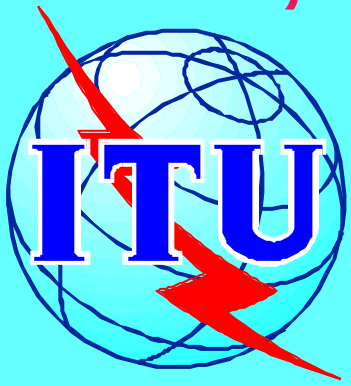
Global trends in telecom development and Int'l Interconnection

Seminar in Arusha, April 2002



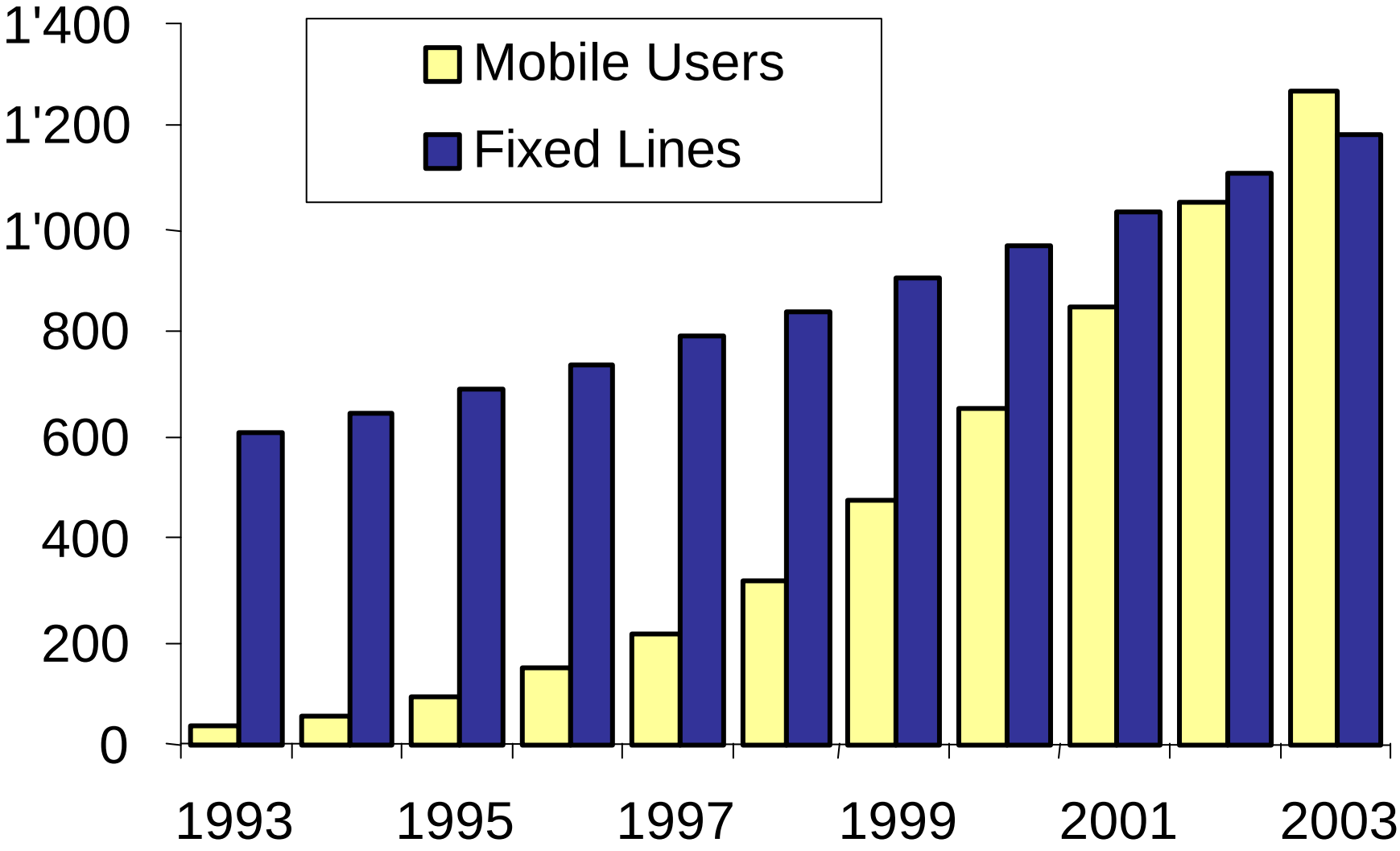
The original document is elaborated by Dr Tim Kelly, ITU/SPU. It has completed by Saburo Tanaka and by Pape-Gorgui Toure. The views expressed in this presentation are those of the authors, and do not necessarily reflect the opinions of the ITU or its membership. Authors can be contacted by e-mail at: Tim.Kelly@itu.int saburo.tanaka@itu.int gorgui.toure@itu.int.

Global trends in telecom development

- **The state of the industry**
- **The state of the market**
- **Situation in the Regions**
- **Paradigm shift**
- **Examining market reality**
- **ITU-T SG3 activities**
  - ⇨ **Transitional arrangements**
  - ⇨ **New remuneration systems**
- **Int'l Interconnection with mobile network**
- **Internet Interconnection – IP Telephony**

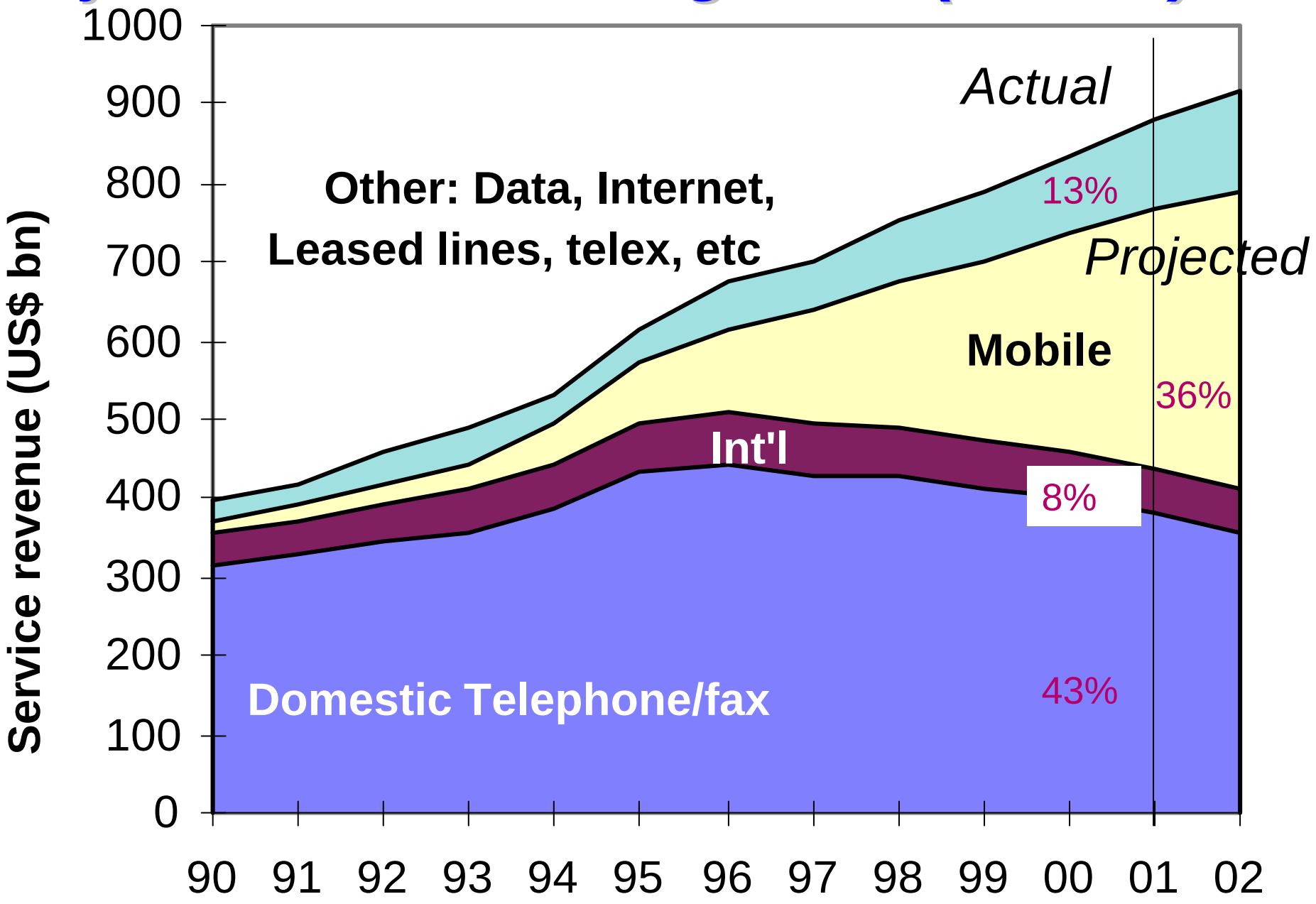
A Mobile Revolution

Fixed Lines vs. Mobile Users, worldwide, Million

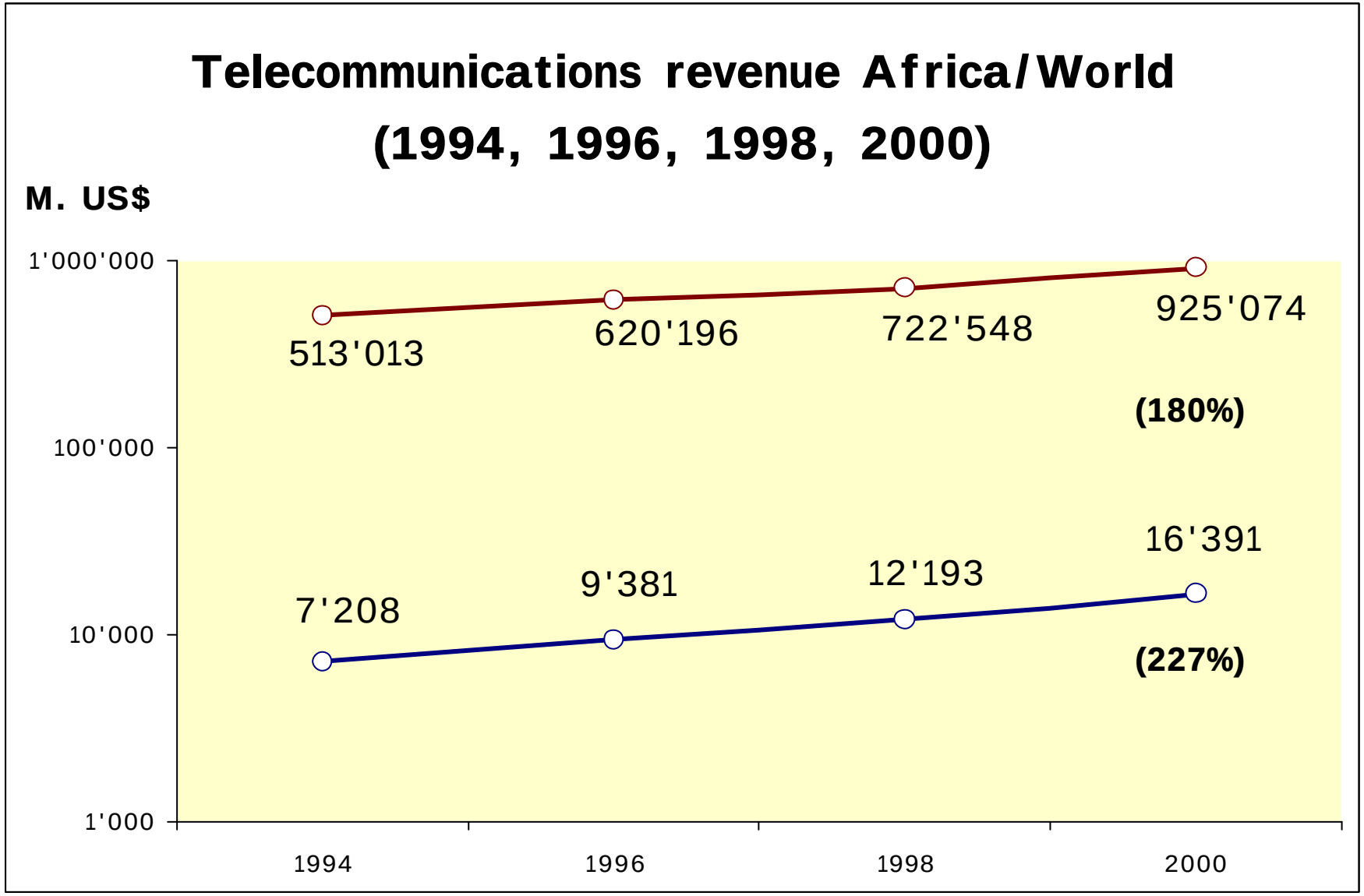


Source: ITU World Telecommunication Indicators Database.

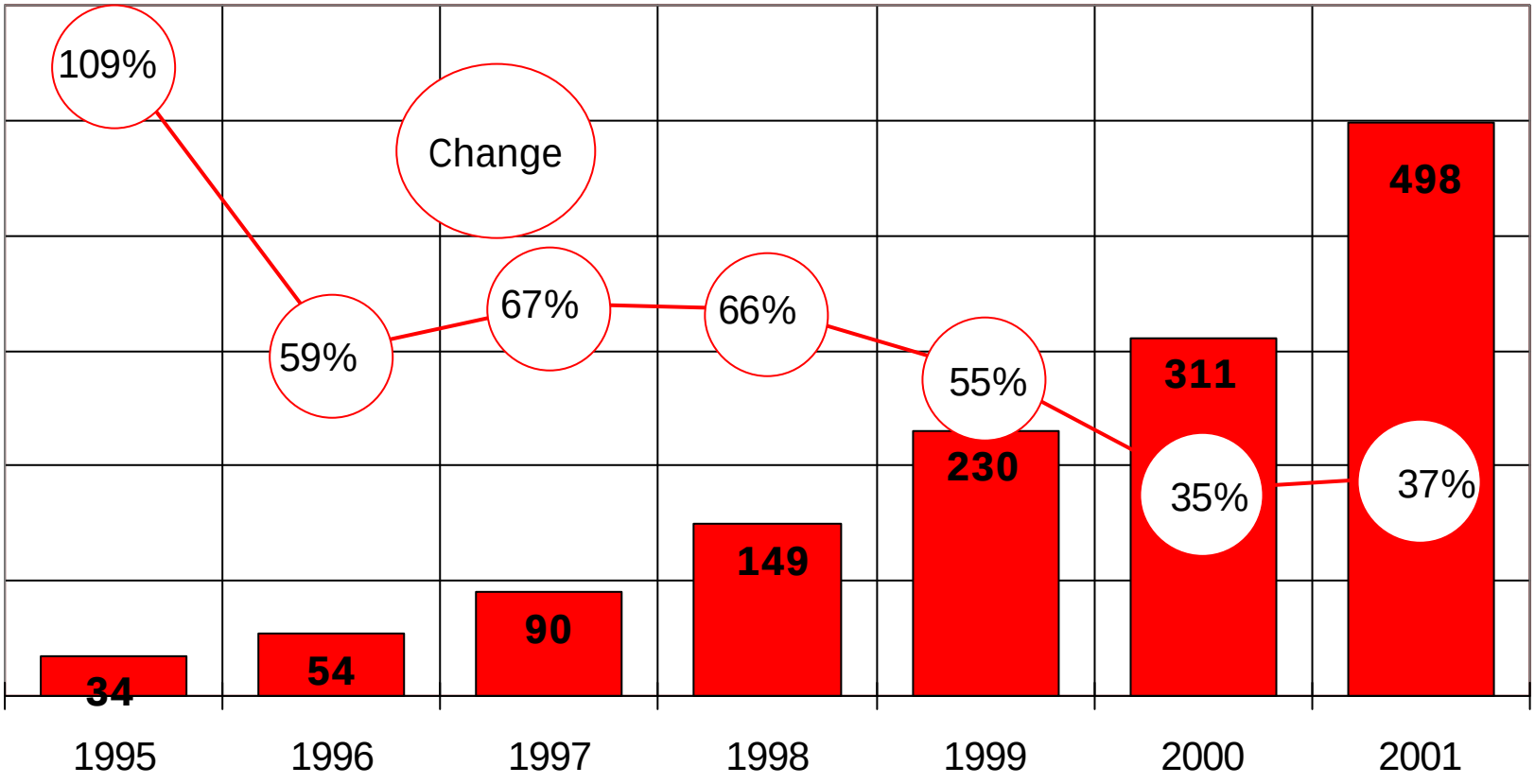
Projection of revenue growth (US$bn)



Source: ITU.

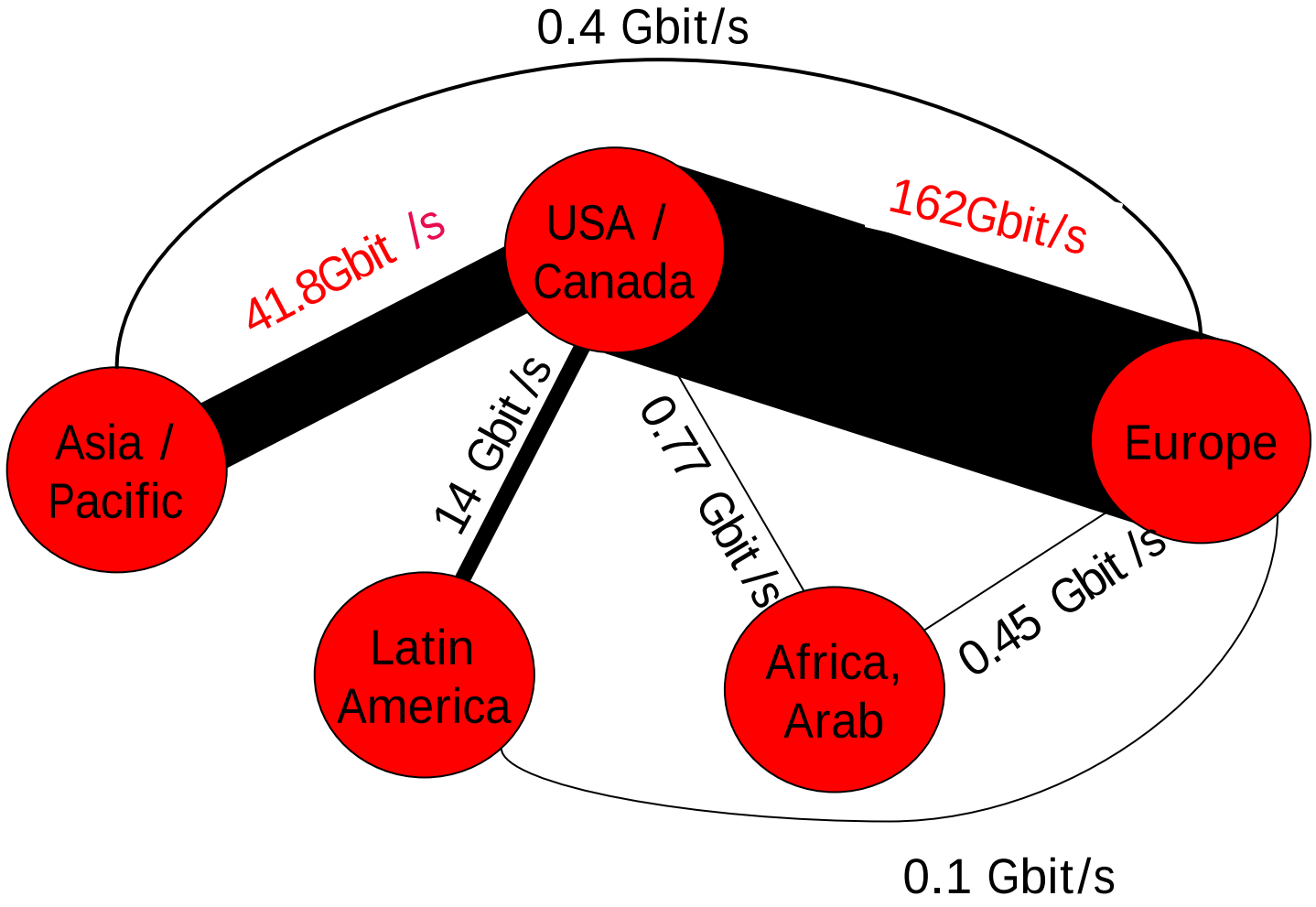

Telecommunications revenue Africa/World
(1994, 1996, 1998, 2000)
M. US$
1'000'000
100'000
10'000
1'000
513'013
620'196
722'548
925'074
(180%)
7'208
9'381
12'193
16'391
(227%)
1994
1996
1998
2000

Internet users, millions
Annual rate of change



Source: ITU.

Inter-regional Internet connectivity

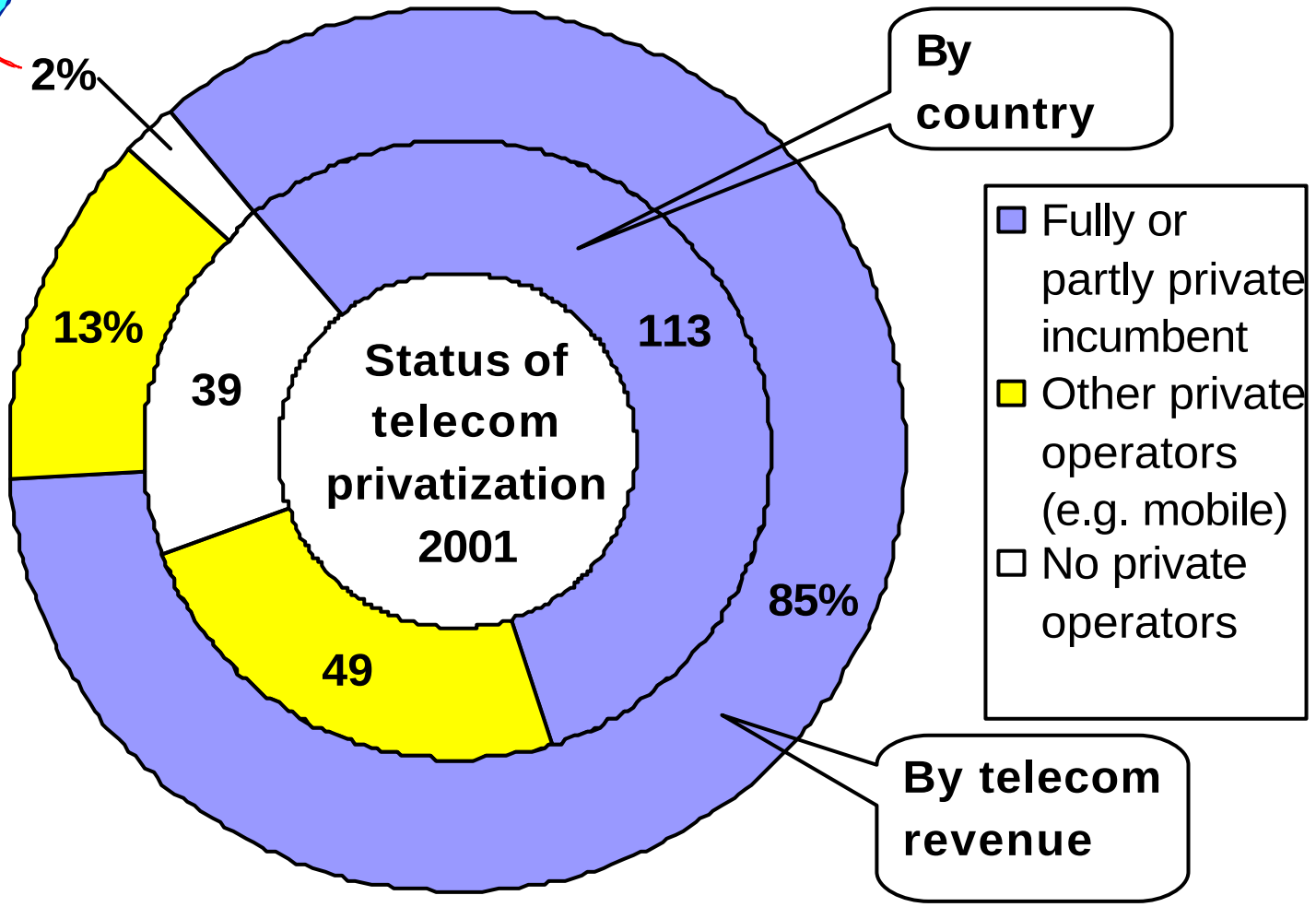


Note: Gbit/s = Gigabits (1'000 Mb) per second.
Source: ITU adapted from TeleGeography.

The state of the market

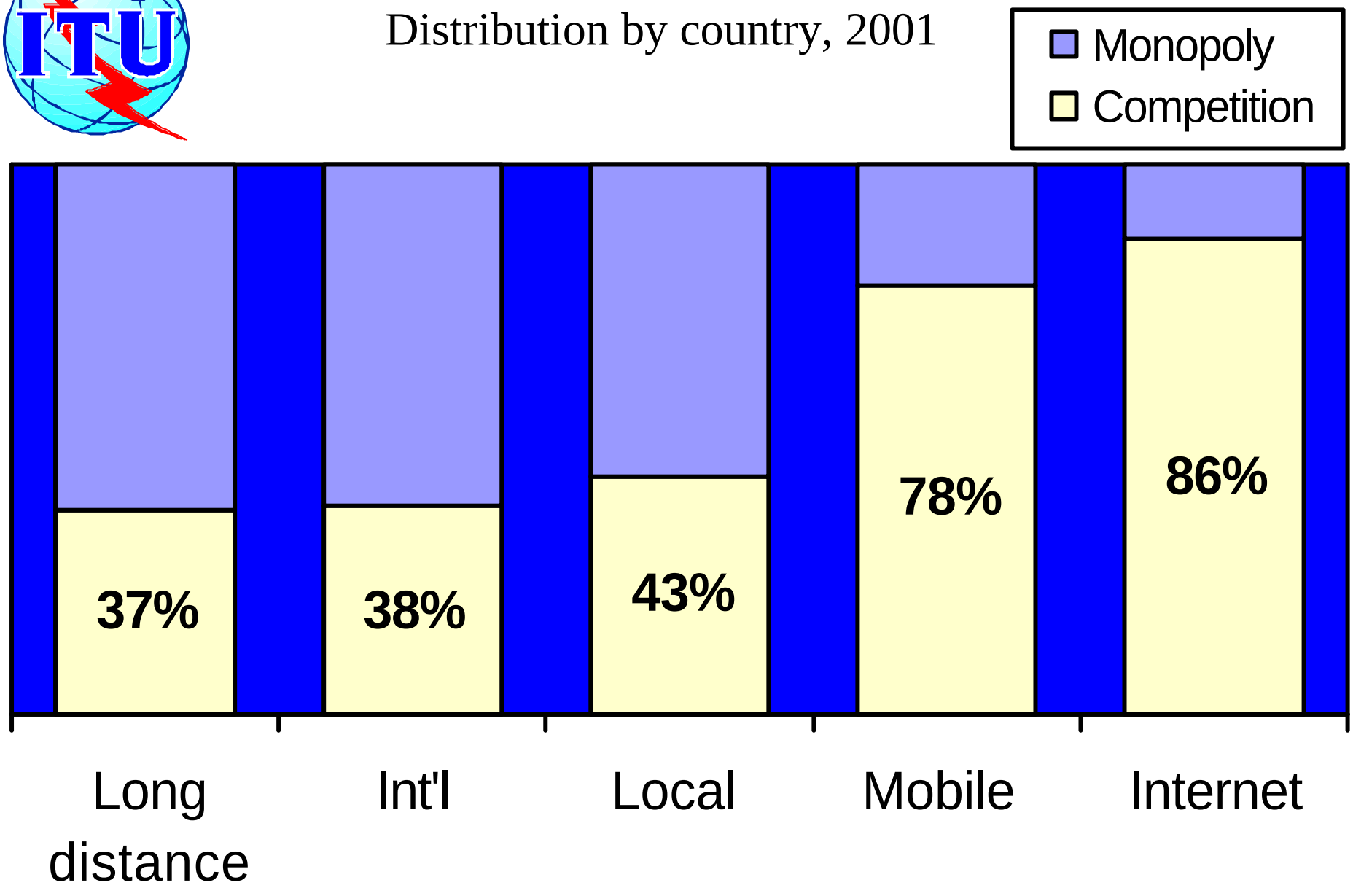
- **Increasing competition**
  - ⇨ **Around two-thirds of telecom subscribers now have a choice of operator**
  - ⇨ **More than 99 per cent of mobile and Internet subscribers now have a choice of operator**
- **Dominantly private-ownership**
  - ⇨ **19 out of top 20 top public telecom operators are partially or fully private-owned**
  - ⇨ **Of the top 20 mobile operators, 16 are fully-private, 3 are partially private, 1 is state-owned**
- **Independent regulators**
  - ⇨ **There are currently 112 independent regulators (only 12 in 1990)**

Private, competitive, mobile and global



Status of telecommunication privatization , by country and by share of global revenue, 2001

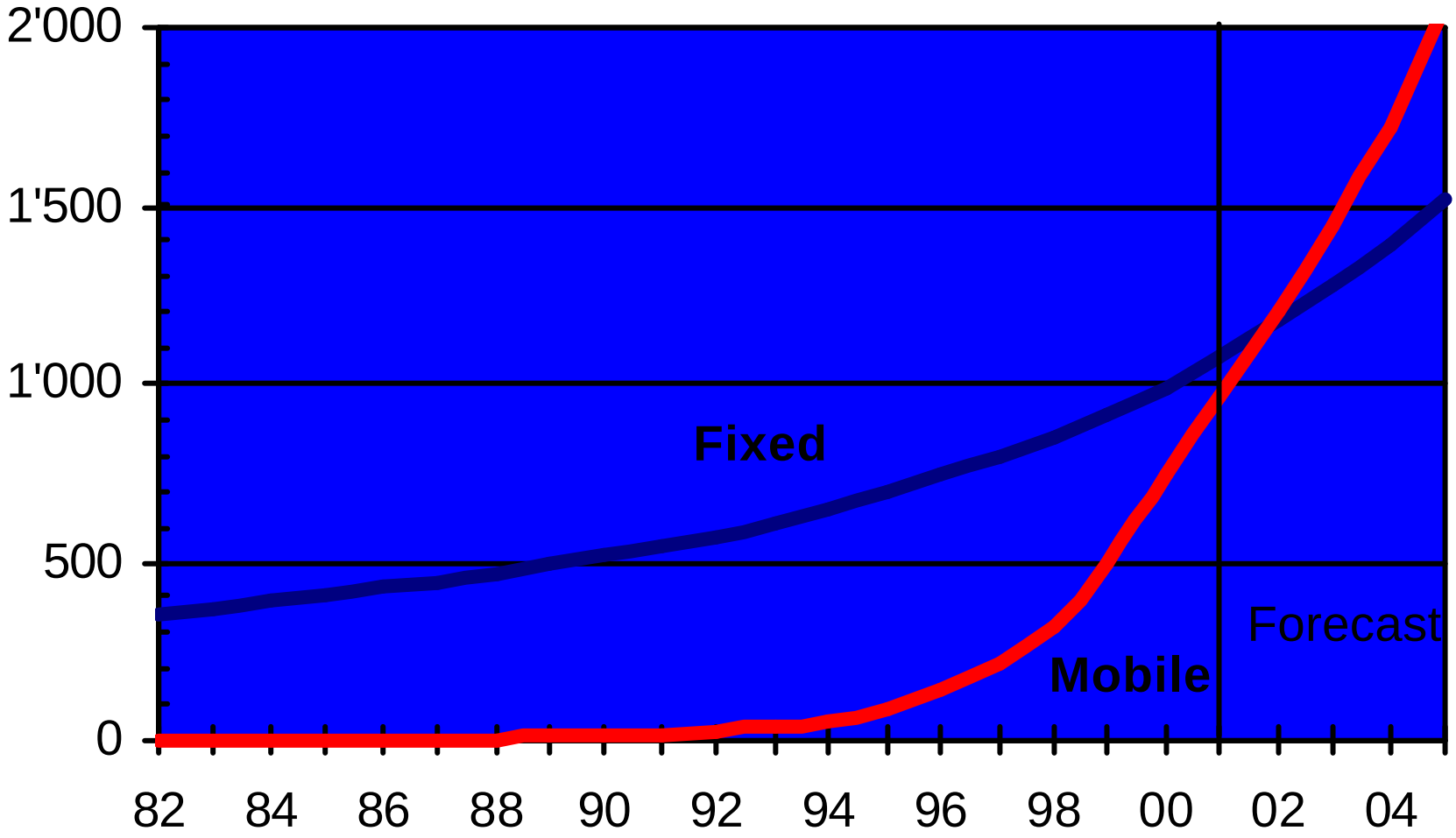
Legal status of competition
Distribution by country, 2001



Legal status of telecommunication competition, by country, 2001

Mobile as the new global network

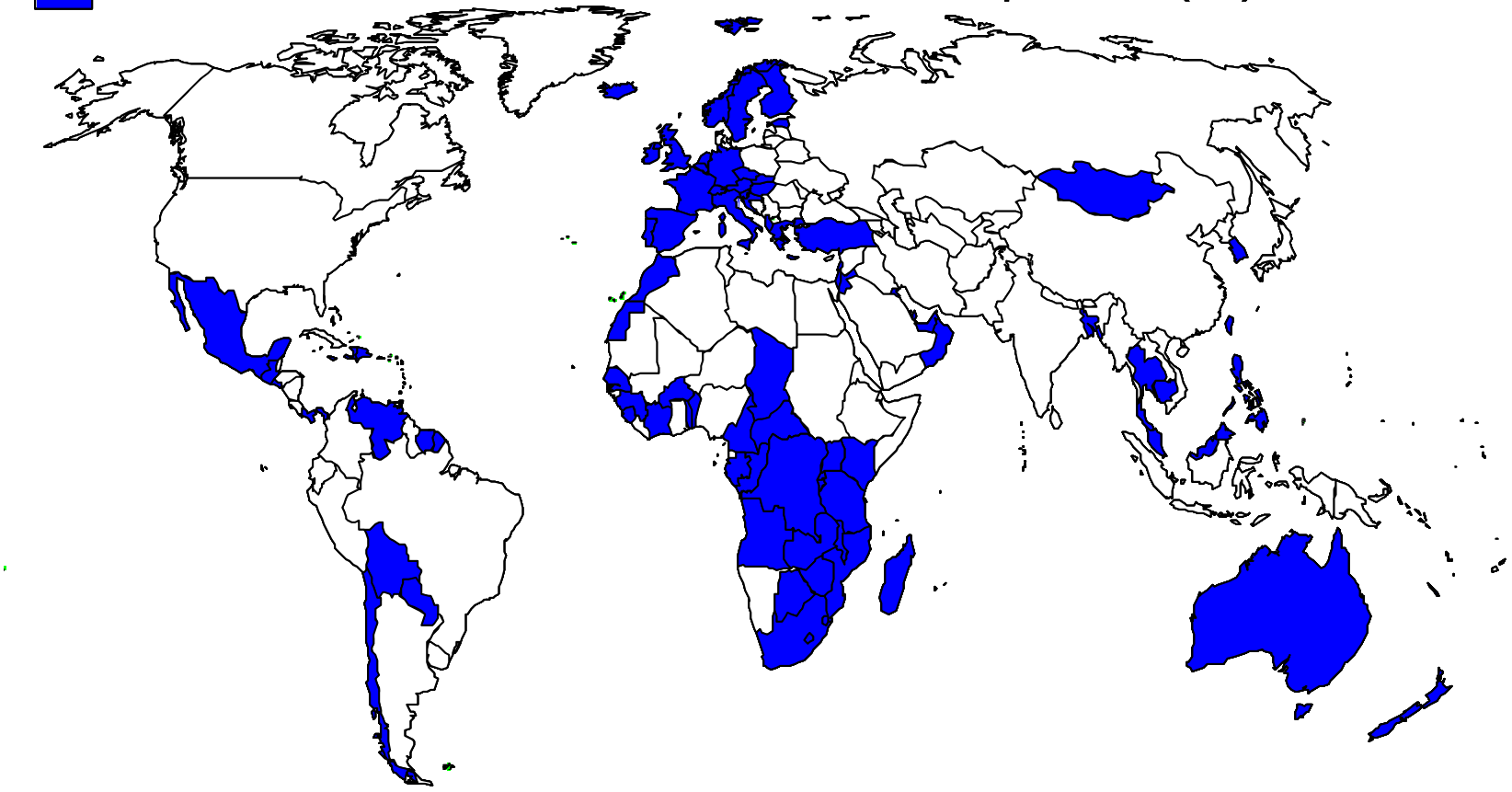
Telephone subscribers, world,

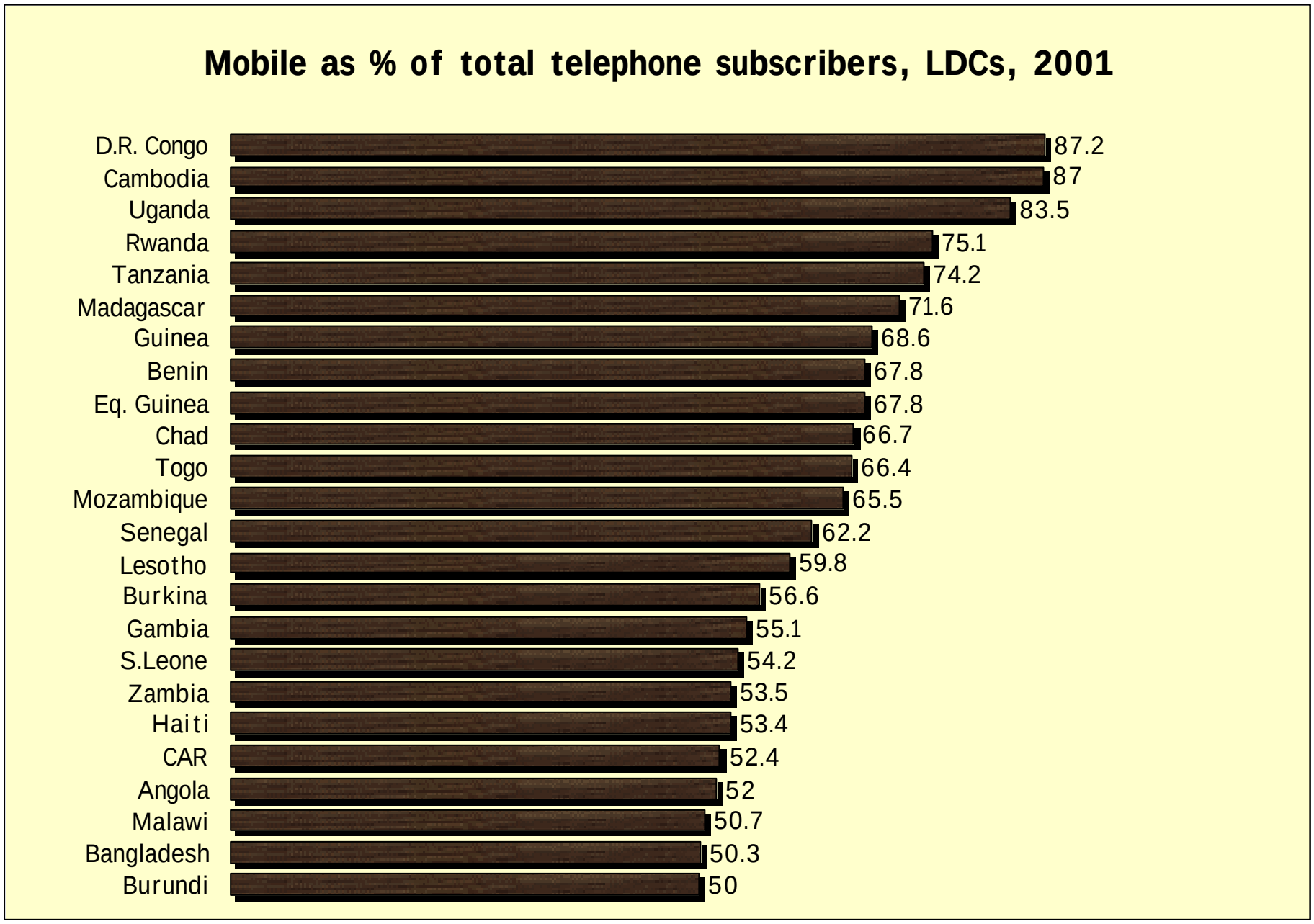


Mobile and fixed telephone subscribers worldwide, 1982-2005

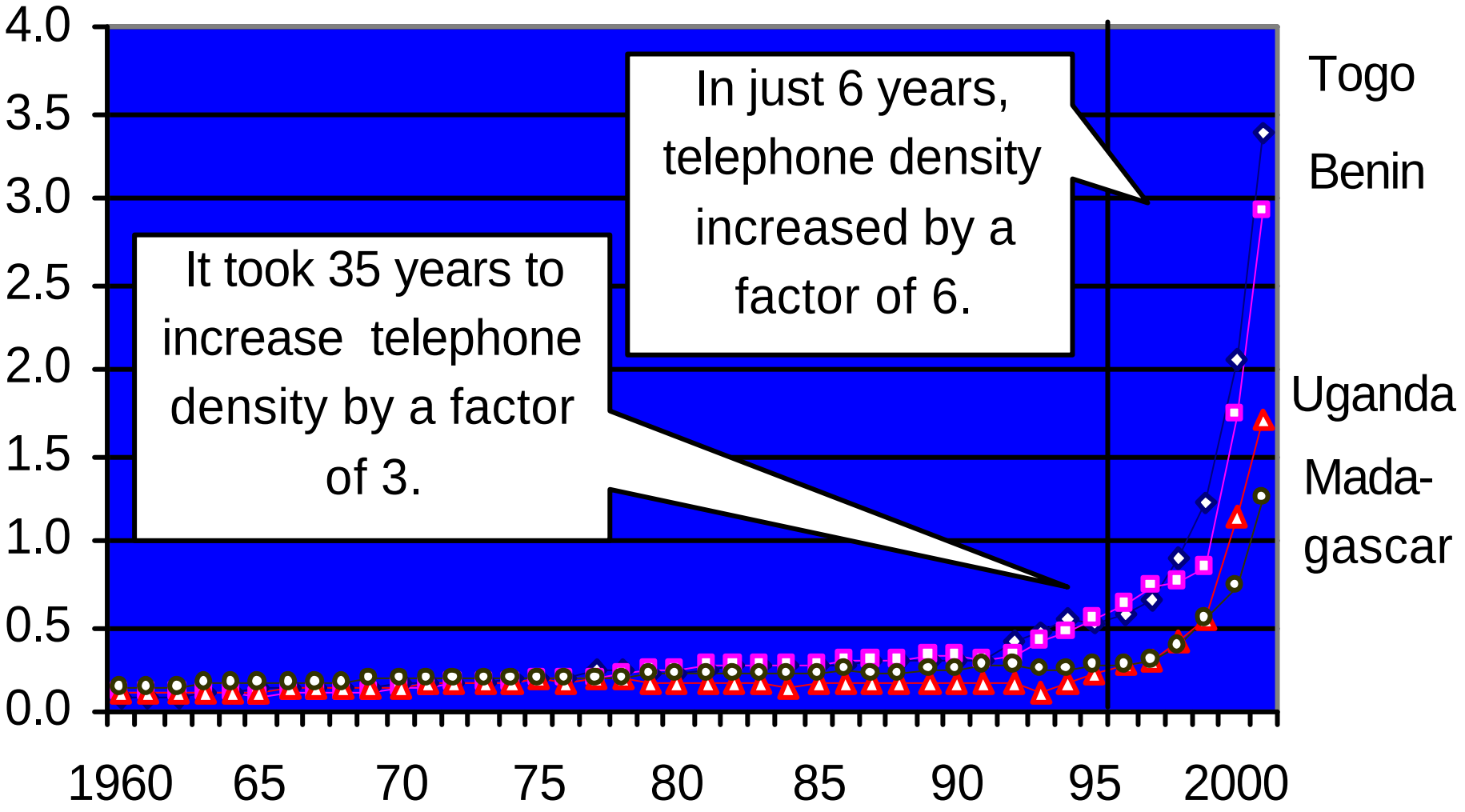
More mobile countries

Countries with more mobile than fixed telephones (97), 2001



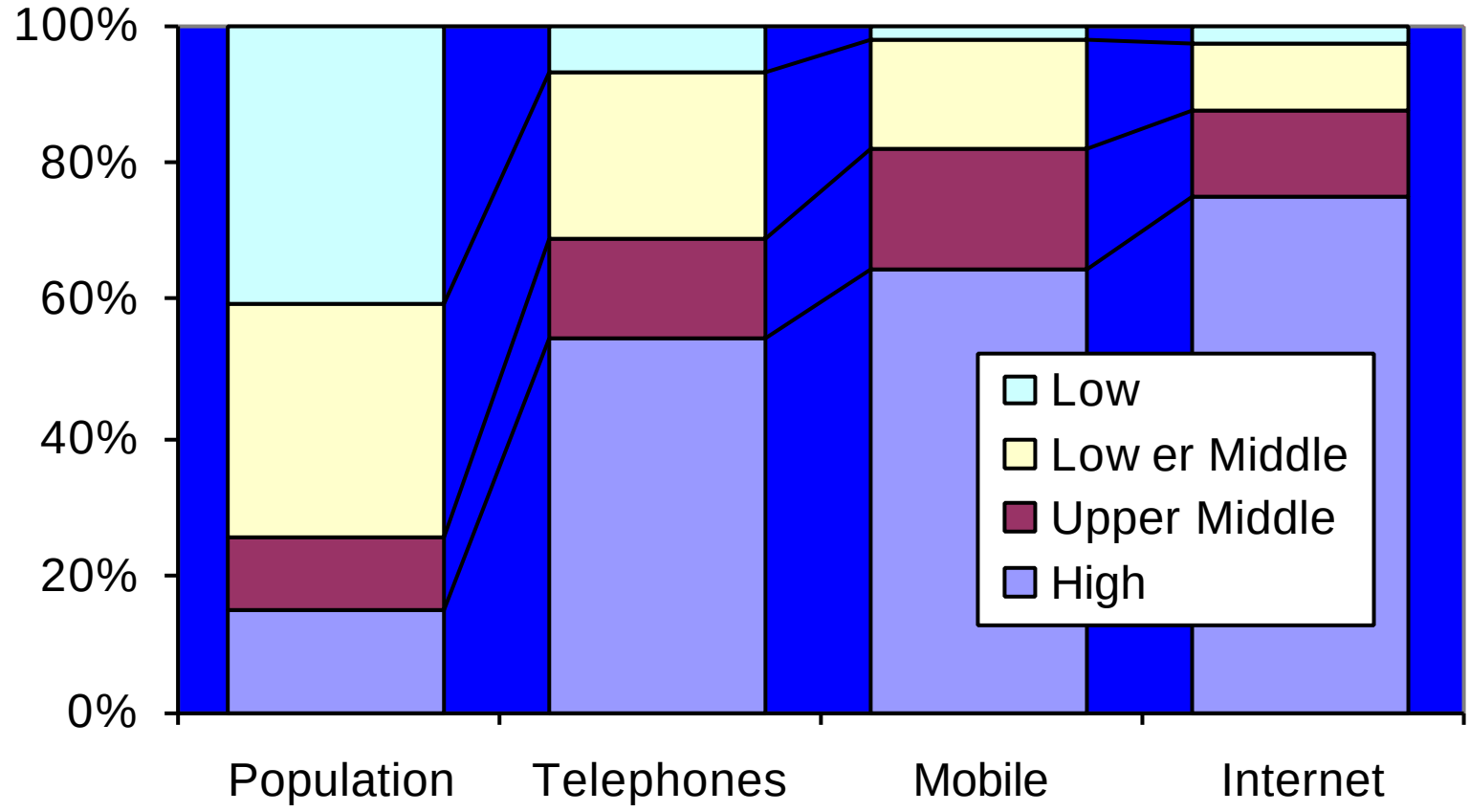

Mobile as % of total telephone subscribers, LDCs, 2001
D.R. Congo 87.2
Cambodia 87
Uganda 83.5
Rwanda 75.1
Tanzania 74.2
Madagascar 71.6
Guinea 68.6
Benin 67.8
Eq. Guinea 67.8
Chad 66.7
Togo 66.4
Mozambique 65.5
Senegal 62.2
Lesotho 59.8
Burkina 56.6
Gambia 55.1
S.Leone 54.2
Zambia 53.5
Haiti 53.4
CAR 52.4
Angola 52
Malawi 50.7
Bangladesh 50.3
Burundi 50

Total telephone users (fixed plus mobile) per 100 inhabitants

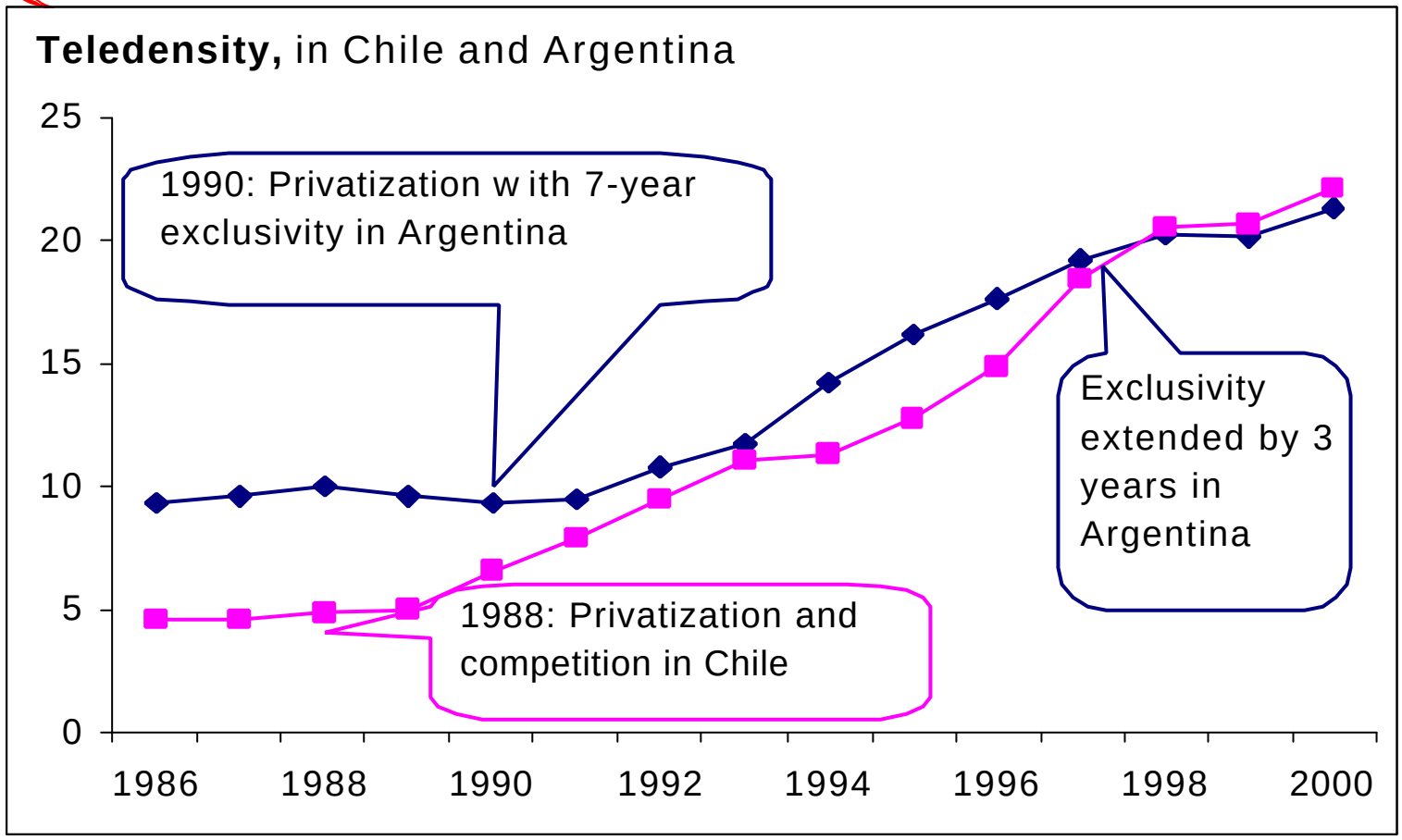


Distribution of population, main telephone lines, mobile cellular subscribers and Internet users by country economic classification, 2001

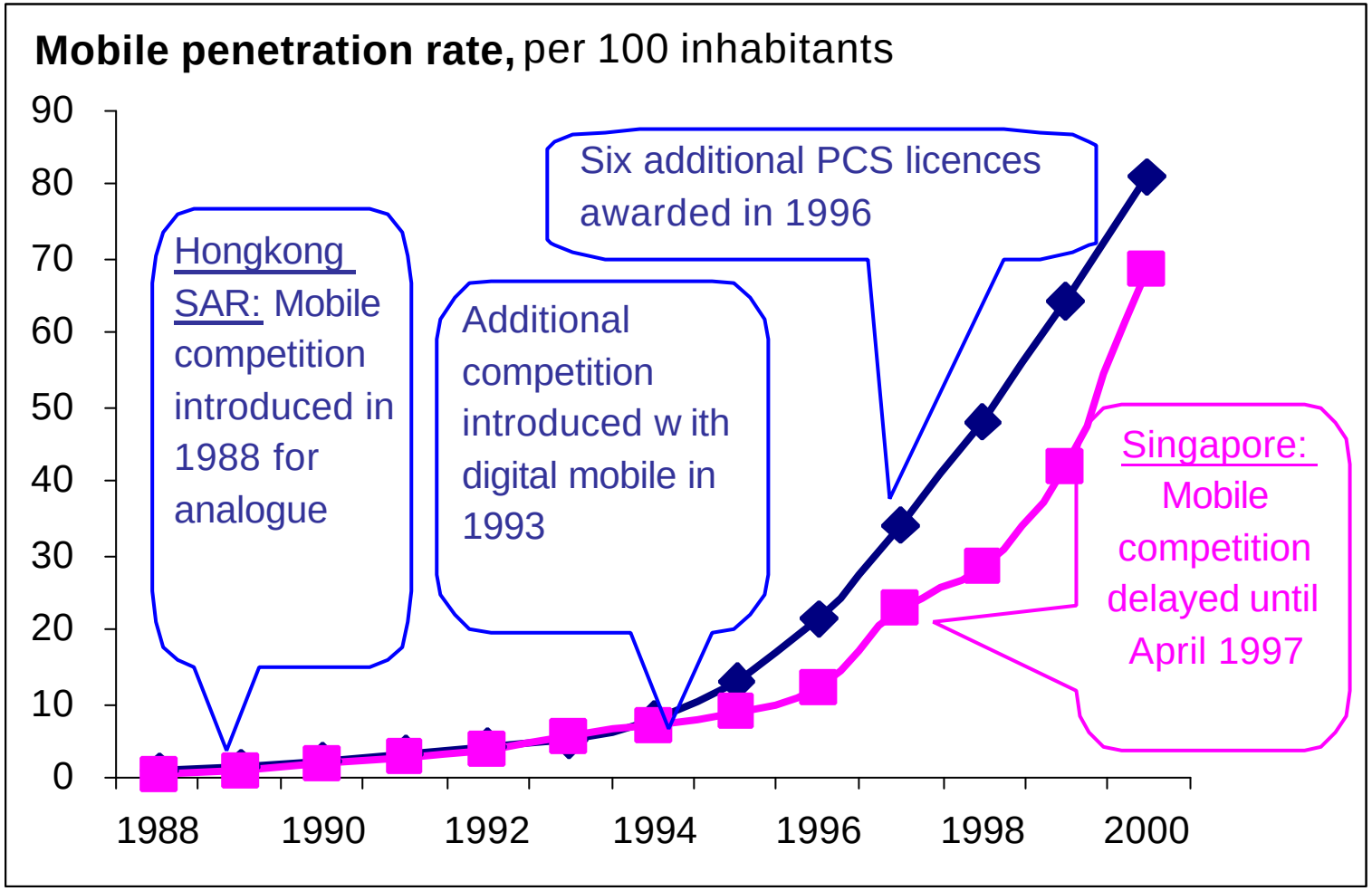
Distribution by economic classification, 2001



Growth in fixed line teledensity, Chile and Argentina, 1986-2000



Growth in mobile teledensity, Hong Kong SAR and Singapore, 1988-2000

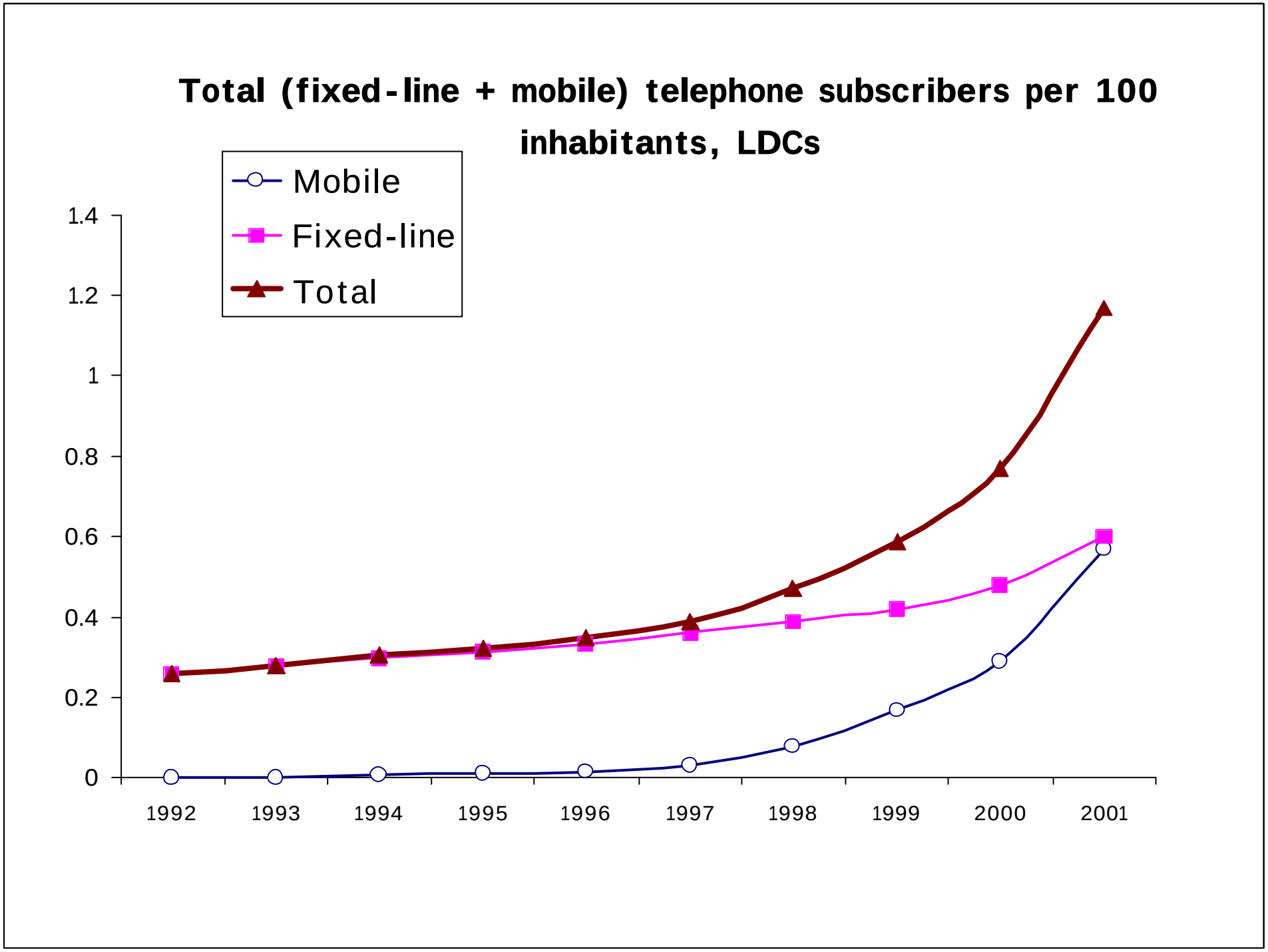


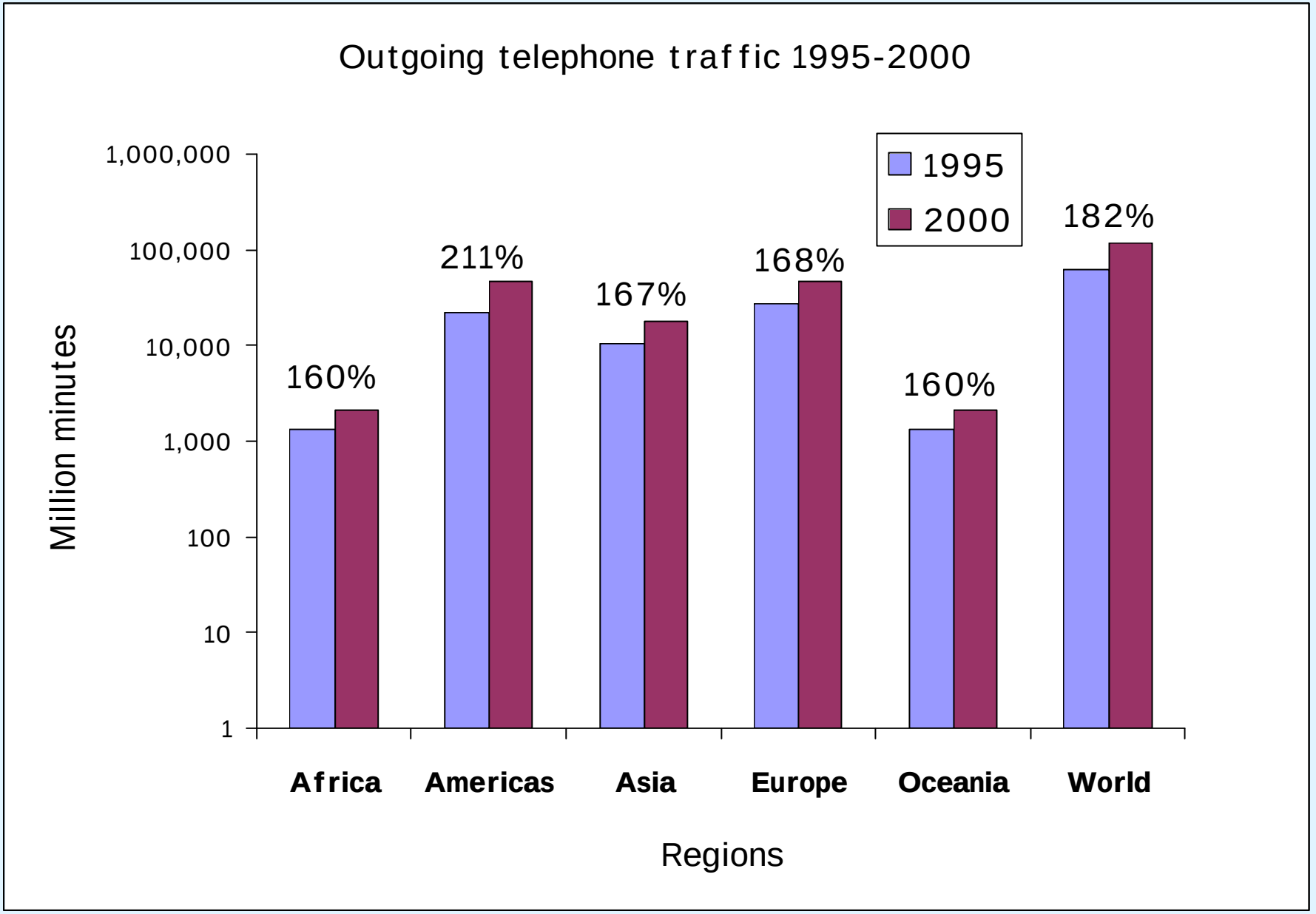
Teledensity with rising rank

Country	2000	1990	Rank 2000	Rank 1990	Change
China	17.8	0.6	95	159	64
Viet Nam	4.2	0.1	141	189	48
Botsw ana	21.6	2.1	91	129	38
El Salvador	21.8	2.4	90	125	35
Jamaica	34.1	4.5	71	106	35
Hungary	67.4	9.6	43	78	35
Mauritius	38.6	5.4	67	100	33
Chile	44.4	6.7	61	93	32
Philippines	12.4	1.0	112	143	31
Morocco	13.3	1.6	107	136	29
Paraguay	20.7	2.7	92	120	28
Cambodia	1.2	0.0	167	194	27
Cape Verde	17.2	2.4	98	125	27
Taiw an, China	137.0	31.4	5	31	26
Poland	45.6	8.6	60	85	25

Teledensity with falling rank

Country	2000	1990	Rank 2000	Rank 1990	Change
Armenia	15.6	15.7	102	60	-42
Iraq	2.9	3.9	149	109	-40
Tajikistan	3.6	4.5	143	105	-38
Uzbekistan	6.9	6.9	128	92	-36
Kyrgyzstan	7.9	7.2	125	90	-35
Angola	0.7	0.8	177	146	-31
Liberia	0.2	0.4	190	162	-28
DPR Korea	4.6	3.8	138	111	-27
Canada	96.1	58.6	33	6	-27
Turkmenistan	8.4	6.0	123	97	-26
Cuba	4.4	3.1	140	115	-25
Moldova	16.5	10.6	99	74	-25
Kazakhstan	12.5	8.0	111	87	-24
Comoros	1.0	0.8	171	149	-22
Ukraine	22.7	13.6	87	66	-21


Total (fixed-line + mobile) telephone subscribers per 100 inhabitants, LDCs
Mobile
Fixed-line
Total
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001


Outgoing telephone traffic 1995-2000
1,000,000
100,000
10,000
1,000
100
10
1
Million minutes
1995
2000
160%
211%
167%
168%
160%
182%
Africa
Americas
Asia
Europe
Oceania
World
Regions

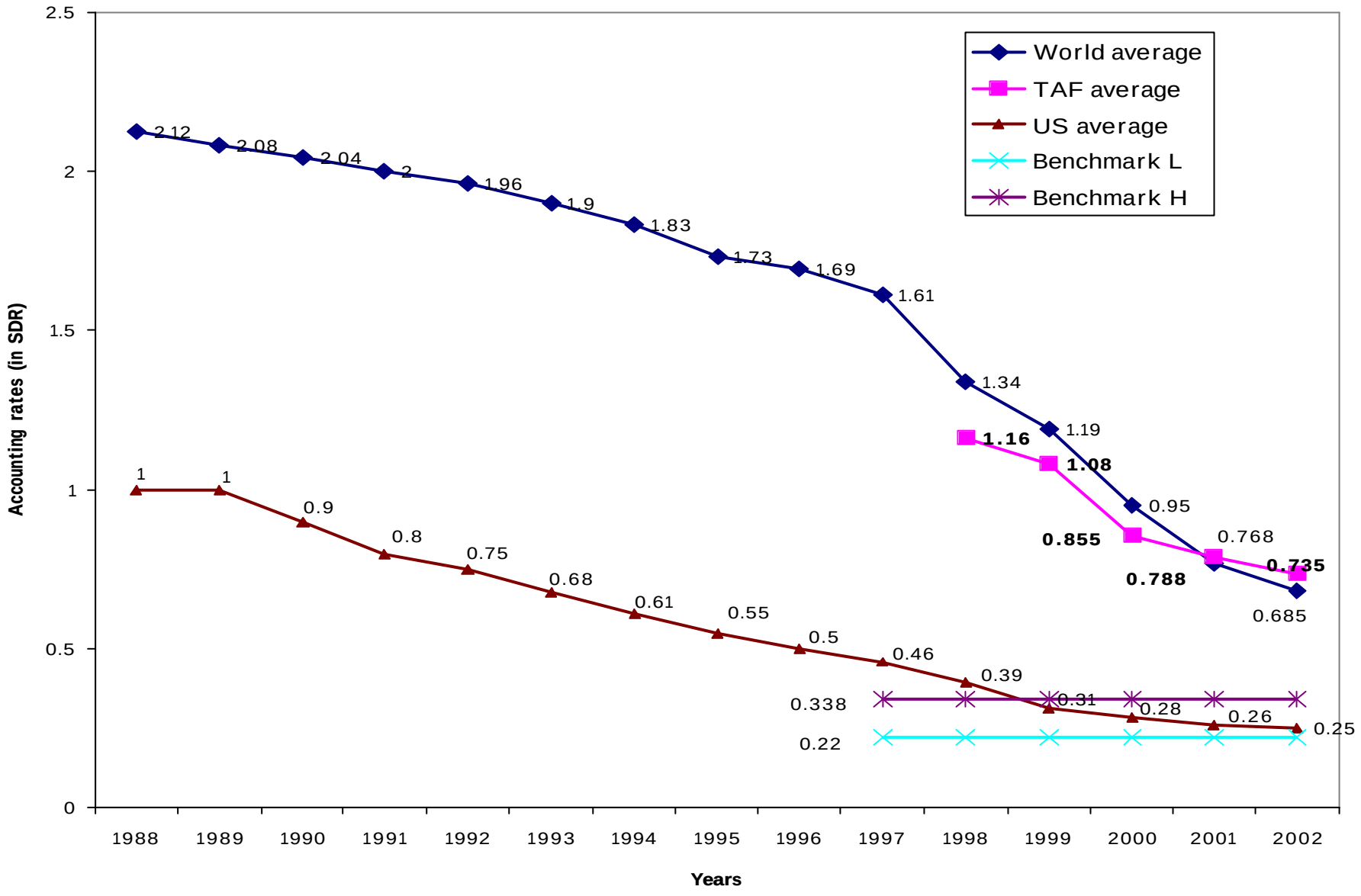
Telephone tariffs (2000)

	Residential (US$)		Business (US$)		Local call (US$)	Subscription as % of GDP per capita
	Connection	M. Subscription	Connection	M. Subscription		
World	86	6.3	113	9.8	0.07	5.7
Africa	62	5.0	77	5.7	0.08	12.7
Americas	105	8.3	134	17.6	0.07	3.1
Asia	108	4.4	139	8.0	0.04	5.5
Europe	84	7.8	117	9.7	0.10	1.1
Oceania	55	8.6	79	14.3	0.13	3.7

Cellular tariffs (2000)

	Connection	M. Subscription	3 minutes local call	
			Peak	Off Peak
World	75	16.6	0.62	0.42
Africa	79	13.3	0.56	0.39
Americas	58	21	0.78	0.57
Asia	83	14.9	0.47	0.32
Europe	62	13.8	0.59	0.41
Oceania	91	35.7	1.40	0.75

Accounting rates trend



Telephony : Some DATA(2000)

Intern'l Telephone revenue : 54 billion US $

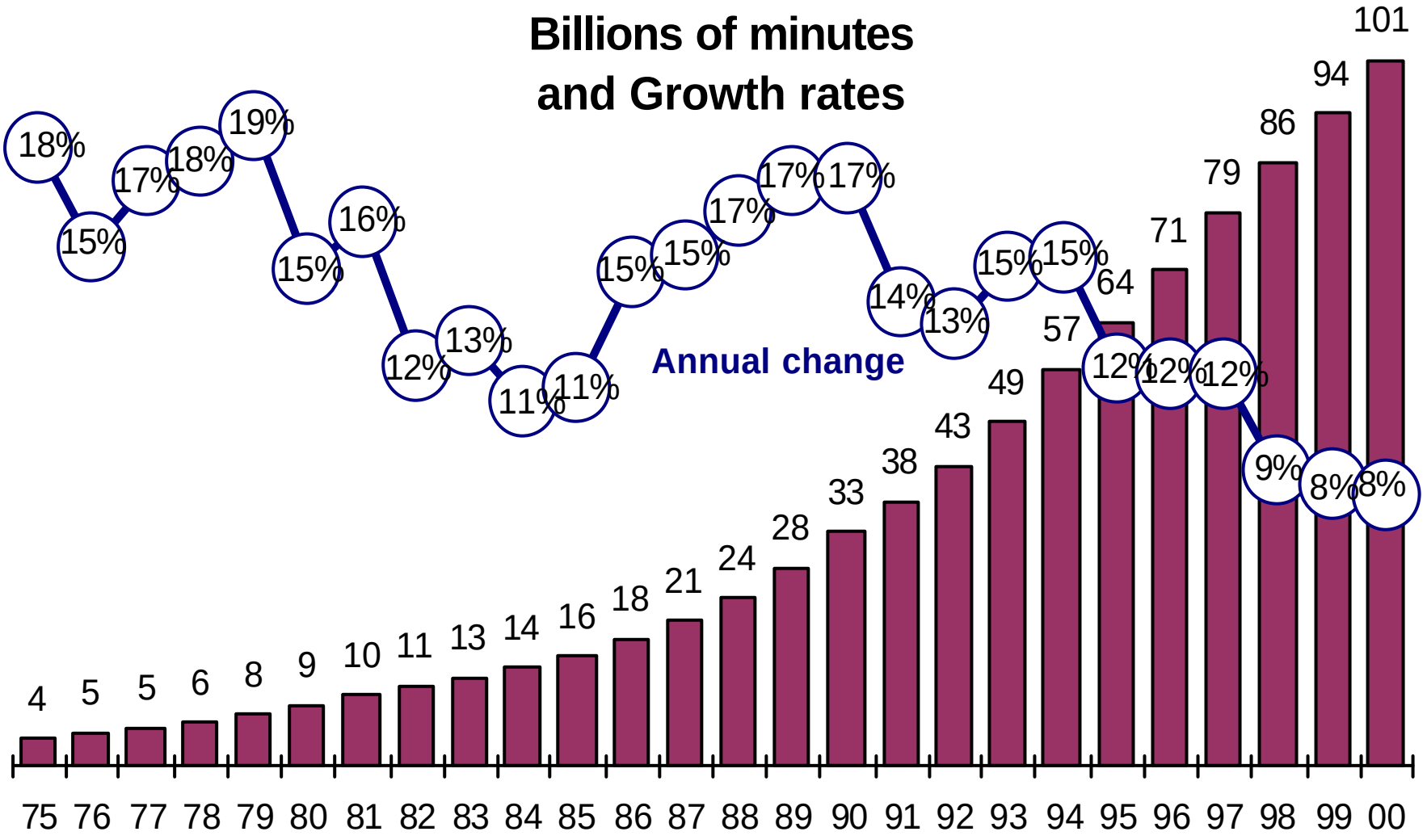
Settlement transaction : 27 billion US $

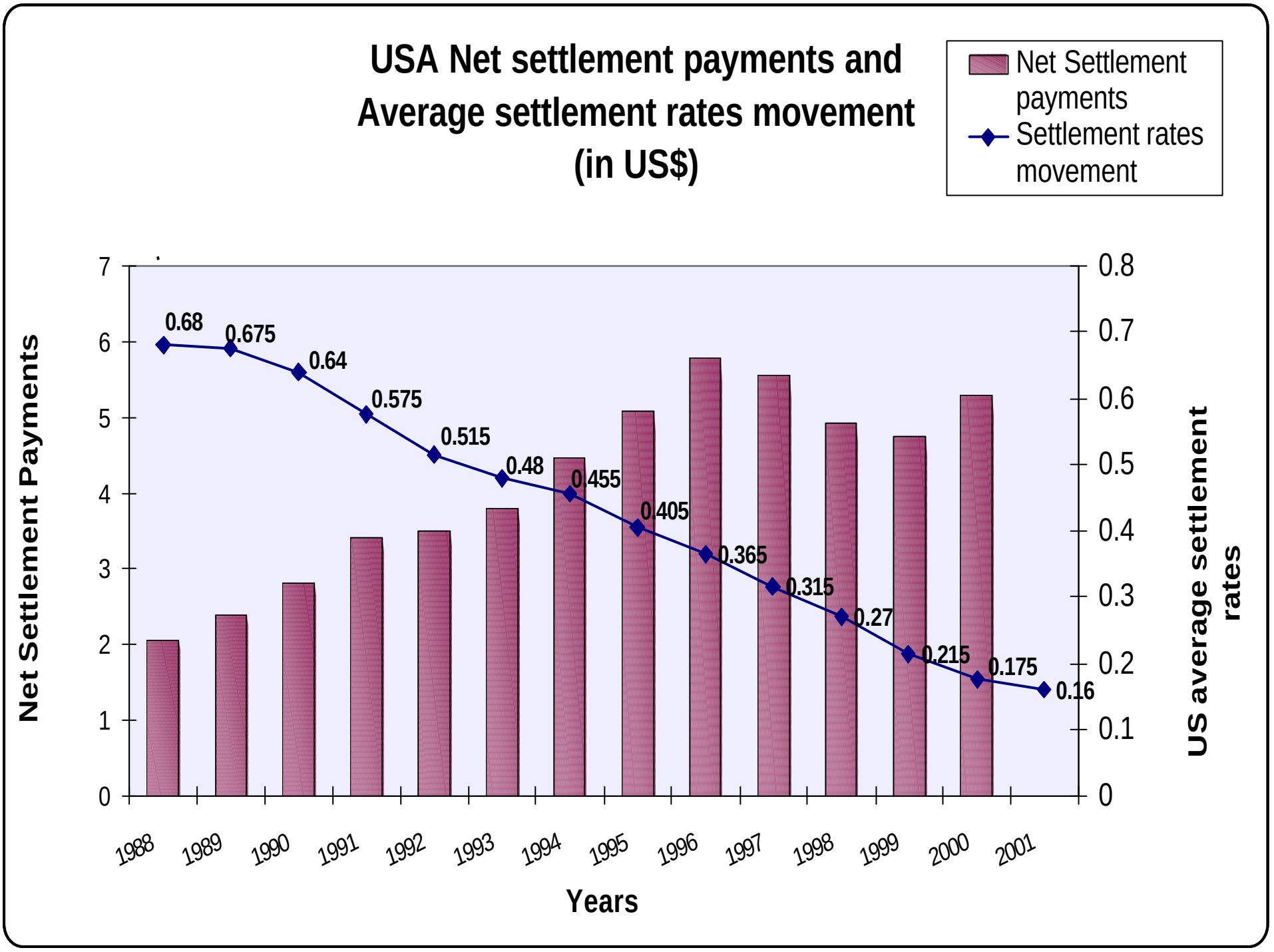
Net Settlement payment to developing countries amount to around : 5 billion US$

Int'l Infrastructure costs reduction: < 20 %

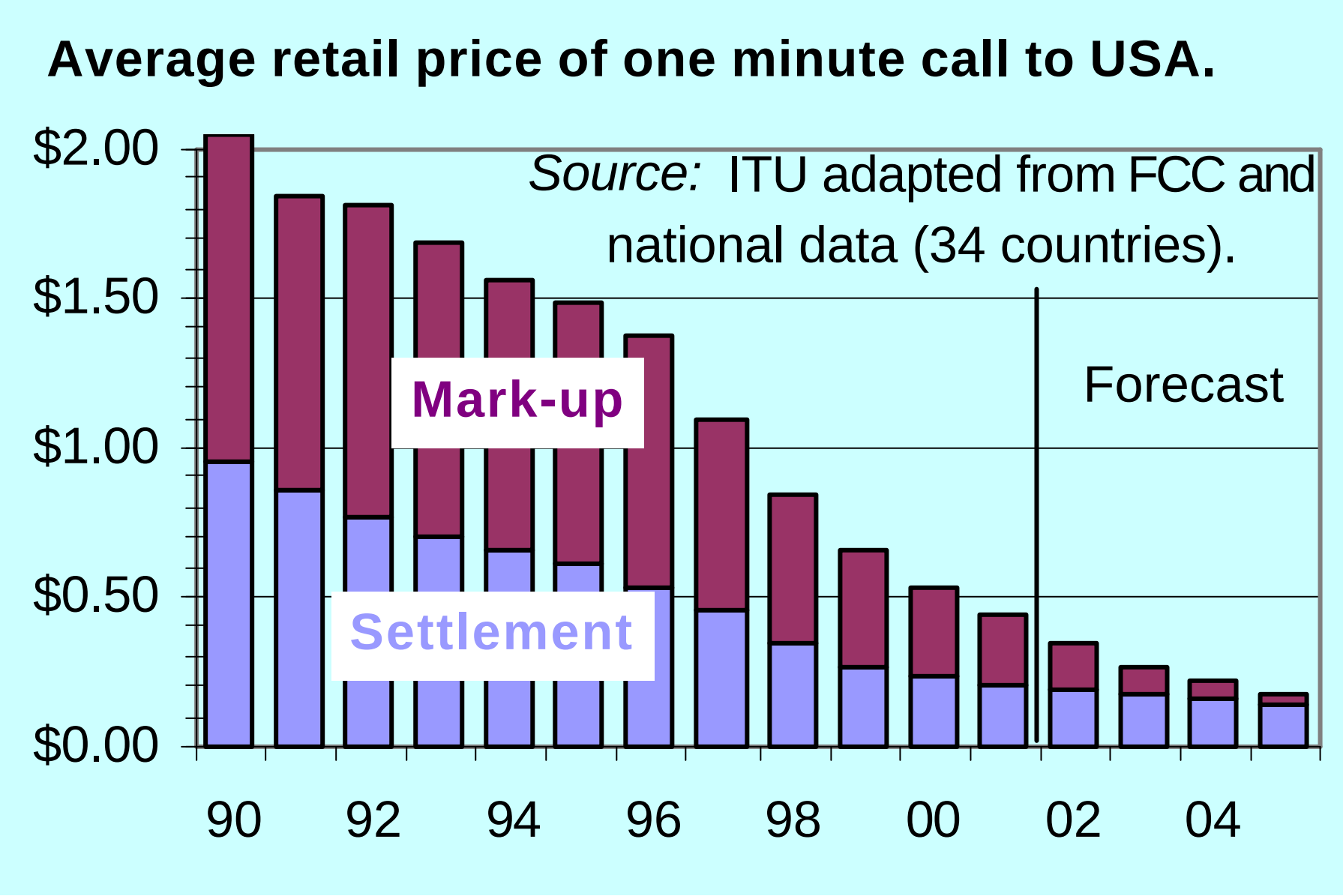
Annual average traffic increase : 8 %

Average Settlement rate reduction: ? %

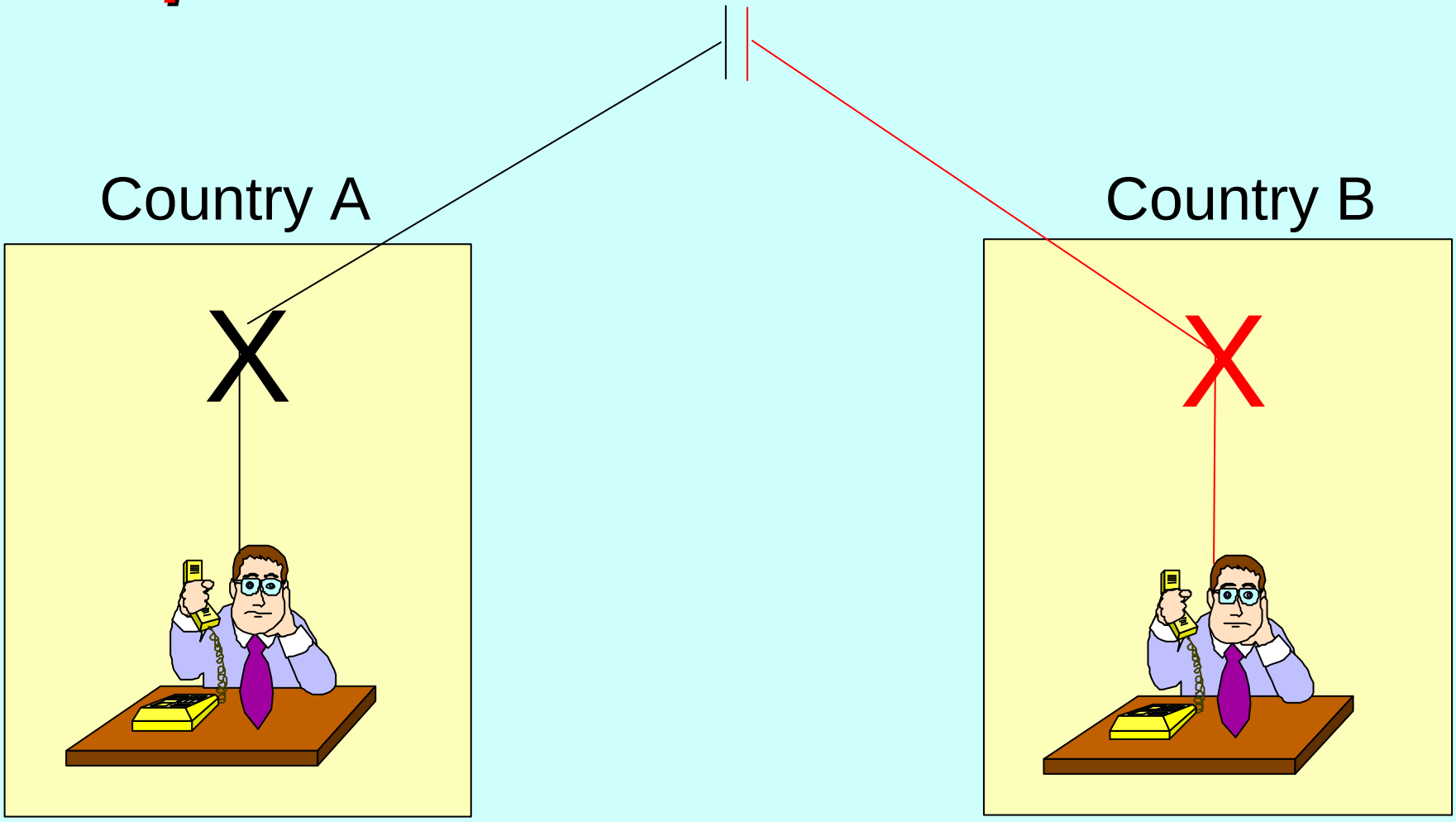

Global international telephone calls
Billions of minutes
and Growth rates
Annual change
4 5 5 6 8 9 10 11 13 14 16 18 21 24 28 33 38 43 49 57 64 71 79 86 94 101
18% 15% 17% 18% 19% 15% 16% 12% 13% 11% 11% 15% 15% 17% 17% 17% 14% 13% 15% 15% 12% 12% 12% 9% 8% 8%
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00


USA Net settlement payments and Average settlement rates movement (in US$)
Net Settlement payments
Settlement rates movement
Net Settlement Payments
US average settlement rates
Years
0.68
0.675
0.64
0.575
0.515
0.48
0.455
0.405
0.365
0.315
0.27
0.215
0.175
0.16
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001

Falling prices

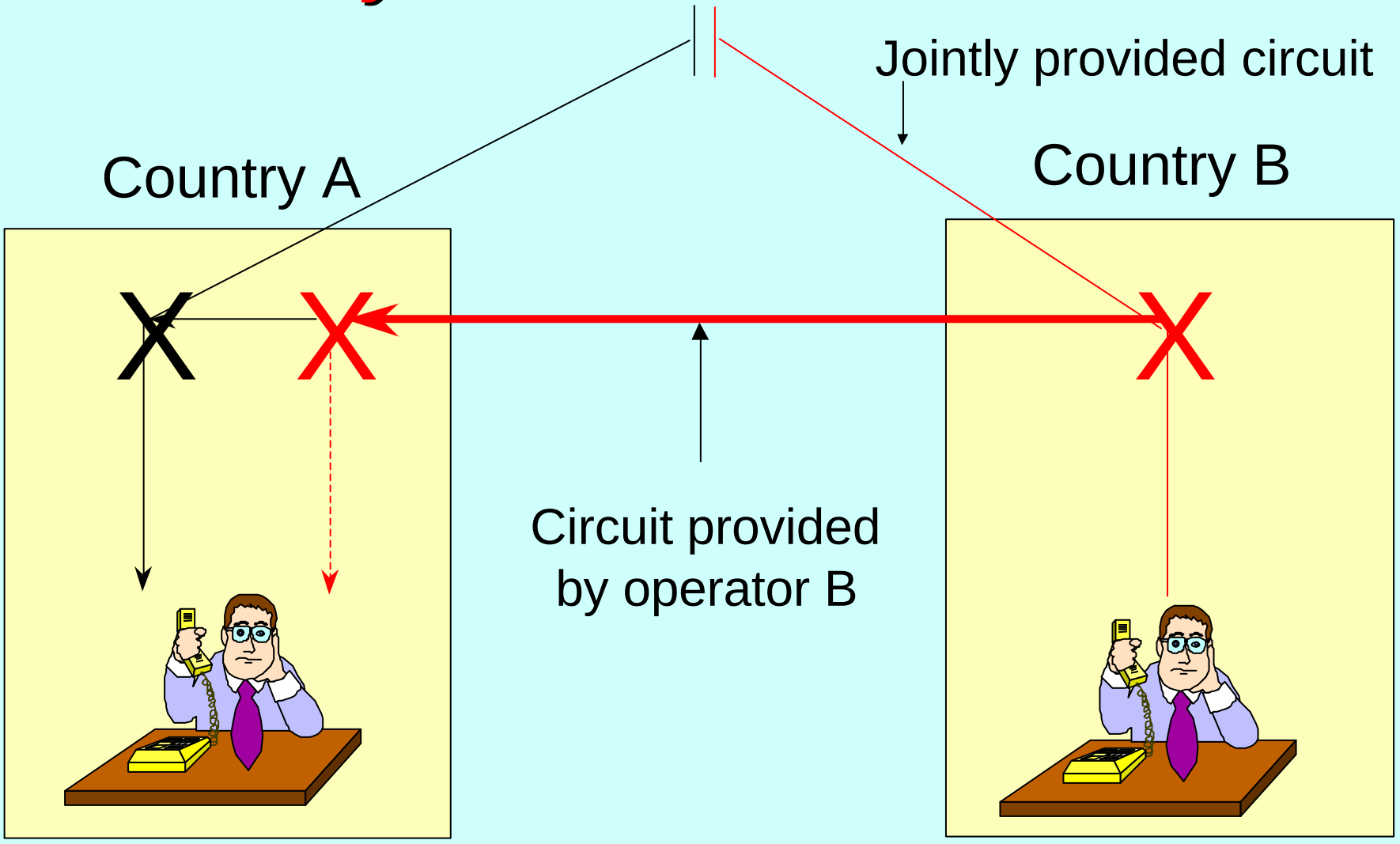


Traditional regime: Joint provision of service



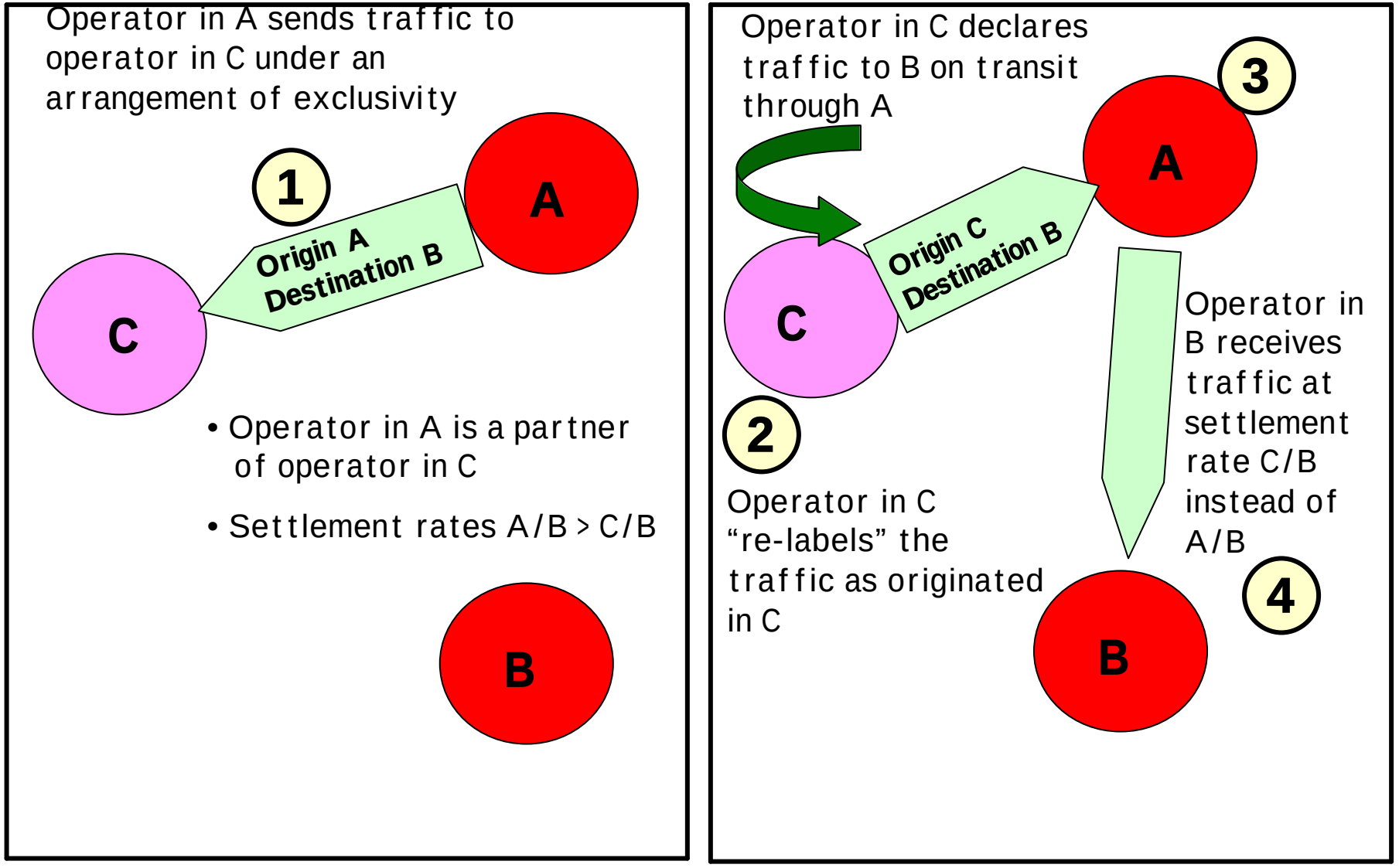
Two different national operators jointly establish an international circuit and decide the revenue they wish to obtain. They then divide that revenue fifty-fifty split.

Emerging regime: Market entry and interconnection

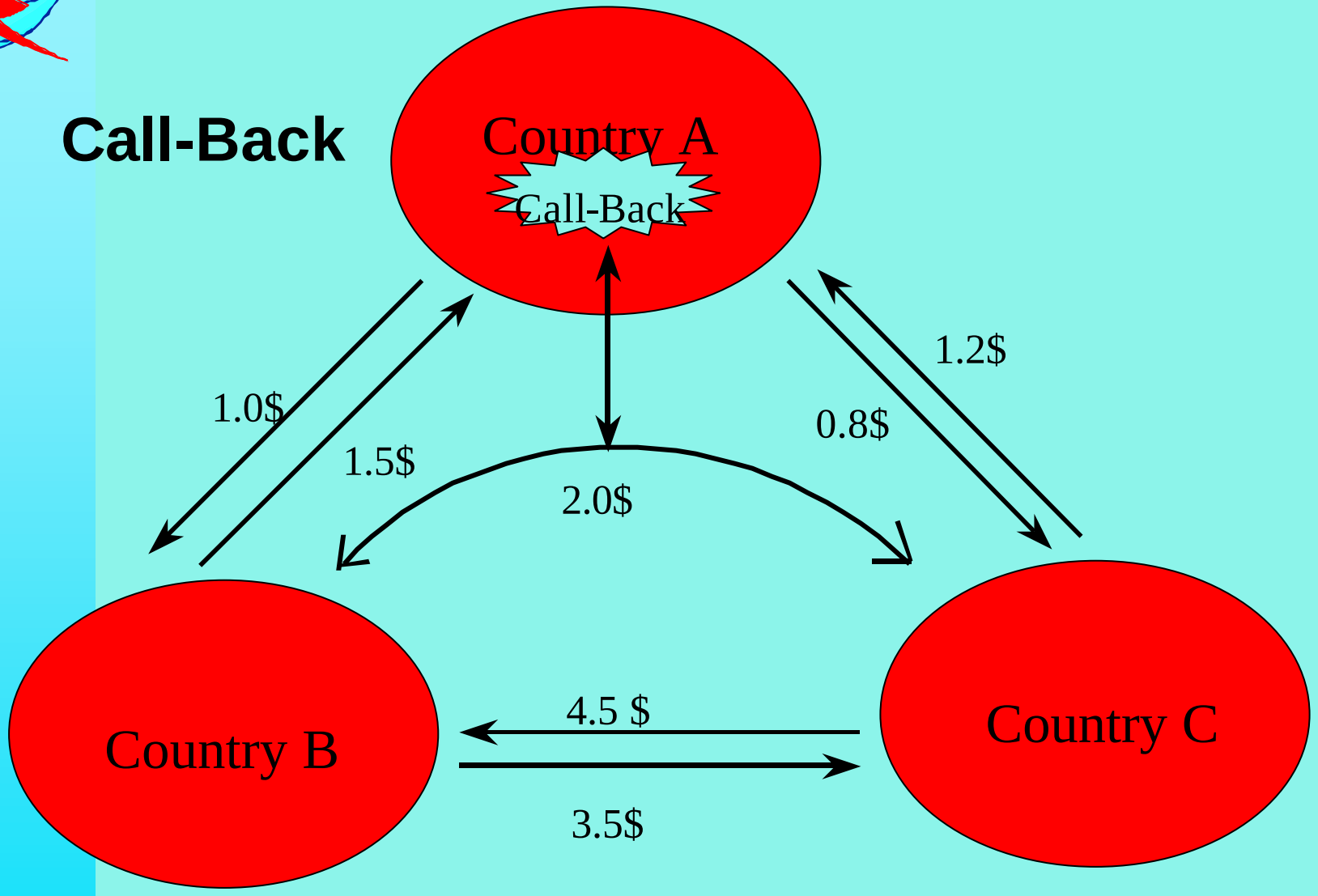


Cross border interconnection and the trading of international traffic minutes

Refile and other practices using accounting rate system

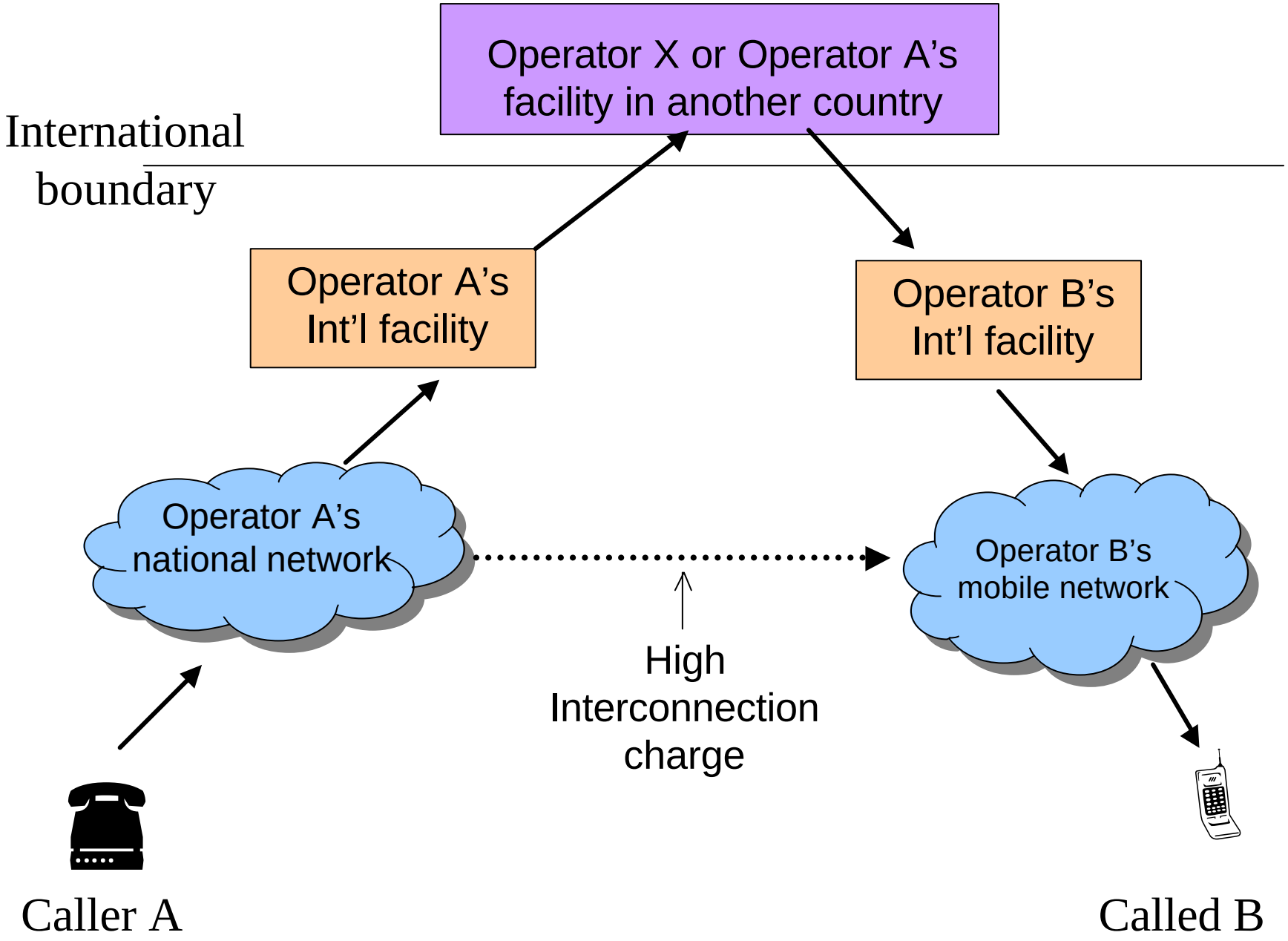


CALL BACK using Accounting Rates



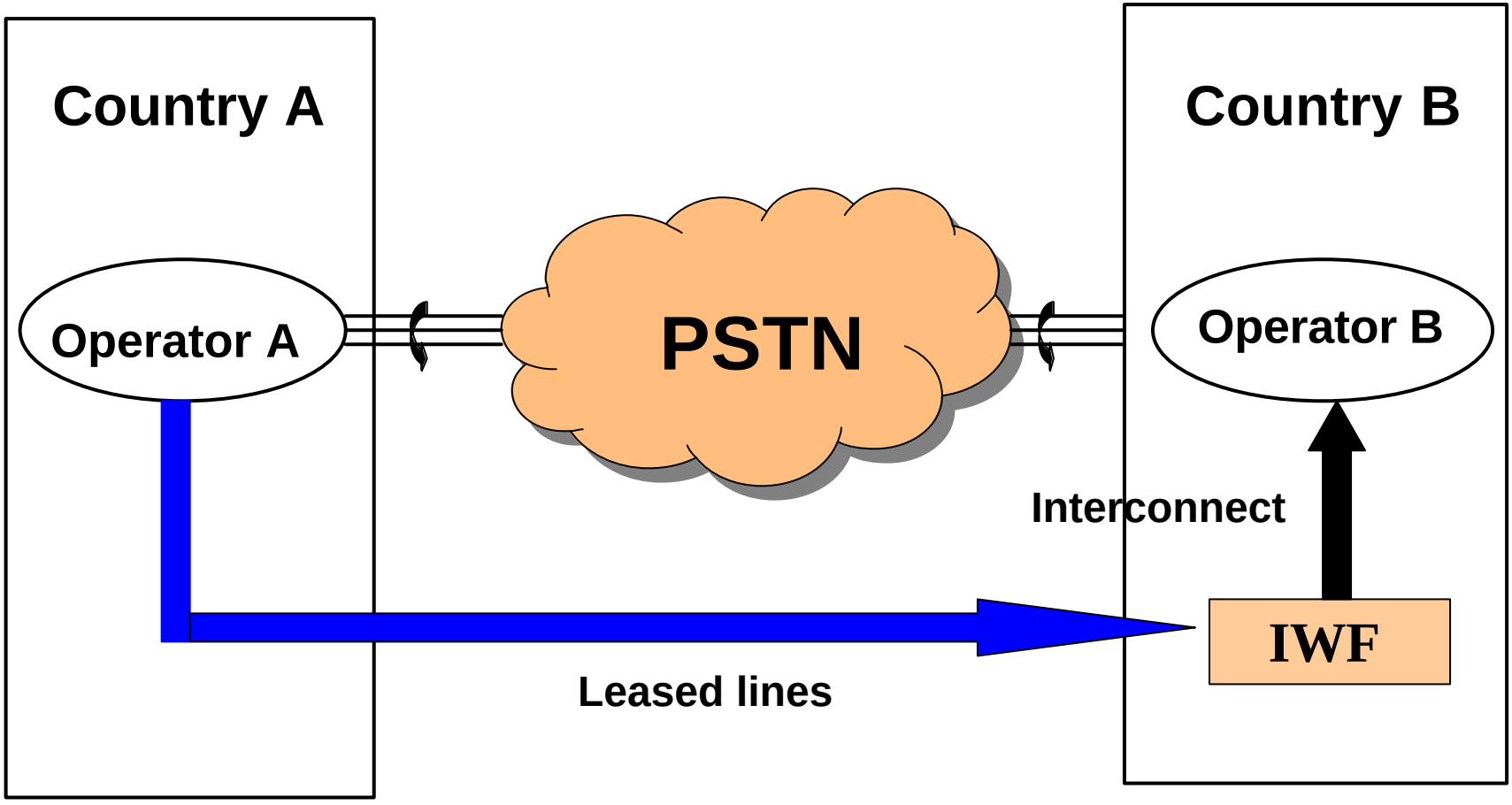
Interconnection of two outgoing calls in country A

Mobile tromboning (using accounting rate)



International simple resale (ISR)

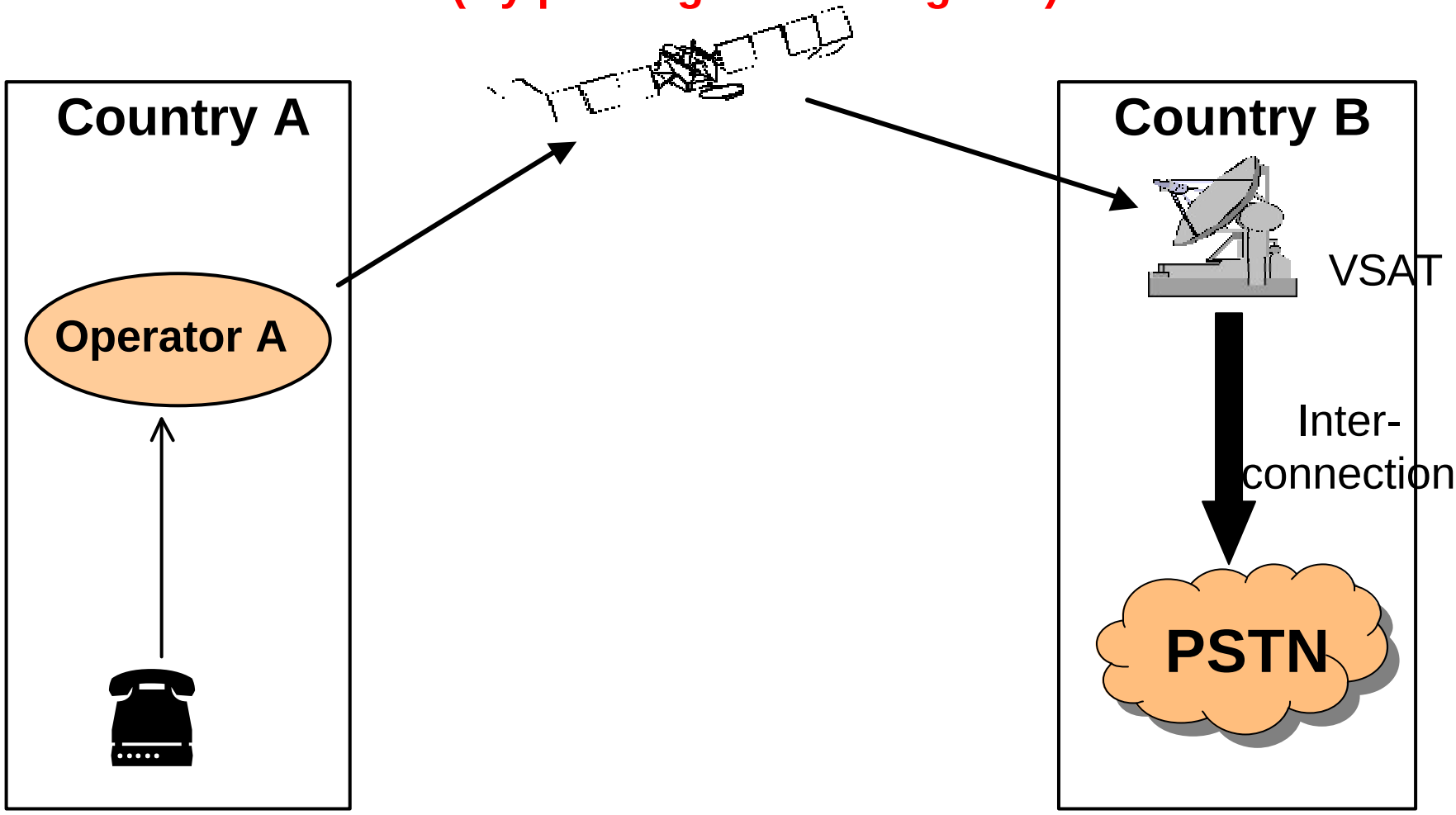
(By-passing accounting rate)



Once a foreign carrier accepts the benchmark rate, it can negotiate ISR arrangements with US carriers

Telephone service using data transmission

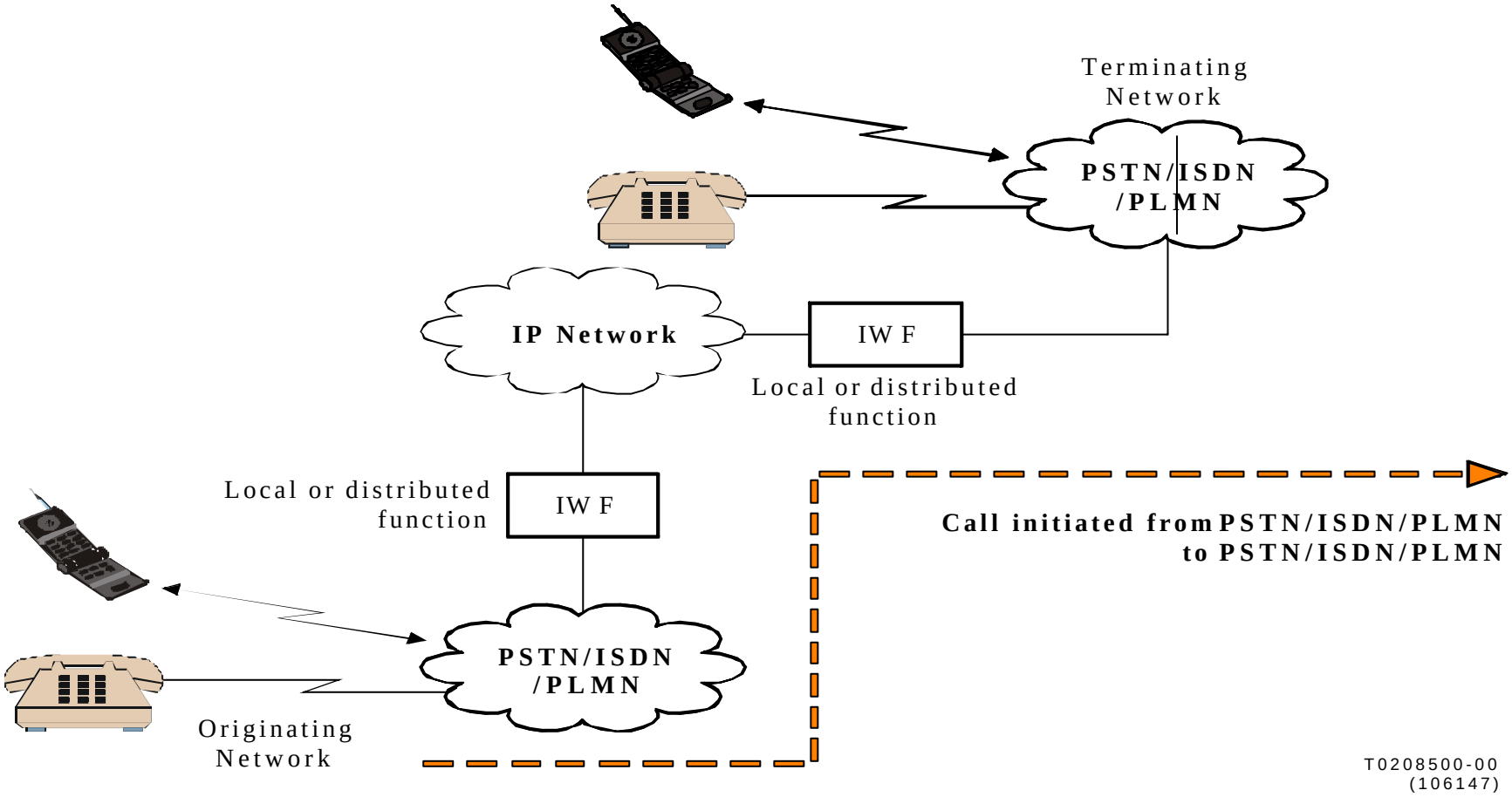
(By-passing accounting rate)



Voice is packetized = data transmission

Telephone regulations do not apply

IP Telephony (by-passing accounting rate)



Call from International Telecommunication Network (ITN) to another ITN via IP-based Network

ITU–T SG-3 Major achievements

- **New Remuneration system**
  - ⇨ **Termination charge system**
  - ⇨ **Settlement rate system**
  - ⇨ **Special arrangement**
- **Difficulty to quickly implement those systems**
  - ⇨ **Condition is to reach cost-oriented rate, but**
  - ⇨ **No cost data or model for some administrations Group 3 is developing cost methodologies**
- **SG3 is now developing cost methodologies**
- **Transitional arrangements**
  - ⇨ **To facilitate staged reduction to cost based rate**
  - ⇨ **to avoid sudden fall of revenue (smooth transition)**

Annex E to Recommendation D.140 "indicative target rates" by Teledensity (T) Band, in SDR (and US cents) per minute.

T<1 A	1<T>5 B	5<T<10 C	10<T<20 D	20<T<35 E	35<T<50 F	T>50 G
0.327 SDR	**0.251 SDR**	**0.210 SDR**	**0.162 SDR**	**0.118 SDR**	**0.088 SDR**	**0.043 SDR**
43.7¢ (end 2001)	33.5¢ (end 2001)	28.0¢ (end 2001)	21.6¢ (end 2001)	15.8¢ end 2001)	11.8¢ (end 2001)	5.7¢ (end 2001)
Low income FCC : 23 ¢ (January 2002/2003)		*Lower middle* FCC : 19 ¢ (January 2001)		*Upper middle* 19 ¢(J.2000)	*High income* FCC : 15 ¢ (January 1999)	

Note: The correspondence between teledensity band and income group shown in the bottom row is intended to be approximate, not precise. Source: ITU-T SG3 Report. 1 SDR = US$1.39.

Annex E Recommends also

- **That transit Administrations move towards the indicative target rate (upper limit) of 0.05SDR (0.07US $) per minute.**

- **To negotiate asymmetrical accounting rate (other than 50/50) if both administrations agree to move to below the indicative target rate.**
  Example:
  Operator A belong to teledensity band E
  Operator B belong to teledensity band F
  A and B agree to achieve TAR 0.2SDR (<0.118x2)
  - ⇨ **A can request settlement rate of 0.09 SDR**
  - ⇨ **B accepts to pay 0.11SDR to A**

Termination charge

- Destination operator (or Government) set the charge
- Charge should be established based on costs
- Termaination Charge includes
  - ⇨ International exchange
  - ⇨ National extension, including local loop
  - ⇨ And if appropriate, international circuit
  - ⇨ Other costs imposed on carriers by the national regulation
- Those components should be separately identified (Unbundled)
- Charge applies to all traffic from any source
- However if significant variation in costs, charge may vary (volume discount)
- Termination charge may be introduced on bilateral agreement basis

Accounting rates and Termination Charges

What' s the difference

Accounting rate	Termination charge
Normally symmetric(50/50)	Not necessarily symmetric (if cost differ)
Bilaterally negotiation	In theory, set unilaterally (need agreement to implement)
Discriminatory (different rates negotiated with different correspondents)	Non-discriminatory (same rate for all correspondents)
Half-circuit regime (would not normally be unbundled)	Full-circuit regime (could be unbundled)

International call terminating on mobile network

- **SG3 revised D.93 in year 2000, allowing to negotiate**
  - ⇨ **a separate rate for traffic terminating on a mobile network**
  - ⇨ **however, this is by bilateral negotiation and when the rate is cost orientated**
  - ⇨ **The difference between the two rates should be as small as possible**
- **Many countries now request very high settlement rates (3 – 5 times)**
  - ⇨ **A review is now going on in the SG3**

Interconnection Rates in selected European countries under CPP (in US $ / minute)

	Fixed-to-mobile interconnect rate	Mobile-to-fixed interconnect rate LOCAL	Mobile-to-fixed interconnect rate SINGLE TRANSIT	Mobile-to-fixed interconnect rate DOUBLE TRANSIT
Austria	0.23	0.017	0.017	0.022
Belgium	0.18	0.008	0.014	0.018
Denmark	0.17	0.008	0.011	0.016
Finland	0.21	0.013	0.013	0.024
France	0.20	0.006	0.012	0.018
Germany	0.24	0.008	0.017	0.021
Greece	n.a.	0.018	0.018	0.025
Italy	0.23	0.009	0.015	0.021
Ireland	n.a.	0.010	0.015	0.021
Luxembourg	n.a.	0.015	0.015	0.015
Netherlands	0.18	0.009	0.013	0.016
Portugal	n.a.	0.009	0.015	0.024
Spain	0.20	0.009	0.015	0.028
Sw eden	0.22	0.008	0.011	0.015
UK	0.16	0.005	0.007	0.016
Switzerland	0.30	n.a	n.a	0.020
Norway	0.156	n.a	n.a	0.018
Average	**0.21**	**0.010**	**0.014**	**0.020**

In 2001, there is an estimate indicating that the average of Fixed-mobile decreased to 0.136 and mobile to fixed has not changed

Internet Interconnection

- **Internet Interconnection has slightly different meaning. Historically Internet interconnection has involved simply different Internet networks.**
- **This Internet Interconnection policies have proved increasingly inappropriate in a commercial industry.**
  - ⇨ **Many operator with larger networks often charge smaller ISPs a traffic-based interconnection fee**
  - ⇨ **Many backbone providers have begun offering transit service networks.**
- **Different type of Interconnection Arrangements**
  - ⇨ **ISP Relationships with customers: usually via a dial-up**
  - ⇨ **ISP-ISP Interconnection: peering or bilateral agreement**
  - ⇨ **Multiple ISP Exchanges when several ISPs need to interconnect in a same city (use of an IXP)**
- **International Regulatory Development**

Recommendation D.50

The ITU-T,

recognizing

the sovereign right of each State to regulate its telecommunication, as reflected in the Preamble to the Constitution,

noting

a) the rapid growth of Internet and Internet protocol-based international services;

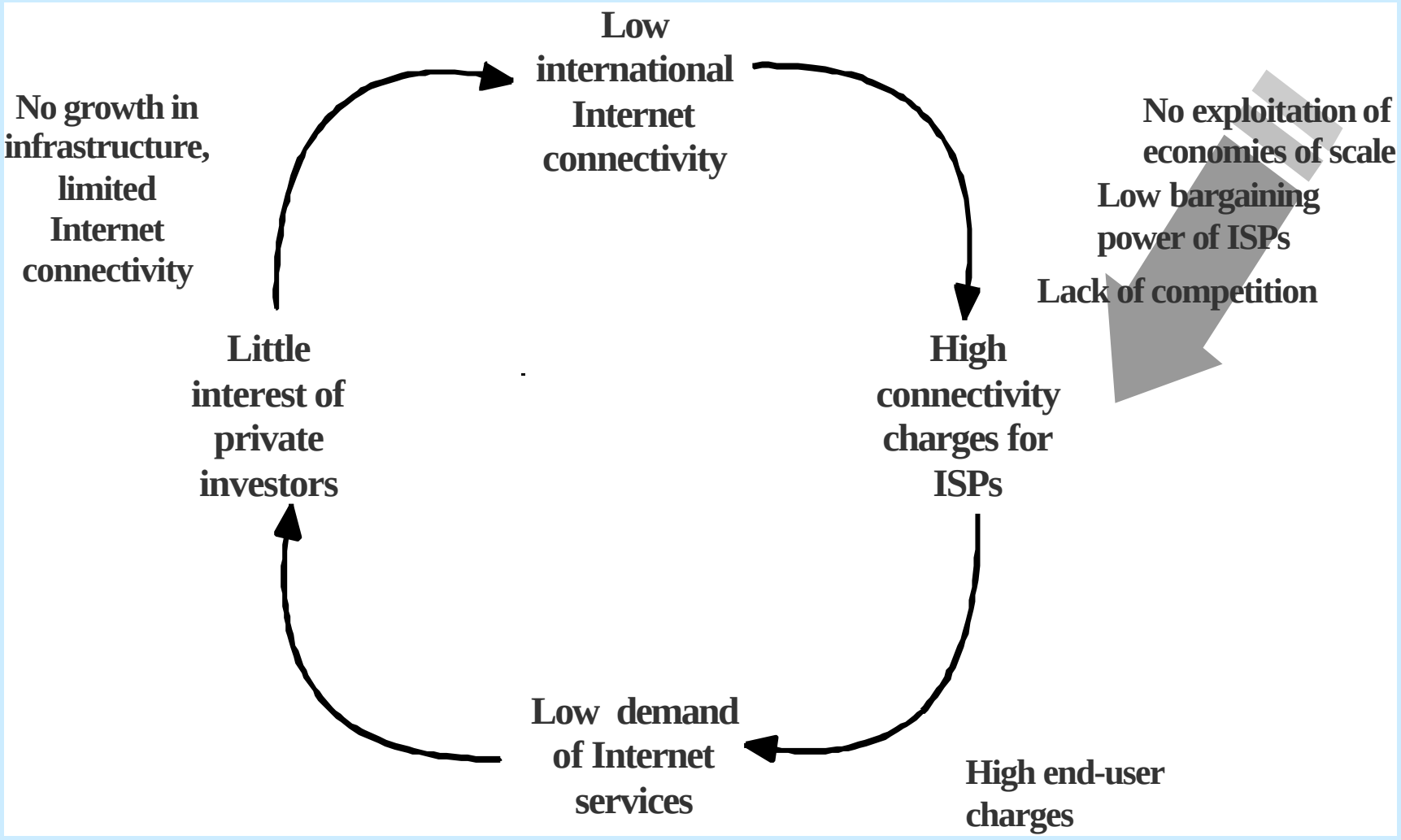
b) that international Internet connections remain subject to commercial agreements between the parties concerned; and

c) that continuing technical and economic developments require ongoing studies in this area,

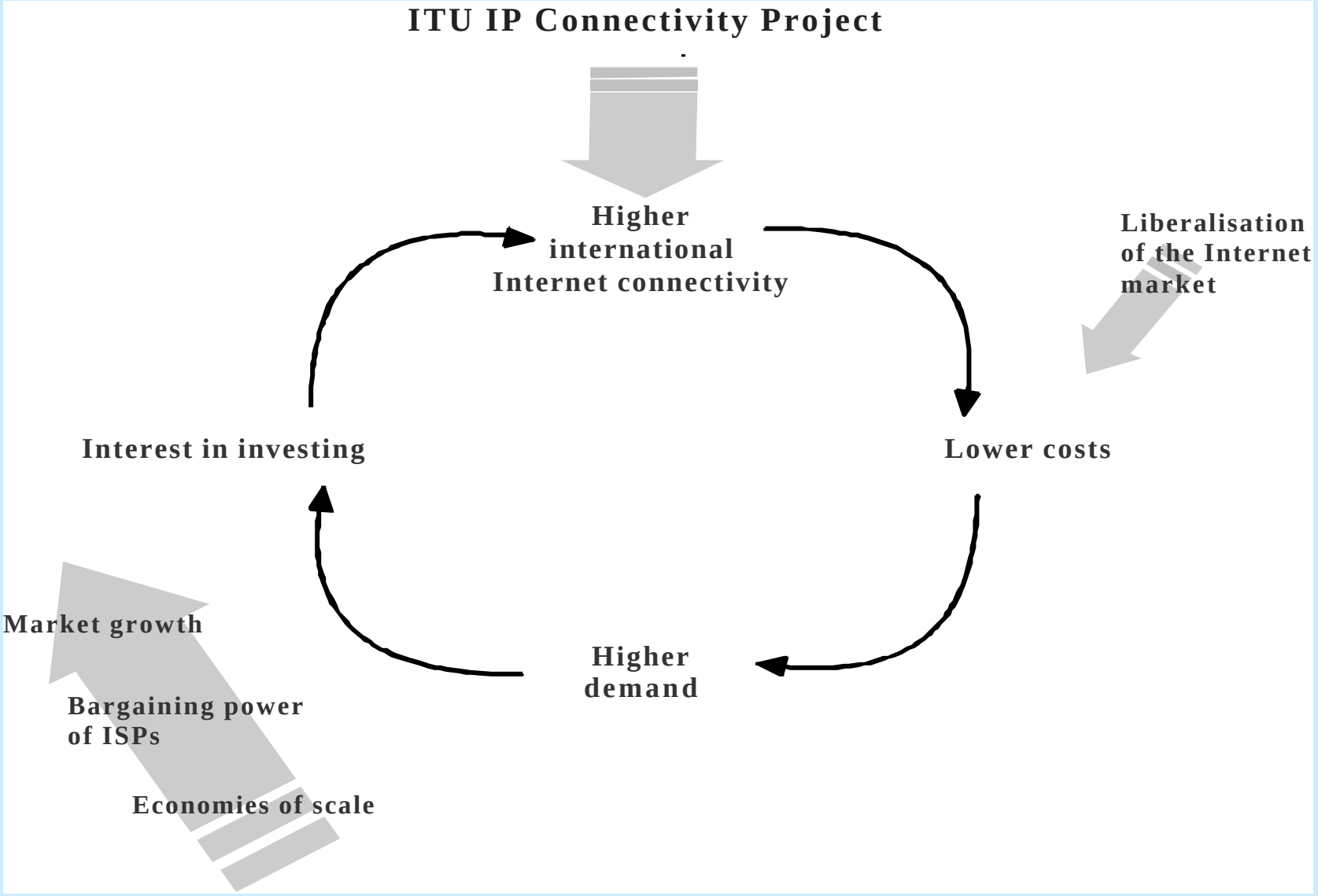
Recommends that

administrations involved in the provision of international Internet connections negotiate and agree to bilateral commercial arrangements enabling direct international Internet connections that take into account the possible need for compensation between them for the value of elements such as traffic flow, number of routes, geographical coverage and cost of international transmission amongst others.

Internet vicious circle

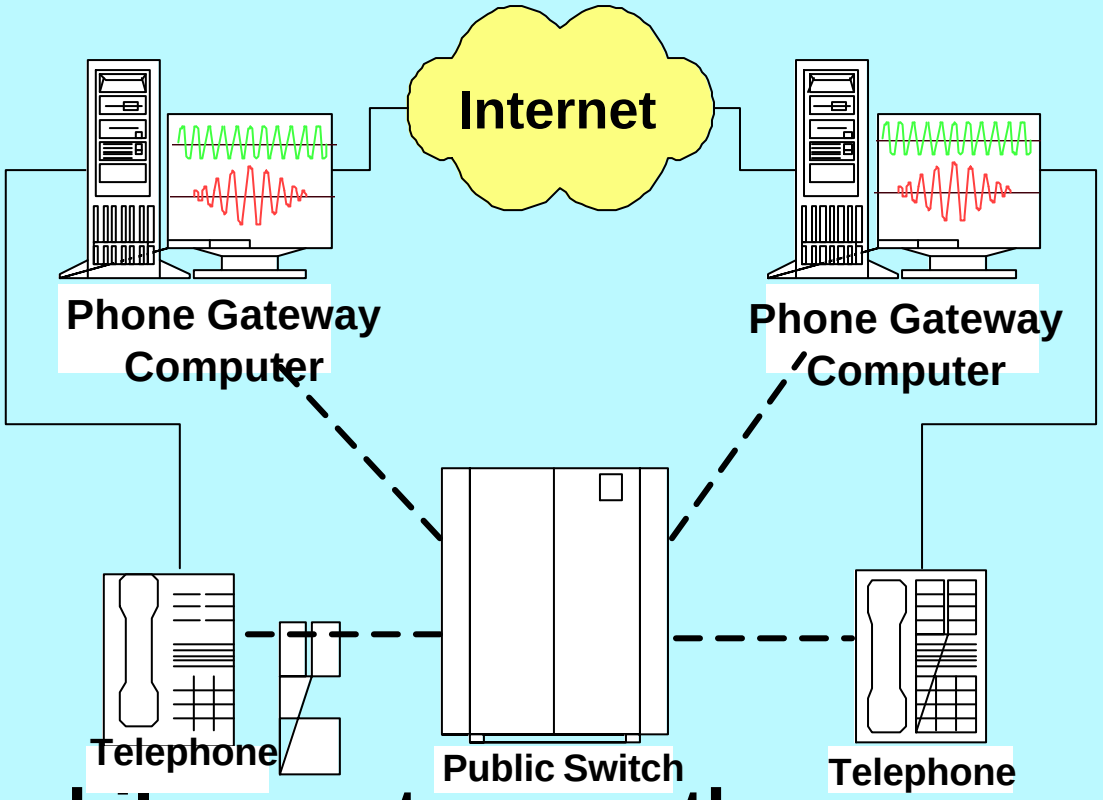


Virtuous circle



IP-Telephony

Telephone to telephone (fax to fax) via Internet



- Any telephone/mobile user to any other
- Main motivation: Accounting rate bypass, market entry for non-facilities-based carriers
- Potential service providers include any PTO with settlement payments deficit (e.g., US = US$5.7bn)
- Market potential: 1.3 billion telephone/mobile users

IP Telephony
Opportunities and challenges

- **Opportunities**
  - ⇨ **Reduce prices to consumers and the costs of market entry for operators**
  - ⇨ **In terms of volume of traffic carried and level of investment committed**

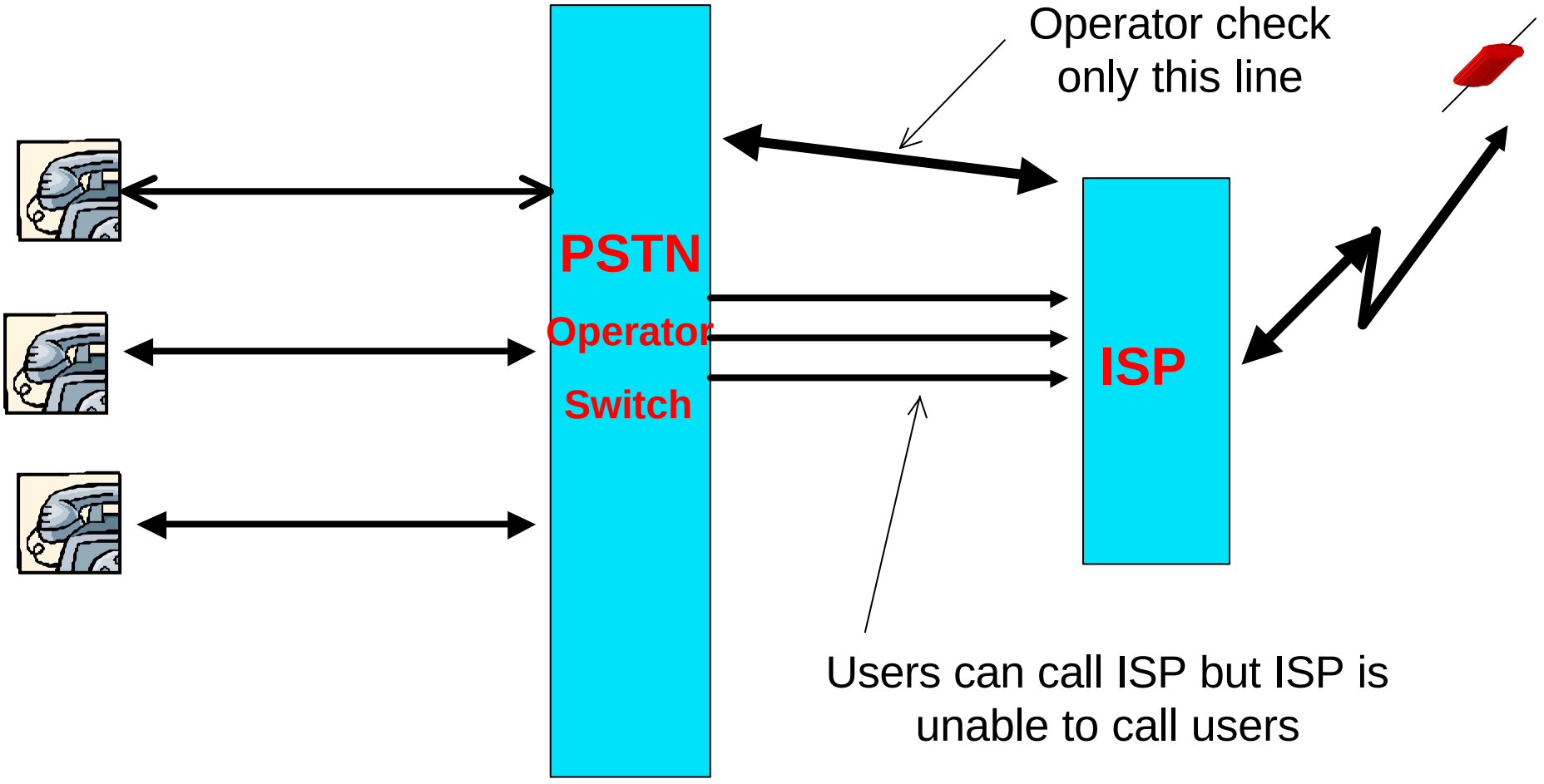
- **Challenges**
  - ⇨ **Undermine the pricing structure of the incumbent Public Telecommunication Operators (PTOs)**
  - ⇨ **Transition to IP-based networks also poses significant human ressource development challenges**

Challenges

Revenue gain and revenue loss

	Accounting Rate	IP-Telephony	Difference
PTO in Developed country	**Collect US$ 1.00 from user** Pays **US $ 0.55 settlement.** **Retains US $ 0.45**	**Collect US$ 1.00 from user** Pays **US$ 0.30 to ISP for terminating call.** Retains **US$ 0.70**	**+0.25 US$**
PTO in Developing country	Receives **US $ 0.55 settlement.**	Receives **US $ 0.02 local call charge.**	**-0.53 US$**
ISP in Developing country	**0**	Receives **0.30 US $ for terminating charge** Pays **0.02 US $ for local call.** **Retains 0.28 US $**	**+0.28 US$**

How the operators in developping countries stop IP-Telephony



Conclusion and Recommendation

- **Erosion of traditional system of accounting rates for exchange of international traffic**
  - ⇨ **Domestic interconnect fees will be dominant mode**
- **Major price cuts in international calls**
  - ⇨ **Availability of new infrastructures**
  - ⇨ **Impact of Internet pricing model (distance and duration independent)**
- **Mobiles exceed fixed-line phones worldwide**
  - ⇨ **Introduction of “third generation” mobiles after 2001**
  - ⇨ **Generational shift, as new users reject fixed-lines**

“ Interconnection and tariff rebalancing”