Columbia Business School

The Impact of broadband policy on the economy

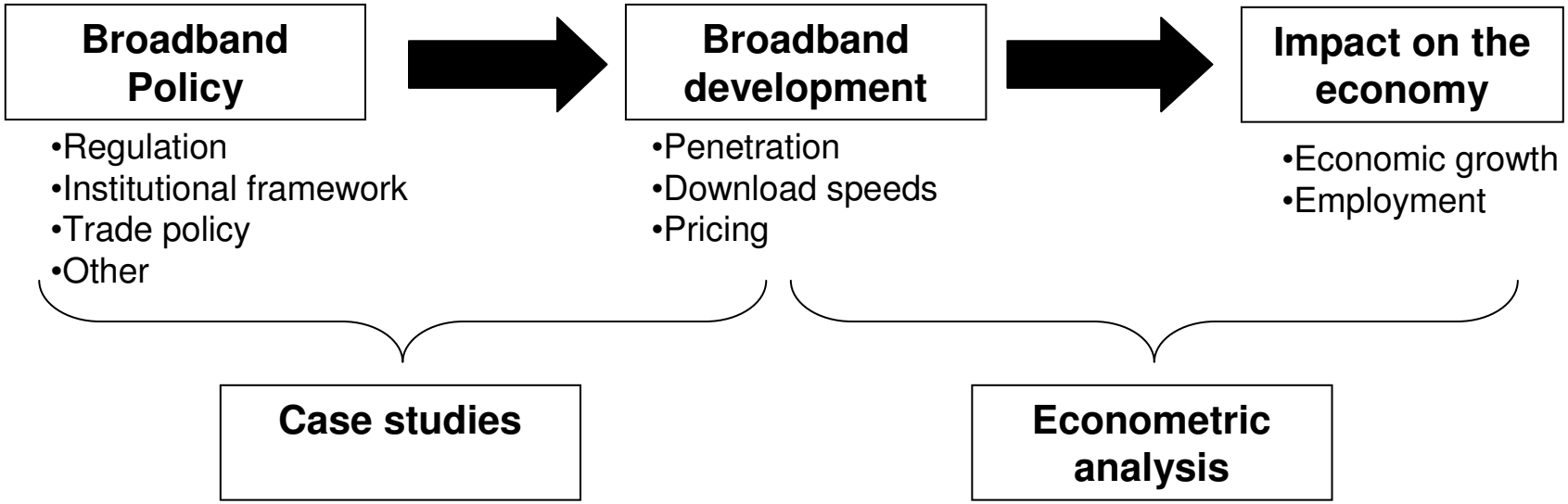
Dr. Raul L. Katz
Adjunct Professor, Finance and Economics Division
Director, Business Strategy Studies

Javier Avila
Research Analyst
Columbia Institute for Tele-information

4th ACORN REDECOM Conference
Brasilia, May 14, 2010

Our study addresses the overall impact of broadband policy on deployment and ultimately, its impact on the economy

STUDY ROADMAP AND METHODOLOGIES



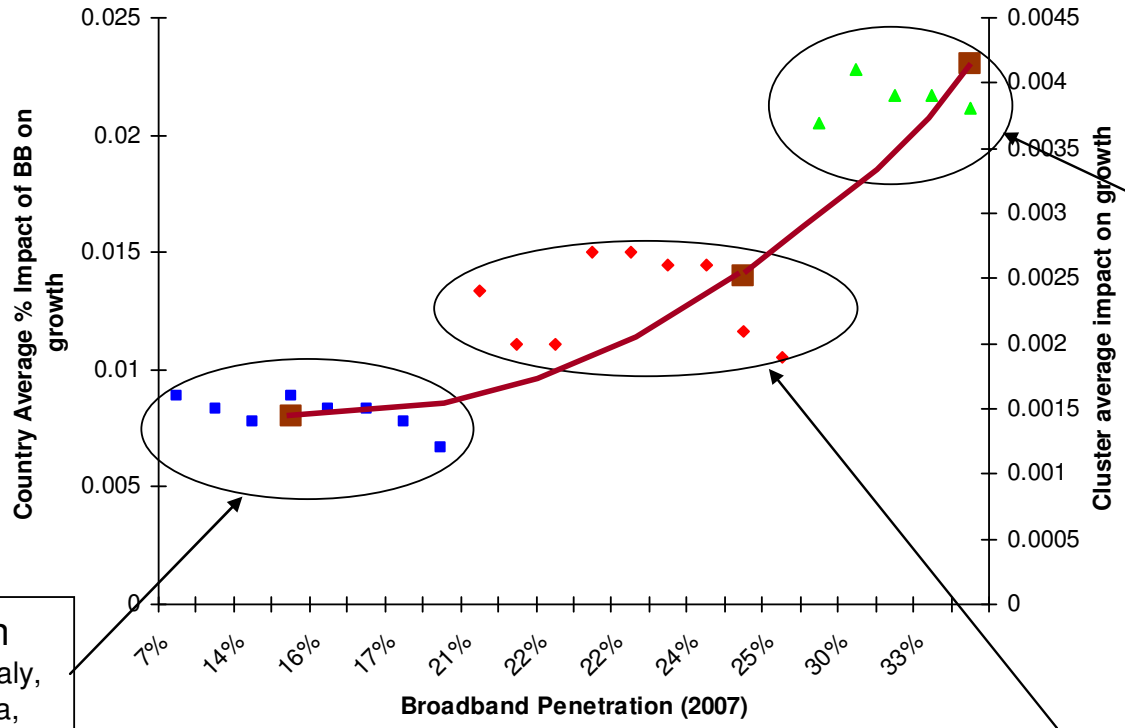
Contenidos

- Economic impact of broadband
- Impact of public policy on broadband deployment: case studies
- Impact of public policy on broadband deployment: an explanatory framework

Research conducted in several countries has confirmed the impact of broadband on economic growth

COUNTRY	STUDY	DATA SET	EFFECT
Germany	•Katz et al. (2009)	2000-2006 for German counties	An increase of 1% in broadband penetration contributes in 0.026% to GDP growth
OECD	•Koutroumpis (2009)	2002-2007 for 22 OECD countries	An increase in penetration of broadband of 1% results in an increase of 0.025% of economic growth
	•Czernich et al. (2009)	1996-2007 for OECD countries	An increase of 10% in broadband penetration increases GDP growth between 0.9 %and 1.5 %
World Bank	•Qiang et al. (2009)	119 countries clustered as high, medium and low income	An increase of 10 % in broadband penetration contributes in 1.21 percentage points of GDP increase for developed countries and 1.38 percentage points for emerging countries

Research has also begun to identify the need to reach "critical mass" to accentuate the impact of broadband on economic growth



Source: adapted from Koutrompis (2009)

Low penetration
- Greece, Portugal, Italy, New Zealand, Austria, Hungary, Spain, Ireland
- Average contribution to GDP growth: 0.008

High penetration
- Denmark, Norway, Netherlands, Sweden, Switzerland
- Average contribution to GDP growth: 0.023

Medium penetration
- Germany, France, Japan, Belgium, UK, Australia, US, Canada, Luxemburg
- Average contribution to GDP growth: 0.014

In addition, broadband has also found to have an impact on job creation

COUNTRY	STUDY	DATA SET	EFFECT
United States	•Lehr et al. (2005)	1998-2002 for ZIP codes	Broadband availability increases employment growth between 0.5 % and 1%
	•Crandall et al. (2007)	For 48 states	Increase in broadband penetration of 1% results in job growth between 0.2 % and 0.3 % assuming that the economy is not operating at full employment
	•Shideler et al. (2007)	County data for the state of Kentucky for 2003-4	An increase in broadband penetration of 1% contributes to employment growth between 0.14 % and 5.32 % depending on the industrial sector
	•Thompson et al. (2008)	2000-2006 for 48 states	Employment growth as a result of broadband varies by industry

We have built a model aimed at testing the impact of broadband on economic growth in Latin American and Caribbean countries

VARIABLES UTILIZED TO MEASURE BROADBAND IMPACT ON ECONOMIC GROWTH

Type of variable	Data set	Source	Rationale
Economic growth	GDP (2004-8)	World Bank,	Dependent variable
Control for level of development	GDP per capita (2000)	World Bank	Measure for starting point of growth
Control for Investment	Investment/GDP (2004-8)	World Bank	Measure for differences in investment levels
Control for Human Capital	Tertiary education (2002)	UNESCO, Earthtrends, University of West Indies, Euromonitor, Government of the Commonwealth of Dominica	Measure for differences in human capital
Broadband penetration growth	Broadband penetration growth (2003-4)	ITU	Independent variable

When controlling for educational level and starting point of development, 1% increase in broadband penetration yields 0.0178 point contribution to GDP growth

BROADBAND IMPACT ON ECONOMIC GROWTH IN LATIN AMERICA

Avrg GDP growth (04-08)=β1*GDP/Capita 2000 + β2*(Investment/GDP)04-08 + β3*Tertiary Education Lev. + β4*(Δ broadband)03-04

GDP growth	Coefficient	Standard error	T-statistic	P>[t]	95% Conf. interval
GDP per capita 2000	-.0006045	.0002142	-2.82	0.011	-.0010528
Investment/GDP	-.0006496	.108927	-0.01	0.995	-.2286365
Tertiary education level	.1900042	.0670932	2.83	0.011	.0495766
Broadband penetration	.0177989	.0061606	2.89	0.009	.0049046
Constant	7.989611	4.063328	1.97	0.064	-.5150321

Number of observations	24
F(4,14)	14.34
Prob>F	0.0000
R2	0.4311
Root MSE	4.7802

INTERPRETATION

- The difference in impact with the World Bank study could be partially explained by the fact that this study includes countries with higher broadband penetration levels, which have reached higher impact
- The statistical relationship of investment is not significant because this has an impact with a longer time lag
- Tertiary education is used to explain country differences in terms of human capital

According to this model, broadband is contributing between ^6.7 and $14.3 billion of the Latin American GDP

- The economic growth of Latin America and the Caribbean between 2009 and 2010 according to the IMF projections will be of 3.4%, generating a GDP of US 3,925 billion
- According to our model, the elasticity of broadband with regard to GDP growth is 0.017% for 1 % increase in penetration for a period without economic crises (2004-8)
- Assuming the possibility of bias (and given the lack of time series) we are inclined to consider as a lower bound the elasticity calculated by Koutrompis (2009) for countries with broadband penetration lower than 20%: 0.008 %
- According to these two estimates, broadband growth (at a prorated average of 37% in the last year) has contributed between $ 6.7 billion and $ 14.3 billion of GDP
- This impact includes direct effects (in the telecommunications industry) and indirect (spillover effects), including not only the incremental impact but also the preservation of economic growth

We also estimated the impact of broadband on job creation for Chile's regions

VARIABLES UTILIZED TO MEASURE BROADBAND IMPACT ON EMPLOYMENT

Type of variable	Data set (by quarter)	Source	Rationale
Occupation	Occupation rate (2002-9)	Regional Institute of Statistics	Dependent variable
Control for labor intensity of region	Economic activity index (2001-9)	Regional Institute of Statistics	Measure for starting point of growth
Broadband penetration growth	Broadband penetration growth (2002-9)	Subtel	Independent variable

According to the model, 1 percentage point increase in broadband penetration results in an increase of 0.18 points in the occupation rate

BROADBAND IMPACT ON EMPLOYMENT IN CHILE (12 Regions 2002-9)

Employment Rate = β1 * Economic activity index + β2 * (Δ broadband penetration) + Constant

Occupation Rate	Coefficient	Standard error	T-statistic	P>[t]	95% Conf. interval
Economic activity index (-1)	0.0003509	0.0000595	5.90	0.000	.0002338
Broadband penetration growth (-1)	0.0018118	0.0004708	3.85	0.000	.0008853
Constant	0.8682527	0.0079638	109.03	0.000	.85258283

Number of observations	
F(4,14)	324
Prob>F	0.0000
F(2,310)	60.89
R2	0.2820

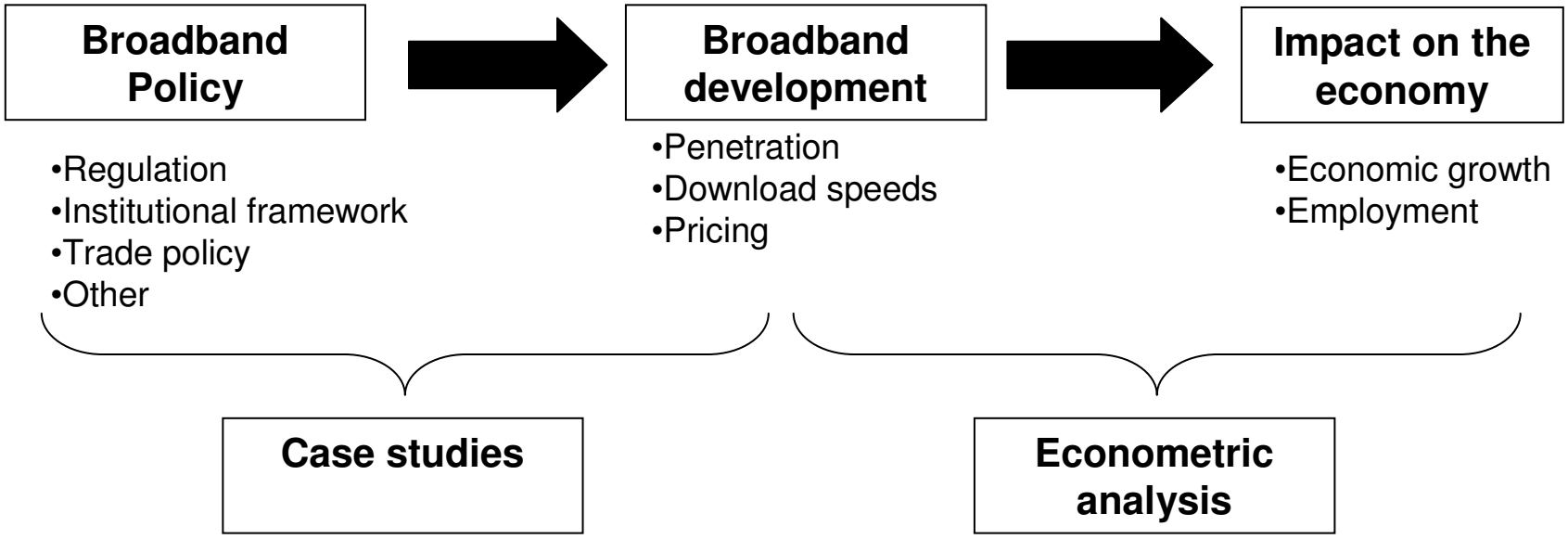
INTERPRETATION

- The data set includes quarterly indicators for the 12 regions of Chile between 2002 and 2009 (the Metropolitan Region is excluded because it does not provide quarterly data)
- The specific characteristics of each region have an impact on the labor market and are controlled by the fixed effects od the panel data

According to the Chilean model, broadband has contributed to the creation of 114,500 jobs in this country

- With an employment rate of 93%, the Chilean workforce amounts to 6,500,000 individuals
- From this percentage, broadband has contributed to 0.18 points in the occupation rate for each 1% incremental penetration
- Chile has reached a broadband penetration of 9.78%, which determines that, at the national level, broadband has contributed to 1.76 percentage points in the national employment rate
- This results in 114,500 jobs between direct and indirect jobs

In sum, our estimates indicate that broadband has a significant impact on the economy of Latin America



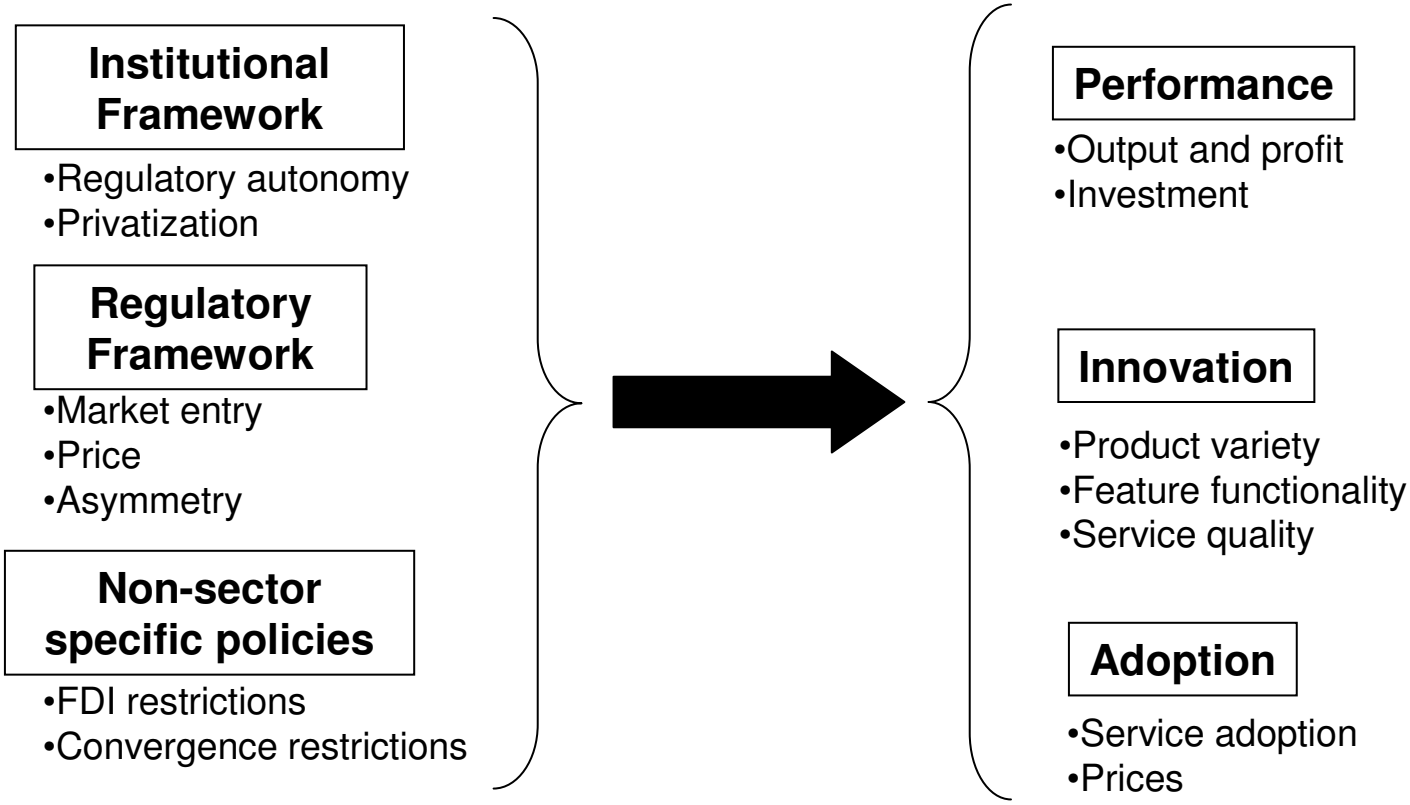
- Broadband penetration contrinuted to the generation of between $6.7 y $14.3 billons of GDP
- Similarly, at least in the Chilean case broadband contributed to the creation of 114,500 jobs

Contenidos

- Economic impact of broadband
- Impact of public policy on broadband deployment: case studies
- Impact of public policy on broadband deployment: an explanatory framework

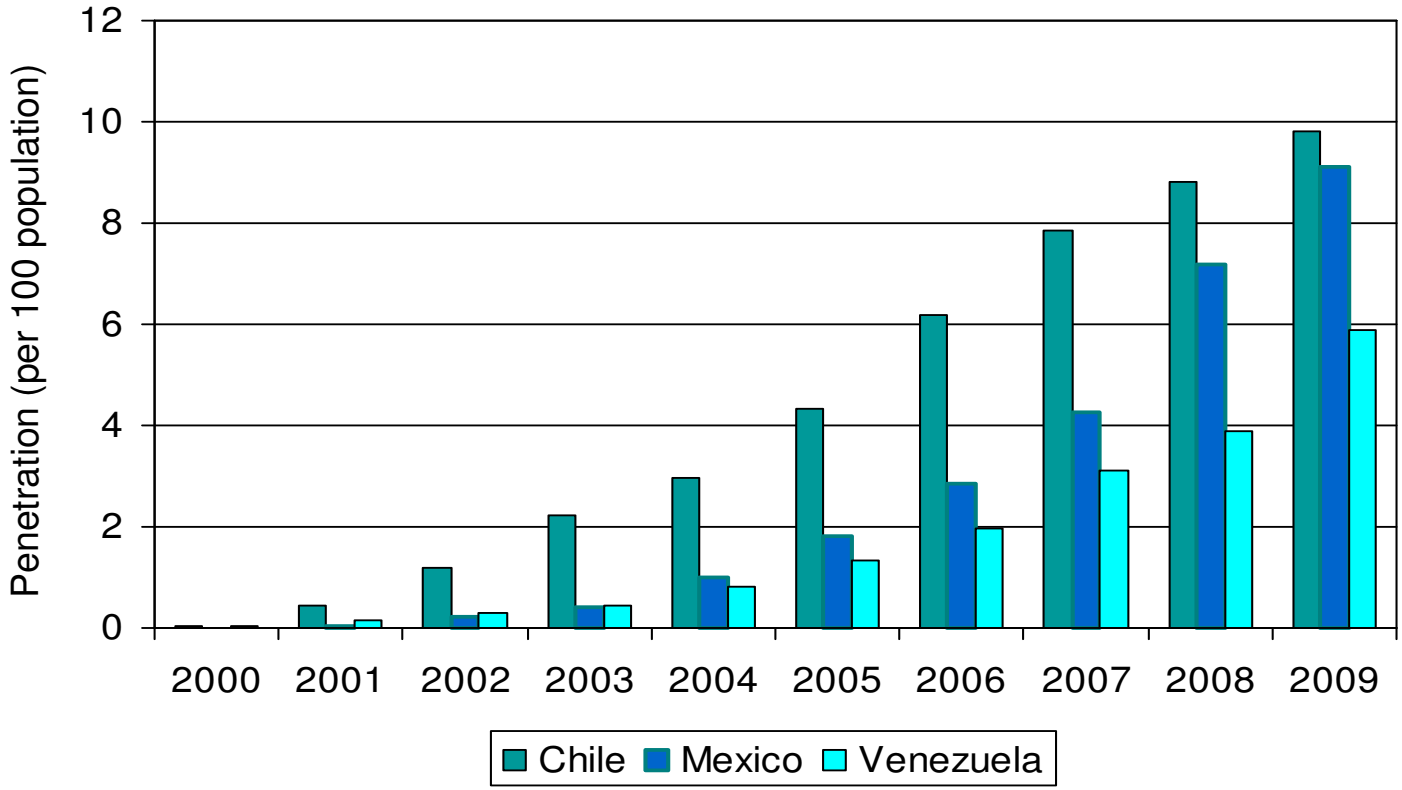
The level of telecommunications development in a given country is influenced by three clusters of policy variables

RELATIONSHIP BETWEEN POLICY VARIABLES AND TELECOMMUNICATIONS DEVELOPMENT



Adoption: Broadband deployment varies among countries in the region

COMPARATIVE PENETRATION OF BROADBAND



Sources: ITU; regulatory authorities

Adoption: Prices do also vary

LATIN AMERICA: COMPARISON OF BROADBAND PRICES AMONG INCUMBENTS AND CABLE TV OPERATORS 2009 (USD)

Country	Company	Minimum Speed		Medium Speed		Maximum Speed	
		Download Speed	Price USD	Download Speed	Price USD	Download Speed	Price USD
Mexico	Telmex	1Mb	22.40	2 Mb	44.87	4 Mb	89.74
	Megacable	1Mb	14.91	2Mb	22.40	10 Mb	59.85
Chile	Telefonica	1 Mb	29.91	4 Mb	39.55	8 Mb	53.00
	VTR	2 Mb	41.15	4 Mb	45.90	15 Mb	56.97
Venezuela	Cantv	256 K	27.91 (*)	1.02 Mb	58.14	--	--
	Intercable	256 K	25.58	1.02 Mb	54.88	4 Mb	116.28

(*) Prepaid offer at $ 9.56

Source: Companies websites

Innovation: So do speed of access

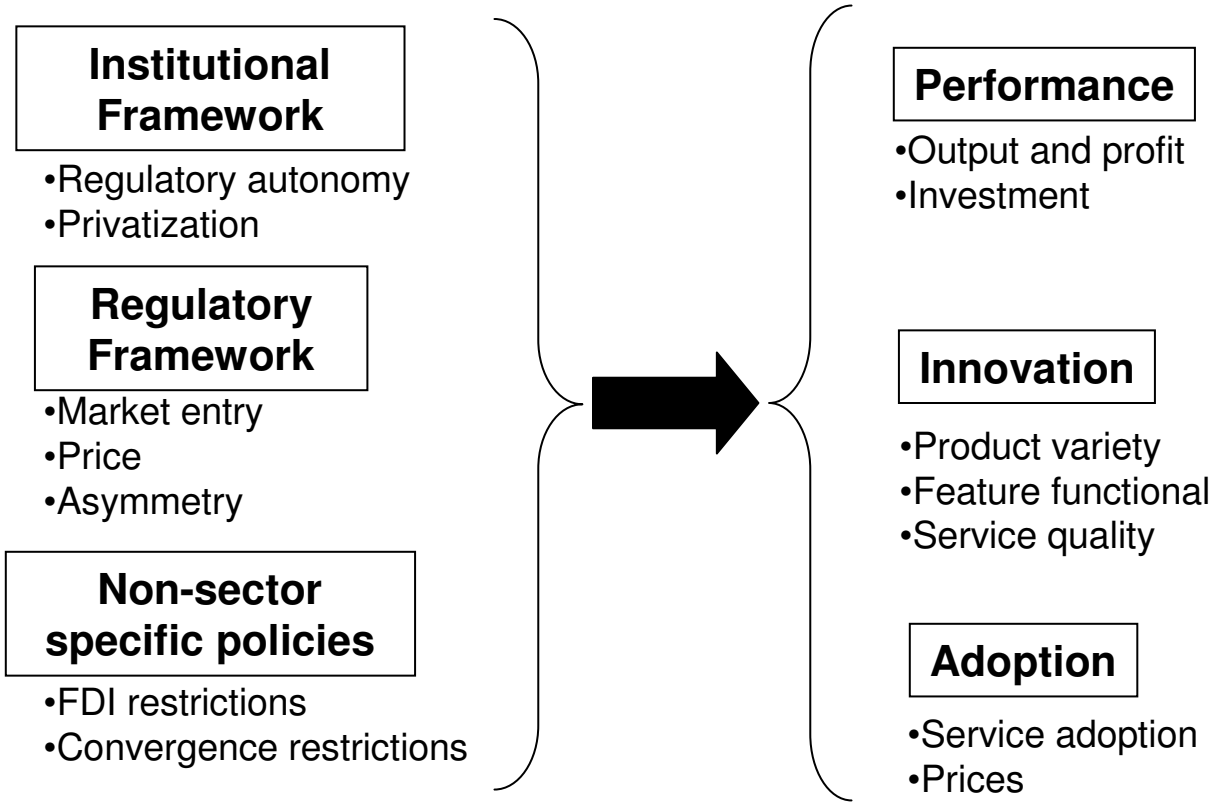
LATIN AMERICA: BROADBAND ACCESS SPEEDS (2008)

	< 256 Kpbs	256-512 Kbps	512 Kbps-1 MBPs	> 1 Mbps
Chile	10 %	25 %	34 %	31 %
Venezuela	1%	38 %	51 %	10 %
Mexico				

Sources: IDC/Cisco

Can we relate the policy variables to the performance of the broadband sector?

RELATIONSHIP BETWEEN POLICY VARIABLES AND TELECOMMUNICATIONS DEVELOPMENT



BROADBAND RANKING

	Chile	Venezuela	Mexico
Adoption	1	3	2
Pricing	1	3	2
Speed	1	2	

Contenidos

- Economic impact of broadband
- Impact of public policy on broadband deployment: case studies
- Impact of public policy on broadband deployment: an explanatory framework

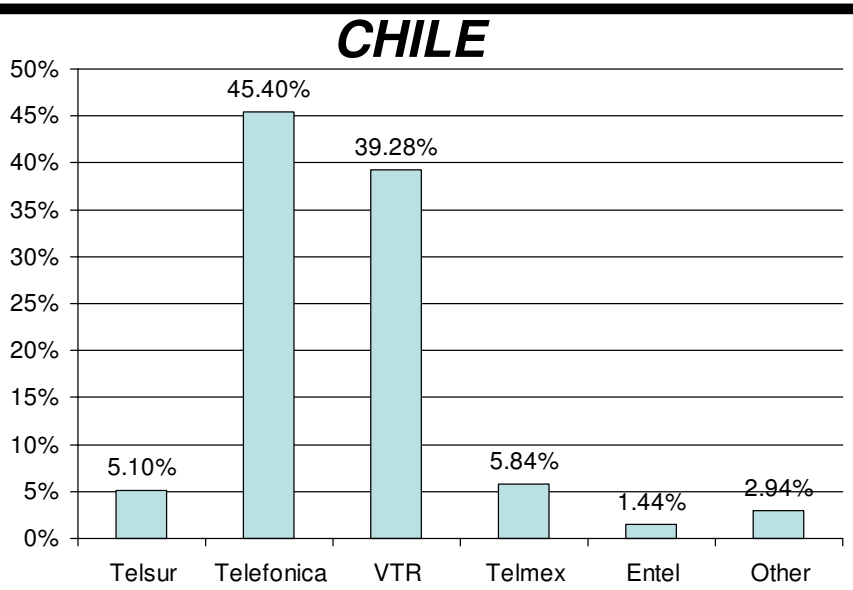
Institutional framework: the primary difference is the ownership of the incumbent in Venezuela, and the lack of digital plan in Mexico

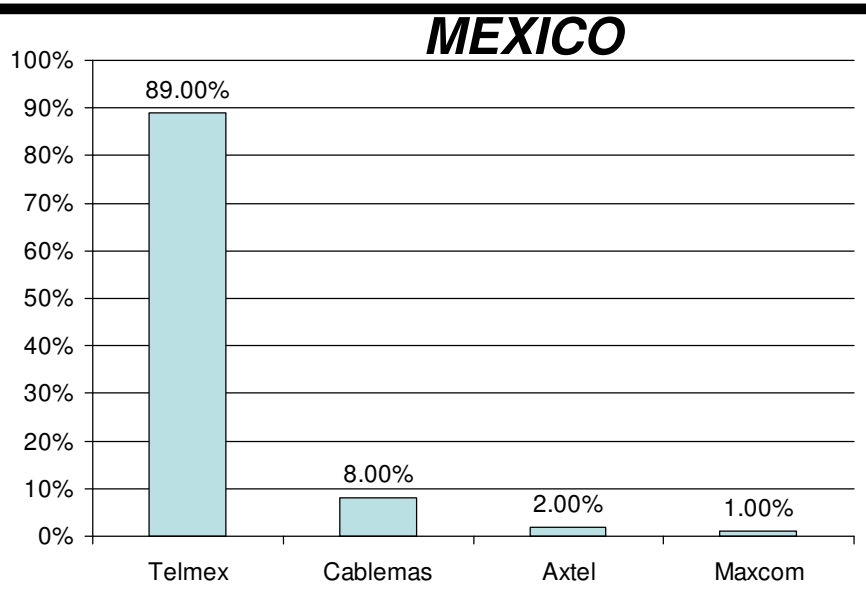
Policies	Alternatives	Chile	Mexico	Venezuela
Regulatory independence	•The regulatory authority is independent in terms of finance, structure and decision making from the operator(s) and the Ministry of Communications	•No	•No	•No
	•The regulatory authority is autonomous in decision making	•No	•Yes	•No
Privatization stages	•State-owned company •Up to a 50% of the company is owned by private shareholders •More than 51% of the company is owned by private shareholders, but the government still holds shares •The privatization is complete	•Privatized	Privatized	•State-owned
Industrial and/or development plan	•Is there a digital plan? Is it revised periodically?	•Yes	•No	•Yes, but not revised
	•Is there a comprehensive ICT strategic plan? Is it revised periodically?	•Yes	•No	•Yes
	•Are there demand-side incentives and an ICT oriented industrial policy?	•Yes	•No	•Yes, government partnerships

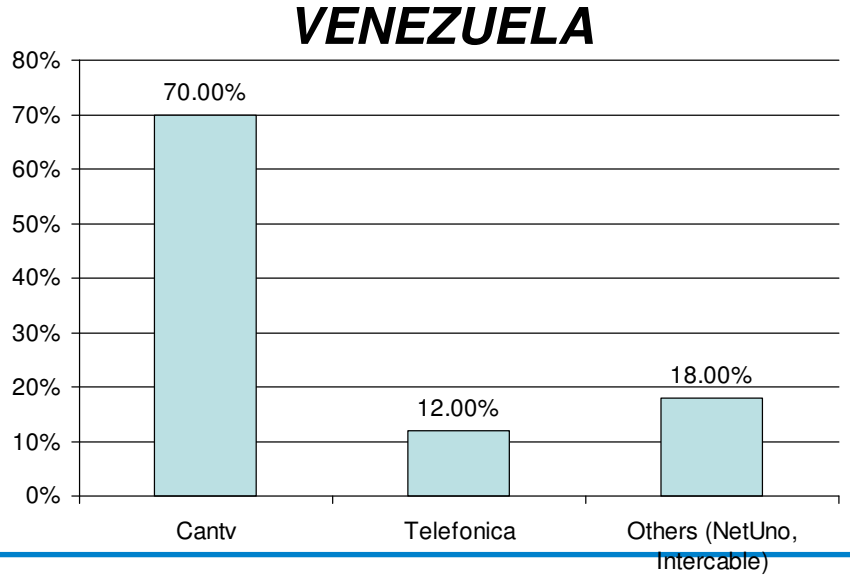
Regulatory framework: Chile is different from other countries in terms of stage of competitive dynamics

Policies	Alternatives	Chile	Mexico	Venezuela
Level of competition	•Services (fixed, wireless, broadband, VAS, etc.) under partial, managed or full competition	•Full competition	•Managed	•Managed
Universal Service Obligations	•Does universal services/service policy exist? •Which services are covered by USO (wireline, broadband)? •Which operators are under USO (incumbent, all)?	•Yes, for voice	•Yes, for voice	•Yes, for voice, dial-up, telecenters
VoIP regulation	•Is VoIP service allowed? •Is there a VoIP regulation in place?	•Yes •Yes	•Yes •No	•No •No

Regulatory framework: this is reflected in Chile's platform based competition







Non-sector specific policies: Mexico is the only country restricting FDI

Policies	Alternatives	Chile	Mexico	Venezuela
Wireless, AS, ISP ownership restrictions	•Are foreigners prohibited from holding shares in an operator? •Are foreigners allowed to own up to 49% of an operator? •Are foreigners allowed to own more than 49% of a company, but a national partner is required? •There are no restrictions on foreign ownership	•No restrictions	•No restrictions	•No restrictions
Fixed line ownership restrictions	•Are foreigners prohibited from holding shares in an operator? •Are foreigners allowed to own up to 49% of an operator? •Are foreigners allowed to own more than 49% of a company, but a national partner is required? •There are no restrictions on foreign ownership	•No restrictions	•Up to 49% of shares	•No restrictions

Can we relate the policy variables to the performance of the broadband sector?

RELATIONSHIP BETWEEN POLICY VARIABLES AND TELECOMMUNICATIONS DEVELOPMENT

BROADBAND POLICIES

	Chile	Venezuela	Mexico
Institutional	Private Dig. Plan	State-own. Dig. Plan	Private No plan
Regulatory	Full competit.	Managed competit.	Managed competit.
Non-sector specific	No restrict.	No restrict.	Investm. restrict.

Institutional Framework

- Regulatory autonomy
- Privatization

Regulatory Framework

- Market entry
- Price
- Asymmetry

Non-sector specific policies

- FDI restrictions
- Convergence restrictions

Performance

- Output and profit
- Investment

Innovation

- Product variety
- Feature functionality
- Service quality

Adoption

- Service adoption
- Prices

BROADBAND RANKING

	Chile	Venezuela	Mexico
Adoption	1	3	2
Pricing	1	3	2
Speed	1	2	

In sum, our estimates indicate that broadband has a significant impact on the economy of Latin America

Broadband Policy → **Broadband development** → **Impact on the economy**

- **Broadband Policy**
  - •Regulation
  - •Institutional framework
  - •Trade policy
  - •Other
- **Broadband development**
  - •Penetration
  - •Download speeds
  - •Pricing
- **Impact on the economy**
  - •Economic growth
  - •Employment

Case studies

- Managed competition, absence of a national plan, FDI restrictions and state presence limits broadband development
- Conversely, full platform-based competition, no FDI restrictions, a national plan, and privatized carriers contribute to broadband development

Econometric analysis

- Broadband penetration contributed to the generation of between $6.7 y $14.3 billons of GDP
- Similarly, at least in the Chilean case broadband contributed to the creation of 114,500 jobs