39

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

Figure II.1. Total fertility trajectories for the world and development groups, 1950-2100 (medium variant)



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

TABLE II.1. ESTIMATED AND PROJECTED TOTAL FERTILITY FOR THE WORLD, DEVELOPMENT GROUPS AND MAJOR AREAS, FOR SELECTED PERIODS AND DIFFERENT VARIANTS

	Total fertility (average number of children per woman)										
				2045-2050				*2095-2100*			
	1970-1975	*1990-1995*	*2005-2010*	*Low*	*Medium*	*High*	*Constant-Fertility*	*Low*	*Medium*	*High*	*Constant-Fertility*
World	4.44	3.04	2.53	1.78	2.24	2.71	3.28	1.51	1.99	2.47	4.61
More developed regions	2.15	1.67	1.66	1.36	1.85	2.35	1.74	1.43	1.93	2.43	1.84
Less developed regions	5.36	3.38	2.69	1.83	2.29	2.76	3.45	1.52	1.99	2.48	4.71
Least developed countries	6.75	5.77	4.53	2.40	2.87	3.34	5.17	1.63	2.11	2.60	5.76
Other less developed countries	5.18	3.08	2.40	1.62	2.09	2.57	2.85	1.45	1.93	2.42	3.73
Africa	6.66	5.71	4.88	2.61	3.09	3.58	5.30	1.64	2.12	2.61	5.71
Asia	4.99	2.96	2.25	1.39	1.89	2.38	2.58	1.35	1.85	2.35	3.16
Europe	2.17	1.57	1.54	1.31	1.80	2.30	1.56	1.39	1.89	2.40	1.63
Latin America and the Caribbean	5.02	3.02	2.30	1.34	1.83	2.33	2.44	1.35	1.85	2.34	2.70
Northern America	2.01	2.00	2.02	1.47	1.97	2.47	2.02	1.48	1.98	2.48	2.03
Oceania	3.23	2.49	2.47	1.60	2.09	2.59	2.70	1.41	1.91	2.40	3.22

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.

NOTE: Only countries or areas with 90,000 persons or more in 2013 are considered.

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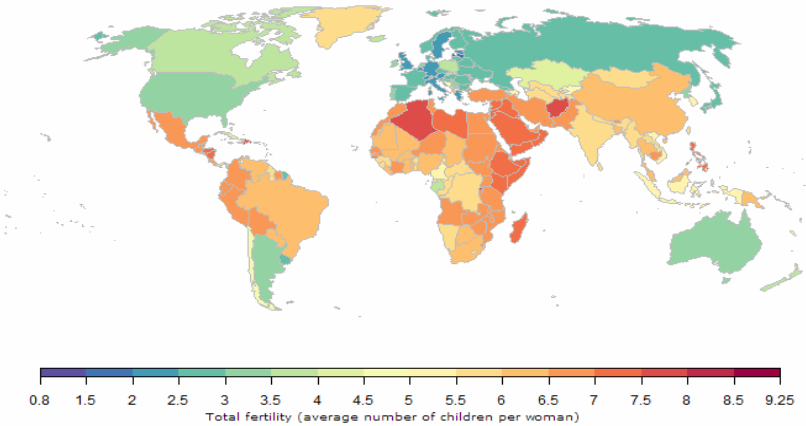
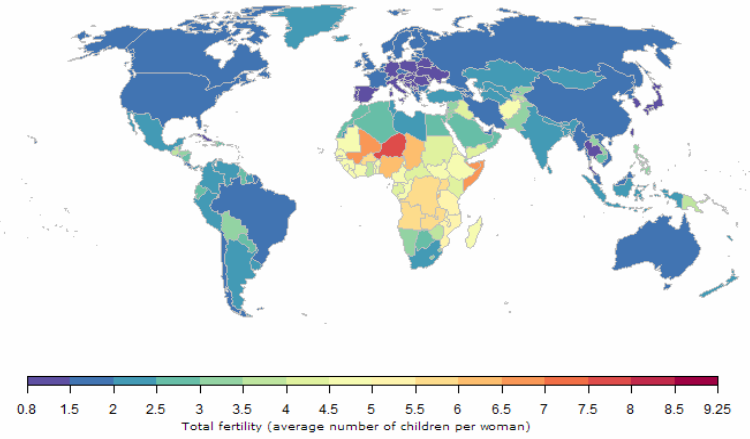
World Population Prospects: The 2012 Revision

1950-1955 total fertility estimate



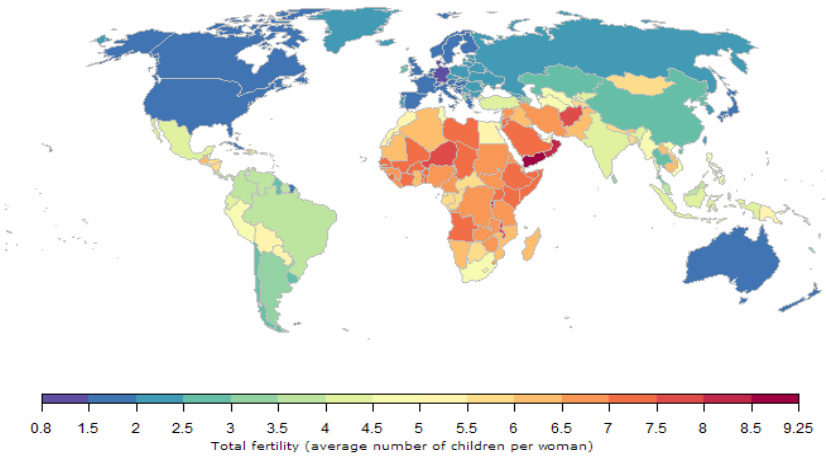
World Population Prospects: The 2012 Revision

2010-2015 median total fertility projection



World Population Prospects: The 2012 Revision

1980-1985 total fertility estimate



World Population Prospects: The 2012 Revision

2030-2035 median total fertility projection

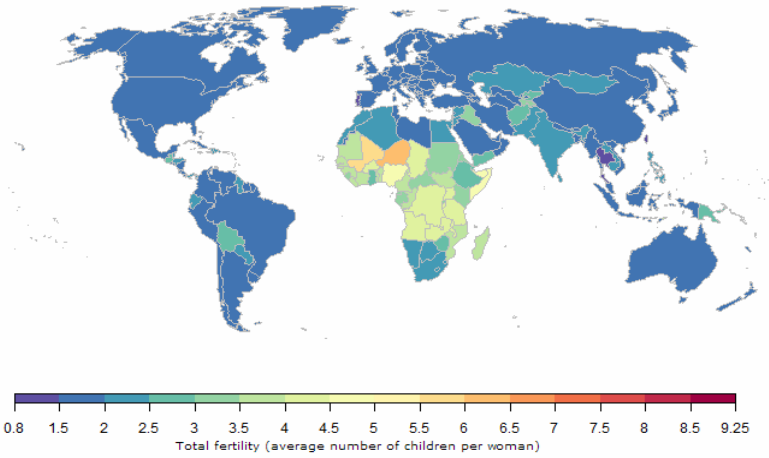


Figure III.1. Life expectancy at birth for the world and development groups, 1950-2100

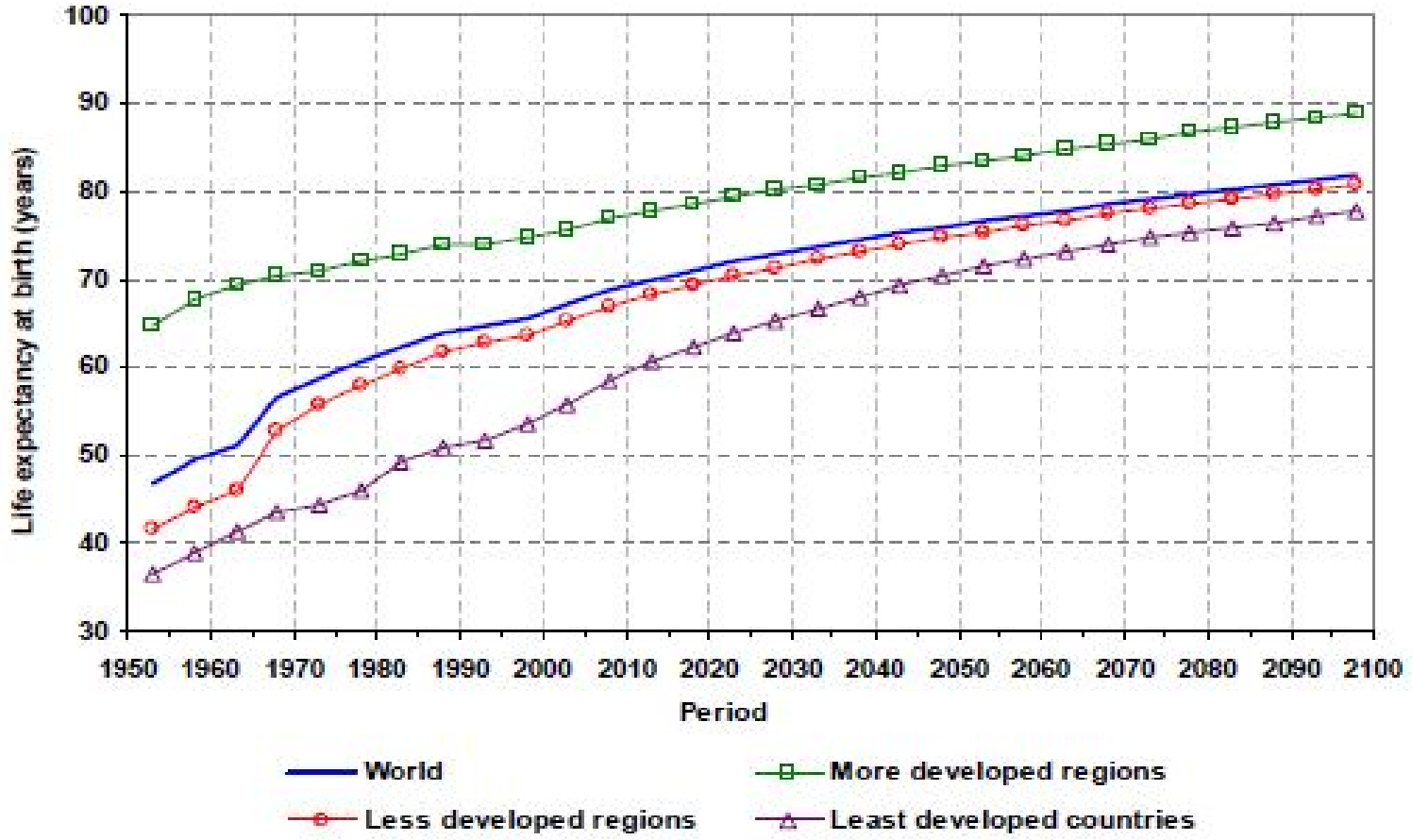
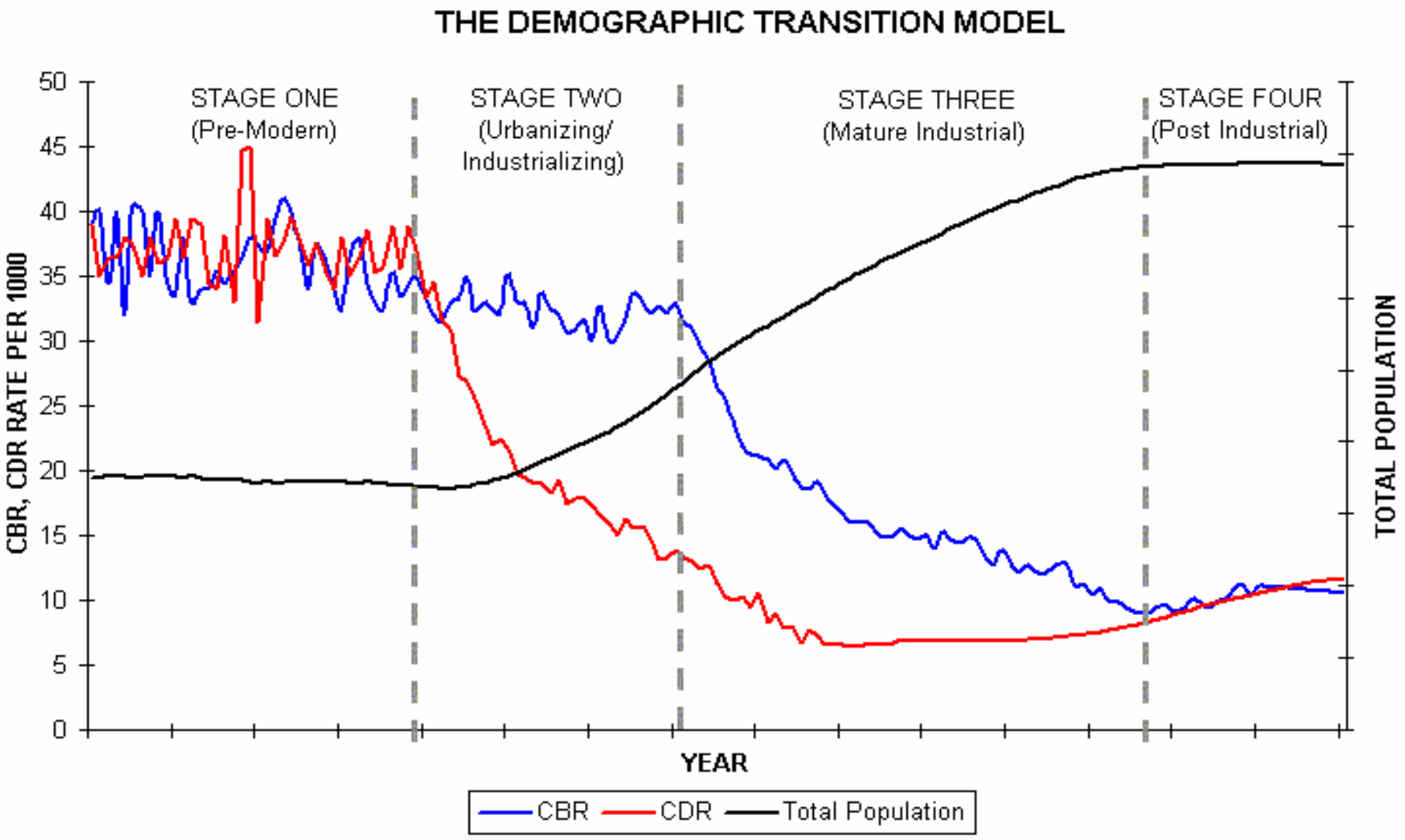


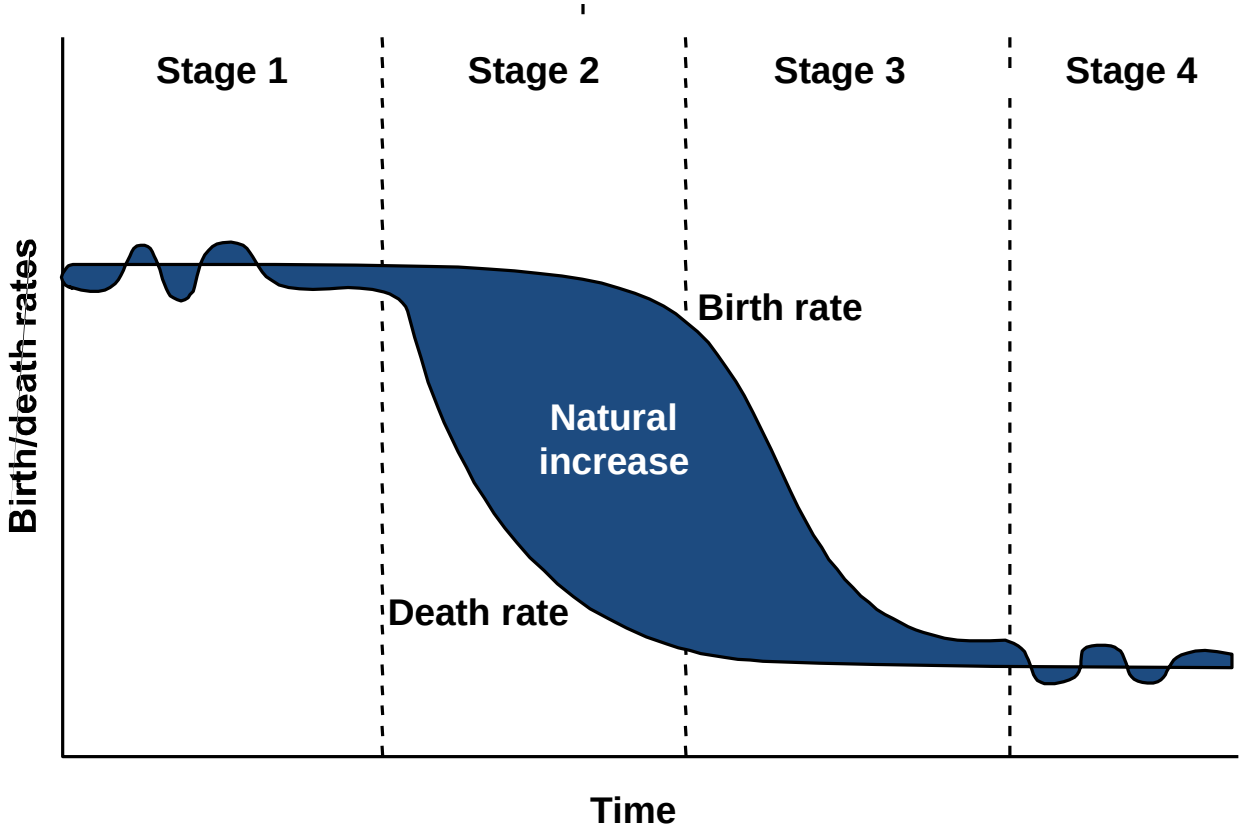
TABLE III.1. LIFE EXPECTANCY AT BIRTH FOR THE WORLD, DEVELOPMENT GROUPS AND MAJOR AREAS, 2005-2010, 2045-2050 AND 2095-2100

Major area	*2005-2010*	*2045-2050*	*2095-2100*
World	68.7	75.9	81.8
More developed regions	76.9	82.8	88.9
Less developed regions	67.0	74.8	80.8
Least developed countries	58.4	70.4	77.6
Other less developed countries	68.8	76.0	82.2
Africa	55.6	68.9	77.1
Asia	70.3	76.9	83.0
Europe	75.3	81.3	87.9
Latin America and the Caribbean	73.4	81.8	87.9
Northern America	78.4	83.7	89.0
Oceania	76.8	81.7	86.6

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision*. New York: United Nations.


THE DEMOGRAPHIC TRANSITION MODEL
STAGE ONE
(Pre-Modern)
STAGE TWO
(Urbanizing/
Industrializing)
STAGE THREE
(Mature Industrial)
STAGE FOUR
(Post Industrial)
CBR, CDR RATE PER 1000
TOTAL POPULATION
YEAR
0
5
10
15
20
25
30
35
40
45
50
CBR
CDR
Total Population

Os Estágios Clássicos da Transição Demográfica



Note: Natural increase is produced from the excess of births over deaths.

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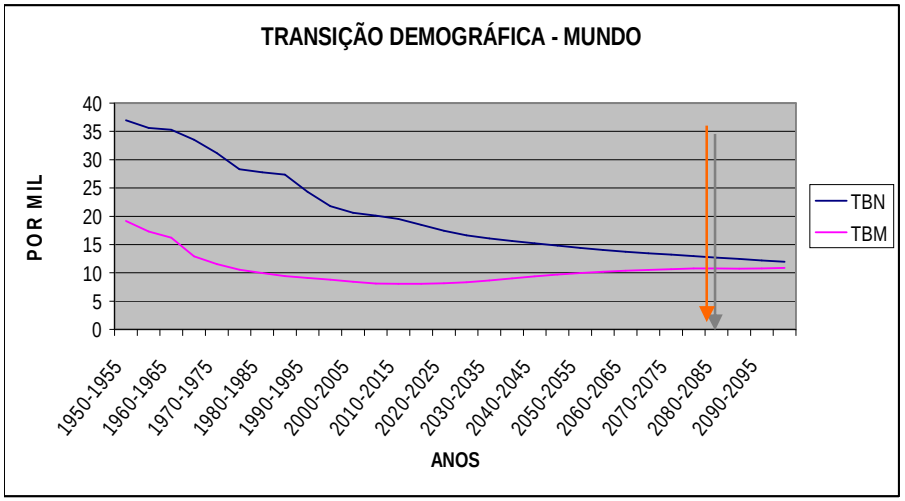

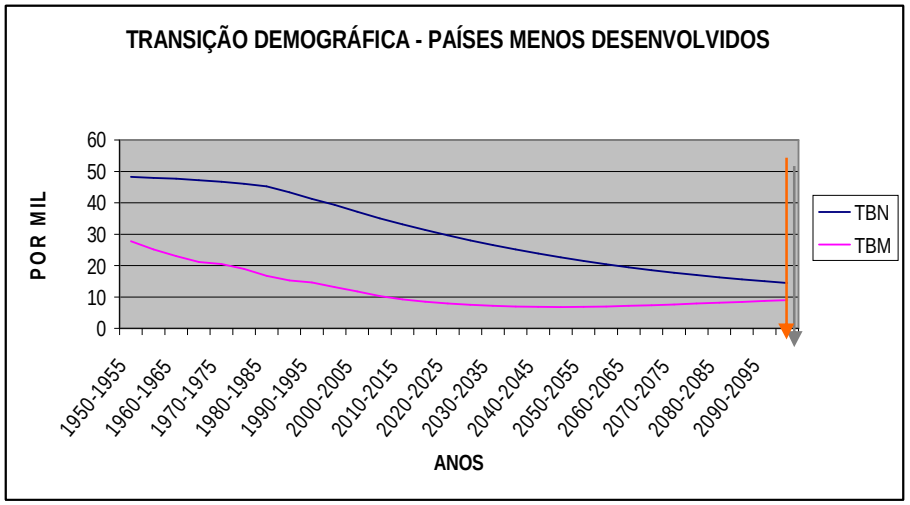

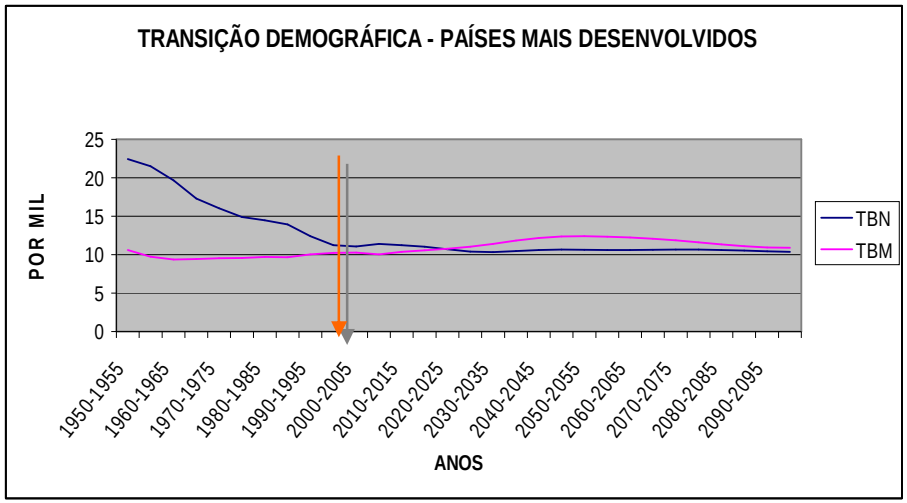

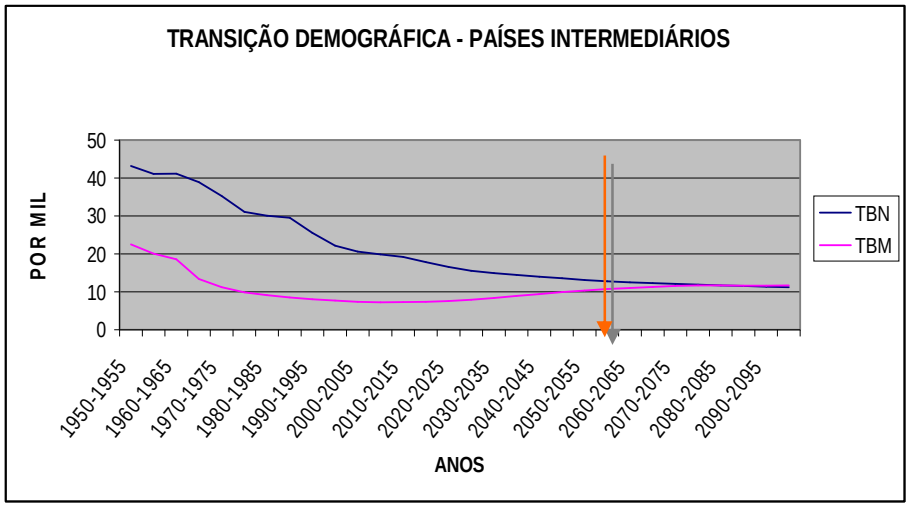

A TRANSIÇÃO DEMOGRÁFICA NO BRASIL

Period	Growth Rate (%)	Crude Birth Rate (1000)	Crude Death Rate (1000)
1950-1955	3.05	44	15.5
1955-1960	2.92	43	14.0
1960-1965	2.97	42	12.6
1965-1970	2.6	37	11.1
1970-1975	2.38	34	9.9
1975-1980	2.35	32	9.0
1980-1985	2.26	30	8.2
1985-1990	1.88	26	7.0
1990-1995	1.57	22	6.8
1995-2000	1.5	21	6.0
2000-2005	1.28	19	6.4
2005-2010	0.94	16	6.4
2010-2015	0.8	15	6.4
2015-2020	0.69	13	6.7
2020-2025	0.54	12	7.1
2025-2030	0.39	11	7.6
2030-2035	0.24	10	8.3
2035-2040	0.1	10	9.0
2040-2045	-0.01	9	9.8
2045-2050	-0.13	9	10.7

Source: UN Population Division Projections

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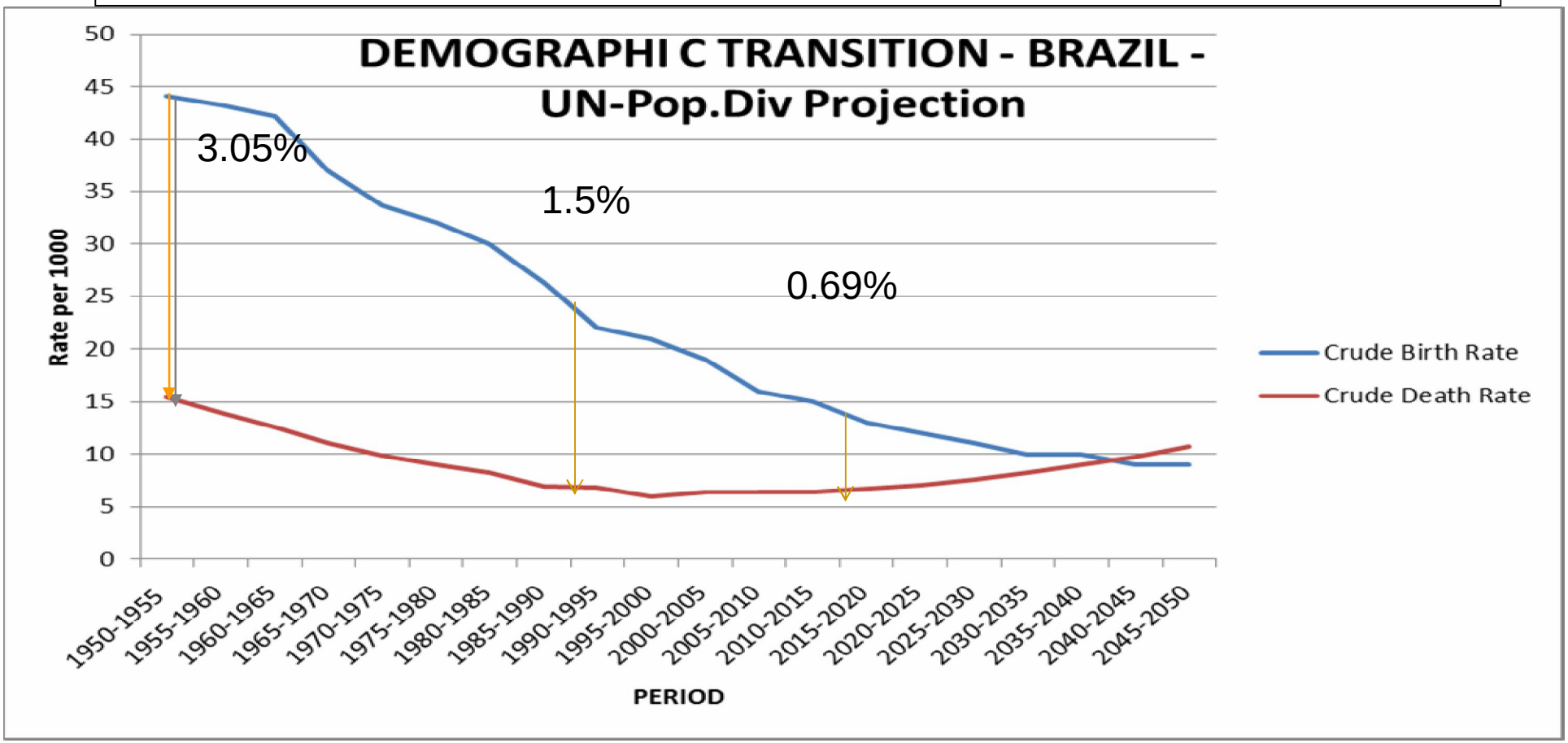
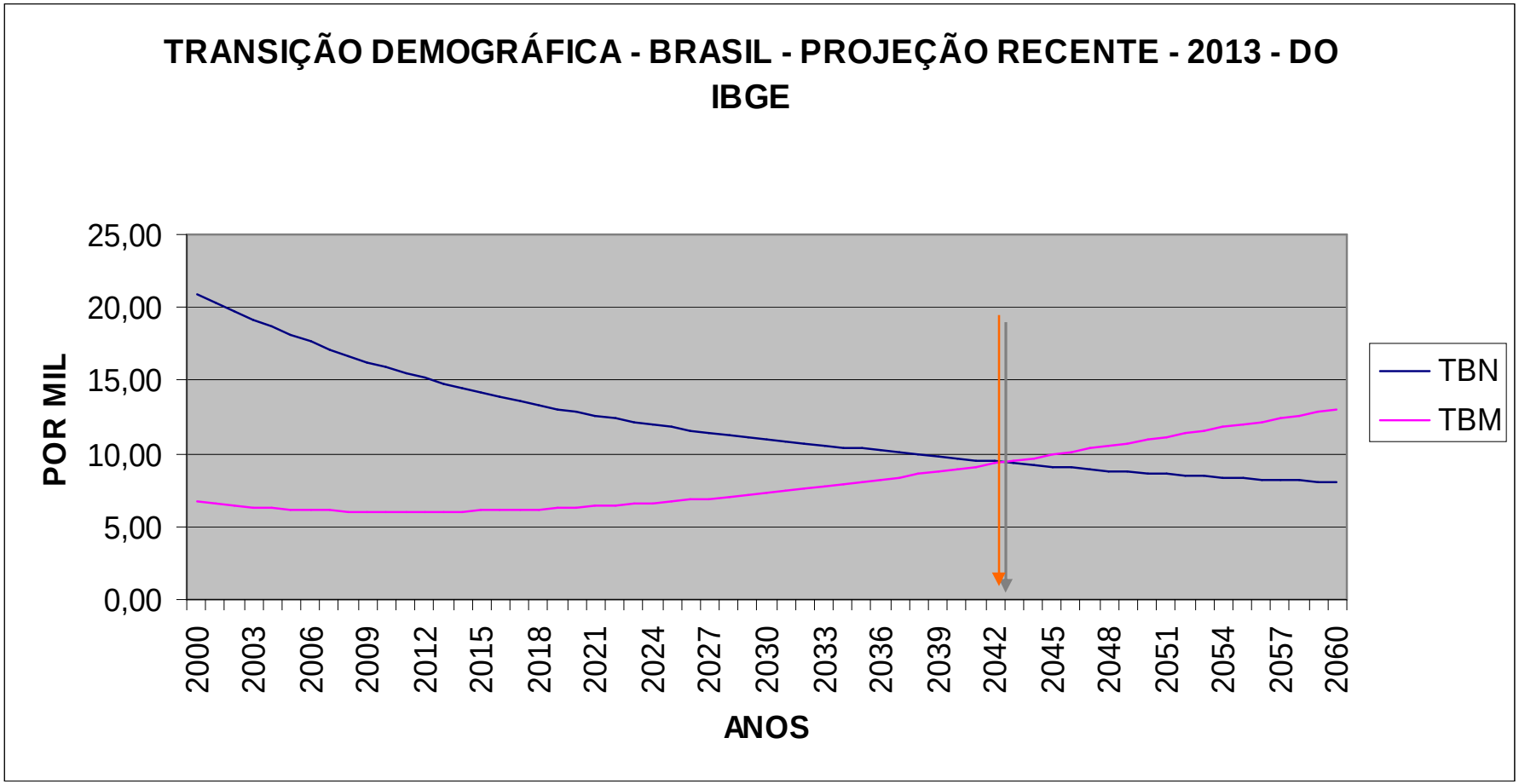
A TRANSIÇÃO DEMOGRÁFICA NO BRASIL

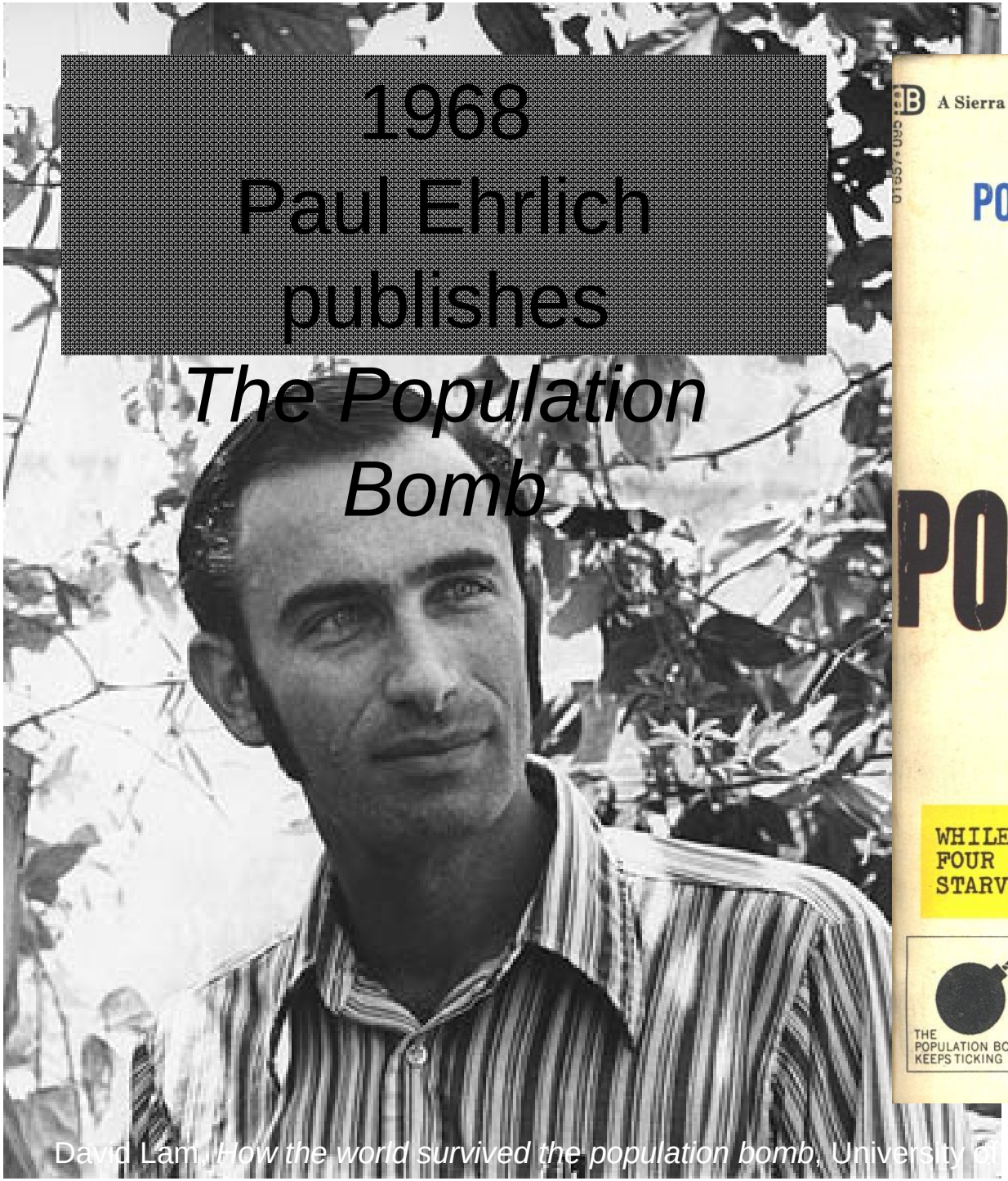


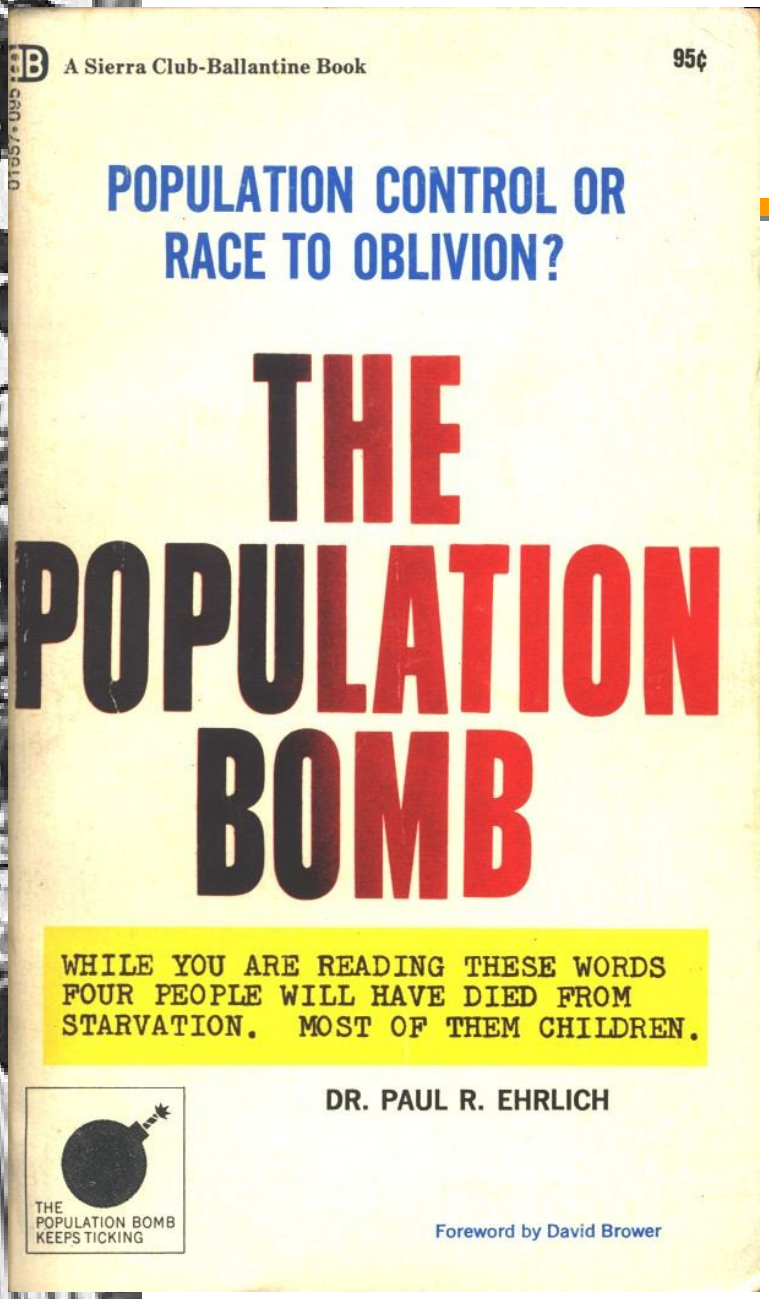

TRANSIÇÃO DEMOGRÁFICA - BRASIL - PROJEÇÃO RECENTE - 2013 - DO IBGE
POR MIL
25,00
20,00
15,00
10,00
5,00
0,00
2000
2003
2006
2009
2012
2015
2018
2021
2024
2027
2030
2033
2036
2039
2042
2045
2048
2051
2054
2057
2060
ANOS
TBN
TBM

Efeitos de “r” (crescimento populacional) sobre o Tamanho Populacional

- A tradição Malthusiana é clássica sobre a relação entre TAMANHO POPULACIONAL e ECONOMIA (RECURSOS).
- Uma versão recente trata da relação entre Tamanho e Capacidade de Carga.
- Relação entre Tamanho e Meio Ambiente.
- Ver Slides do PPT de David Lam – *Demography* e PAA Presidential Address. 2011

1968 Paul Ehrlich publishes *The Population Bomb*

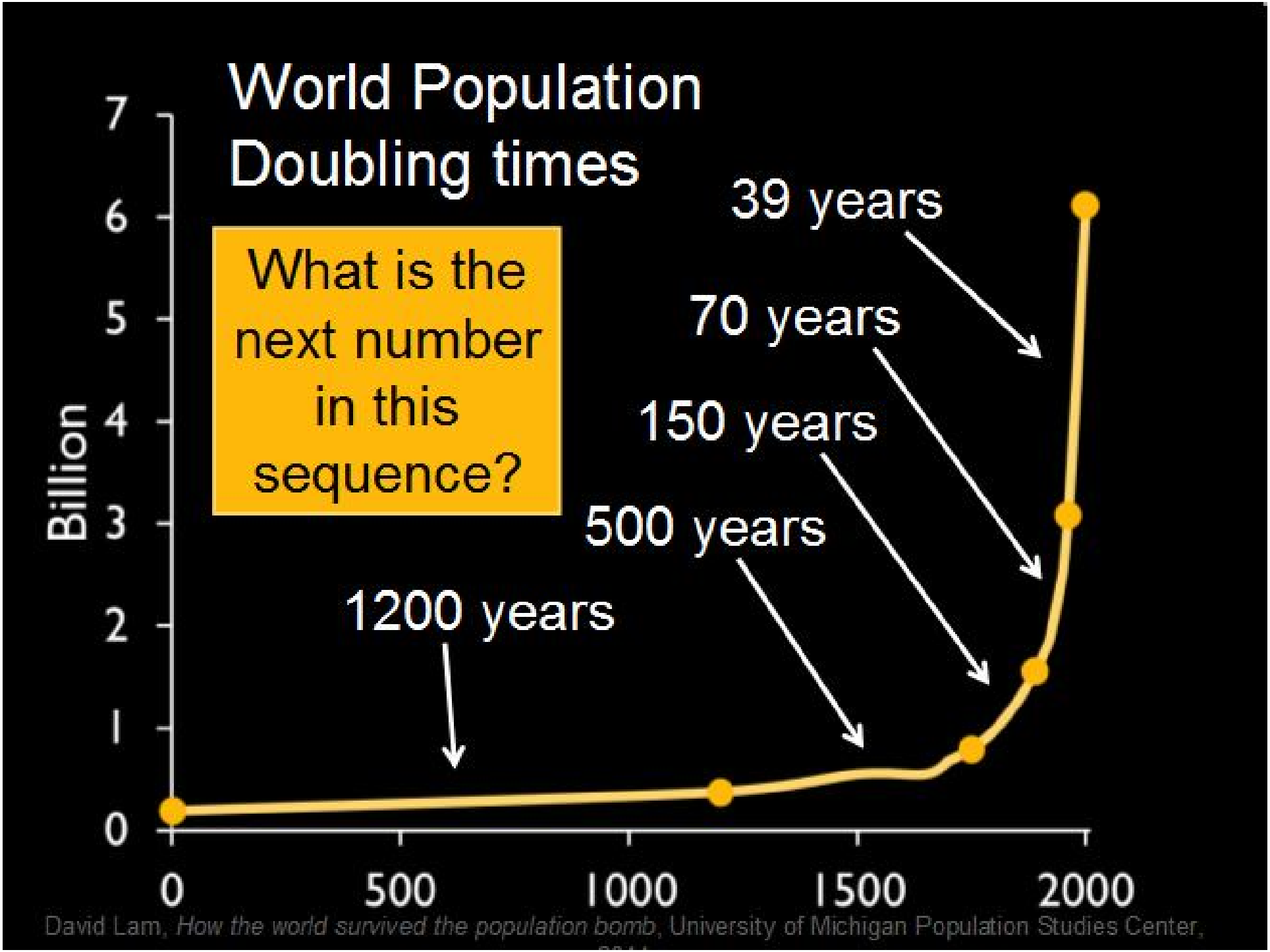




David Lam, *How the world survived the population bomb*, Univers[illegible] igan Population Studies Center,

How unusual was the demography of the 1960s?

David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center,


World Population
Doubling times
What is the next number in this sequence?
39 years
70 years
150 years
500 years
1200 years
Billion
7
6
5
4
3
2
1
0
0
500
1000
1500
2000
David Lam, How the world survived the population bomb, University of Michigan Population Studies Center,

How many years from 1999 until the world population reaches 12 billion?

a. 20 years **b.** 30 years **c.** 40 years

d. 60 years **e.** 100 years **f.** Over 100 years

g. Over 1000 years?

David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center,

O MODELO IPAT

A identidade deste modelo é dada pela equação abaixo:

$$I = PAT \qquad (1)$$

Sendo que

I = Impacto ambiental de uma sociedade

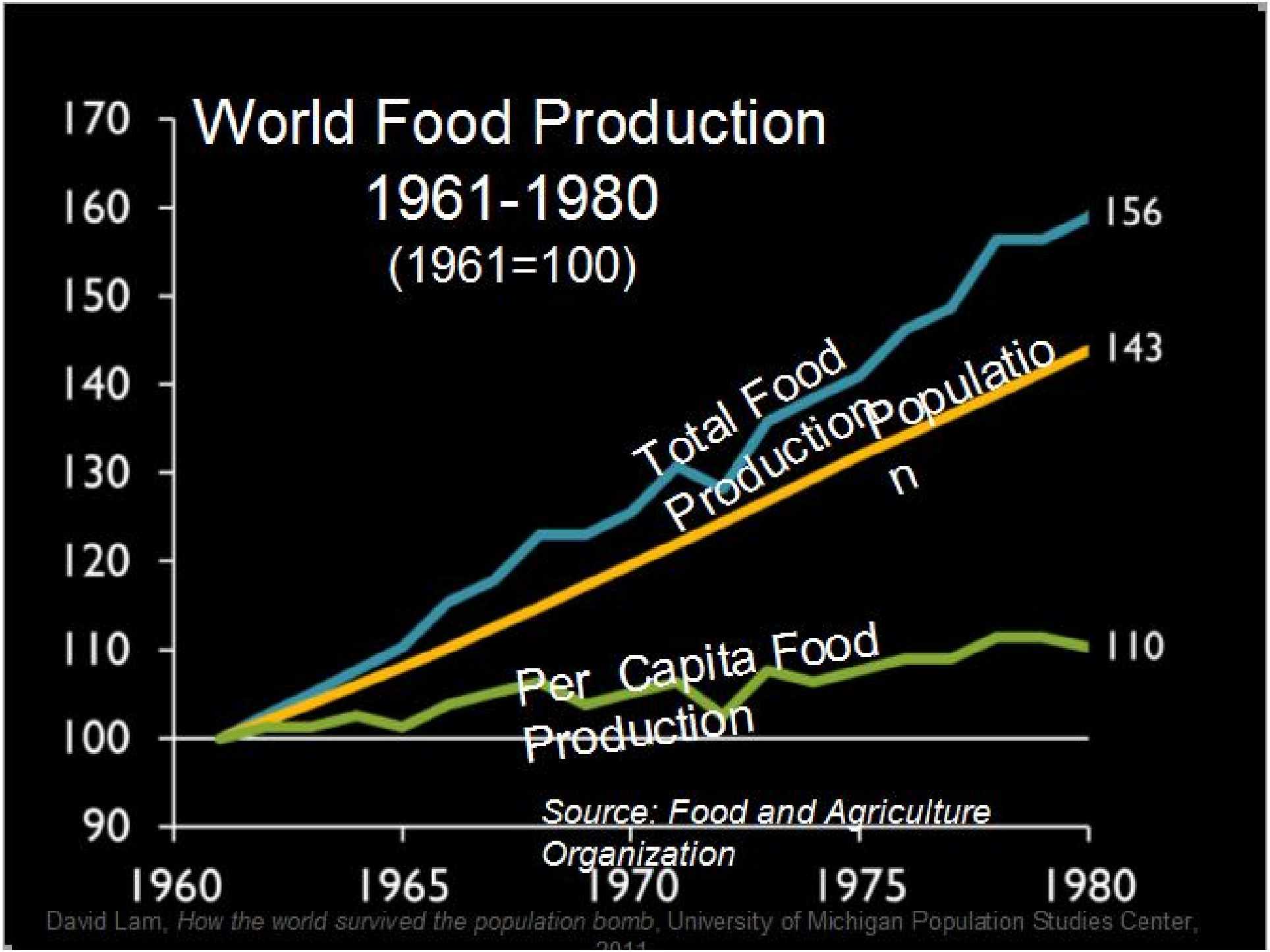
P = O tamanho populacional de uma sociedade

A = O nível de afluência de uma sociedade ou o consumo per-capita

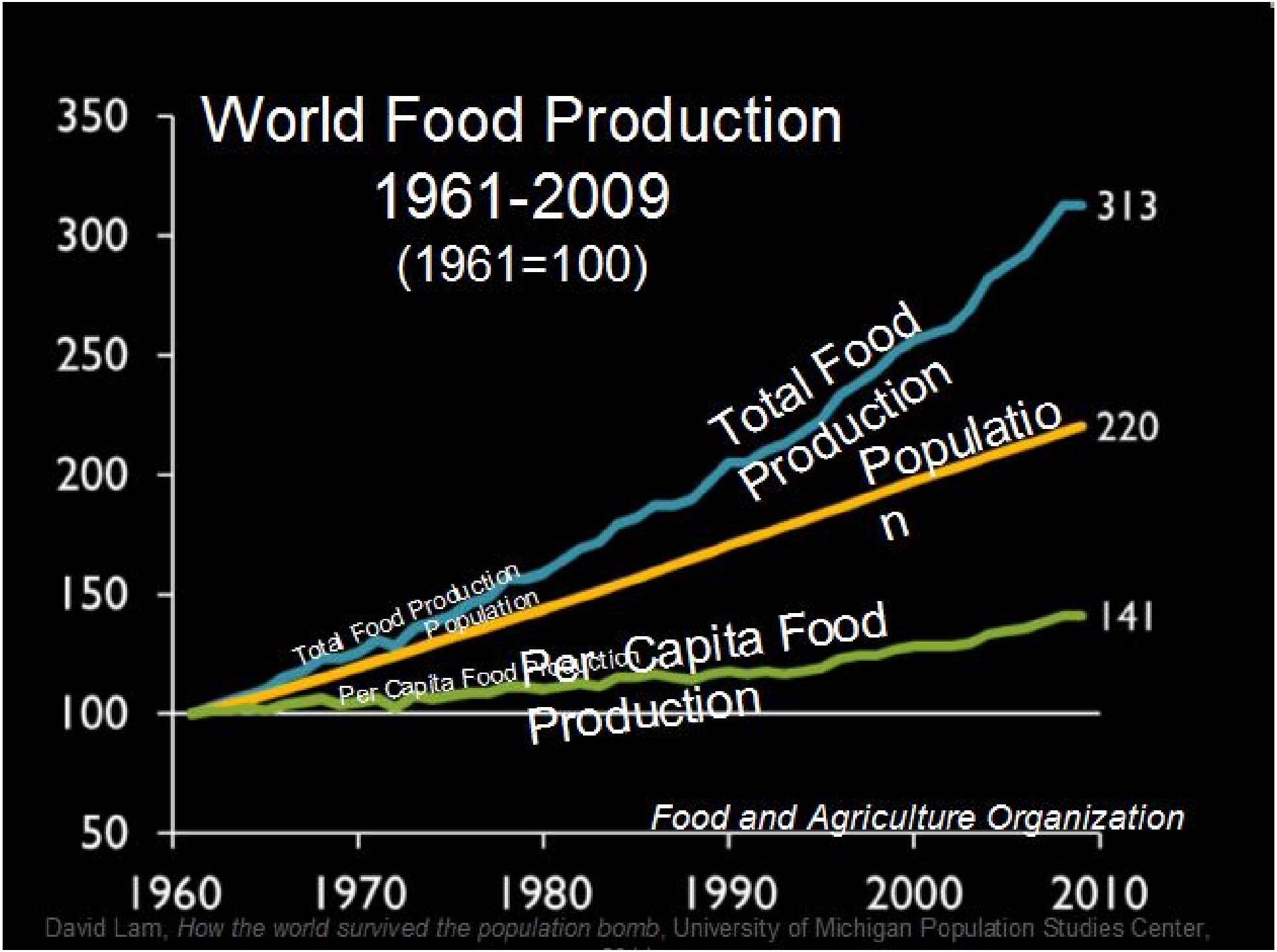
T = Tecnologia, incluindo os arranjos sociais, políticos e as instituições

- **Três Preocupações da Época de Ehrlich segundo David Lam:**

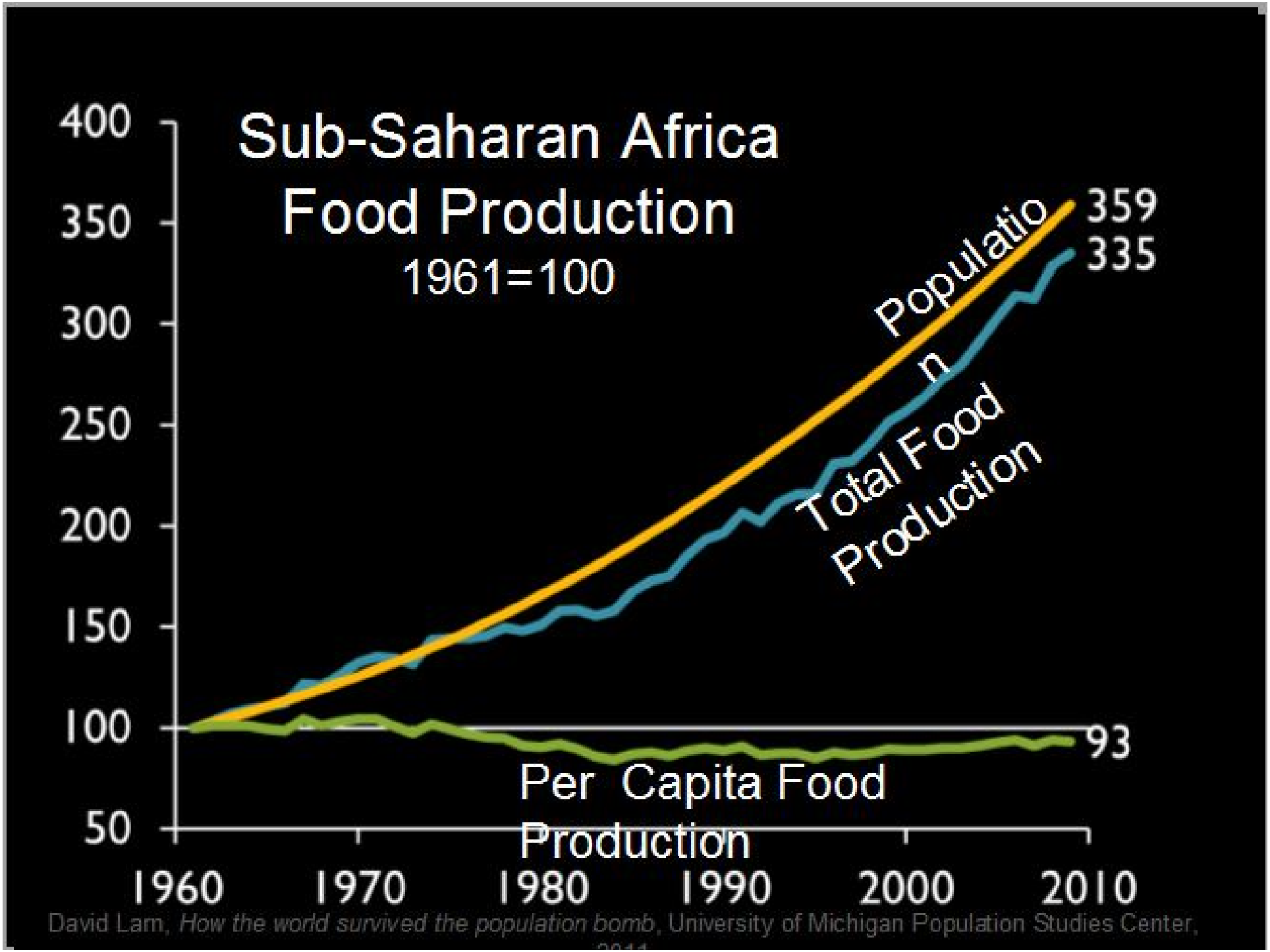
1. Como resolver o problema da Oferta de Alimentos?
2. Como resolver o problema dos Recursos Naturais?
3. Como resolver o problema da pobreza?



David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center, 2011



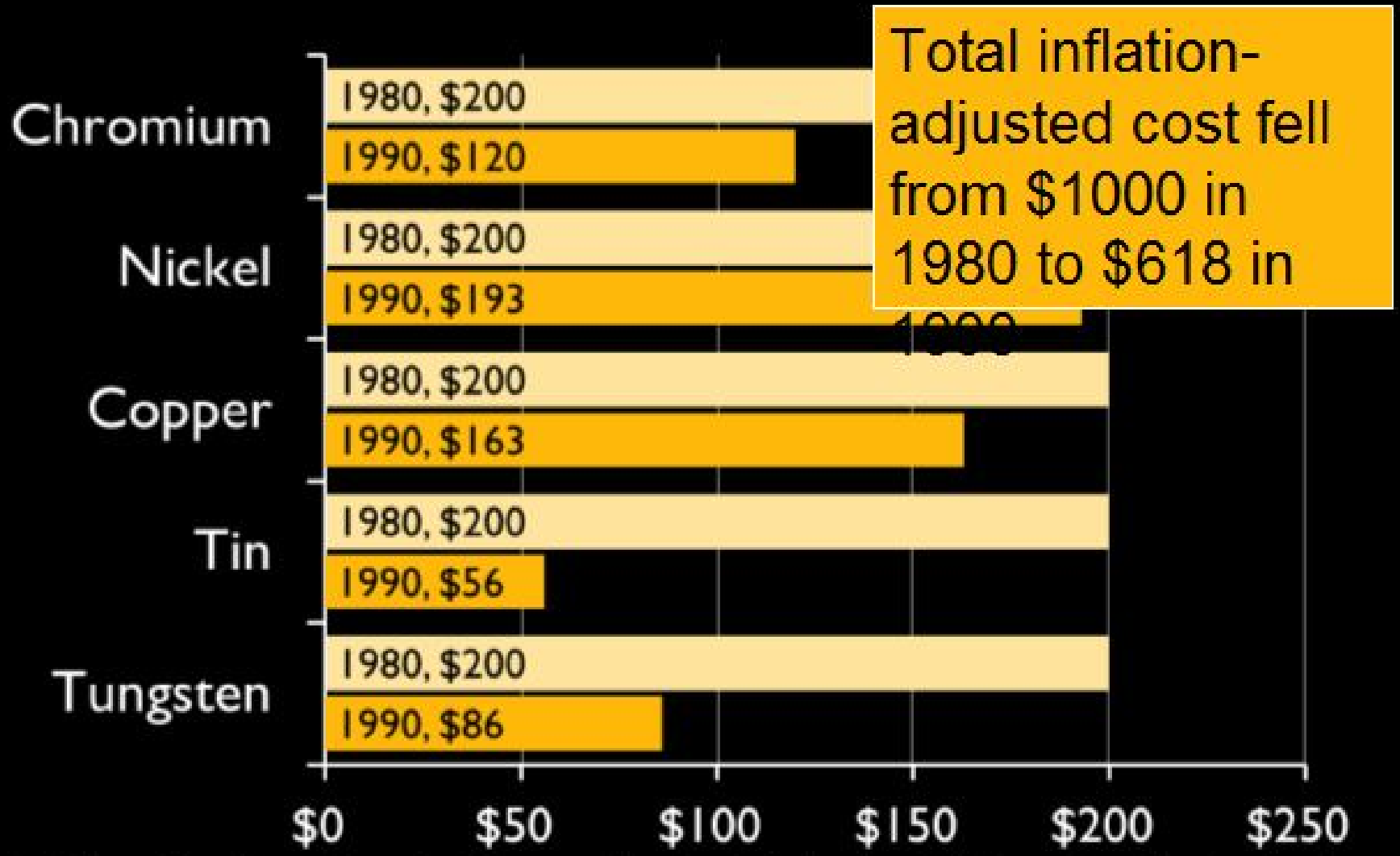
David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center,



David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center,

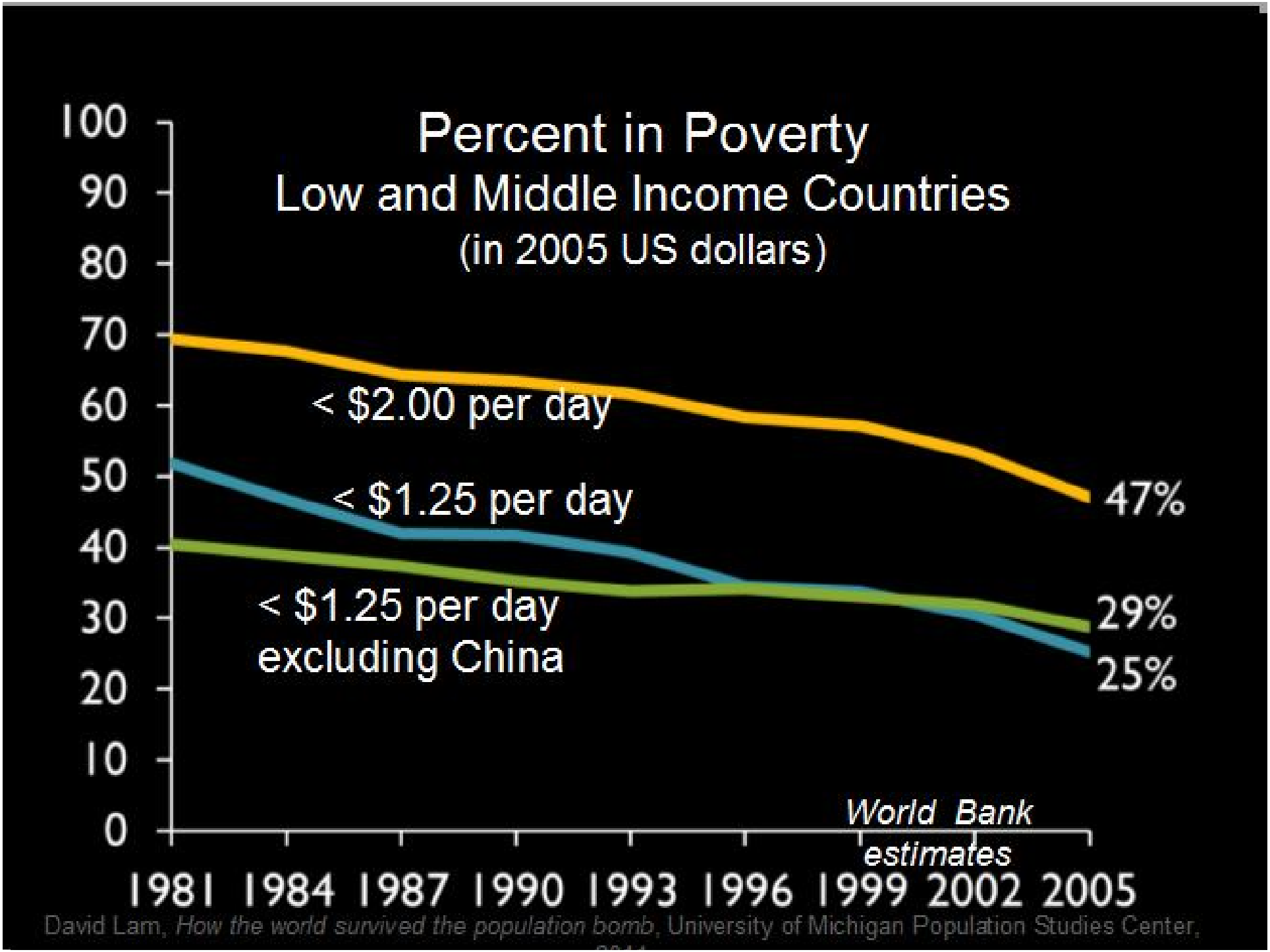
- *No caso dos recursos naturais houve a famosa aposta que Julia Simon propôs a Paul Ehrlich. Ele aceitava pagar o valor de mil dólares em qualquer recurso natural no futuro, tal era sua confiança de que o preço cairia com o tempo.*

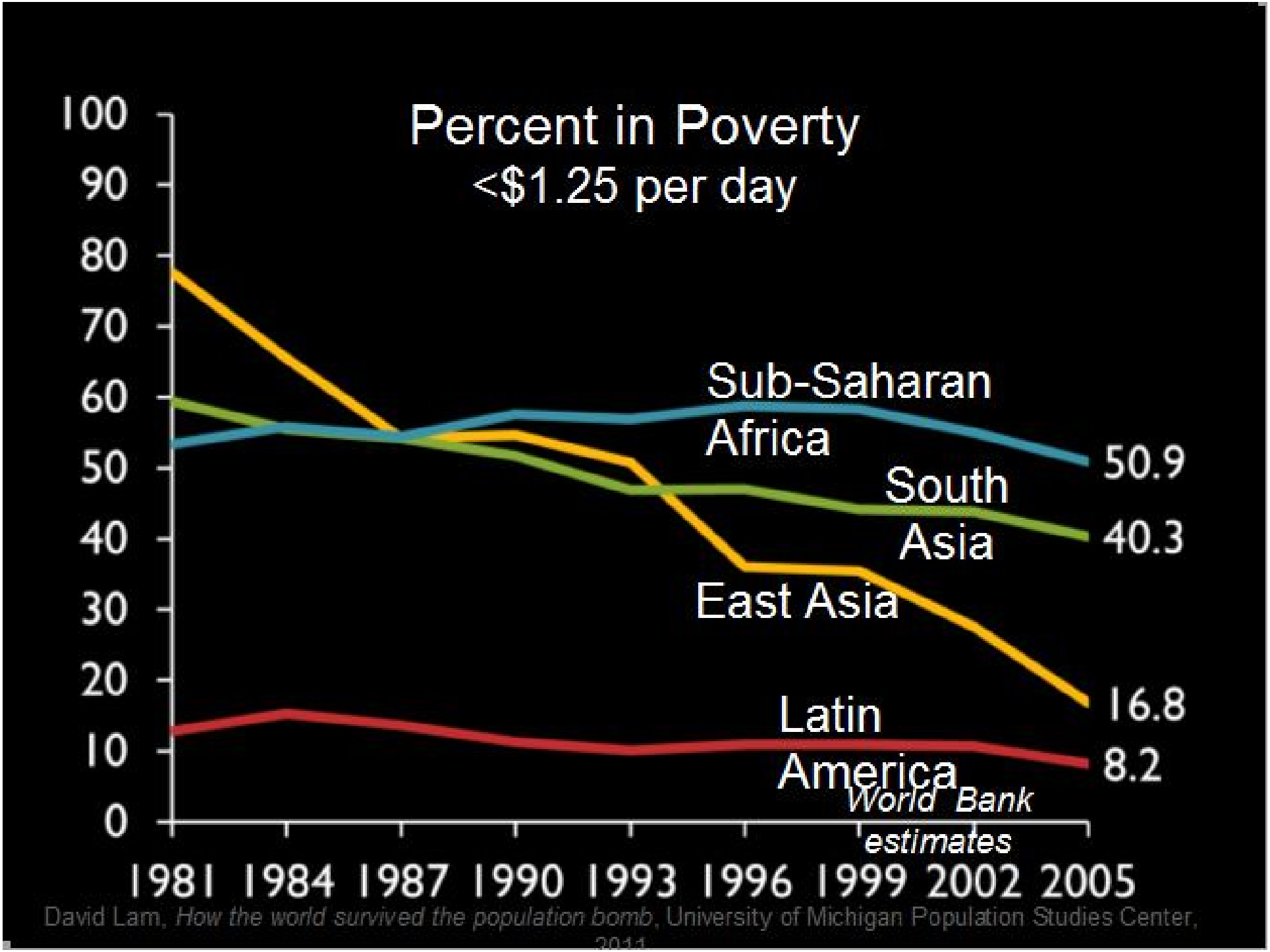
Julian Simon's bet with Paul Ehrlich



David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center, 2011

- *No caso da Pobreza, David Lam mostra que há uma queda na taxa de pobreza, em termos globais esta queda é maior por causa do desenvolvimento da China.*


Percent in Poverty
Low and Middle Income Countries
(in 2005 US dollars)
100
90
80
70
60
50
40
30
20
10
0
< $2.00 per day
< $1.25 per day
< $1.25 per day
excluding China
47%
29%
25%
World Bank
estimates
1981 1984 1987 1990 1993 1996 1999 2002 2005
David Lam, How the world survived the population bomb, University of Michigan Population Studies Center,



David Lam, *How the world survived the population bomb*, University of Michigan Population Studies Center, 2011

Efeitos de "r" (crescimento populacional) sobre a Estrutura Etária

Figure 3. Evolution of the dependency ratio for the world according to different scenarios, 2000-2300

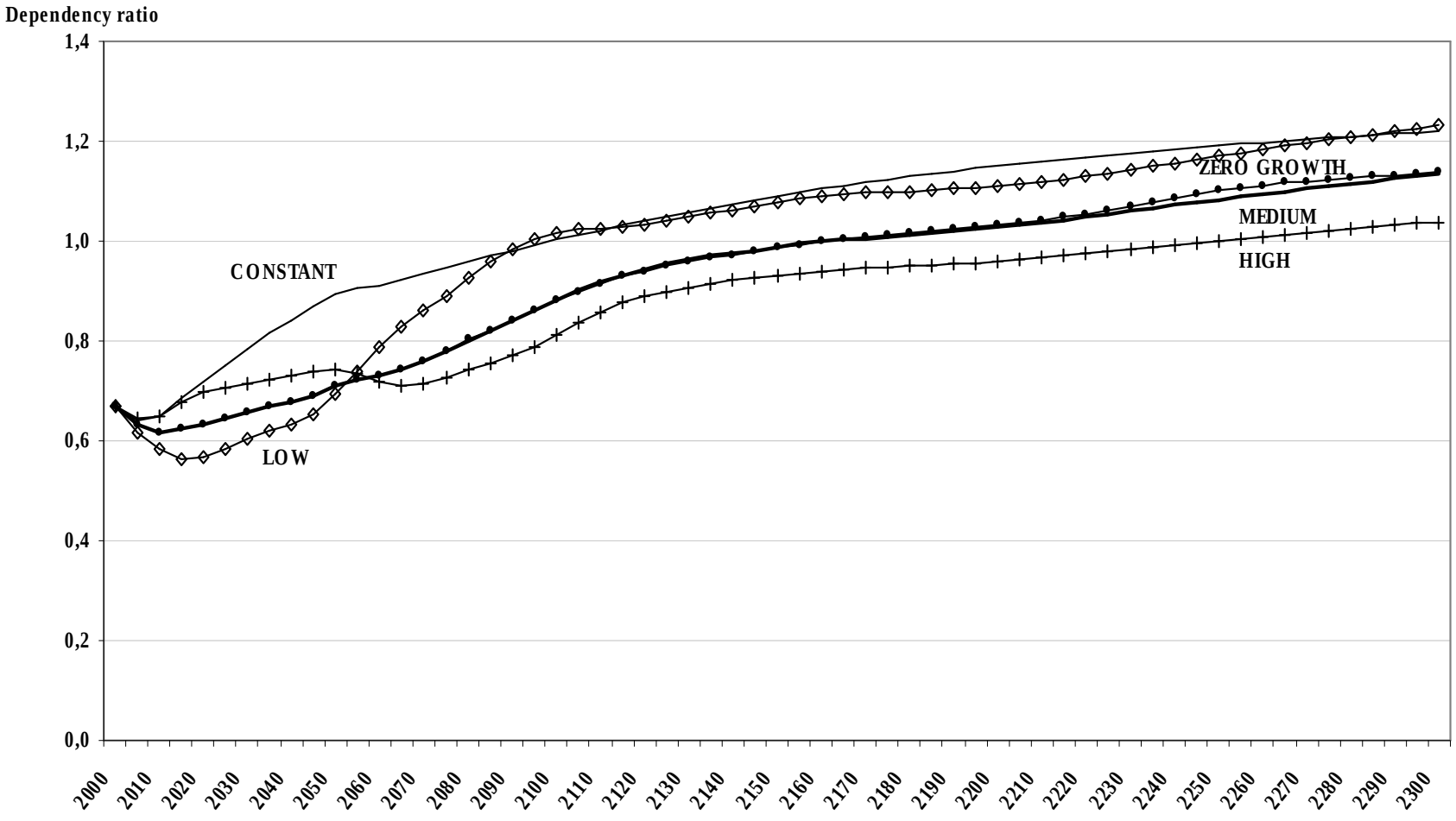


TABLE I.6. AVERAGE ANNUAL RATES OF CHANGE OF THE TOTAL POPULATION AND THE POPULATION IN BROAD AGE GROUPS, BY DEVELOPMENT GROUP AND MAJOR AREA, 2013-2050 AND 2050-2100 (MEDIUM VARIANT)

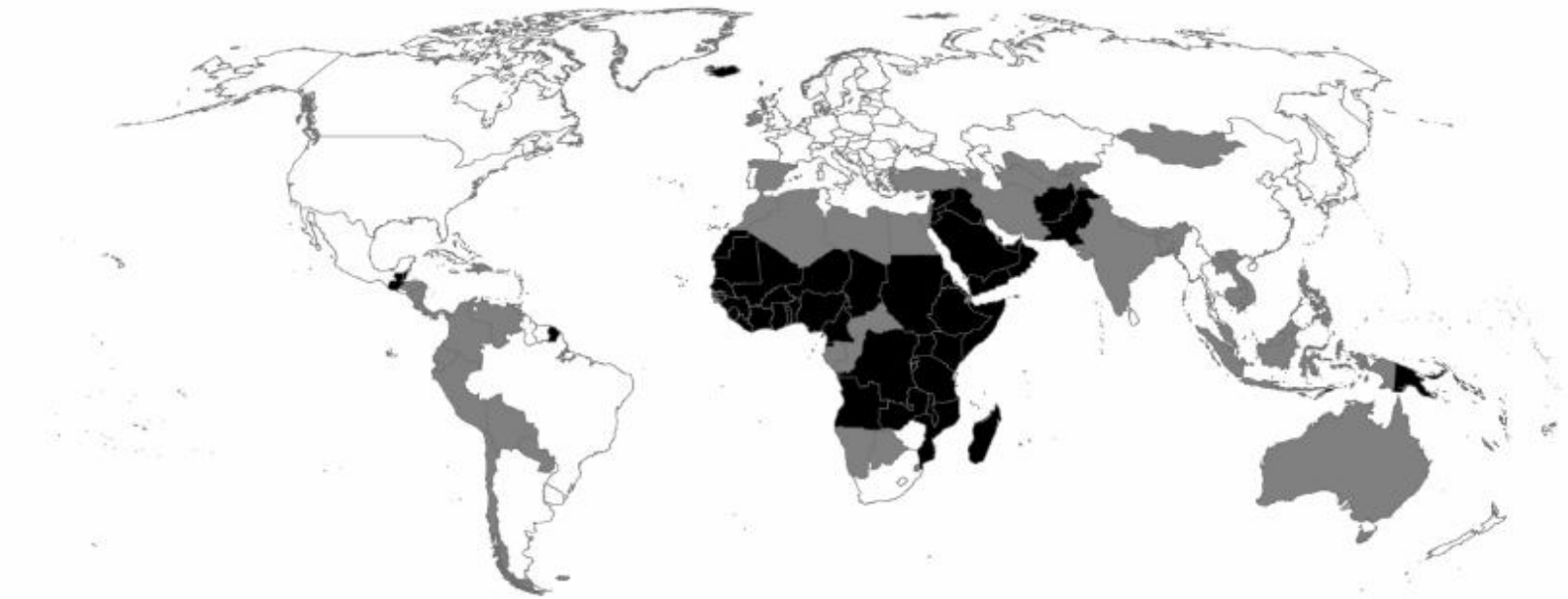
	2013-2050					*2050-2100*				
Development group or major area	*0-14*	*15-59*	*60+*	*80+*	*Total population*	*0-14*	*15-59*	*60+*	*80+*	*Total population*
World	0.22	0.50	2.37	3.19	0.78	-0.09	0.13	0.78	1.50	0.26
More developed regions	0.05	-0.29	1.01	2.10	0.11	-0.08	-0.09	0.11	0.56	-0.03
Less developed regions	0.24	0.63	2.87	3.90	0.90	-0.09	0.15	0.92	1.82	0.30
Least developed countries	1.12	2.00	3.59	4.12	1.89	0.25	0.83	2.37	3.53	0.96
Other less developed countries	-0.07	0.33	2.79	3.88	0.68	-0.26	-0.11	0.63	1.58	0.06
Africa	1.43	2.22	3.41	3.67	2.07	0.33	1.03	2.65	3.87	1.12
Asia	-0.38	0.11	2.63	3.62	0.50	-0.46	-0.40	0.40	1.40	-0.18
Europe	-0.16	-0.60	0.91	1.91	-0.12	-0.22	-0.24	-0.14	0.41	-0.21
Latin America and the Caribbean	-0.51	0.27	2.96	4.11	0.64	-0.49	-0.45	0.62	1.60	-0.12
Northern America	0.43	0.32	1.48	2.70	0.62	0.12	0.13	0.62	0.96	0.28
Oceania	0.65	0.88	2.05	3.14	1.07	-0.04	0.21	1.03	1.54	0.41

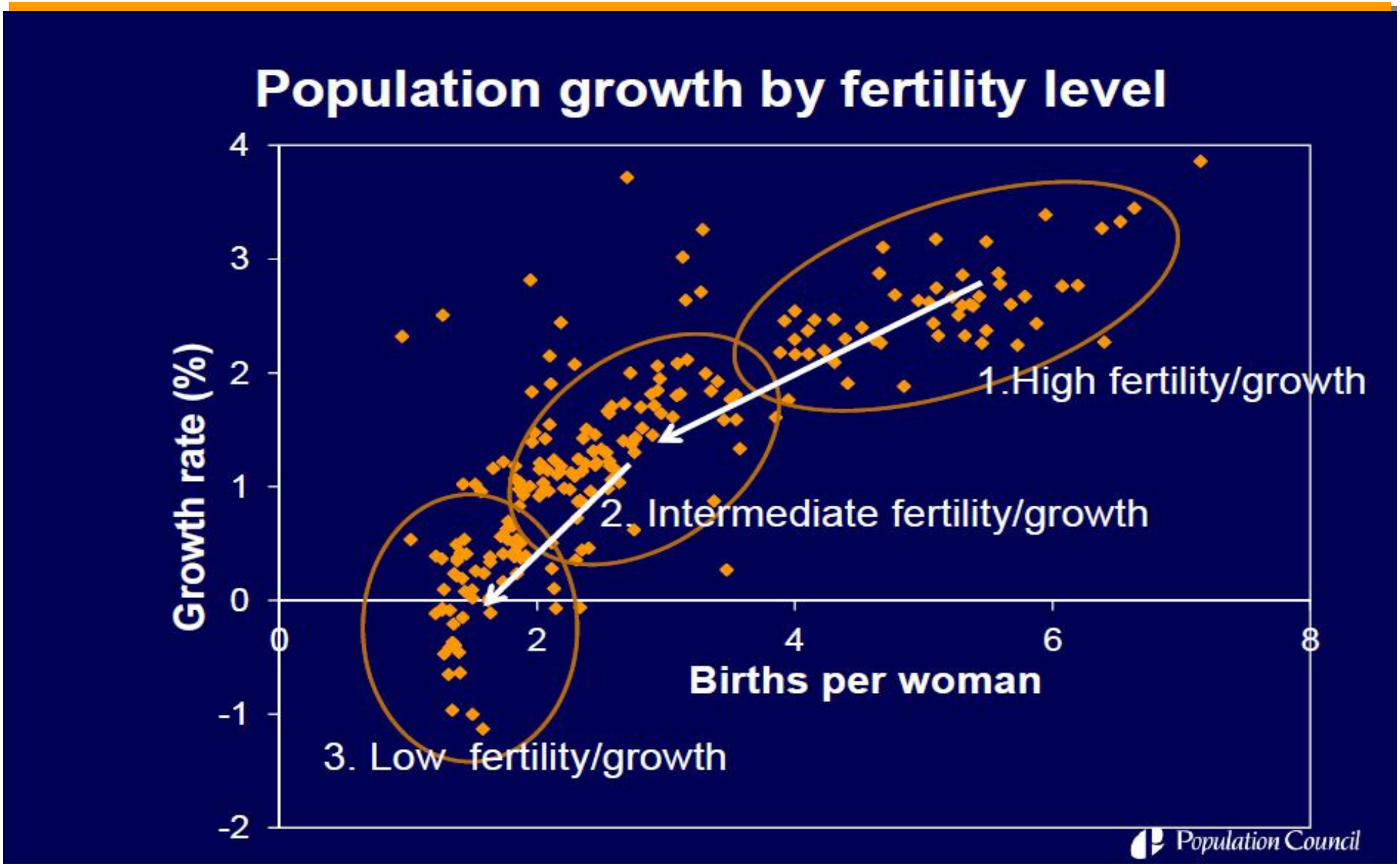
Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). *World Population Prospects: The 2012 Revision.* New York: United Nations.

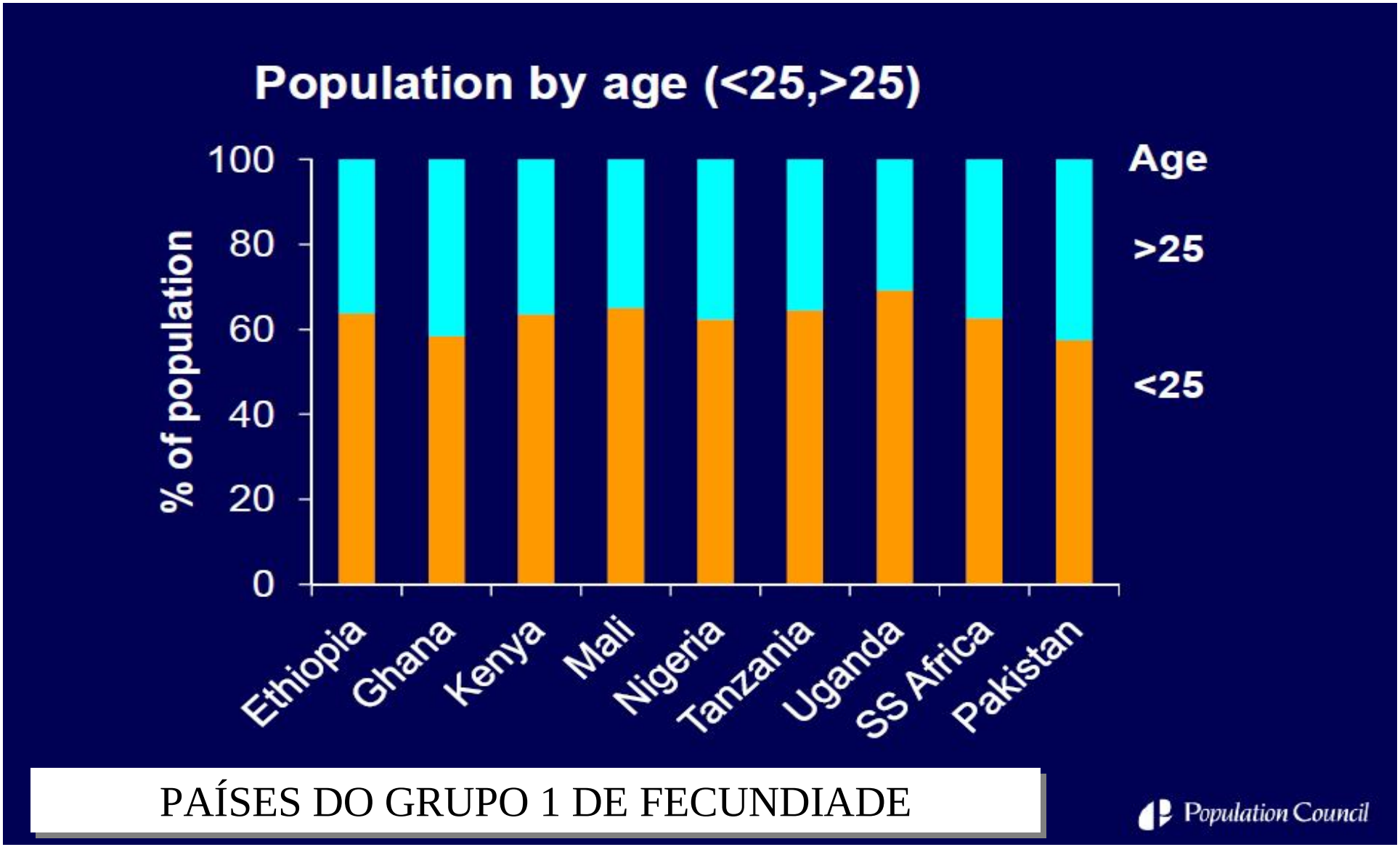
NOTE: Only countries or areas with 90,000 persons or more in 2013 are considered.

- O envelhecimento populacional é causado primordialmente pelo declínio da fecundidade.
- Em um primeiro momento ele causa o chamado “Dividendo Demográfico”, dado pelo aumento na proporção da população em idade ativa em relação à população total.
- Num segundo momento há um aumento na razão de dependência dos idosos.
- Os próximos slides seguem uma apresentação didática de John Bongaarts no último encontro da IUSSP na Coréia.

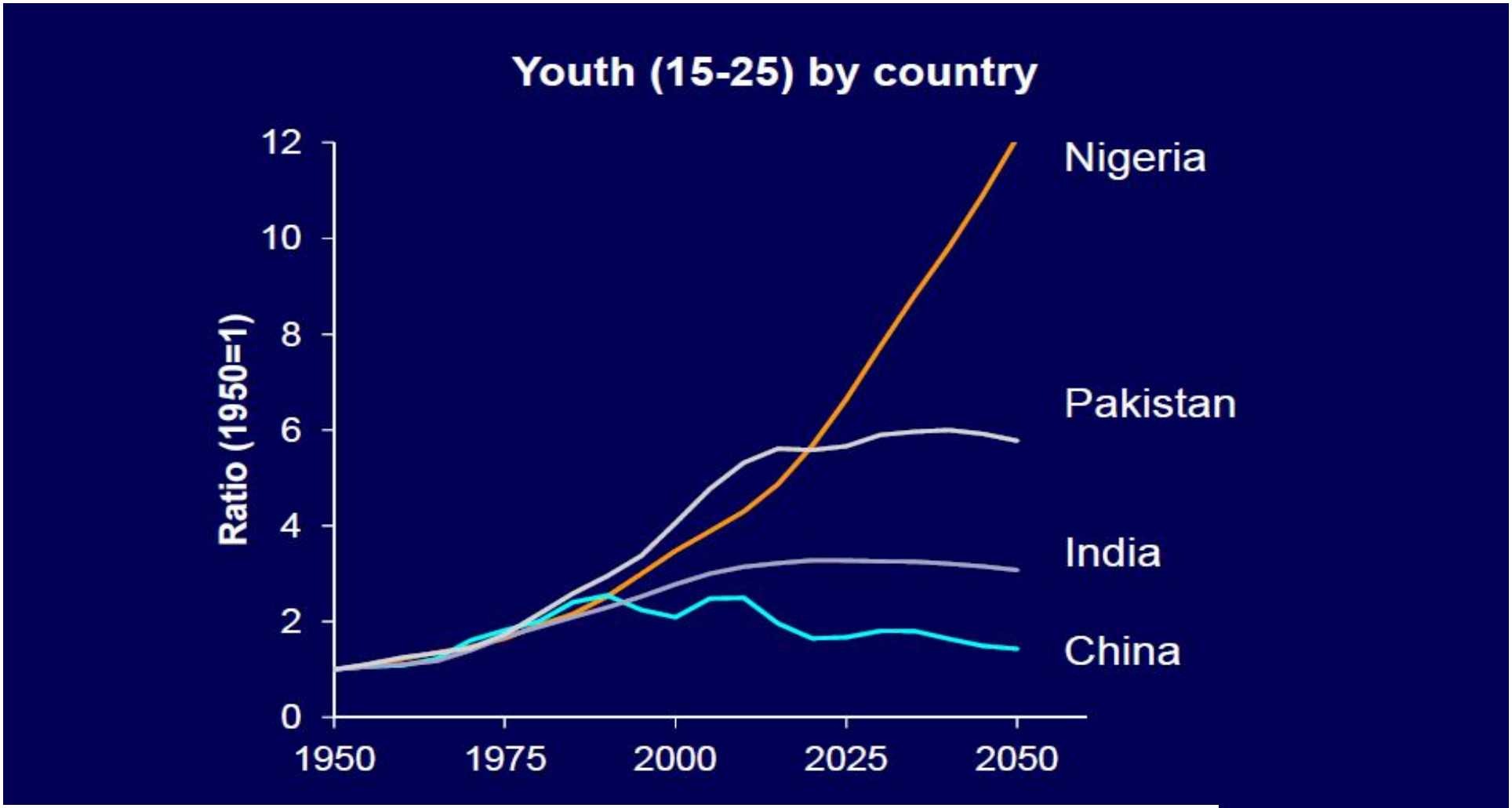
Population growth rates 2005-2010



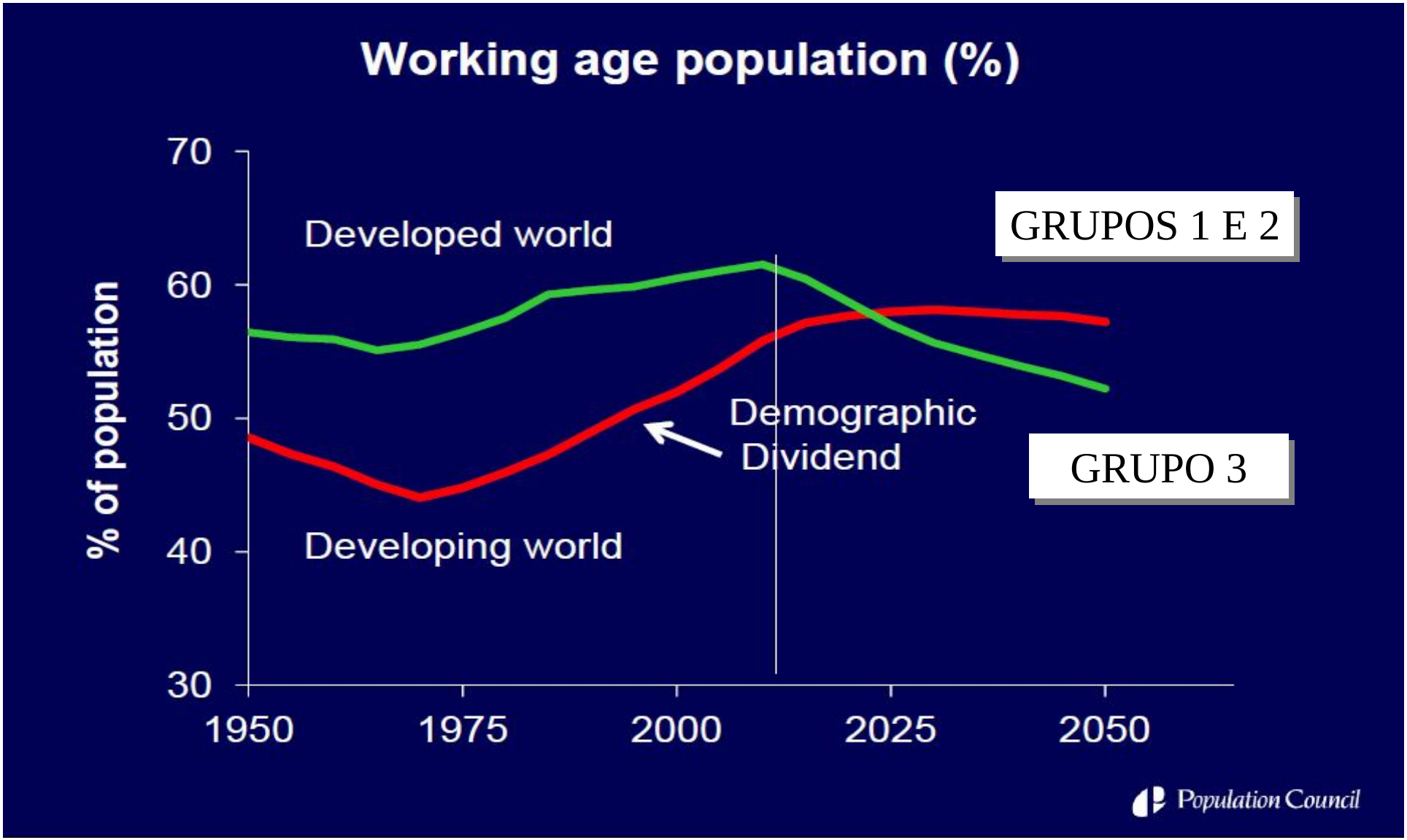

Population growth by fertility level
Growth rate (%)
4
3
2
1
0
-1
-2
0
2
4
6
8
Births per woman
1.High fertility/growth
2. Intermediate fertility/growth
3. Low fertility/growth
Population Council

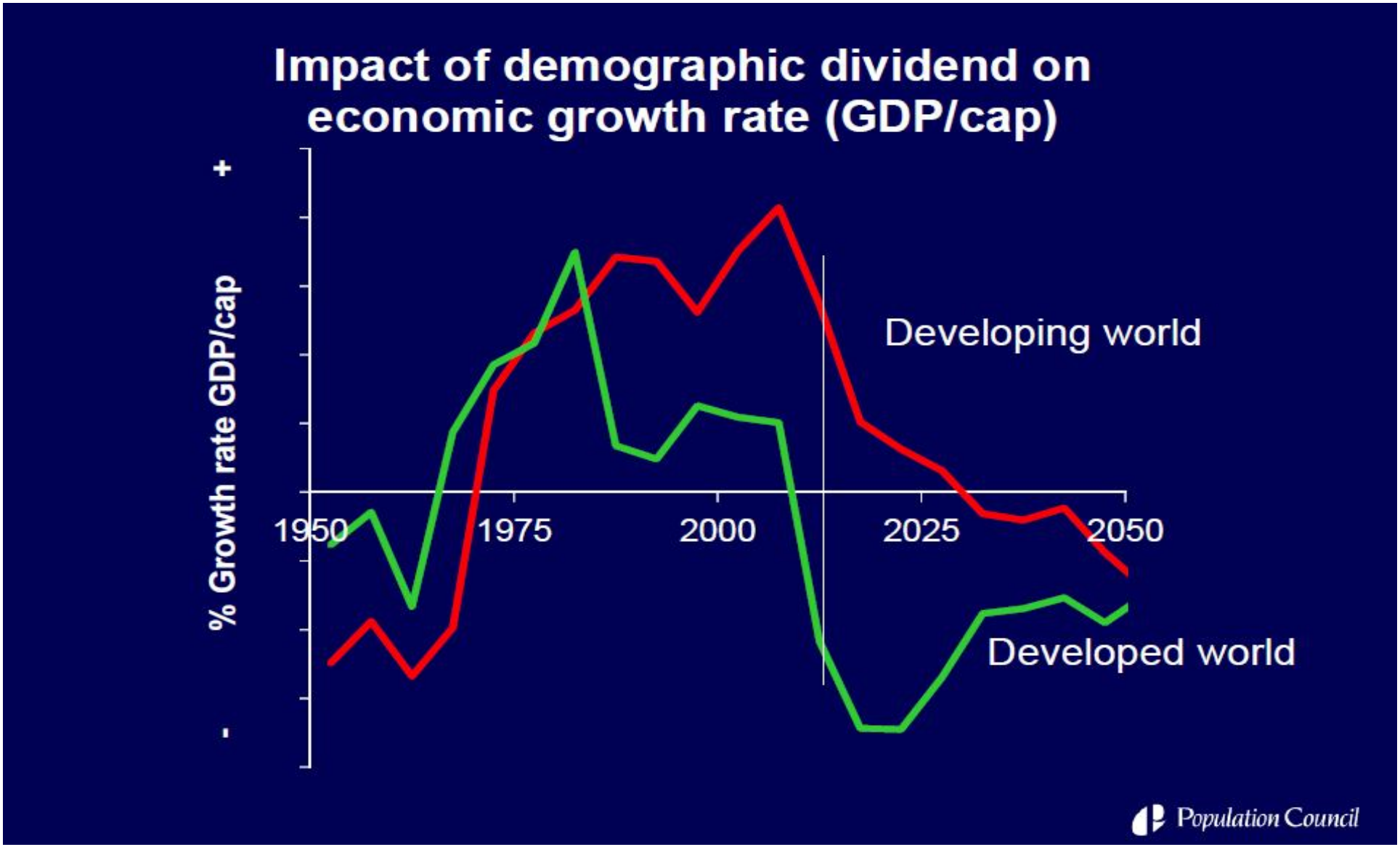


PAÍSES DO GRUPO 1 DE FECUNDIADE



PAÍSES DOS GRUPOS 1 E 2 DE FECUNDIDADE


Working age population (%)
% of population
70
60
50
40
30
1950
1975
2000
2025
2050
Developed world
Developing world
Demographic Dividend
GRUPOS 1 E 2
GRUPO 3
Population Council


Impact of demographic dividend on economic growth rate (GDP/cap)
% Growth rate GDP/cap
+
-
1950
1975
2000
2025
2050
Developing world
Developed world
Population Council

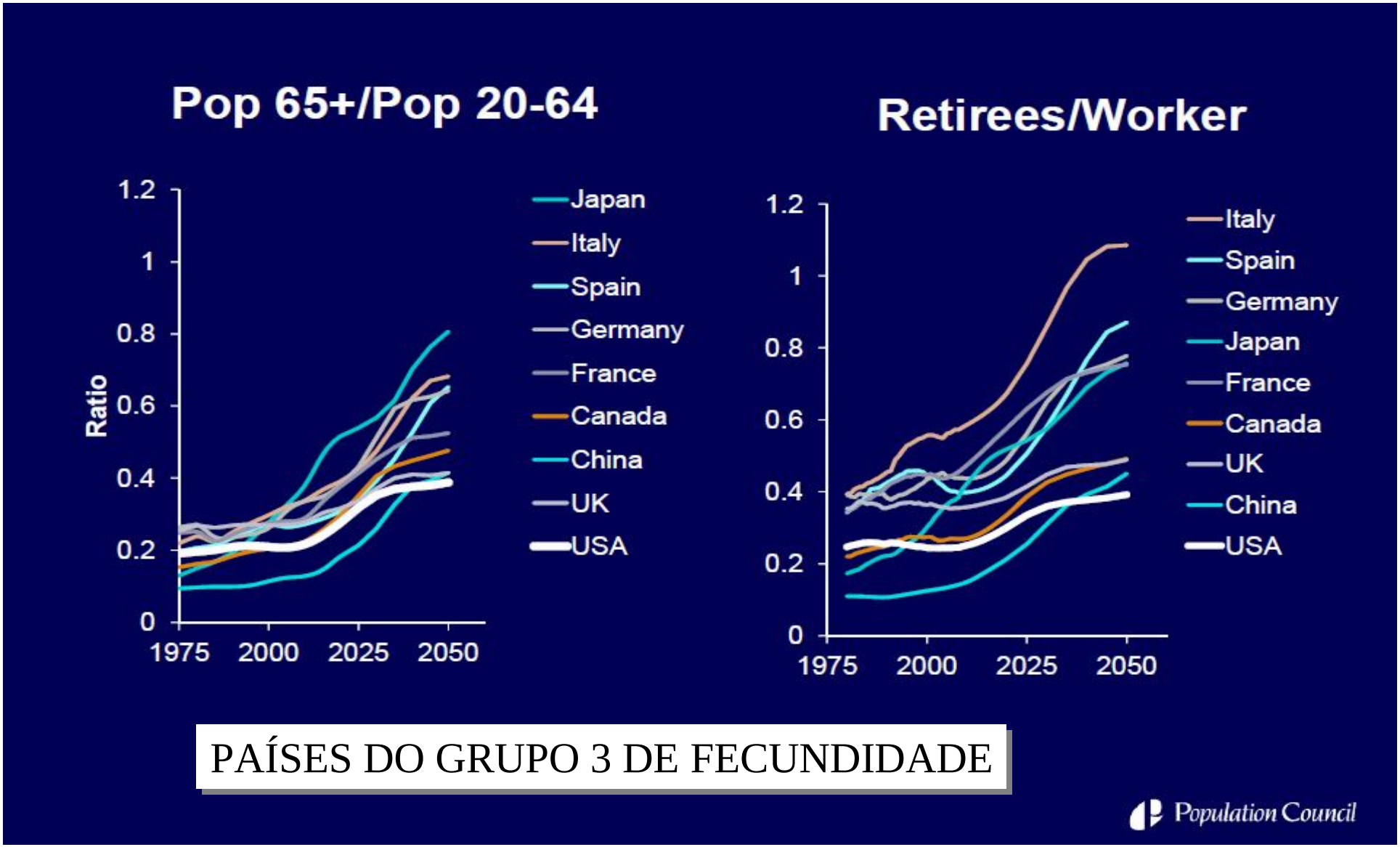
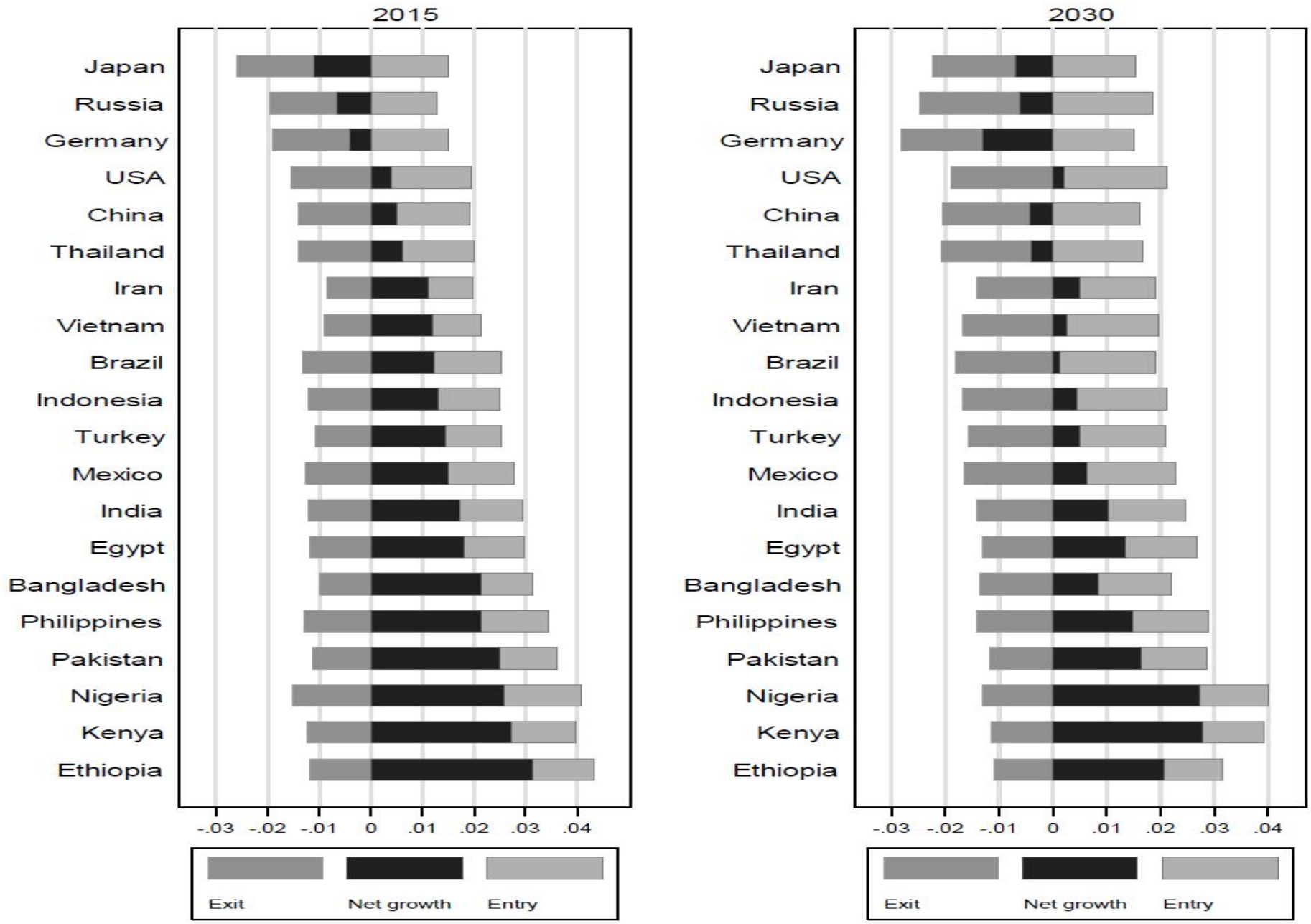

Pop 65+/Pop 20-64
Ratio
1.2
1
0.8
0.6
0.4
0.2
0
1975
2000
2025
2050
Japan
Italy
Spain
Germany
France
Canada
China
UK
USA
Retirees/Worker
1.2
1
0.8
0.6
0.4
0.2
0
1975
2000
2025
2050
Italy
Spain
Germany
Japan
France
Canada
UK
China
USA
PAÍSES DO GRUPO 3 DE FECUNDIDADE
Population Council

Figure 8. Projected annual growth rate of working-age population, 2015 and 2030



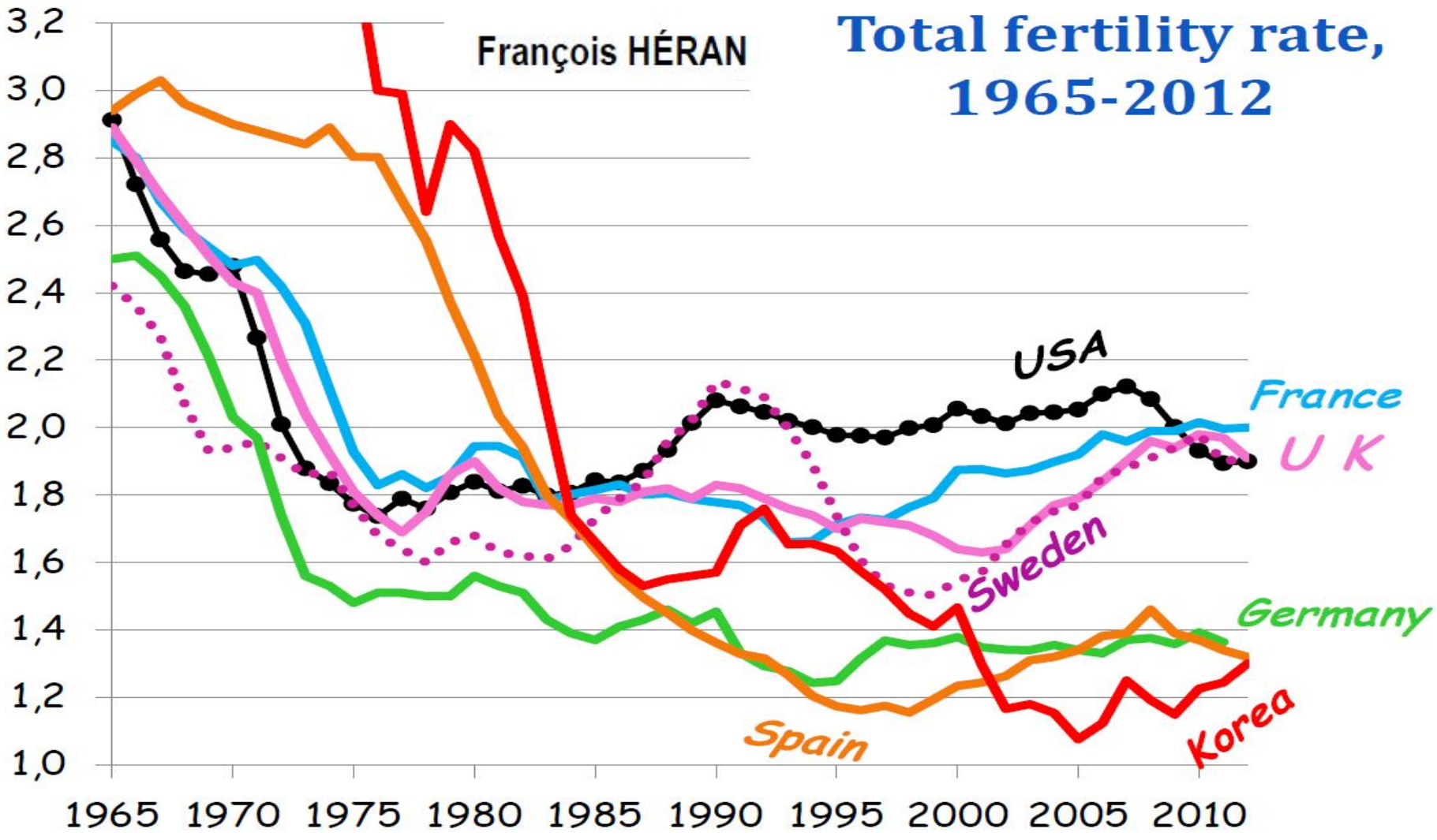
Population aged 15-64, UN Population Prospects: 2010 Revision, Medium Variant Projections

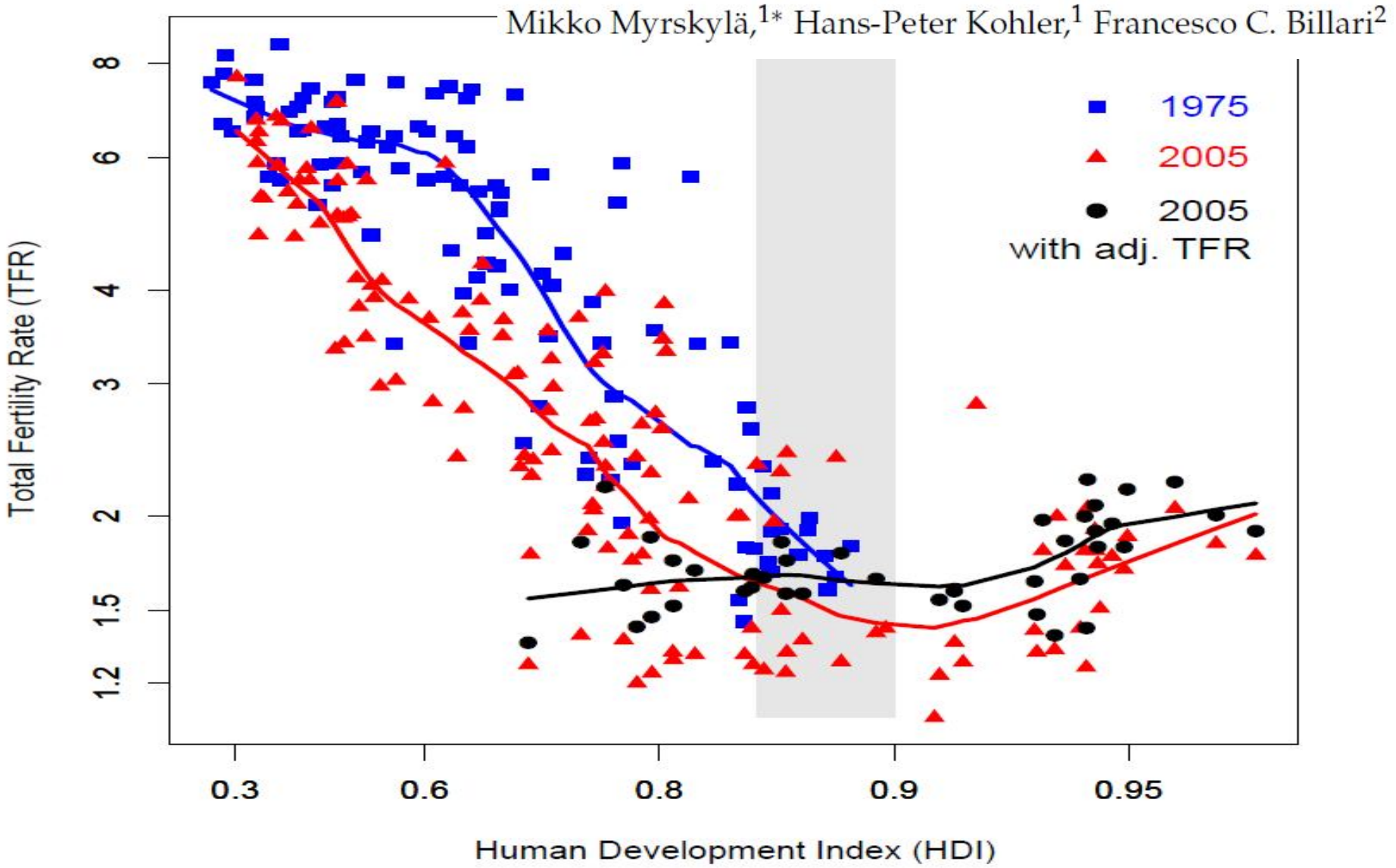
Lam e Liebbrandt, 2013

UFMG - Universidade Federal de Minas Gerais
FACE - Faculdade de Ciências Econômicas
Cedeplar - Centro de Desenvolvimento e Planejamento Regional

Algumas incógnitas sobre o futuro demográfico e implicações com o desenvolvimento

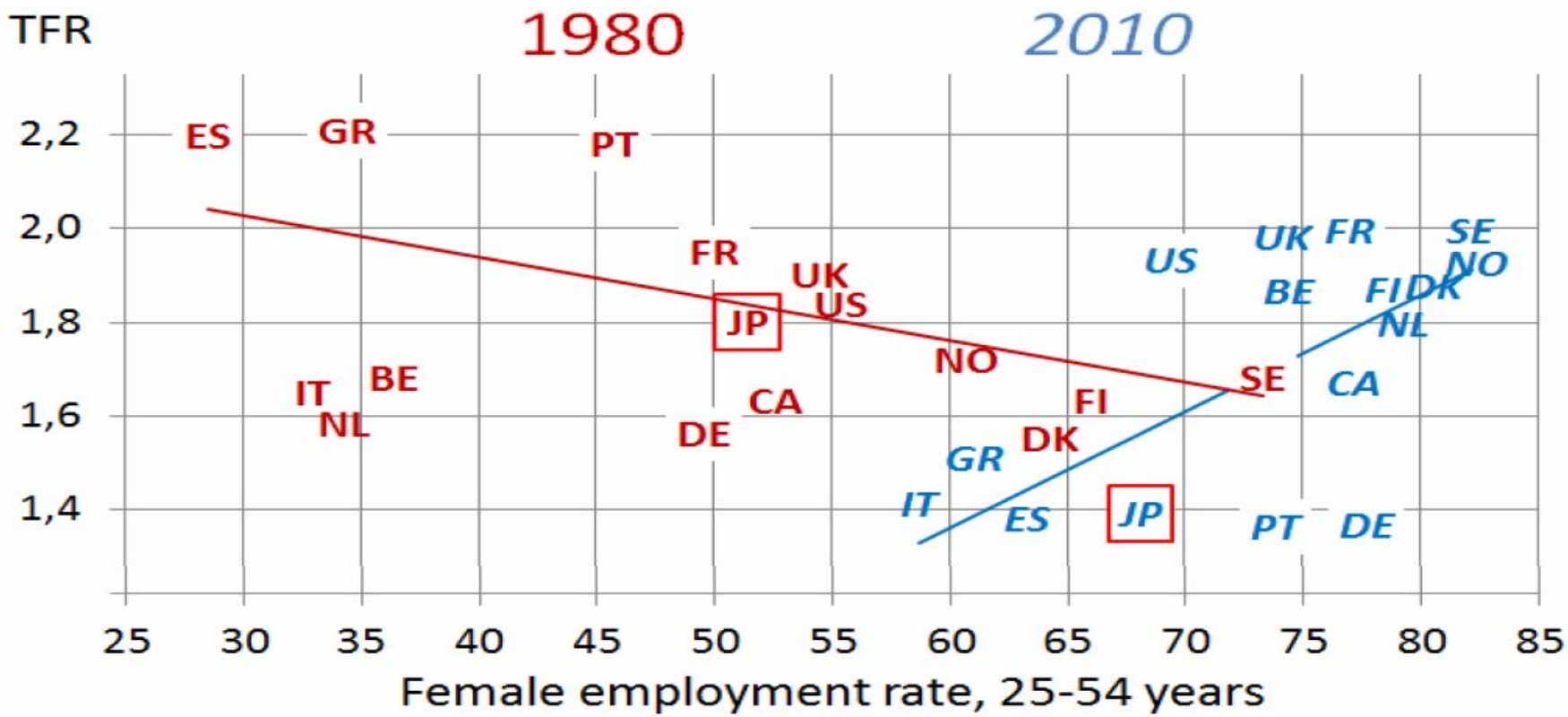
- O problema da fecundidade BEM ABAIXO do nível de reposição: Haveria um risco de uma IMPLOSÃO OU INVERNO DEMOGRÁFICO?
- Há evidências de um “pequeno efeito de rebatimento com alta da fecundidade” ?

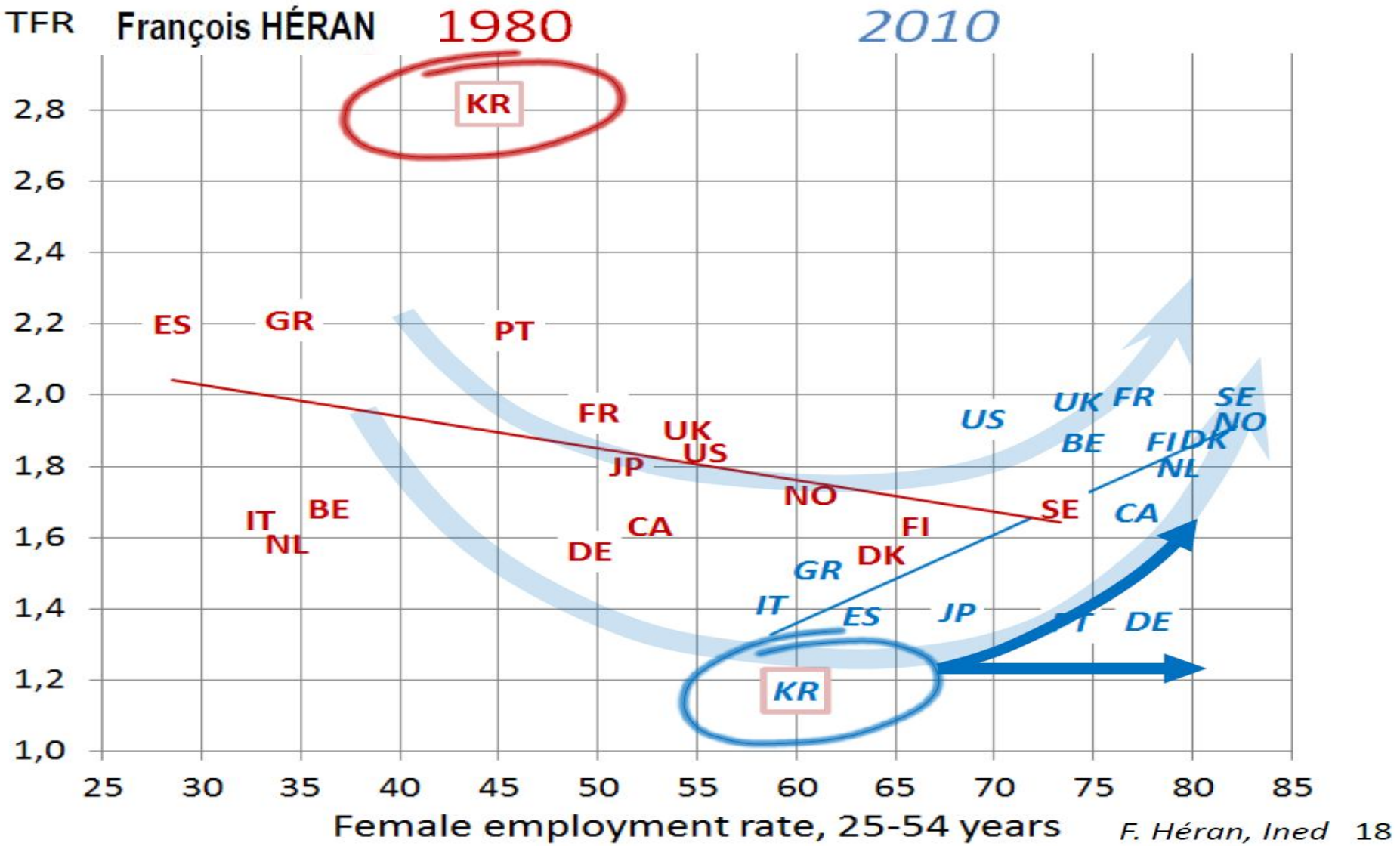

François HÉRAN
Total fertility rate, 1965-2012
3,2
3,0
2,8
2,6
2,4
2,2
2,0
1,8
1,6
1,4
1,2
1,0
1965 1970 1975 1980 1985 1990 1995 2000 2005 2010
USA
France
U K
Sweden
Germany
Spain
Korea


Mikko Myrskylä,[1*] Hans-Peter Kohler,[1] Francesco C. Billari[2]
1975
2005
2005
with adj. TFR
Total Fertility Rate (TFR)
8
6
4
3
2
1.5
1.2
0.3
0.6
0.8
0.9
0.95
Human Development Index (HDI)

François HÉRAN

The new relationship between women's employment and fertility




TFR
François HÉRAN
1980
2010
2,8
2,6
2,4
2,2
2,0
1,8
1,6
1,4
1,2
1,0
KR
ES
GR
PT
FR
UK
US
JP
NO
SE
IT
BE
NL
CA
DE
FI
DK
GR
IT
ES
JP
DE
US
UK
FR
SE
NO
BE
FI
DK
NL
CA
KR
25
30
35
40
45
50
55
60
65
70
75
80
85
Female employment rate, 25-54 years
F. Héran, Ined

- Papel da Equidade de Gênero em várias esferas para a reversão da queda na fecundidade.
- Equidade de Gênero nas Instituições Públicas: Mercado de Trabalho e Educação
- Equidade de Gênero e Flexibilidade nos Arranjos Familiares
- Políticas Públicas voltadas para a Equidade de Gênero: Licença Maternidade e Paternidade, Creches, Transferências de Renda para Famílias Maiores.

OBRIGADO !!!!!!!!!!!!