

Opportunities and challenges for policies focusing on local productive and innovative systems

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Research Network on Local Productive and Innovative Systems

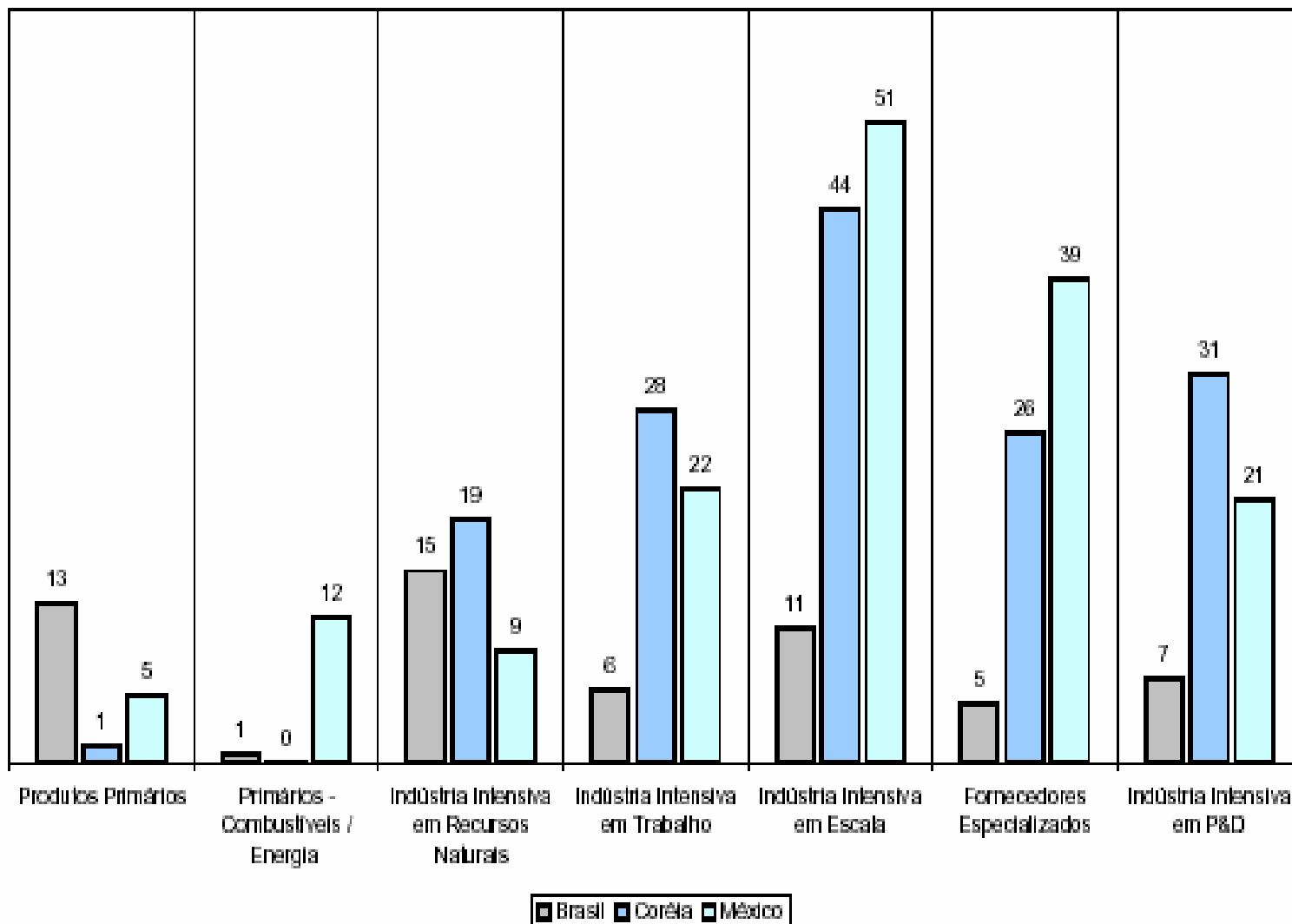
RedeSist

Federal University of Rio de Janeiro, Brazil

Brazil - Main Economic Indicators - 1995-2004

	Percentages									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
GDP growth (%)	4.2	2.7	3.3	0.1	0.8	4.4	1.3	1.9	-0.2	5.2
Per capita GDP growth (%)	2.7	1.2	1.9	-1.2	-0.5	3.1	0.0	0.6	-1.4	3.7
Variation in consumer prices ^a	22.4	9.6	5.2	1.7	8.9	6.0	7.7	12.5	9.3	7.2
Variation in nominal exchange rate (%) ^b	13.9	7.2	7.4	8.2	52.9	6.5	20.4	53.5	-19.4	-0.1
Total gross external debt (% of GDP)	23.5	24.1	25.8	32.0	45.0	39.2	44.5	49.4	47.8	42.7
Gross domestic investment (% of GDP)	22.3	20.9	21.5	21.1	20.2	21.5	21.2	19.8	20.1	20.7
	Billions of dollars									
Current account balance	-18.1	-23.2	-30.5	-33.8	-25.4	-24.2	-23.2	-7.7	4.1	11.1
Merchandise exports	46.5	47.9	53.2	51.1	48.0	55.1	58.2	60.4	73.1	95.0
Merchandise imports	49.7	53.3	59.8	57.7	49.3	55.8	55.6	47.2	48.3	62.0
	Index: 2000=100									
Real effective exchange rate	75.7	72.3	71.1	73.6	108.5	100.0	120.1	134.7	135.2	129.7 ^c

Exportações - US\$ bilhões



Selected developing countries: share in world exports and GDP growth, 1980-2000

Country	1980	1985	1990	1995	2000	□ GDP 1990-2000 (% yearly growth)
<i>Developing countries</i>	29,1	25,2	23,0	25,3	29,5	-
Asia	15,6	20,7	21,5	25,6	25,9	-
China	0,89	1,40	1,80	2,93	3,92	10,1
South Korea	0,86	1,55	1,89	2,46	2,71	6,2
Malaysia	0,64	0,79	0,85	1,46	1,54	7,0
Singapore	1,0	1,2	1,5	2,3	2,2	7,9
Thailand	0,3	0,4	0,7	1,1	1,1	4,4
India	0,4	0,5	0,5	0,6	0,7	5,4
Indonesia	1,1	1,0	0,7	0,9	1,0	4,2
Ireland	0,41	0,53	0,69	0,88	1,25	7,3
Brazil	0,99	1,31	0,91	0,92	0,87	2,7
Mexico	0,89	1,37	1,18	1,57	2,61	3,5

Research Network on Innovation Systems - RedeSist

- Central aim:
 - analyze the means of acquiring, using and disseminating knowledge - the most important source of creating value in productive spheres
 - capture and assess the **processes of learning and competence building**
- Emphasis on the importance of accumulating capabilities for the **sustainable competitiveness**
 - versus 'spurious competitiveness' = low costs based on depreciation of labor and natural resources

Main results obtained by RedeSist

www.ie.ufrj.br/redesist

- development of the concepts of Local Productive and Innovative Systems and Arrangements - LPI SAs
- development of a methodology for empirical surveys and policy evaluation
 - general structure for the reports - role of the LPI SA in the **international, national and local economies**, analysis of the case, **policy recommendations**
 - plan for interviews, questionnaires (for different types of agents), sample and tabular plans

Concept of Local Productive and Innovative Systems and Arrangements - LPI SAs

LPI SAs comprise

- ❑ firms: producers of final goods and services, suppliers of inputs and equipment, service providers, etc. and their different forms of association
- ❑ other public and private organizations in charge of education and training, R&D, engineering, promotion, financing, representation, etc.

Systems are groups of economic, political and social agents localized in the same area, performing related economic activities and presenting consistent articulation, interaction, co-operation and learning processes.

Arrangements are those cases in which there is no (or almost no) articulation among the agents

PRINCIPAIS PRODUTOS E SETORES LOCAIS



Cassiolato, J., Lastres, H. and Maciel
(eds)

*Systems of Innovation and
Development.*

Cheltenham: Elgar, 2003

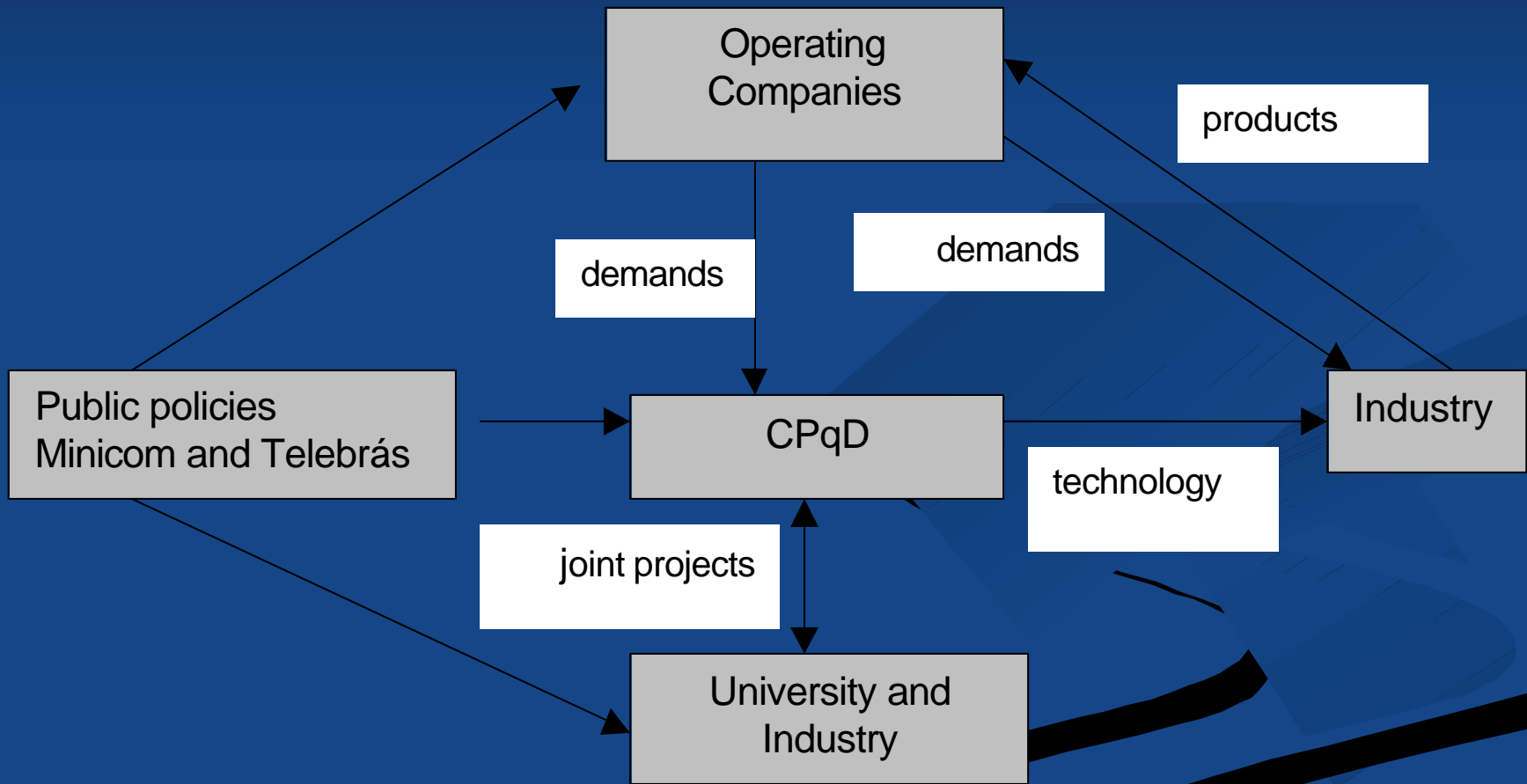
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Local Systems: the cases of Telecom
and Aircraft

Development of the Brazilian telecom innovation system

- Origin: mid 1970s
 - Creation of Embratel, Telebrás and CPqD
 - Government policies focusing on
 - stimulating setting up of nationally owned telecom equipment firms
 - increase of local added value by the multinational subsidiaries
 - local technological and innovation development in telecom in hardware and software

Brazilian telecom innovation system (From the 1980s to mid 1990s)



Main achievements of the Brazilian telecom innovation system

- Gradual involvement of multinational subsidiaries in the process of innovation and technological capability development
- Establishment of a network of local suppliers (120 local firms responsible for 17% of the market in 1982)
- Development of key technologies for the telecom system expansion (Trópico)
- Reduction in the investment costs of building the Brazilian telecom network

'CPqD has developed virtually from scratch a range of digital exchange systems designed not only to suit Brazil's tropical climate, but also the particular types of telephone traffic conditions found in the various regions. CPqD's close relationship with industry has enabled technology transfer and joint development with local firms in exchange, transmission and peripheral telecom technology' (p. 19) and 'there can be little doubt that in the areas of industrial and technological progress in digital telecom Brazil was, in the 1980s, leading the Third World, mostly as a result of the policies adopted after 1974' (Hobday,1990, p. 19-20).

Changes in the Brazilian institutional and regulatory model - International Context

- Context of the 1990s: liberalisation of telecom industry and privatisation of the state monopoly became a consensus
- New set of influences based on internet technologies: fundamental changes transforming the telecom industry
- New technological regime: R&D intensive activities concentrated in the equipment suppliers

Changes in the Brazilian institutional and regulatory model (I)

- Early 1990s: Trade liberalisation did not significantly affect the organisation of the innovation system
 - Major consequence: increase in the share of foreign capital in the telecom industry
 - Nationally owned firms: Productive restructuring and downgrading processes
 - reduction in R&D efforts
 - CPqD: changes of orientation
 - focus on operating system and software development

Changes in the Brazilian institutional and regulatory model (II)

- 1995: beginning of the liberalisation process (Telebrás' Privatisation in 1998)
 - Increase in the number of fixed installed lines with low competition in local telephony
 - Significant increase in the number of mobile lines with high competition
 - High investment by all operators in the period 1995-2001 (approximately US\$ 24 billion)

Impacts on the telecom innovation system (I)

- National telecom industry
 - Increase in telecommunications imports of components, parts, pieces and final products with negative effects on the trade balance
 - Entrance of new equipment suppliers
 - Acquisition of dynamic nationally owned firms by MNCs subsidiaries

Impacts on the telecom innovation system (II)

Table 1: Trade balance of the telecommunications equipment industry and total electronic complex deficit (1996-2002)

(US\$ million)

Description/Year	1996	1997	1998	1999	2000	2001	2002
Imports	1 925.2	2 664.2	2 578.7	2 540.3	3 160.0	3458.3	1432.9
Exports	154.1	288.1	329.1	484.2	1 310.3	1547,8	1546
Telecom Trade Balance	-1 771.1	-2 376.1	-2 249.6	-2 056.1	-1 849.7	-1910.5	113.1
Electronic Complex Trade Balance	-5 474.3	-6 378.8	-5 680.0	-5 157.9	-6 299.1	-5805.1	-3 115.1

Source: BNDES (Social and Economic Development National Bank - www.bnades.gov.br)

Impacts on the telecom innovation system (III)

Table 2: Market Share of the main suppliers of telecom equipment in the Brazilian market, by origin of capital (*)

Year	1988	1997	2000
Market share of the nationally owned firms	77%	41,5%	8,7%
Market share of the foreign firms	23%	58,5%	91,3%

Source: Oliva, 2002 .

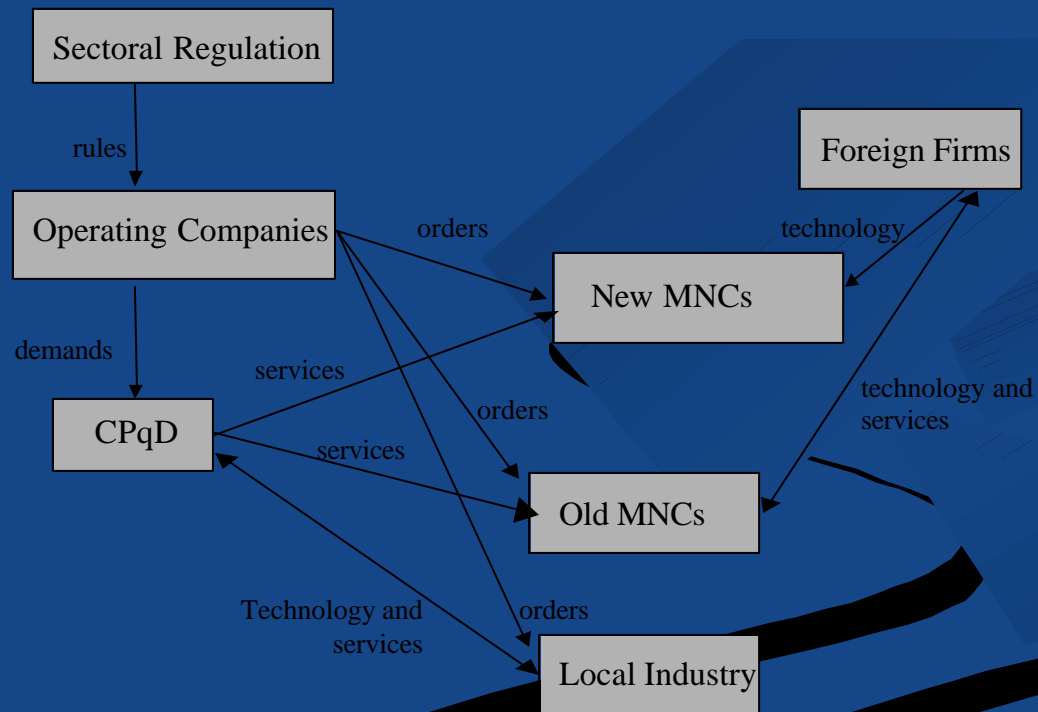
(*)The concept of nationally owned and foreign firms are based on the control of voting capital criterion.

Impacts on the telecom innovation system (IV)

- Transformation of CPqD into a private Foundation (resources from concession contracts and Funttel)
 - Change in the mix of activities
 - reduction of research activities of higher risk
 - increase in short term consultancy and technical assistance
 - Change in technological strategies of firms
 - Reduction of R&D by both national and MNCs subsidiaries

Impacts on the telecom innovation system (V)

Figure 3: Innovation system of telecom
(late 1990s)



New telecommunications industry: major international trends

- Change of the mix of R&D between incumbents and equipment suppliers
- Concentration of R&D efforts in the equipment supplier layer
- Low R&D investment by the incumbents
- Pressures to reduce long run R&D
- Developed countries maintain innovation and R&D efforts in telecommunications
 - incumbents still by locally
- Globalisation: "more rhetoric than reality" (Fransman, 2002)

Main Challenges for Brazil (I)

- New operators with global procurement policies and traditional suppliers
- Denationalisation of the telecom industry (equipment suppliers and incumbents)
- Brazilian multinational subsidiaries concentrated in product adaptations to local markets
- FUNTTEL, FUST, supporting instruments from BNDES and New Informatics Law - Is it enough???

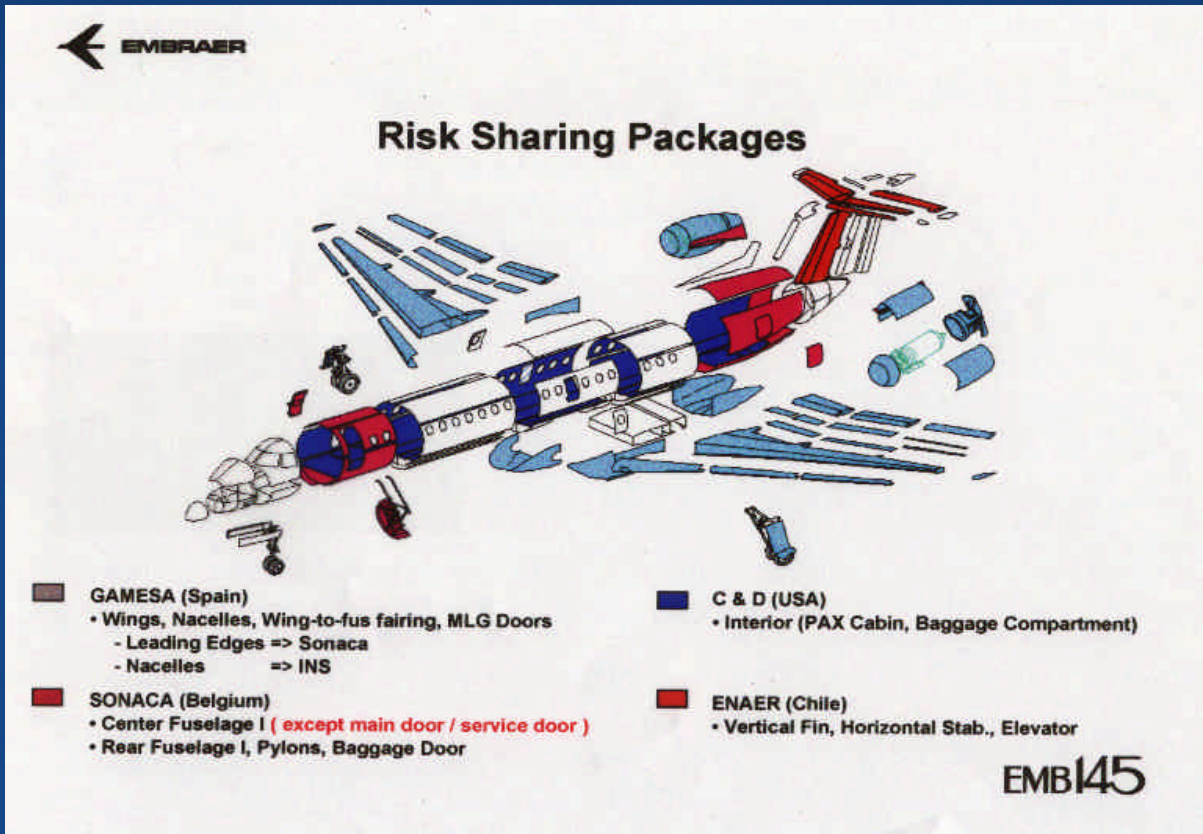
Brazil Total exports, Exports of manufactured goods and Exports of Airplanes
1995-1999 (US\$ million)

	1995	1996	1997	1998	1999
A - Total exports	45506	47747	52994	51140	48011
B - Exports of manufactured goods	25565	26413	29194	29387	27329
C - Exports of airplanes	182	284	681	1159	1772
D - C/B	0.71	1.08	2.33	3.94	6.48

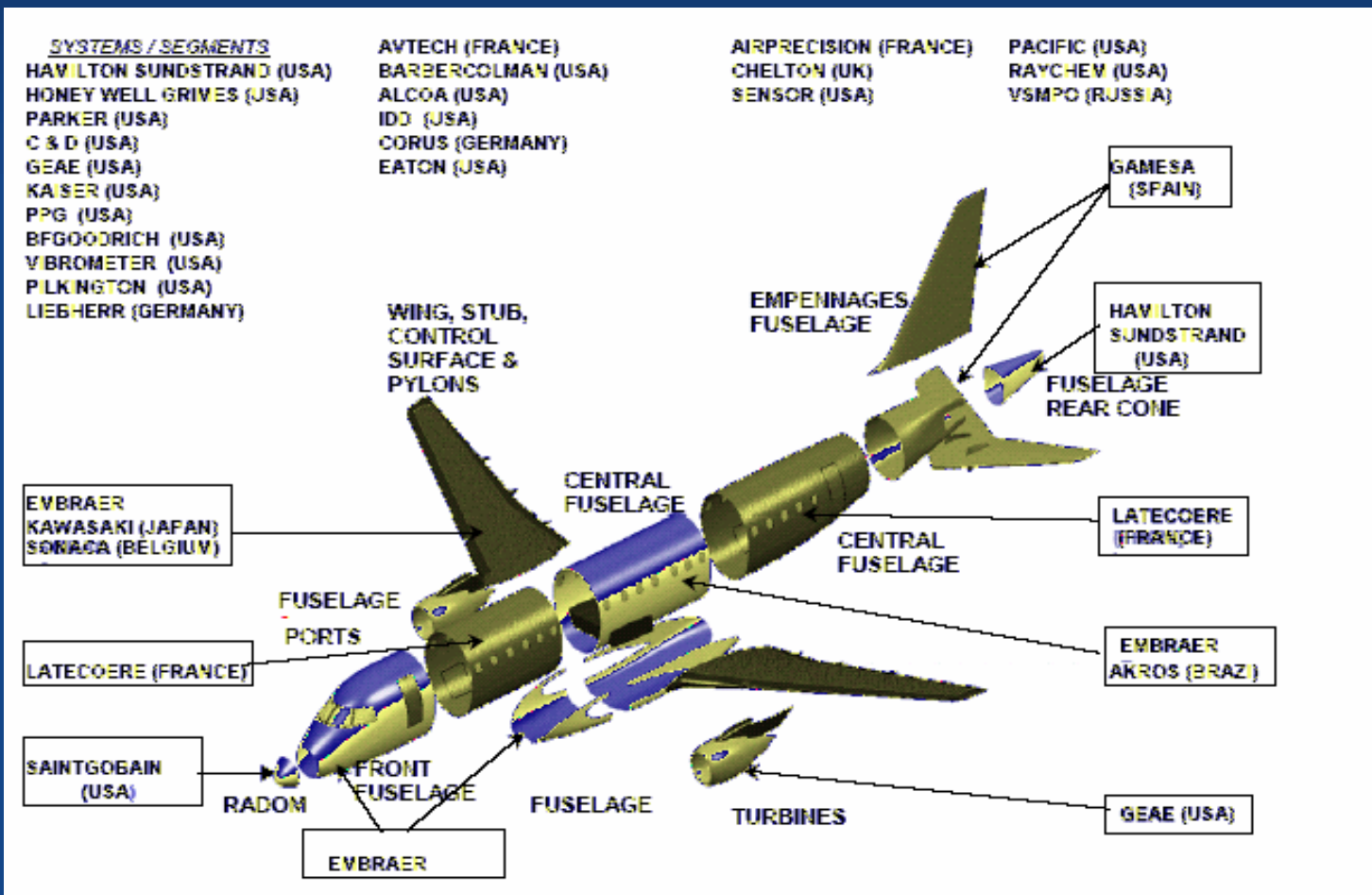
Embraer's share of sales in the world market for jet aircraft, 1999

MODEL	SEATS	SALES		DELIVERIES		BACKLOG	
		Quant.	%	Quant.	%	Quant.	%
EMBRAER							
ERJ-135	37	6	1.1	16	7.4	124	13.6
ERJ-145	50	125	22.5	81	37.3	176	19.3
ERJ-170	70	40	7.2	-	0.0	40	4.4
ERJ-190/200	108	30	5.4	-	0.0	30	3.3
TOTAL		201	36.2	97	44.7	370	40.5
BOMBARDIER							
CRJ 100/200	50	172	30.9	82	37.8	253	27.7
CRJ 700	70	3	0.5	0	0.0	99	10.8
TOTAL		175	31.4	82	37.8	352	38.5
FAIRCHILD DORNIER							
328 JET	32	78	14.0	15	6.9	82	9.0
428 JET	44	40	7.2	-	0.0	40	4.4
728 JET	70	60	10.8	-	0.0	60	6.6
TOTAL		178	32.0	15	6.9	182	19.9
BRITISH AEROSPACE							
RJ 85	32	2	0.3	11	5.1	7	0.8
RJ 100	44	2	0.3	12	5.5	3	0.3
TOTAL				23	10.6	10	1.1
TOTAL		556	100.0	217	100.0	914	100.0

Division of Labour between Embraer and its Risk Partners for the ERJ-145/140/135



Division of Labour between Embraer and its Risk Partners for the ERJ-170/190



EMBRAER

- **1947** - Setting up Aeronautic Technical Centre (CTA) starts and its engineering school I TA (Aeronautic Technological Institute),
- **1954** - Setting up at CTA of the Institute of Research and Development (IPD), aiming at developing research in basic areas for aeronautics (aircraft's project, electronics, materials, engines and flights tests
- **1969** - Embraer set up
- **1970** - Embraer started manufacturing activities
- **1989** - Studies for the development for ERJ-145, (first jet produced by Embraer) starts.
- **1994** - Embraer was privatised.
- **1996** - Two hundred ERJ-145 were sold at the Farnborough Fair, England.
- **1997** - Embraer after a dramatic dispute with the Bombardier group, got the largest contract of its history at the Le Bourget Aeronautic Fair, in France..
- **1999**- Twenty percent of Embraer's ordinary shares are acquired by a French consortium led by Aérospatiale Matra, Dassault Aviation, Thompson-CSF and Snecma.

Main conclusions of the 38 empirical studies

- Diversity of situations – diversity of policy prescriptions (ex. shoes in RS, SP, PB and MG; clothing in GO, PB, RN and SE)
- Targeting the local market: important for accumulating capabilities (ex. wine in RS, shoes in MG)
- Importance to take into account power relations (eg. aircraft industry in SP X car industry in MG)
- Need for finding new and collective financing instruments and mechanisms (cluster and cooperative banks, support for collective actions)
- Importance of education

Main conclusions of the 38 empirical studies

- Drive for exports - sometimes negative effect on social capital (ex. shoes RS subjected to a global commodity chain)
- Need to target the **upgrading of local capabilities** (both entrepreneurs and employees) **and social capital**
 - this includes infrastructure (teaching and research institutions) and other local organizations (including upgrading in policy organizations)
- Participation in LI PSAs has helped firms of all sizes, but specially micro, small and medium enterprises - MSEs - to survive and grow
- Importance of promoting **national coherence and coordination** instead of allowing for **fragmentation and perverse dispute between regions**

Main conclusions of the 38 empirical studies

- Relevance of targeting collective actors and of mobilizing the participation of local agents in the design and implementation of the policies
- Importance of adding to - instead of replacing - the tacit knowledge accumulated by local agents about the historical, economic, social and political environment of these LPI SAs

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