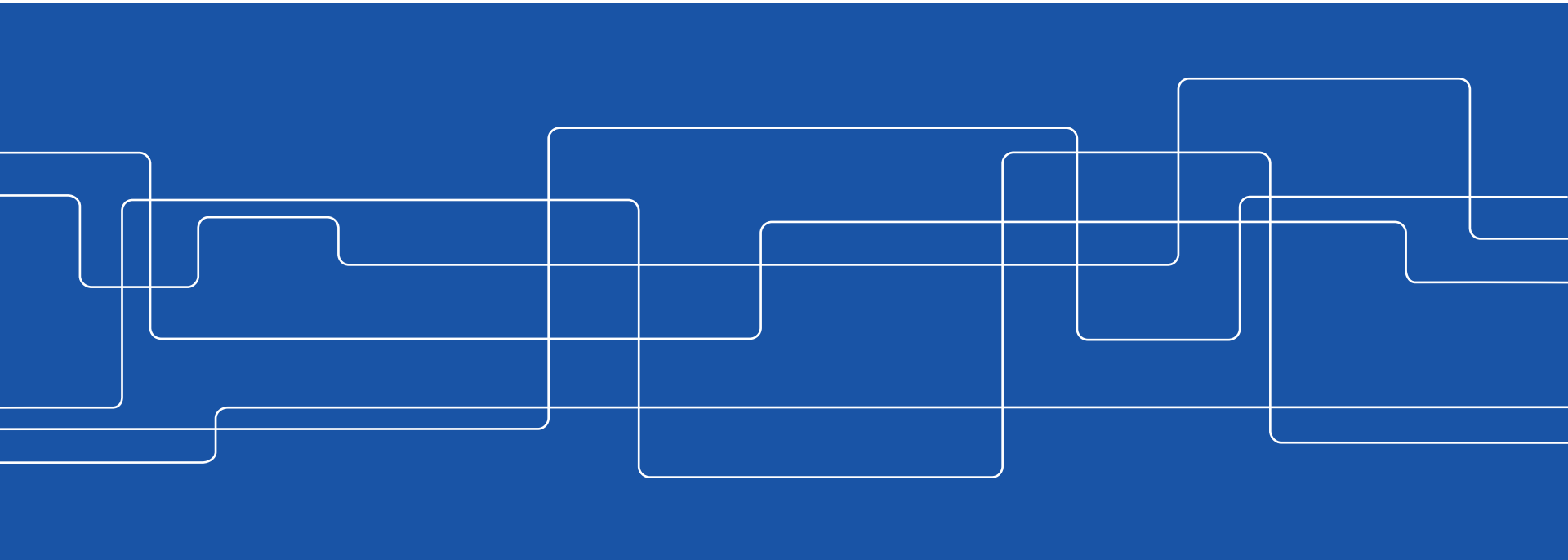
Differences In Spectrum Regulation Between Developed and Developing Markets

“A comparison between Selected Latin American Markets and Sweden”

Ashraf Awadelkarim Widaa Ahmed

ahmed2@kth.se



Outline

- Background: Spectrum Authorization Regimes
  - Why to regulate at all?
  - Common authorization Approaches
  - Engineering and economic value of spectrum
- Spectrum Regulation : Similarities and Differences
  - Why Chile and Ecuador?
  - Why Sweden?
  - Summary of Similarities and Differences

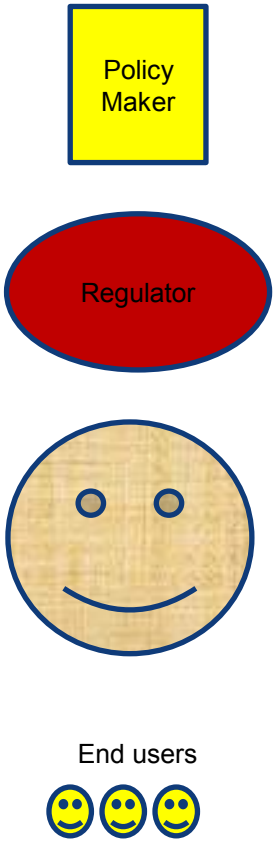
Background: Spectrum Authorization Regimes

Why to Regulate (at all)? Historical Background

Historically, in most countries outside of North America, state-owned service providers delivered telecommunications services on a ***monopoly basis***.

Telecommunications services were provided by government departments or agencies, in a similar manner to postal, road transportation, and other government services.

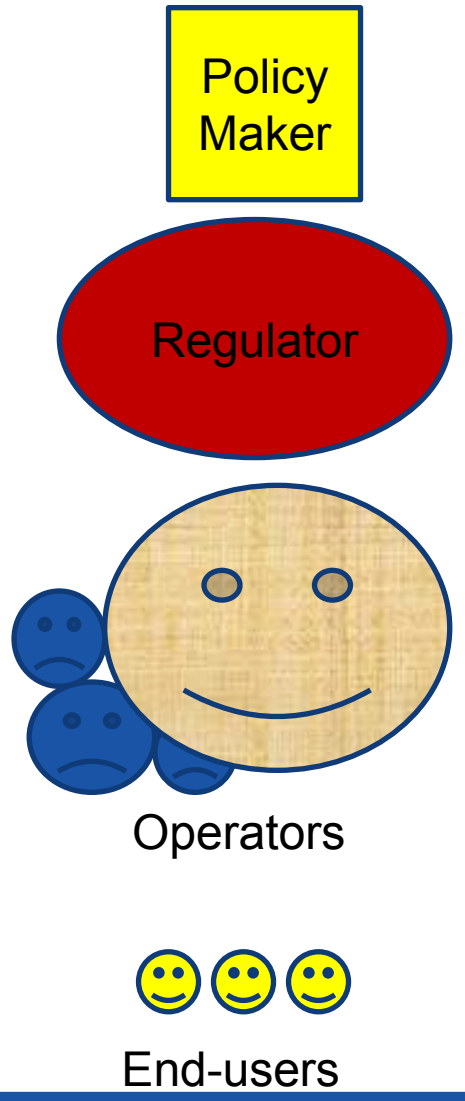
These departments and agencies were often referred to as Post, Telephone and Telegraph Administrations (PTTs).



Why to Regulate (at all)? Privatization and Liberalisation,

- Separate authorizations ("individual licenses") were generally issued to ***both*** incumbent service providers, in the process of **liberalization and privatization**, and the new private sector entrants.

- These authorizations set out the terms and conditions governing their provision of telecommunications service, often being very specific on ***what*** **service** could be **offered**, and ***how*** e.g. **spectrum bands** and **radio access technology (RAT)**



Some common objectives and challenges of Lliberalization, and privatization process

- Privatization or commercialization of agencies, PTTs; to
  - Facilitate the expansion of networks and services;
  - Attracting investment in the ICT sector;

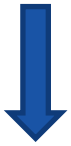
- How to assure fair competition in the market
  - need for mechanisms to ensure the availability of scarce resources on fair and equitable terms;
    - The radio spectrum is limited by physical laws, international agreements and the national regulatory system.
    - Another limited resource is the quantity of telephone numbers, MCC, MNC, etc…
- How to protect End-subscribers;
  - Need for a framework for quality of service, use fees model, ..

Shift in Licensing Approach

Today, three ways are used to authorize ICT service providers:

Individual license: narrow service & platform

Class license: all telecommunications-ICT services of the same type, regardless of technology use



Service neutral and technology neutral..

Common spectrum Authorization Approaches

1- Exclusive rights regimes

- Where spectrum is licensed or awarded to a single user for his exclusive use
- Exclusive right regime include different assignment model:
  - **Administrative Assignment: First Come First Served and Beauty Contest**
  - **Market Assignment**
    - ❑ **Spectrum trading (Secondary market)**
    - ❑ **Spectrum auction**

2- Common use

- Where the use of spectrum is license-exempt or shared with other users

- Good for extremely limited spectrum or niche market use (e.g. indoor services WiFi-like)

Why is the choice of Licensing model and authorization mode important?

Authorization and licensing policies determine the market structure and level of competition

and, ultimately, the efficiency of the services delivered to end customers:

- Availability
- Affordability
- Reliability

Spectrum has technical, social and economic dimensions

• **Social and Economically (Service)** efficient use of spectrum means the maximization of the value of outputs produced from available spectrum.

+ Commercial service use

+Public Service use

• **Engineering (deployment/topology)**, efficient use of spectrum, at a basic level, implies coverage and capacity aspects:

+ Us as minimum Radio base station as possible

+ Improve the coverage and capacity in the served area.

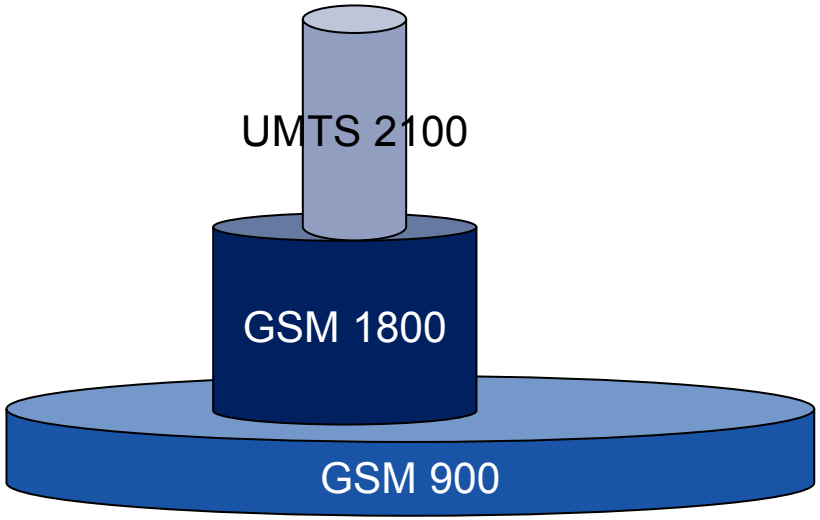
• **Technically (Link Level based on RAT),**

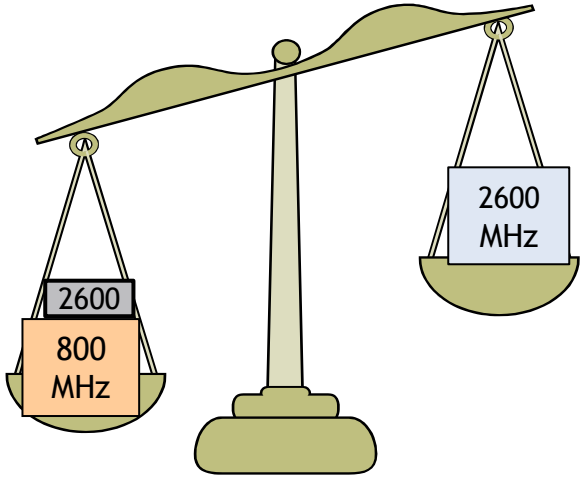
Data rate /Hz, how much data and information can be transmitted for a given amount of spectrum capacity.

Engineering Value of Spectrum
Coverage vs. Capacity

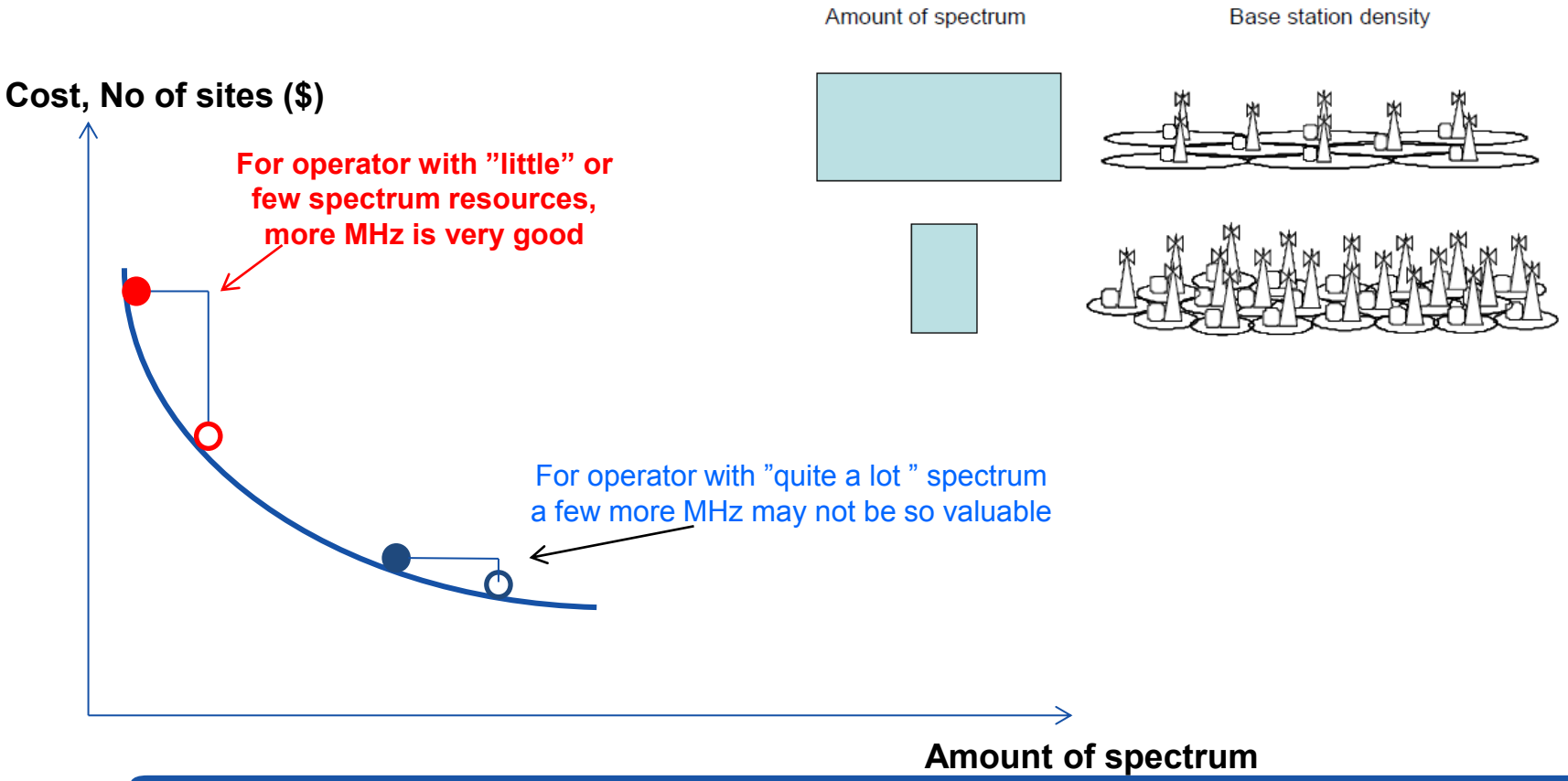
- The deploymnet strategy of a mobile network operator is shaped by its relative ability to gain access to sufficent spectrum resources!

More radio base stations | **More spectrum resources** | **More advance RATs** = **Targeted QoS**



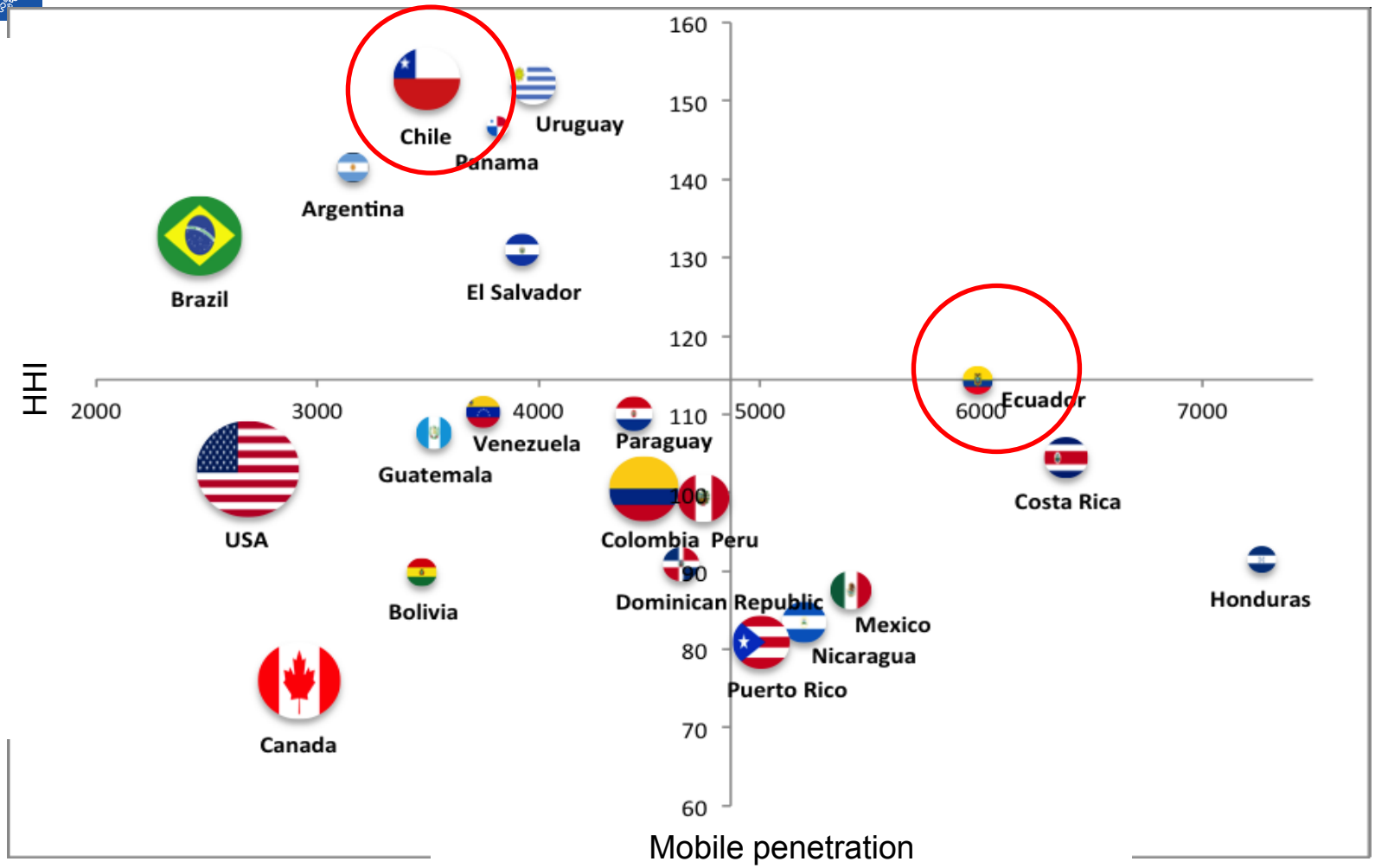


Spectrum determines competitiveness



Spectrum Regulation : Similarities and Differences (Ecuador and Chile vs Sweden)

Why Chile, and Ecuador ?



* The size of the bubble determines the total spectrum allocated in the country

Why Ecuador? Why Chile?

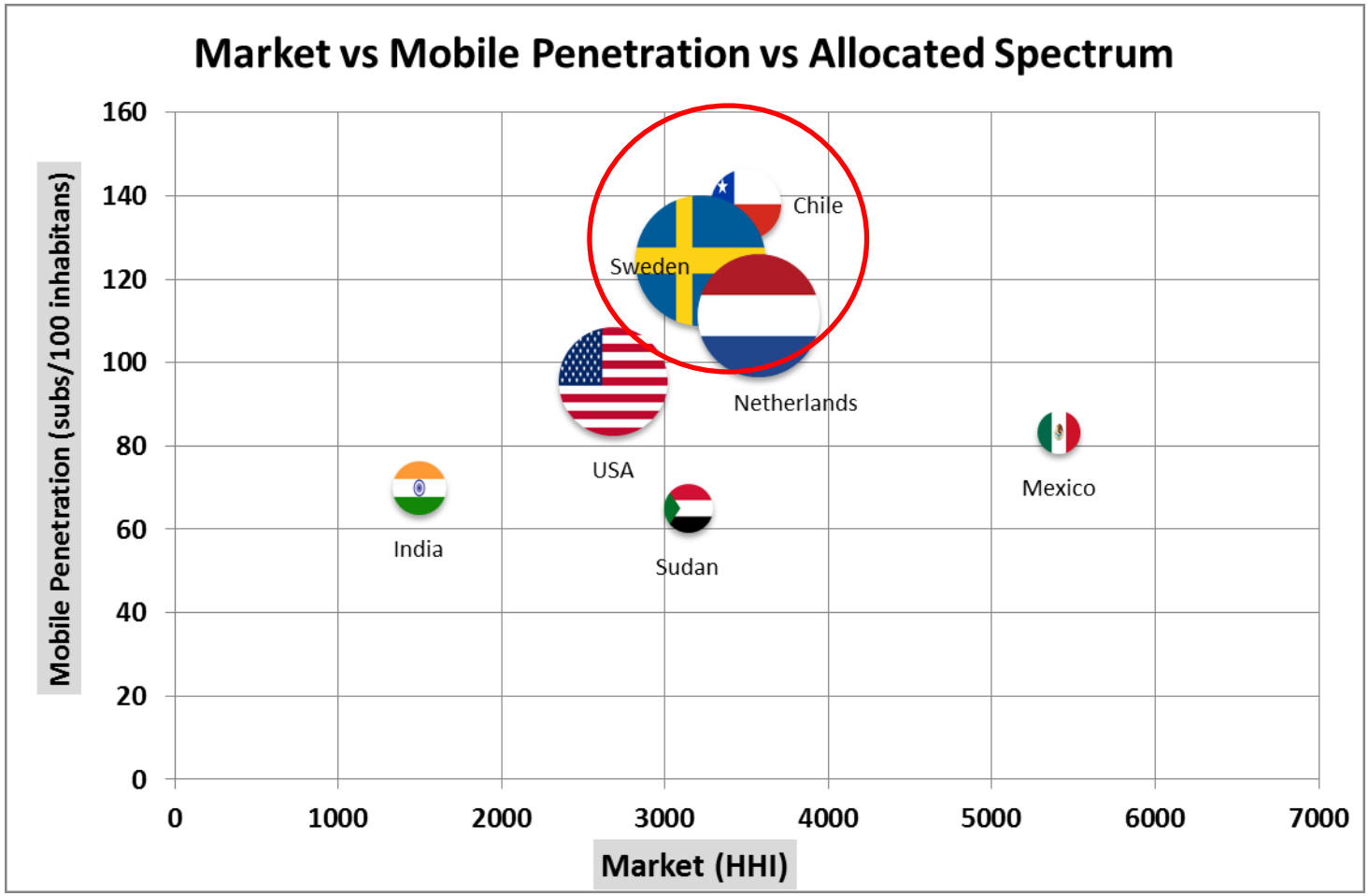
Ecuador

- Among least developed markets in the region
- Low spectrum, low fixed line penetration
- Needs to enhance mobile broadband services
- Proposals can be made, interesting case!

Chile

- One of the most developed markets in the region
- 4G services in 2013
- Still, low spectrum allocation and low fixed line penetration (compared to Europe)
- Lessons can be learned!

Why Sweden?



* The size of the bubble determines the total spectrum allocated in the country

What is 'Herfindahl-Hirschman Index (HHI)?

- A commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. The HHI number can range from close to zero to 10,000. The HHI is expressed as:

  HHI = s1^2 + s2^2 + s3^2 + ... + sn^2

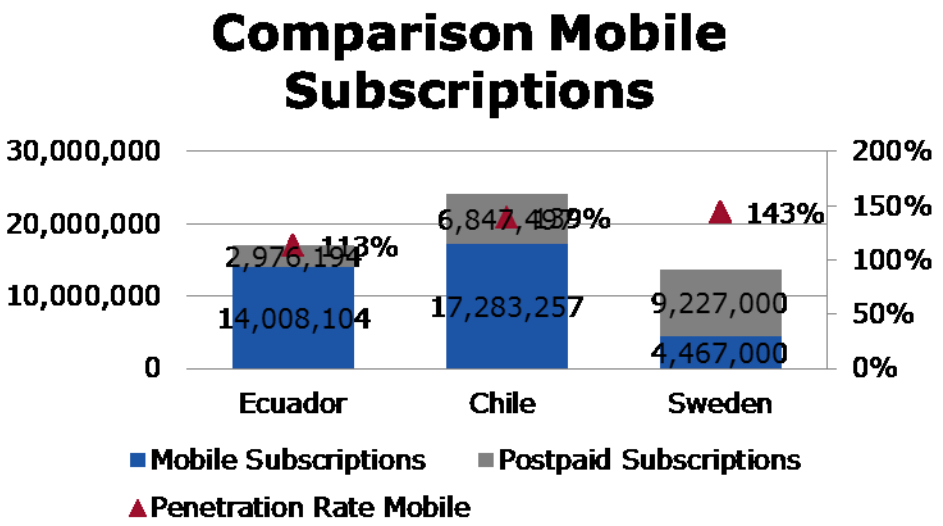
  (where sn is the market share of the ith firm).

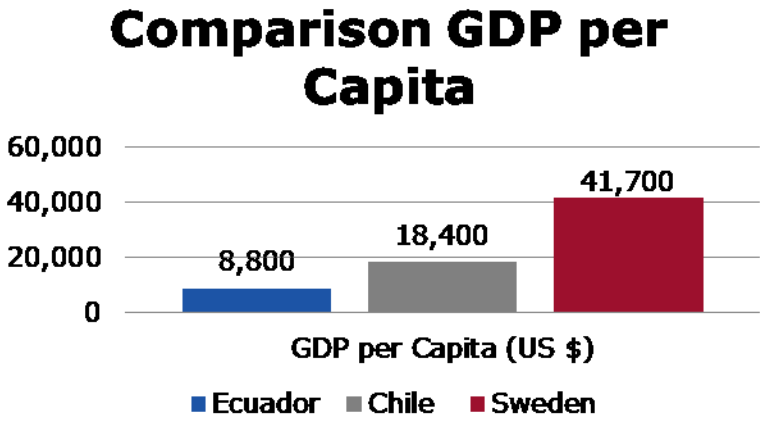
- The closer a market is to being a monopoly, the higher the market's concentration (and the lower its competition). If, for example, there were only one firm in an industry, that firm would have 100% market share, and the HHI would equal 10,000 (100^2), indicating a monopoly. Or, if there were thousands of firms competing, each would have nearly 0% market share, and the HHI would be close to zero, indicating nearly perfect competition.

- The U.S. Department of Justice uses the HHI for evaluating mergers.

Source: http://www.investopedia.com/terms/h/hhi.asp

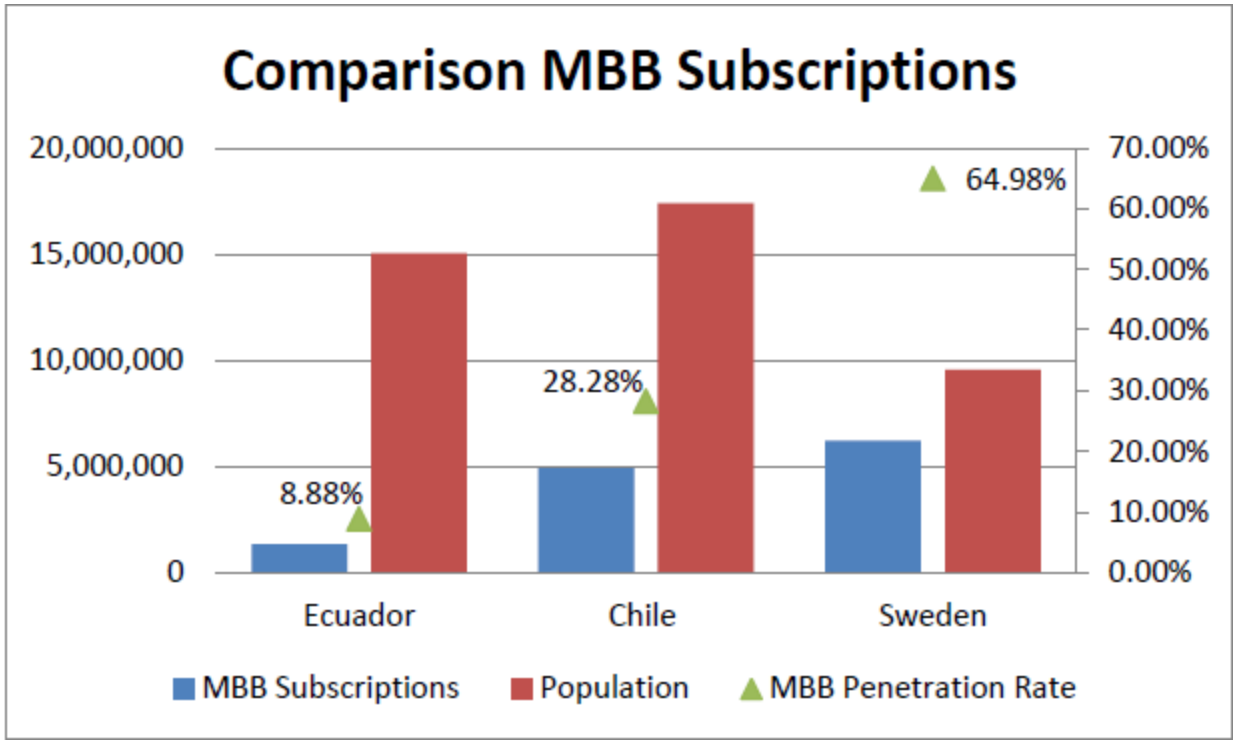
Mobile Subscriptions





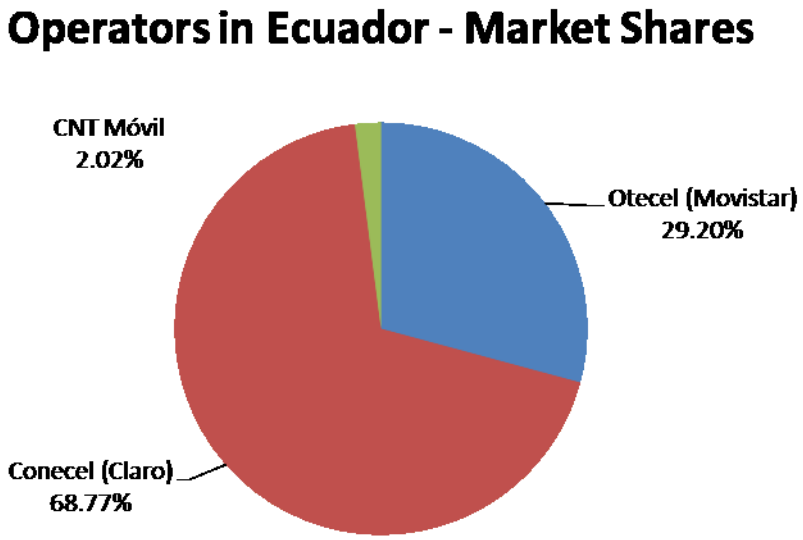
- Price Sensitive Customers in Latin America

Mobile Broadband Subscriptions



What are the reasons for the similarities and differences?

Market Structure: Ecuador



Source: CONATEL Ecuador

- Private operators Conecel and Otecel hold a duopoly (since year 1993).
- CNT (entered the market in 2003): State-owned. Weak competitor so far.
- Market competition rather unbalanced!

Regulatory Body in Ecuador

- Ministerio de Telecomunicaciones - MinTel (Ministry of Telecommunications): It was created in August 2009. It has the power to create and issue regulatory policies. It is important to mention that the Minister is also the President of the regulator authority, CONATEL.

- Consejo Nacional de Telecomunicaciones - CONATEL (National Telecommunications Council): It is recognized by the International Telecommunications Union (ITU) as the official regulator authority of the country. It was established in August 2009.

- Secretaría Nacional de Telecomunicaciones - SENATEL (National Secretary of Telecommunications): It is the entity that actually executes and implements policies and regulations for the sector. It may be said that CONATEL and SENATEL work as one entity.
- Superintendencia de Telecomunicaciones - SUPERTEL (Superintendence of Telecommunications): It is in charge to monitor and control the proper use of radio spectrum, as well as the performance of telecommunications service providers.

Concession Licenses and Spectrum Allocation Approach in Ecuador

- Pre-2007: Very small fees and no operator commitments in implementations
- Post-2007. New Gov't. Make up for losses.
- Rather high license renewal prices for private operators (Avg. 2.10 €/MHz/Pop).
- Still no implementation commitments.
- Public operator does not pay for spectrum anymore.
- Not clear when or how new spectrum for 4G will be allocated to private MNOs.

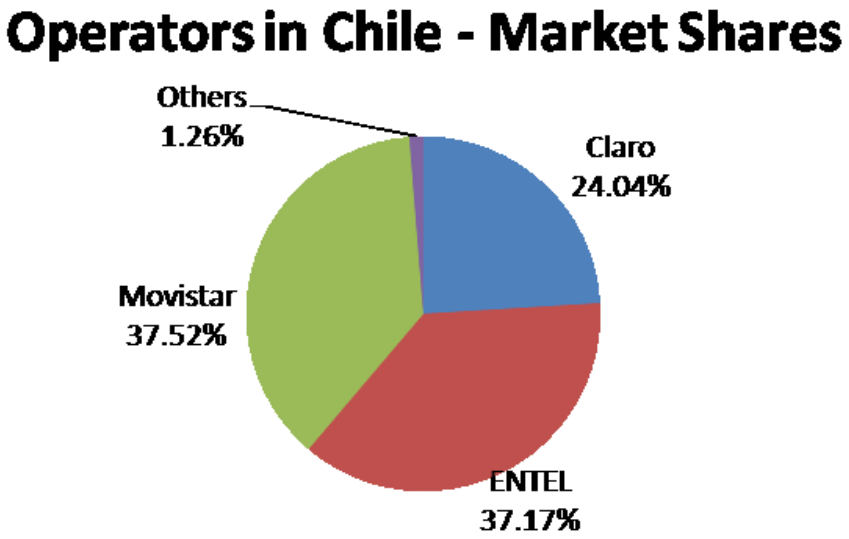
Total Spectrum allocated in Ecuador

Operator	700 MHz	850 MHz	1700/2100 MHz	1900 MHz	Total (MHz)
Conecel	0	25	0	10	35
Otecel	0	25	0	10	35
CNT Movil	30	0	40	40	110
Total	30	50	40	60	180

- The average spectrum holding per operaor is very low.
- Uneven distribution, in favor of public operator CNT Movil

Market Structure in Chile

The market in Chile is highly competitive among the region The most important players in the market are Claro, Entel and Movistar



- Movistar (since 1989), owned by Telefonica since 2004.
- ENTEL privatized in 1992 and l their GSM network in 1997,
- Claro entered the market in 19

- All private company
- Entry of two new operators in 2012. Nextel and VTR Móvil
- Introduction of MVNOs in the market in 2012.
- Increased competition

Regulatory Body in Chile

- SUBTEL, official Regulator Authority.

- Subject to Ministry of Transport and Telecommunications
  - SUBTEL considered branches of the Ministries in charge of their sector

→ Regulator Authority still has certain political influences

Additionally, there is another organism in charge of controlling monopoly-like situations in all business sectors. It is called Tribunal de Defensa de la Libre Competencia, or TDLC (Tribunal for the Defense of Free Competition). In the telecom segment, it has mainly influenced decisions over some of the regulations regarding the prices for different services

Concession Licenses and Spectrum Allocation Approach in Chile

- Beauty contests with small bids in complementary spectrum auctions.
- Avg. Spectrum Price: 0.014 €(MHz/Pop)
- Network implementation commitments for operators.

→ Allow operators to focus their investments on network deployments

Total Spectrum allocated in Chile

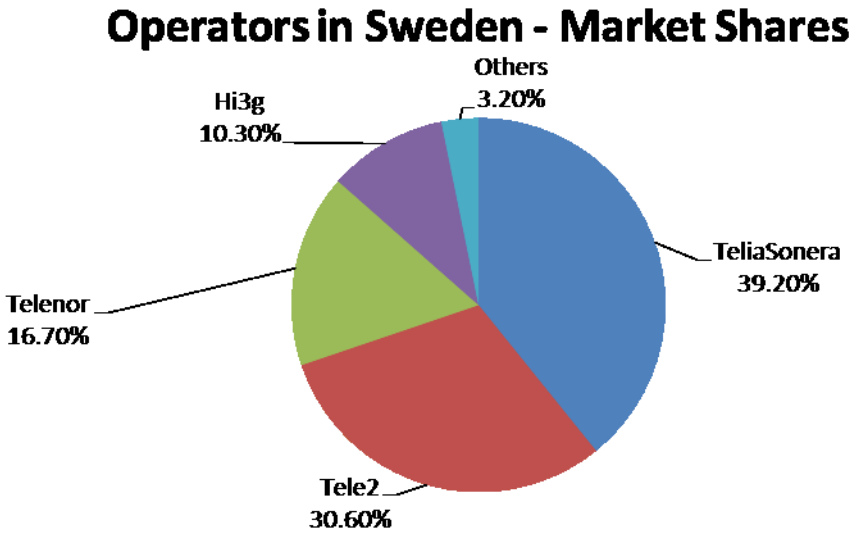
Operator	800 MHz	1900 MHz	1700/2100 MHz	2.6 GHz	Total (MHz)
Movistar (Telefónica)	25	30	0	40	95
ENTEL	0	60	0	40	100
Claro (Amér. Móvil)	25	30	0	40	95
Nextel	0	0	60	0	60
VTR Móvil	0	0	30	0	30
Total (MHz)	**50**	**120**	**90**	**120**	**380**

→ Significant amount of total spectrum allocation. Privileged position in Latin America

→ Rather fair distribution. However, new operators need spectrum in lower bands.

* SUBTEL has announced a spectrum auction for the 700 MHz band in the near future

Market Structure in Sweden



Source: PTS Sweden

- Incumbents Telia (Incumbent lunch GSM service in 1992) and Tele2 (1992)
- Telenor, based on Norway (entered Swedish market in 2001)
- Early 2000s, Hi3G introduced in the market
- Strong MVNO presence (33 total)
- One of most competitive markets in Europe!

Key Mobile Operators in Swedish Market

How They Entered The Market

- Sweden awarded four licenses for third-generation mobile telephony through a "beauty contest" in December 2000.

- The incumbent (Telia) did not receive a license and appealed to the Administrative Court, but the appeal was rejected !

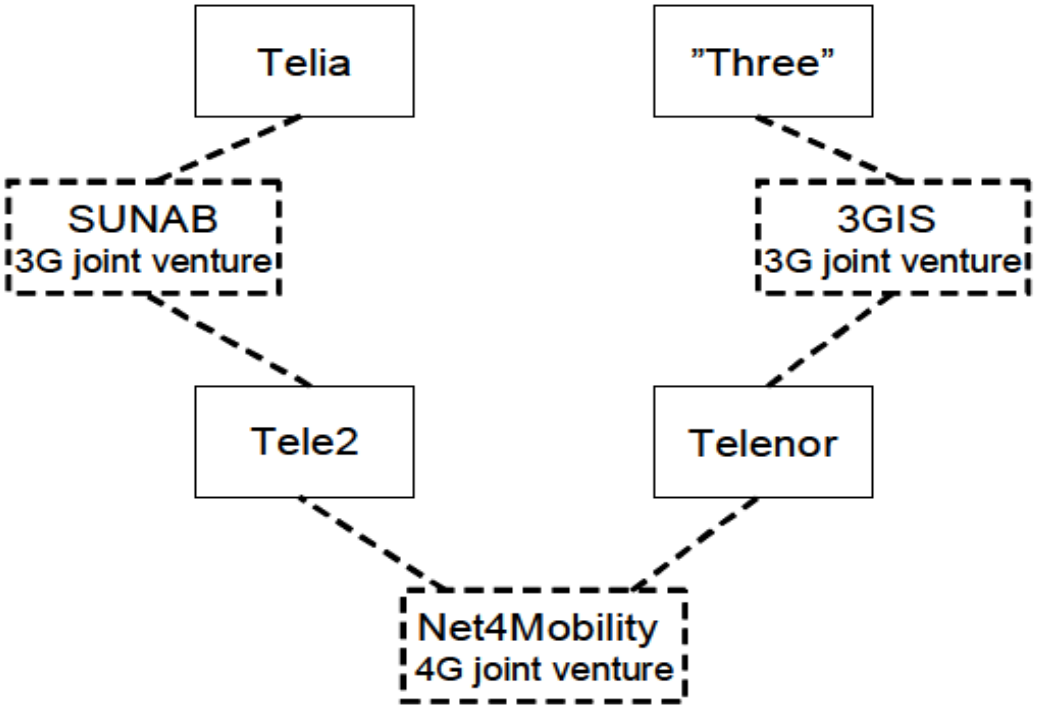
- After Telia failed to acquire a license to offer UMTS technology in 2001, they entered into a network sharing agreement with operator Tele2, which was named Svenska UMTS-Nät AB (SUNAB). Currently, they both keep 50% ownership of this joint venture .

- Additionally, Telenor got involved in another joint venture called 3GIS with operator Hi3G, which was meant to be used for the deployment of their 3G networks in the 2100 MHz band.

- Additionally, a significant number of MVNOs run operations through agreements to use capacity from the networks of the main MNOs.

Joint ventures for 3G and ´4G Services

Joint Ventures for Shared Network Deployment between Swedish Mobile Operators (Markendahl & Mölleryd, November 2012)



- In addition to their joint venture with Telia, Tele2 has established another one in 2009. It is called Net4Mobility and it is shared with Telenor, at 50% ownership each. Their goal was to roll-out 2G and 4G networks together.

Regulatory Body in Sweden

- Swedish Post and Telecom Aurhority (PTS) established in 1992

- Completely independent from other public entities, including the Swedish Government.

Concession Licenses and Spectrum Allocation Approach in Sweden

- Spectrum auctions. Bids not too high or low.
- Avg. Price: 0.40 €/MHz/Pop
- Network implementation commitments for operators.
- New: Licenses made service free and technology free.

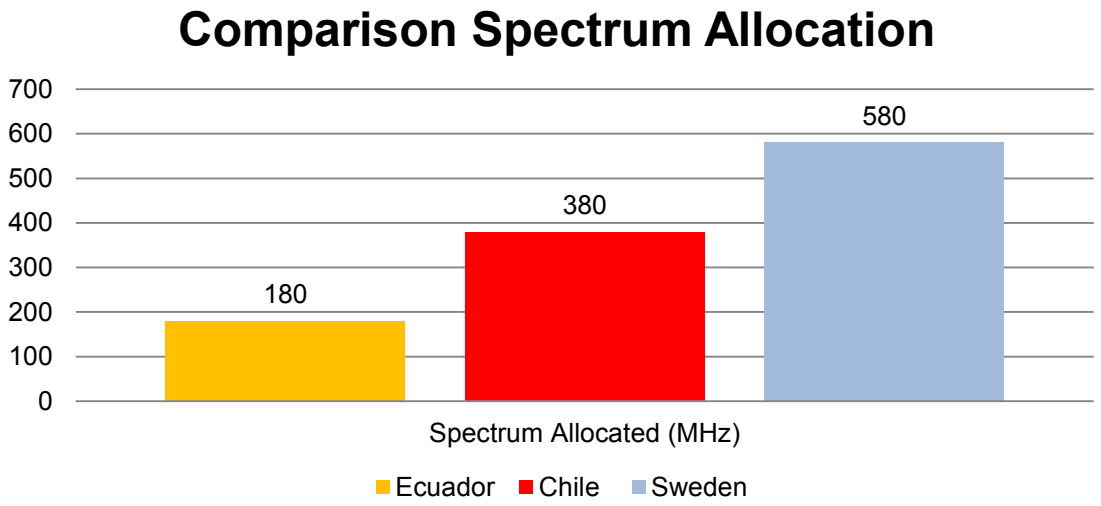
Bidder	Bandwidth Allocated 2.6 GHz Band	Auction Investment (US $)
Telia	40 MHz	93,900,000
Tele2	40 MHz	91,500,000
Telenor	40 MHz	89,000,000
HI3G	20 MHz	49,500,000
Intel	50 MHz (TDD)	26,600,000

Table 4.1. Spectrum Allocation in the 2.6 GHz Band after 2008 Auction[12]

Spectrum Allocation per Operator

Operator	800 MHz	900 MHz	1800 MHz	2100 MHz	2.6 GHz	Total (MHz)
Telia	20	20	70	0	40	150
Tele2	0	25	0	0	0	25
Telenor	0	15	0	40	0	55
Hi3G	20	10	0	40	70 (50 TDD)	140
SUNAB (Tele2 + Telia)	0	0	0	40	0	40
Net4Mobility (Tele2 + Telenor)	20	0	70	0	80	170
Total (MHz)	60	70	140	120	190	580

Spectrum Allocation



Ecuador

- Two bands allocated to three operators (850, 1900 MHz)
- CNT Móvil awarded 70 MHz spectrum in two additional bands for LTE deployment (700 and 2600 MHz)

Chile

- Operators now using a total of 4 bands (800, 1900, 1700/2100, 2600 MHz)

Sweden

- Operators allocated spectrum in 5 bands (800, 900, 1800, 2100, 2600 MHz)

Summary on Concession License and Spectrum Allocation Approach

Ecuador

- Pre-2007: Very small fees and no operator commitments in implementations
- Post-2007. New Gov't. Make up for losses. High license renewal prices for private operators. Still no implementation commitments.
- Public operator does not pay for spectrum anymore.
- Not clear when or how new spectrum for 4G will be allocated to private MNOs.

Chile

- Beauty contests with small bids in complementary spectrum auctions.
- Network implementation commitments for operators.

Sweden

- Spectrum auctions with bids higher than Chile.
- Network implementation commitments for operators.
- New: Licenses made service free and technology free.

Indecency of the regulatory body Sweden vs. Chile, and Ecuador

	Ecuador	Chile	Sweden
Regulatory Body	Consejo Nacional de Telecomunicaciones - CONATEL (National Telecommunications Council): It is recognized by the International Telecommunications Union (ITU)	SUBTEL, official Regulator Authority	The independence and autonomy of the Swedish national regulatory authority (Post- och telestyrelsen (PTS)) is underpinned by the Swedish Constitution, and the NRA has the requisite powers under EC law (1993).
Date of Putting in place the regulation Framework	After the Lliberalization process	Before the Lliberalization process	Before the Lliberalization process
Independency	Complex Structure five entities are involved	SUBTEL is a government agency reporting to the Ministry of Communications and Information Technology	PTS is independent government agency reporting to the Ministry of Industry, Employment and Communications
Measures/actions taking to intensify competition in the market	+CNT (entered the market in 2003): State-owned. Weak competitor so far. +in 2009 the regulator made the decision to implement number portability in the market + Passive Sharing is allowed	+ By end of 2011, 22 MVNO licenses are issued +. number portability was implemented since 2012 + The introduction of network infrastructure in beginning of 2012 (i.e., antenna towers) providers to encourage site sharing.	+In May 2000 PTS set the fees that would apply for the administration of number portability, + Open the door for network sharing for rolling the 3G service in the market since 2000. +more than 30 MNVO

Thanks