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*Global supply chains and the Brazilian aeronautical industry: Technological disruption and employment*

Based on a study to the ILO Research Department

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# *Presentation structure*

1. The Brazilian aeronautical industry in global supply chains
2. Impacts of technological disruption in the Brazilian aeronautical industry
3. Employment in the Brazilian aeronautical industry
4. Concluding remarks

# *1. The Brazilian aeronautical industry in global supply chains*

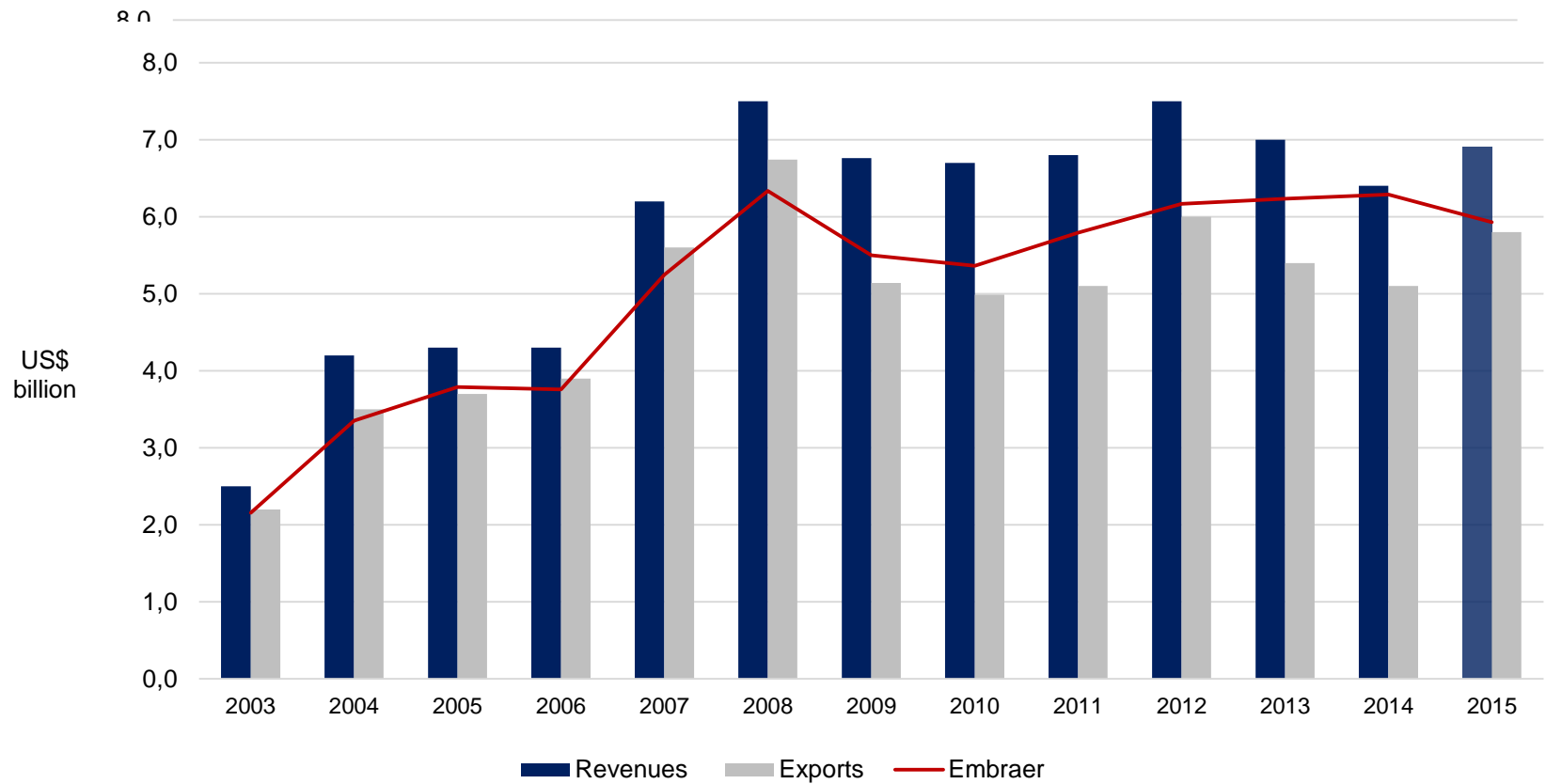
## The Brazilian aeronautical industry is Embraer

- Embraer is a Brazilian large corporation, the result of 70 years of a successful public policy
- Industry: revenue (US\$ 7 billion), companies (300 units), employees (35 thousand)
- Embraer's stake: revenue (80%) and number of employees (45%)
- The industry performance has a very high correlation with the evolution of its leading company

## Embraer has an active international insertion

- leads the niche of commercial jets (70 to 120 seats), with E-Jets and E-2 aircrafts
- 3rd largest commercial aircraft manufacture in the world, behind Boeing and Airbus
- structural surplus in trade balance: approximately US\$ 1.2 billion per year (2003-2016)

Chart 1 – Brazilian aeronautical industry: revenues and exports of AIAB member companies, with emphasis on Embraer (revenues), 2003-2015



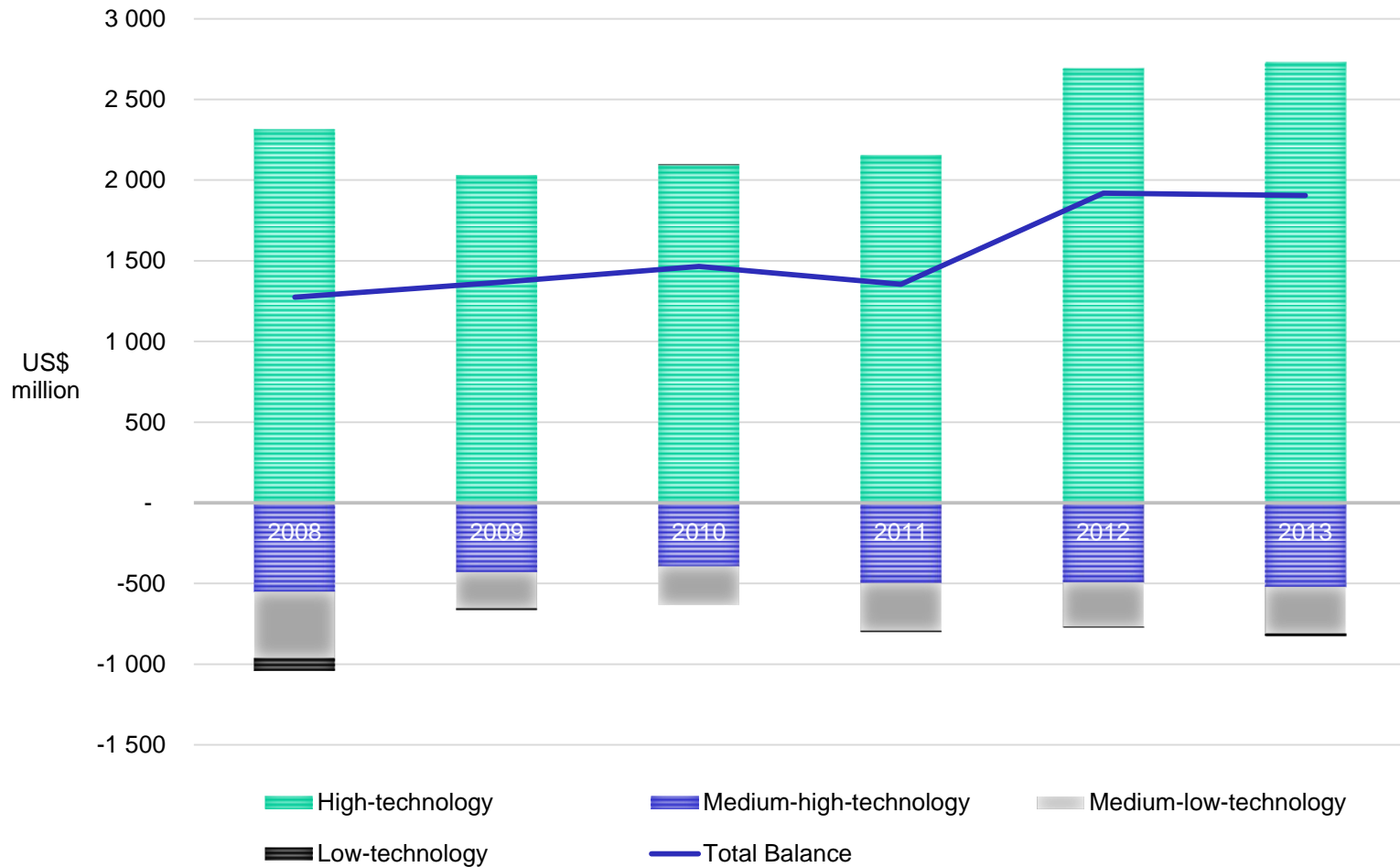
Source: data from AIAB and Embraer

# 1. *The Brazilian aeronautical industry in global supply chains*

## Embraer's GSC: Evolution

- Since foundation, Embraer has focused on design and assembly of aircrafts  
⇒ most of raw materials, components and on-board systems was imported
- 1990's: limitations imposed on Embraer, made it a pioneer in the introduction of "risk partnerships" in the global aeronautical industry, modifying the supplier relationship model  
2000's: this innovative mode of organization was deepened
- **2010's:** Embraer changed its relationship model with its suppliers ⇒ simultaneous movements of verticalization and internationalization
  - ✓ E-2: mainly in aerostructures and software
  - ✓ Objective of Embraer: complete control of systems integration

Chart 4 – Brazilian aeronautical industry: Evolution of the trade balance according to technological intensity, 2008-2013



## 2. Impacts of technological disruption in the Brazilian aeronautical industry

### The huge impact of disruptive innovations in the aeronautical industry

- A wide range of disruptive and incremental technologies probably will result in a new “dominant project” of commercial aviation (big projects: *Green Aviation* and *Clean Sky*)
  - (a) “hybrid wing-fuselage” standard
  - (b) “hybrid-electric propulsion” systems
  - (c) combination of new materials and nanostructure
  - (d) ICT-derived innovations (AI, NNT and IoT): services
  - (e) Industry 4.0: digitalization, automation, interactive robots and 3D printing
- Impact in the key aeronautical technologies: design, system integration and manufacture
- OEMs: Strategy of internalization of the main activities
  - ✓ guarantees a control of the aircraft design, as well as the integrated innovations
  - ✓ makes possible, technically and economically, the incorporation of new technologies

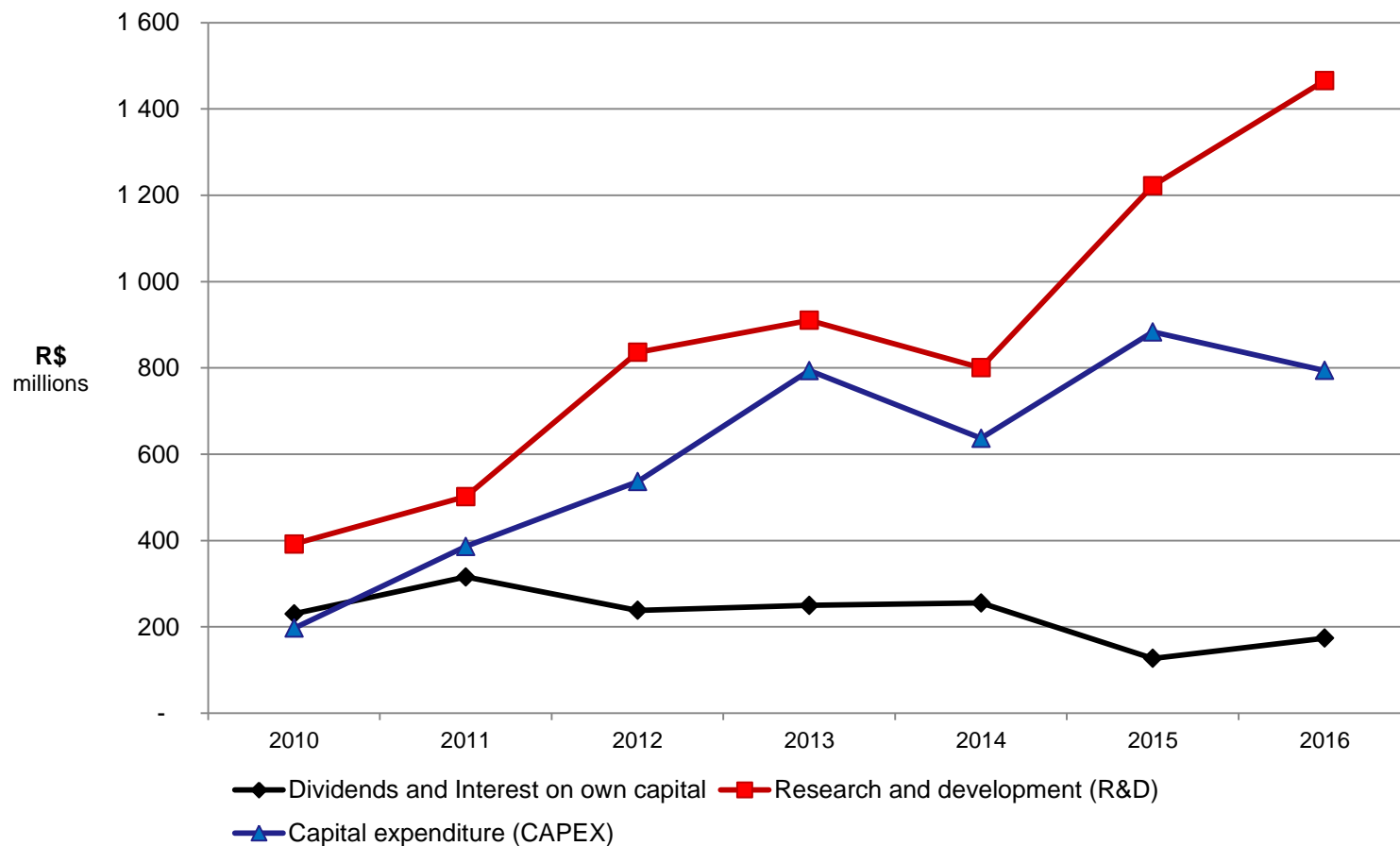
## 2. Impacts of technological disruption in the Brazilian aeronautical industry

### Great effort by Embraer to incorporate new disruptive technologies

- Embraer has been using a successful technological follower strategy
  - ✓ High competence in project engineering and market intelligence
- Embraer's strategies to address the impact of disruptive technologies
  1. Efforts to incorporate new technologies into product (*digital airplane*) and process (*digital factory*), highlighting on-board softwares, virtual reality and automation
  2. Strengthen participation in the military and executive aircraft markets to mitigate risks. The impacts of disruptive technologies in these two segments should be lower
  3. Embraer X: stake in Uber Elevate's revolutionary project
- Investments in R&D increased from US\$ 400 million (2010) to US\$ 1.4 billion (2016), resulted in
  - ✓ R&D Intensity 2016-2017: Embraer (7.4), Airbus (4.9) and Boeing (4.6)
  - ✓ Embraer is technologically equivalent to other OEMs but in a smaller scale
- High competence in key technologies makes Embraer a potential target for a takeover



Chart 5 – Embraer: Evolution of dividends and interest on own capital, R&D and CAPEX (millions R\$), 2010-2016



Source: data from Embraer Annual and Financial Reports

### 3. *Employment in the Brazilian aeronautical industry*

#### The impact of disruptive technologies: decrease the volume and increase the skills

- Salaries kept their level, but decreased in comparison to the total salary of all the industry
- Increased the productivity (27.8%) and the value aggregation (33.2%) (2007-2014)
- Reduction in the number of production workers and an increase in the demand for workers in activities not directly linked to production (R&D, sales, marketing, ...)
- **Embraer** increased the number of employees in non-Brazilian subsidiaries (4% in 2008 to 14% in 2016). However, the total number of employees remained stable
- Great increase in qualification of Brazilian aeronautical industry workers
  - ✓ Expansion in scientific and managerial activities and reduction in labor-intensive activities
  - ✓ Rise in demand for higher-level education professionals
- Changes in GSC: verticalization increase the bargaining power of the Unions, however, internationalization decrease their bargaining power

Chart 6 – Brazilian aeronautical industry: number of employees and revenues (US\$ billion), 2001-2015

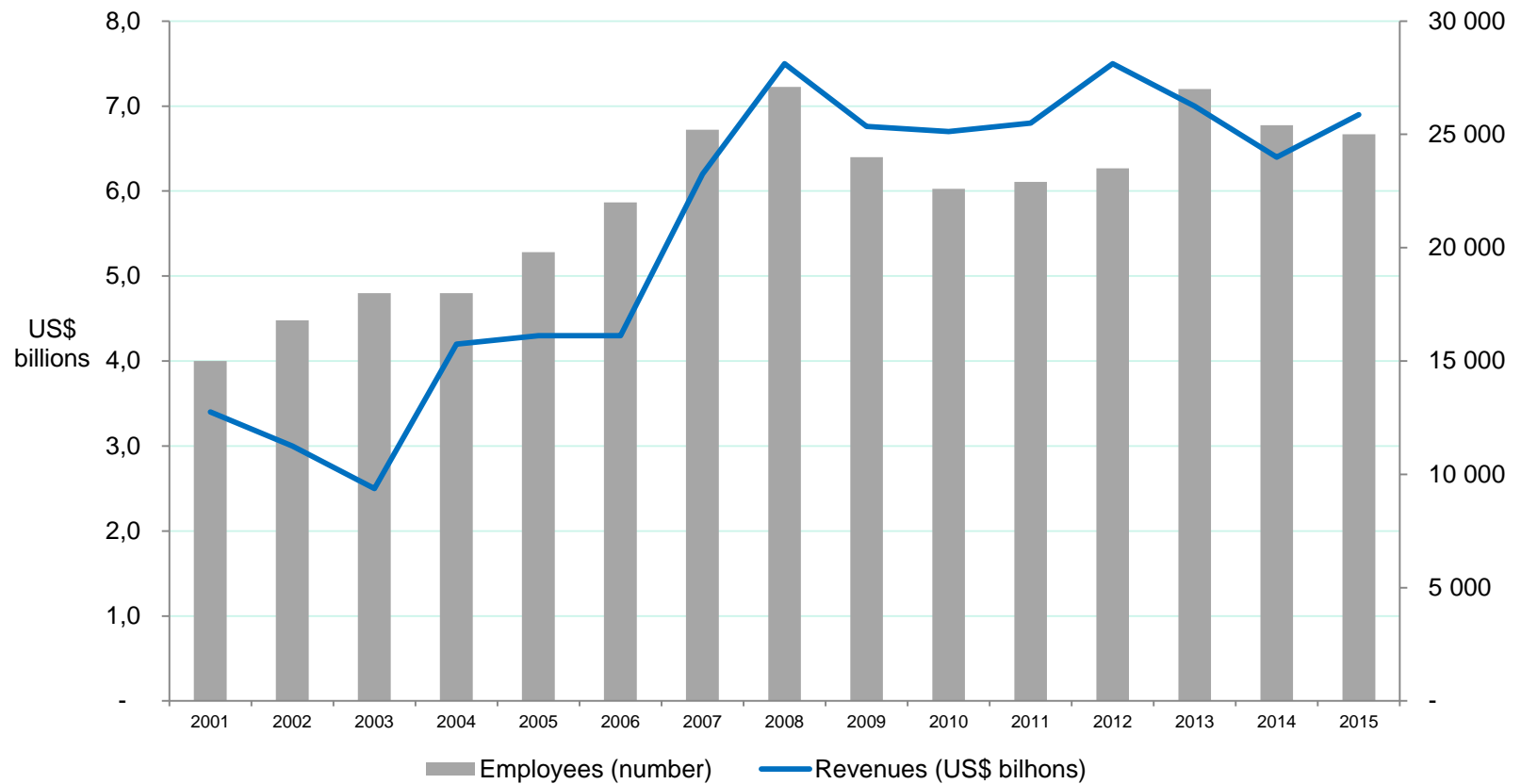
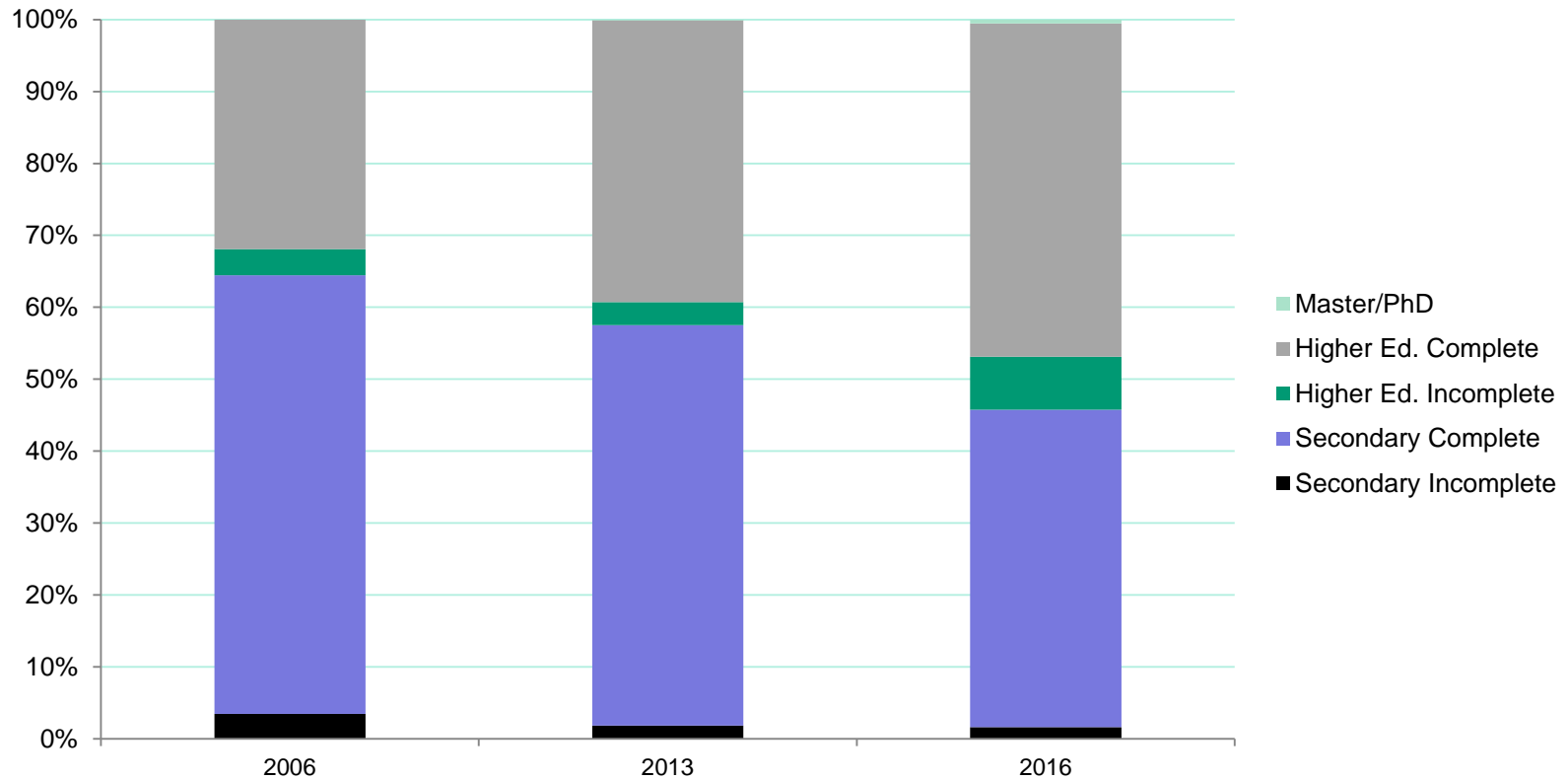


Chart 8 – Brazilian manufacturing and aeronautical industry:  
productivity (thousand R\$) and value aggregation, 2007-2014



	Productivity (GPV/EP) (Thousand R\$)		Value Aggregation (ITV/GPV) (%)	
	Aeronautical Industry	Total Industry	Aeronautical Industry	Total Industry
2007	236,8	160,9	34,1	41,7
2008	247,5	166,6	33,2	42,4
2009	200,5	152,3	27,8	43,0
2010	231,8	160,8	37,8	43,7
2011	241,2	159,5	41,0	43,7
2012	272,7	158,0	41,9	42,9
2013	278,8	160,5	48,4	42,4
2014	302,6	161,1	45,4	41,8
$\Delta$ (%)	27,8	0,1	33,2	0,3

Chart 9 – Brazilian aeronautical industry: evolution of employee participation according to the educational level (%), 2013 and 2016



## *Concluding remarks*

- The Brazilian aeronautical industry, centered on Embraer, has achieved an important position in the GSCs: “vertical and horizontal” power in competition with other companies
- However, the structural changes caused by disruptive technologies imposes a huge challenge for Embraer
- To address these changes, Embraer has made big investments to incorporate disruptive technologies, that impact its supply chain (verticalization and internationalization) and employment: fewer jobs but more high-qualified workers ⇒ similar to large competitors
- Nevertheless, this same strategy of verticalization and internationalization of the productive activities is the goal of its big competitors. In this context, Boeing’s proposal to acquire the commercial aviation (core business) of Embraer, put the Brazilian company as a target
- If it to materialize, there will be a dismantling of the Brazilian aeronautical industry, with negative impacts for the local technological development and the creation of high-qualified jobs, but the volume of low-qualified jobs probably increase
- ❖ The national control of large corporations are fundamental to determinate the model of insertion in GSC



**Thank you !**

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