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EMBRAER - Empresa Brasileira de Aeronáutica S.A. (Brazilian aerospace conglomerate): Brazilian aircraft flying around the world

Abstract

In 2017, Embraer held 58 percent of the world's market share in commercial jets for the regional aviation market. In addition, according to projections, Embraer will have to produce and deliver a commercial jet every two days over a twenty-year period. According to the International Civil Aviation Organization, there are 1,548 aircraft manufacturing companies in the world. However, only a few can be considered "assemblies" and only five of these carry out large-scale production: Airbus (Europe), Boeing (USA), Bombardier (Canada), Embraer (Brazil) and Tupolev (Russia). Embraer emerged in a 'developing country' with no tradition in the aerospace sector and became a strong competitor in the small and medium-sized global aircraft market. To understand Embraer's experience, a synthetic review was carried out of the main theories related to the internationalization process. Moreover, primary documents were used in this study, as well as extensive literature on the company's history and internationalization process. The starting point is the hypothesis that internationalization had a fundamental impact on the growth of the company. As a preliminary conclusion, it is possible to say that Embraer started out with the "world market" in mind. Likewise, it is possible to affirm that the decision to focus on executive, military, small and medium-sized aircraft aviation to boost regional markets proved to be assertive.

Keywords: Embraer; Technology; Innovation; Growth; Internationalization of the company

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Introduction

A search of data with the *International Civil Aviation Organization* (ICAO) shows that there are 1,548 aircraft manufacturing companies listed worldwide. Among these companies, only a few dozen can be considered "assemblies". Also, among these "assembly" companies, only five of them carry out large–scale production: Airbus (Europe), Boeing (USA), Bombardier (Canada), Embraer (Brazil) and Tupolev (Russia). The concentrated nature of this industry is clear. Within this group, Embraer excels as a company headquartered in a developing country without a tradition of aviation.

Even though Embraer is based in a country lacking technological, the company has, throughout its history, accumulated enough knowledge and technology to become the leader in the market for commercial jets with up to 130 seats. The company is also the main exporter of high value added goods in Brazil (Annual Report 2015, 4). In 2016, the company had a net profit of $167.7 million, with total revenue of $6.2 billion[1]. Embraer is undoubtedly a global company, with several manufacturing units throughout Brazil as well as units on every the other continent, except for Africa, Oceania and Antarctica.

As it is Brazil's biggest technology company there have been many academic and non-academic studies looking at Embraer. Their themes are diverse and cover innovation and technological gains, organizational performance, growth and internationalization. Relevant to the last two themes is work by Silva (2009), Rodengen (2009), Godfrey et al. (2009), Andrade (2013) and Vinagre (2015) (analyzing the company's growth) and by Rodengen (2009), Souza (2012),

[1] http://www.valor.com.br/empresas/4893096/lucro-da-embraer-dispara-em-2016 Access in 31 July 2017.

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Marinho and Dalla Costa (2013) (covering its internationalization). However, there is a gap in the discussion about the relationship between the company's growth and internationalization. In order to contribute to a better understanding of this relationship, this study aims to assess the impact of internationalization on Embraer's growth.

To achieve this objective, this text is divided into two main sections, in addition to this introduction. The first section is qualitative in nature and explains how some contextual factors, including government intervention, contributed to Embraer's growth and internationalization. The second is quantitative in nature and shows the impact of internationalization on the company's growth. These sections are followed by the conclusion.

Internationalization and growth

Studies involving internationalization and growth are nothing new. According to Chesnais (1996), the first discussions of this relationship can be found in studies on imperialism by Hobson and Lenin. These authors argued that the domestic market acted as a limiting factor to growth. Yet it was work by Penrose (1959) that made this relationship more evident. According to the author, "it is easy to envisage a process of expansion of international firms within the theoretical framework of the growth firms" (Penrose 1959, xv). In her view, internationalization can be seen as a company movement towards growth. Additionally, and as stated by Kyläheiko et al. (2011, 511), "the growth strategy is always a combination of the product and market options."

Early studies argued that internationalization was focused on direct foreign investment. For Hymer (1970), for example, multinational companies were understood in relation to imperfect market structures. Buckley and Casson (1976, 1985) added that internationalization is an important path to growth and to create value in imperfect structures. Dunning (1988, 2000)

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summarized Hymer's work and created the Ownership, Location, Internalization (OLI) paradigm.

Any relation to Penrose's theory of growth comes from the fact that internationalization can be understood as a growth movement resulting from optimal choices (Pitelis 2002). This allows companies to use internationalization to obtain market opportunities.

More recently, studies have focused on entrance choices (Madhok 1997; Erramilli, Sanjeev, and Chekitan 2002). From this aspect, the company is understood by using statistical resources that are transformed into capacities through dynamic elements.

A second class of studies on internationalization looks at how it occurs. Noteworthy in this line is pioneering work by Johanson and Wiedersheim-Paul (1975) and Johanson and Vahlne (1977), which later became known as the Uppsala model. This model describes internationalization as an incremental process. At the outset, because of a lack of knowledge regarding international markets, the company internationalizes through simple activities. Over time, the company acquires knowledge, committing more resources abroad and undertaking more complex forms of internationalization. In addition, early on it internationalizes to countries that are more culturally similar and later moves to more culturally distant countries.

The Uppsala model is based on the work of both Penrose (1959) and Cyert and March (1963) and posits a direct relationship between internationalization and growth, which are both treated as a process and as cumulative.

More recently, the focus on how internationalization occurs has looked at chain companies (Johanson and Vahlne 1990; Chetty and Blankenburg Holm 2000), since they operate jointly with the capacity of other companies, whether in the domestic or foreign market.

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The third aspect of internationalization regards the moment when the company starts the process. Initial studies showed that internationalization would happen once the company matured. However, a new type of internationalization appeared during the 1990s: the "born globals" (Madsen and Servais 1997). In relation to speed, the Uppsala model underscores that late internationalization allows the company to accumulate resources. While theories related with rapid internationalization, such as the "new ventures" and "born globals" theories, state that they can consolidate their advantages. This suggests that the company has choices to make, weighing advantages and risks, especially of the small and medium kind (Hessels and Parker 2013).

There is a wide range of work assessing the relationship between internationalization and growth. For example, Davis and Harveston (2000) found that family businesses are more prone to internationalize and grow depending on the age and education level of the owners. Sapienza et al. (2006) built a model related to internationalization and the growth outlook for new ventures, pointing out that internationalization is important for a business to grow. The Sapienza model (2006) was analyzed by Schueffel et al. (2011), with no evidence found that internationalization is important for growth. Using a different methodological approach, Salwan (2011) looked at the growth and internationalization of Tata Motors. Unlike these authors, this text intends to show the existing relationship between growth, exports and internationalization at Embraer.

Emergence and growth of Embraer

By the end of the 1960s, aviation had already been fully consolidated globally. Evidence of this can be seen in the Concorde, the first supersonic airplane for passenger transport, which was

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released in 1965. In 1969, the year Embraer began operations, Boeing launched its 747 models, the largest and one of the most popular aircraft for commercial flights.

In the case of Embraer, actions taken in previous decades helped to foster its start. It is important to mention the establishment of the Ministry of Aeronautics in 1941, which defined the development of the Brazilian aerospace industry as a strategic government policy. Within this scenario, the *Centro Tecnológico da Aeronáutica* - CTA (Technical Center of Aeronautics) was created in 1947. It established several institutes, including the *Instituto Tecnológico de Aeronáutica* - ITA (Technological Institute of Aeronautics). All of these institutions "started the long-term strategy to support the generation of human resources and local RD&I[2] capabilities for the aerospace sector" (Versino 2014, 64)[3].

CTA's main task was to build an aircraft for both civilian and military use. In 1965, the Bandeirante projects began, culminating in the first flight in 1968. The following year, more precisely on August 19, 1969, Embraer was incorporated by Decree-Law no. 770, which governed the production and sale of the Bandeirante, a twin-engine airplane with capacity for 12 passengers. In a ceremony held in Rio de Janeiro on December 29, 1969, Ozires Silva took office as Embraer's first Superintendent Director (Silva 2005).

The founders were already in early discussions and were convinced that it was necessary to launch "compact turboprop airplanes, initially designed to carry 9 to 12 passengers," that is, craft intended to serve small airports and regional markets. "Our goal was to answer the following question: what type of airplane could adequately handle the incipient but promising service of medium and small cities?" (Silva 2008, 58).

[2] Research, Development and Innovation

[3] For a detailed history of the various companies and institutions that have operated in the national aerospace sector since the beginning of the 20th century see: Morais (2006), Rodengen (2009, 15-37), Embraer's website, Cabral (1987) and Botelho (1999).

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The maiden flight of the Bandeirante occurred in 1972. That same year, the aircraft received approval; and in 1973 the first three units were delivered to the Brazilian Air Force (FAB). Since sales began, several Brazilian airlines have acquired Bandeirante aircraft in order to meet regional demands. An important facilitator was the creation of the *Sistema Integrado de Transporte Aéreo Regional* - SITAR (Integrated Regional Air Transport System) in 1975, aimed at modernizing regional aviation. The creation of SITAR made it possible for the government to intervene in "companies' administrative decisions, both in the choice of lines and retrofitting of the fleet, as well as in the establishment of ticket values and other measures of the kind" (Embraer 2006).

After the Bandeirante, other aircraft were released, including the EMB 200 Ipanema, used for agricultural aviation, and the EMB 200 Urupema and the EMB 326GB Xavante, which were manufactured in partnership with the Italian company Aermacchi. This partnership paved the way for other international conventions, such as the Piper convention in 1975 for industrial production of and cooperation on light aircraft.

Presenting a panoramic view of Embraer's history, Versino (2014, 62-81) highlights four phases and a period of crisis prior to the privatization of the company:

Phase I, from 1962 to 1969, represents the formative years. That is when the IPD-6504 Program was created by a group within the Aircraft Department of the Research and Development Institute at CTA.

Phase II, from 1970 to 1978, covers the creation and early years of Embraer, a time when the government was its largest buyer and a financier, mainly through the Ministries of Aeronautics and Agriculture.

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Phase III, from 1979 to 1990, represents Embraer's consolidation and insertion in the foreign market. At the end of this stage, Versino highlights a significant crisis period from 1991 to 1994 which preceded the company's privatization.

Phase IV, from 1995 onwards, covers Embraer's recovery, expansion, diversification and strong investment in the foreign sector. This phase established Embraer as one of the largest regional jet manufacturers.

In order to better understand the evolution and growth of Embraer during its initial period, the table 1 shows the number of aircraft units sold between 1973 and 1986. There are three main groups of buyers: the domestic market, the foreign market and the government (through FAB). A clear tendency cannot be seen for any of these groups, since all three show fluctuations.

Table 1. EMBRAER - Aircraft delivered - 1971 to 1986

Pattern	Client	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	Sub total	Total
EMB-110	FAB			5	14	22	19	9	23	4	11	10	3		14			134	462
	BR others			8	12	8	30	8	1	1	4	5	4	3		1	2	87	
	Exterior					5	3	1	18	46	53	51	29	16	14	1	4	241	
EMB-120	FAB																		25
	BR others																		
	Exterior															6	19	25	
EMB-121	FAB								4	2								6	98
	BR others									5	17	11	8	1	1	1	1	45	
	Exterior											5	14	24	4			47	
EMB-326	FAB	3	18	12	19	16	13	19	19	11	5	2	13	4				154	181
	BR others																		
	Exterior						2		2	3	6	1	1	12				27	
EMB-312	FAB													12	39	46	21	118	153
	BR others																		
	Exterior														12	6	7	35	
	Sub total general							246	Total General										919
	Sub total FAB							169	Total FAB										412

Source: Adapted from Cabral (1987, 41).

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In relation to total sales, there is clear upward growth in Embraer's first decade, with a relative disturbance in the second half of the decade, particularly in 1977. Due to an economic crisis in Brazil, from 1980 forward there is a systematic decrease in sales. Major insertion in foreign markets is prominent starting in the 1980s, as well as government purchases through FAB made in parallel with a period of diminishing sales in the foreign market.

The Government: Sponsor, Manager and Buyer

The government surely played a role that extends far beyond serving as Embraer's shareholder and controller. It not only participated in Embraer's creation, but also became its main shareholder, from its founding up to its privatization (1969-1994). Moreover, because it was difficult for the company to convince private investors, the federal government intervened through tax stimulus bills, allowing "legal entities to convert 1% income tax payable into Embraer shares" (Silva 2008, 86)[4].

Decisive support of Embraer also came from the government early on in the form of the FAB, which "ordered 80 Bandeirante aircraft, agreeing to pay the equivalent of 30-40% of manufacturing costs in advance, with the remainder being paid upon delivery of the aircraft" (Rodengen 2009, 49).

The history of aircraft deliveries at the beginning of Embraer's activities also shows the government's effective and essential participation. When the number of aircraft delivered between 1971 and 1986 are considered, out of a total of 919 units, FAB acquired 412, or 44.8%, almost half of total production. Access to the foreign market was an important milestone in Embraer's history (see below). This became more effective from 1978 onwards. Data from

[4] According to Cabral (1987, 57), from 1973 to 1985, Embraer received $292.7 million from these incentives.

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previous years (1971 to 1977) shows that the government's participation became more evident. Out of a total of 246 aircraft delivered, FAB acquired 169, or 68.7% of total units, as shown in Table 1.

Orders by the Brazilian Ministry of Aeronautics, both of Bandeirante and Xavante aircraft, were sufficient financially to resolve problems regarding the launch of new and improved versions of the Bandeirante. With this higher profile, Embraer began to attract interest from other markets, especially the United States.

According to Rodengen (2009, 209), Embraer continued to maintain close ties with its military roots (government) even after becoming a leader in the commercial market. In 2008, 72% of the aircraft in the FAB fleet were manufactured by Embraer and 98% of the military aircraft produced by the company were purchased by FAB.

In line with on-demand research from FAB, Embraer developed a military cargo ship, the KC 390, "a twin-engine jet aircraft that can meet the demands of different military operators" (Silva 2008, 206; Dalla Costa and Souza Santos, 2011). The ERJ platform was also used to create military versions. In 2002, Embraer began producing the ERJ-145 AEW & C "radar aircraft," characterized by a large antenna at the top of the fuselage, which is capable of detecting aircraft more than 400 km away while flying at low altitudes. This aircraft was purchased by the Brazilian, Greek, Mexican and Indian Air Forces[5].

Indirectly, the federal government contributed to Embraer through the creation of SITAR, in 1975. SITAR was created through Decree 76590, which divided the country into five regions and consequently, promoted the creation of five airlines to supply them. The goal was to

[5] http://airway.uol.com.br/aviao-que-reergueu-embraer-erj-145-completa-20-anos/ Accessed July 31, 2017.

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respond to the demands of medium-sized cities that did not have enough traffic for large airplanes. As a result, the new companies acquired 52 Bandeirante aircraft (Cabral 1987, 29).

While the government played an important role in the growth of Embraer, other institutions also contributed in their own way to its evolution. From the standpoint of professional training, ITA - created in 1947 in Rio de Janeiro and later transferred to São José dos Campos-SP in 1950 (Cabral 1987; Rodengen 2009; Botelho 1999; Silva 2008) - was of fundamental importance. ITA is a public institution linked to the Air Force Command and housed under the Department of Aerospace Science and Technology[6]. Considered a center of excellence in engineering education, ITA specializes in these two areas and provides the following programs: i) undergraduate courses; ii) *stricto sensu* postgraduate programs at the Master's, Professional Master's and PhD levels; iii) *lato sensu* post-graduate specialization and continuing education. According to Silva (2008, 259), "undoubtedly, the existence of ITA was fundamental. Without it, Embraer would not have been founded".

It is also important to highlight the role played by the *Instituto Nacional de Pesquisas Espaciais* – INPE (National Institute of Space Research) and by other universities, such as the University of São Paulo, which offers an Aerospace Engineering course through the São Carlos School of Engineering.

Another important factor was the contribution of national, state and municipal governments to the implementation and development of basic institutions for the advancement of aerospace science and industry. In the case of ITA and CTA, "the city of São José dos Campos ceded land and created the necessary infrastructure, and the state government of São Paulo provided critical

[6] www.ita.br/info Accessed July 31, 2017.

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financial aid for their management and institutional renewal, at the time of their founding and later during financial crises" (Botelho 1999, 151).

International Partnerships

An essential aspect for Embraer's growth, knowledge, innovation and consolidation was the partnerships it built over time. Up until 1974, Brazil was a major importer of small single-engine and twin-engine aircraft with up to 10 seats, mostly from the United States. In 1975, following a successful experiment with Aermacchi, Embraer signed an agreement to manufacture six light Piper aircraft models (Silva 2005, 351). In addition to the sale of about 3,000 aircraft, the agreement generated cash flow stability and allowed for the discovery of new light aircraft manufacturing techniques with a company already that was established on the market (Rodingen 2009, 61).

Also in 1975, as compensation for the acquisition of 49 Tiger II supersonic fighters by the Brazilian government, Embraer obtained a licensing agreement with Northrop to produce parts and components for the F-5 fighter plane for Aermacchi. In addition to cash flow, this deal provided valuable manufacturing knowledge (Mattos 2006, 31).

In 1980, Embraer completed the delivery of 167 Xavantes aircraft to FAB and rejoined Aermacchi to create a new jet fighter. In 1981, the Brazilian Ministry of Aeronautics signed an agreement with Aeronautica Militare Italiana to develop the AMX (Aeritalia Macchi Experimental) jet, giving FAB ample access to advanced technology. "The AMX has brought computational integration and fly-by-wire technology to Brazilian aircraft manufacturing. This technology would be used later, including for larger planes" (Rodengen 2009, 83).

In 1990, Embraer established a contract with Boeing, and was thus charged with manufacturing mechanical flap holders for the Boeing 747 and 767 aircrafts. The following year, Boeing hired

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Embraer to build vertical stabilizers, as well as wingtip fairings for the Boeing 777 (Rodengen 2009, 117).

At the end of 1991, Embraer resumed the ERJ 145 project, a 50-seat regional jet. In order to make the new aircraft viable, Embraer obtained letters of intent from 14 airlines in Australia, Europe, Latin America, and the United States. Structure and equipment suppliers partnered with Embraer to provide engineering and production capabilities for the ERJ 145: Gamesa (Spain) provided the aircraft wings, Sonaca (Belgium) made the fuselage rings, Enaer (Chile) produced the horizontal and vertical empennages, and C&D Interiors (USA) was responsible for the interior design of the airplane (Mattos 2006).

The company's growth process continued to be focused on product lines serving the regional market. In 2017, Embraer held a 58% of the world's regional jet market. The company expects to maintain and/or increase this percentage. According to these numbers, Embraer will have to deliver 3,700 aircraft in the next 20 years (delivery starts in 2018 for the new E175-E2, E190-E2, E195-E2 models), which would require it to produce and deliver one regional jet every two days and to certainly maintain current partnerships and establish new ones with foreign companies.[7]

The internationalization of Embraer

In 1969, the year Embraer was founded, was when Brazil started its greatest period of economic growth, which became known as the *Brazilian Miracle* and lasted until 1973. Throughout the 1970s, economic policies were in line with the import substitution process (Tavares 1974),

[7]http://todosabordo.blogosfera.uol.com.br/2017/09/13/embraer-jato-comercial-mercado-mundial. Accessed October 11, 2017.

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where the focus was to strengthen both supply and domestic demand. Little attention was paid to foreign markets; but that was not the case with Embraer, which began to export soon after opening: six years after its founding and three years after the maiden flight of the Bandeirante (EMB 110).

According to Silva (2008, 105), exports were essential. To this end, "we decided to start working on two fronts: improving our product and trying to sell the aircraft to countries that accepted Brazilian certification issued by Brazil's CTA".

According to Rodengen (2009, 62-70), Embraer's first export took place in 1975, with the sale of five EMB 110 Bandeirante aircraft to the Uruguayan Air Force and ten units of the EMB 200 Ipanema agricultural model to the Uruguayan Ministry of Agriculture. In 1976, exports went to Chile (Bandeirante EMB 111), and in 1977, exports went to Togo (EMB 326GB Xavante).

However, CTA approvals were insufficient for key markets. As a result of this limitation, Embraer began a certification process with the world's main oversight agencies, including the Federal Aviation Administration (USA), the Direction Générale de l'Aviation Civile (France), the Civil Aviation Authority (UK) and the Australian Department of Transportation. The French were the first agency to award certification, allowing Air Litoral to acquire its first Bandeirante unit in 1977. As a result, Embraer's good performance in France helped its international expansion.

In 1978, the Civil Aviation Authority and the Australian Department of Transportation also certified the Bandeirante aircraft. As a result, Air Écosse, Air Wales, Brit Air and Kar Air, as well as Australia's Air Masling, purchased Bandeirante aircrafts (Mattos, 2006, 19). Exports

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continued to grow after the Federal Aviation Administration, which regulates air transportation in the USA, certified the Bandeirante, also in 1978.

The aircraft's arrival in the North American market was helped by the 1978 Airline Deregulation Act, which stripped control of various aspects of air transport from the government, allowing for new routes, seat flexibility and price competition. This law increased demand because companies now needed small aircraft, which were exactly the models offered by Embraer, and this ended up benefitting the company. The Bandeirante was so successful in the US that Embraer set up a subsidiary in Fort Lauderdale, Florida, called Embraer Aircraft Corporation (Embraer 2016).

In the transition from the 1970s to the 1980s, with the exception of Asia and Antarctica, companies or government agencies on every other continent owned some type of Embraer aircraft, with the Bandeirante model being the most popular. By 1979, 250 units had already been delivered. Three hundred units were delivered in 1980 and 400 in 1982. By December 31, 1986, 463 units had been sold, around 240 of which were purchased on the foreign market, with around 125 of these going solely to the American market (Cabral 1987, 30)[8].

Embraer conquered the foreign market with its medium-sized aircrafts which were, above all, aimed at serving the regional aviation market. It sold and delivered aircraft to 98 companies from 50 countries, mainly to the USA and Europe, but also to other regions and countries in Africa and Central and South America. Table A.1 (Appendix) shows the companies and their home countries, as well as quantities ordered and delivered along with firm orders for future deliveries.

[8] Rodengen (2009, 73-77) describes Embraer's entry into the American market in detail, highlighting the difficulties in relation to competition from companies that had already been established for years in this market.

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An analysis of the information in the firm orders history shows that out of a total of 2,580 orders, 1,274 were placed by US companies, which represents 49.4%. Of the 2,047 aircraft delivered, 1,250 were purchased by US firms, accounting for 61.1% of all orders; and of the 533 firm orders not yet delivered, 335 are from US firms (62.8%). This data shows how important the US is to Embraer's foreign operations, accounting for more than half of its deliveries and future orders.

China is the second largest individual buyer, with 162 firm orders (6.3%), 121 (5.9%) aircraft delivered and another 41 requests for future deliveries (7.7%).

However, Europe, as a group of countries, comes in second when considering orders and deliveries from the United Kingdom, Ireland, France, Germany, Spain, the Netherlands, Poland, Portugal, Austria, Switzerland, Sweden, Luxembourg, Italy and Greece, with a total of 449 orders (17.4%) and 362 deliveries (17.7%). There are moreover 53 firm orders for future deliveries (9.9%).

Nine other American countries are on the list: Canada, Brazil, Colombia, Panama, Ecuador, El Salvador, Argentina, Venezuela and Mexico, which made 290 orders (11.2%), with 253 deliveries (12.3%) and 37 aircraft yet to be delivered (8.8%).

The other countries are divided among Africa, the Arab countries and the Far East, totaling 50 countries and 98 companies involved in future acquisitions and demands. Altogether, there are 2,047 Embraer aircraft flying on six continents. This does not include individual buyers of executive aircraft or airplanes made for the Brazilian Air Force and purchased by air forces in other countries.

In addition to this history of orders and deliveries, there are a series of orders for new aircraft being developed and tested by Embraer, which will start operating in 2018, as can be seen in

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Table 2, showing not only buyer companies, but also the countries where these new aircraft will be sent.

Of these new orders, out of a total of 285, 125 were made by American companies (43.8%), another 50 by companies from India and Ireland, for a total of 17.5% between these two countries, and 30 by Brazilian companies (10.5%). The remaining orders are distributed between two other Norwegian (3) and Indonesian (5) companies, in addition to ten units for "undisclosed customers." Once again, US companies hold a prominent position, having shown an interest in acquiring about half of the new aircraft under development.

Table 2. Firm orders for Embraer aircraft 175-E2, 190-E2 and 195-E2 – 2017

Customer	Firm orders	Deliveries	Firm orders backlog
Embraer 175-E2	**100**	**-**	**100**
Skywest (USA)	100	-	100
Embraer 190-E2	**83**	**-**	**83**
Air Costa (India)	25	-	25
Aircastle (USA)	15	-	15
Aercap (Ireland)	23	-	23
ICBC (China)	10	-	10
Hainan (China)	2	-	2
Wideroe (Norway)	3	-	3
Kalstar (Indonesia)	5	-	5
Embraer 195-E2	**102**	**-**	**102**
Air Costa (India)	25	-	25
Aircastle (USA)	10	-	10
Aercape (Ireland)	27	-	27
Azul (Brazil)	30	-	30
Customer not disclosed	10	-	10

Source: Created by the authors from Embraer. *Annual Report*, 2017.

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Due to the complexity of aeronautical activity, it is fundamental that an aeronautical company have a customer service structure. Having representatives was important for both early sales and for early provision of after-sales services. As Silva (2008, 107) points out, "although the factory could have an active presence in the market, the need for local representatives was essential". The first exports to North America were to Aero Industries Inc., which was in charge of marketing and sales of Embraer aircraft. Because of the limitations of Aero Industries Inc., the Embraer Aircraft Corporation – a wholly owned subsidiary of Embraer in Brazil – was established in Fort Lauderdale, Florida. Embraer Aircraft Corporation took control of sales and technical assistance (Silva 2008, 116-117).

In the case of Europe, an Embraer subsidiary was set up as a result of the sale of the EMB-121 Xingu to the French Air Force, which made this purchase with the stipulation that a subsidiary be created in France. This was how Embraer Aviation International, a subsidiary of the company in Brazil, was established inside Le Bourget Airport (Silva 2008, 122).

In order to support after-sales operations, Embraer has service and spare parts sales centers in São José dos Campos (São Paulo), Fort Lauderdale (Florida), Mesa (Arizona), Nashville (Tennessee) and Windsor Locks (Connecticut) in the USA, in Villepinte (near Roissy - Charles de Gaulle Airport), France, and in Singapore. This is in addition to its specialized network, which already has about 60 authorized service centers worldwide. To support customers, Embraer also maintains spare parts distribution centers and specialized technical teams in Louisville, USA; Beijing, China; and Dubai, United Arab Emirates (Embraer Annual Report 2011, 6).

Support for sales, marketing, and promotion activities is carried out by offices located in São José dos Campos, Fort Lauderdale and Villepinte, as well as by offices in Beijing, China, and

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Singapore. Special emphasis should be given to the expansion of the service network in Europe through the acquisition of OGMA-Indústria Aeronáutica de Portugal in 2005, a Portuguese company that provides aeronautical maintenance and production.

For expansion and better parts service for customers in Europe, Africa and the Middle East, a new parts distribution center was set up at the Embraer facility in Villepinte, replacing the old center located in Le Bourget and unifying all of the support, services and sales operations in the region at a single location (Embraer Annual Report 2006, 8).

In 2002, Embraer put a new international strategy into action to support sales, marketing and after-sales in the US, following the acquisition of Celsius Aerotech Inc., an aeronautic maintenance, repair and inspection company based in Nashville, Tennessee. Afterwards, the company changed its name to Embraer Aircraft Maintenance Services and added 210 employees to its staff (Mattos and Lourenção 2006, 43).

In 2003, Embraer signed a co-management agreement with China Aviation Supplies Import and Export Corporation, which allowed the company to open its first office in Beijing (Rodengen 2009, 181). That same year, in association with the Harbin Aircraft Industry Group in China, it set up Embraer Regional Jet-ERJ in China, an operation that was active for 13 years.During this period, both companies manufactured more than 40 ERJ-145 jets and five Legacy 650 aircraft (Executive model derived from the ERJ-135), all intended for the local market[9].

In 2008, the company expanded its activities in the United States, building a new approximately 14,000-square-meter facility in Melbourne, Florida, where the business aviation operation was housed. This facility also housed Embraer's first final assembly line in the US, capable of

[9]http://airway.uol.com.br/aviao-que-reergueu-embraer-erj-145-completa-20-anos/. Accessed July 31, 2017.

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producing the Phenom 100 and Phenom 300 executive jets. In 2008, Embraer opened new service centers for executive jets in the United States at Phoenix-Mesa Airport in Mesa, Arizona; at Bradley International Airport in Windsor Locks, Connecticut; and at Fort Lauderdale-Hollywood International Airport, in Fort Lauderdale, Florida (Rodengen 2009, 205-207).

Within an industrial context, the company has consolidated its operations at plants in Évora, Portugal, and in Melbourne, in the United States. It has also acquired a 100% stake in Aero Seating Technologies (AST), an aircraft seat company located in the United States. In addition to the aforementioned actions, the subsidiary company's headquarters in Europe was transferred from Villepinte, France, to Amsterdam, in the Netherlands (Embraer Annual Report 2015).

In the United States, the biggest buyer of Embraer aircraft, the group maintains 13 companies whose areas of expertise include: i) corporate activities in the USA; ii) sales of spare parts and support services; iii) aircraft maintenance; iv) after-sales support; v) support for the defense and commercial segments; vi) final assembly of jets; vii) engineering services; viii) production and maintenance of aircraft seats; ix) supply of Super Tucano aircraft; x) corporate and institutional activities; xi) training for pilots, mechanics and crew members; xii) marketing operations support; and xiii) commercial and institutional representation. This structure is justified both due to the planes already sold in that country and to sales expectations for the new Embraer 175-E2; 155-190-E2 and E2, to be delivered in 2018 and in relation to which American companies account for 43.8% of all orders made.

The second biggest buyer of Embraer aircraft is Europe. The group maintains firms in several countries on the continent. In Portugal, for instance, it has five firms that are responsible for: (i) making investments in subsidiaries; ii) maintaining and producing aircraft; iii) coordinating

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investment and economic activities; iv) manufacturing parts and metal products for the aircraft industry; and v) manufacturing parts and composite products for the aircraft industry.

In addition to Portugal, the group maintains six other companies (three in France and three in the Netherlands), with: i) corporate activities in Europe; ii) parts sales and after-sales services; iii) commercial representation in Europe, Africa and the Middle East; iv) provision of the SGDC system to the Brazilian government; v) Embraer's financial operations; and vi) corporate activities.

Five other subsidiaries are based in the United Kingdom, Ireland, Spain and Switzerland, performing the following activities: i) lease and sale of used aircraft; ii) manufacture of interiors for commercial aircraft; iii) training service for pilots, mechanics and crew members; iv) corporate activities; and v) investments in subsidiaries.

There are also two other companies in China engaged in sales, after-sales maintenance, and aircraft manufacturing; while the Cayman Islands has three companies, devoted mainly to financial operations. There are 2,366 people working at branches outside of Brazil. In addition to these employees, there are another 3,677 effective employees working at companies that are subsidiaries of and affiliated to Embraer (Embraer. Annual Report 2015, 4).

Regarding external production related to the aircraft industry, Embraer holds three manufacturing units for aircraft interiors and parts (two in Portugal and one in Ireland); two production units (one in the USA and one in Portugal); and two final assembly units for airplanes (one in the US and one in China), totaling seven industrial plants.

Internationalization as a growth factor

This section discusses whether Embraer's internationalization could be one of the causes of its growth. With this in mind, econometric techniques were used to analyze three variables:

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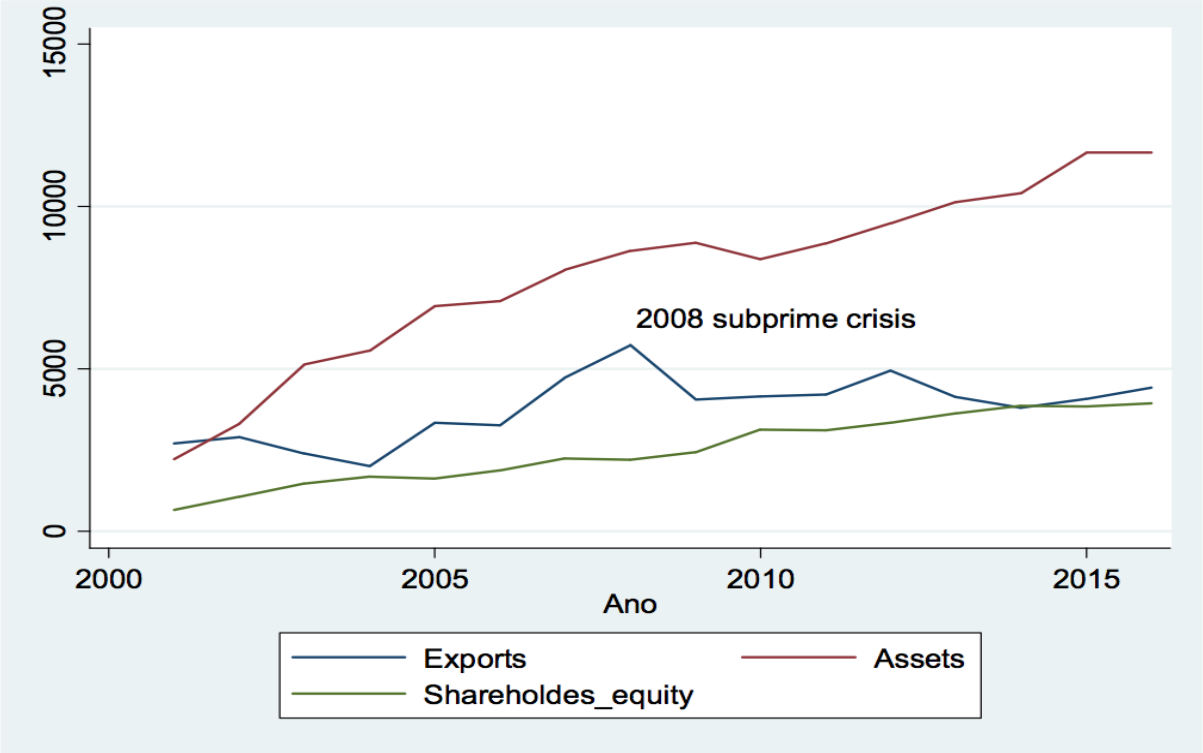
exports, net asset value and shareholders' equity from 2001 to 2016. Data were obtained according to availability from the annual results statement. Graph 1 shows the evolution over time of these variables.

It is notable that there was growth in the period for all the variables analyzed. However, exports showed an upward trend up until 2008, the year of the subprime crisis, when a drop occurred. From that moment on, exports remained virtually constant. Not surprisingly, Embraer's shareholders' equity and assets demonstrated the same growth behavior. However, and this is normal, net asset value saw sharper fluctuations than shareholders' equity; that is because there are operations that are included in the former and cannot be incorporated into the latter, such as leverage.

Graph 1. Evolution over time of exports, net asset value and shareholders' equity



Source: Authors.

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The graph also suggests that the variables are integrated. The Dickey-Fuller test was conducted to clear up any doubts. The null hypothesis of the test indicates that the variable is integrated, i.e., it is not stationary. Otherwise, the alternate hypothesis indicates that the variable is stationary.

Table 3. Dickey-Fuller Test

	ADF	MacKinnon Z (t)	N	Critical Values	
				1%-	5%
Assets	-2.401	0.1413	15	-3.750	-3.000
Exports	-1.812	0.3747	15	-3.750	-3.000
Shareholders' equity	-1.313	0.6230	15	-3.750	-3.000

Source: Authors.

Considering the fact that all tests were not statistically significant, the hypothesis that all of the variables are integrated, or rather, that all of them are non-stationary, cannot be refuted. This result is consistent with the behavior of the company's growth.

In order to conduct a Granger causality test, the variables must be stationary. One way to perform variable stationary is by means of differences ($Dy = y_t - y_{t-1}$). Results demonstrate that a single difference is enough to make the variable stationary.

The Granger causality test for two time series - X and Y, for instance - checks whether X precedes Y, Y precedes X, or they occur simultaneously (Greene 2008). In order to perform this causality test, the Vector Auto-Regressive model (VAR), whose results are omitted, must be estimated. The model was estimated by taking into account the lags of orders two and three. Greater lags would imply losses of degrees of freedom due to the relative shortness of the series. Afterwards, Granger causality tests were calculated. Their results are shown in Table 4.

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Table 4. Granger Causality Wald Tests

		Lags (2)			Lags (3)		
Equation	Excluded	Chi2	df	p-value	Chi2	df	p-value
D. Assets	D. Shareh' equity	3.444	2	0.179	2.7505	3	0.432
D. Assets	D. Exports	4.614	2	0.100	2.9611	3	0.432
D. Assets	ALL	9.795	4	0.044**	13.294	6	0.039**
D. Shareh' equity	D. Assets	7.546	2	0.023**	129.21	3	0.000*
D. Shareh' equity	D. Exports	30.041	2	0.000*	124.23	3	0.000*
D. Shareh' equity	ALL	31.032	4	0.000*	278.45	6	0.000*
D. Exports	D. Assets	.493	2	0.782	8.3315	3	0.040**
D. Exports	D. Shareh' equity	.066	2	0.967	3.7493	3	0.290
D. Exports	ALL	.495	4	0.974	10.092	6	0.121

* denotes statistical significance of 1%; ** denotes statistical significance of 5%; and *** denotes statistical significance of 10%. D is the difference operator used to turn the series into a stationary series.
"D. Shareh' equity" is short for "D. Shareholders' equity"
Source: Authors.

In relation to assets, the export and shareholders' equity variables do not establish a causal relationship, since they were not statistically significant. In relation to shareholders' equity, both assets and exports demonstrate a causal relationship because the results are statistically significant to at least five percent for the lags of both order two and order three. In relation to exports, it should be noted that only the net asset value establishes a causal relationship when the lag of order 3 is taken into account.

In short, it is apparent that the variable net asset value influences both the shareholders' equity and exports variables. Exports have an impact on shareholders' equity, and shareholders' equity does not influence any other variable. Since the objective of this study is to check the impact of internationalization on the company's growth, analysis is done by verifying the impact of exports over the other variables.

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The effect of assets on exports is due to the fact that exports require funding. This has an advanced impact on the company's cash through loans, which are also accounted for under net asset value. It is therefore plausible that the assets establish a causal relationship due to the necessary provisions for exports. Exports, in turn, establish a causal relationship with shareholders' equity, which is precisely the wealth owned by the company. Therefore, according to the data analyzed, internationalization, as measured by the value of exports, influences the growth of the company.

Conclusion

The analysis of the data shows how important internationalization was as a process in the growth of Embraer, the aerospace company studied. The limited size of the Brazilian domestic market is notable and, in fact, could limit the speed and scale of the company's growth.

Despite having a short history compared to other international competitors, Embraer has managed to develop technologies, create new aircraft and hold onto a significant slice of the international market share in the regional air transport sector, military aviation, agriculture aviation and executive aviation.

Several factors contributed to this. The government was essential to this growth since it: i) served as the company's majority shareholder, from its creation until its privatization (1971-1994); ii) encouraged and created institutions that were essential to the development of both the training of skilled labor and the production of RD&I (ITA, USP, INPE); iii) initially acquired 68.7% of aircraft produced (1971-1977), which secured the resources needed for the start-up of activities; iv) purchased 98% of military aircraft manufactured by Embraer through FAB; and v) created the Integrated Regional Transportation System that led the company to sell planes to serve the country's regional market. Lastly, the municipal government of São José dos

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Campos and the São Paulo state government provided infrastructure, land and financial assistance to the company.

Another factor that contributed to Embraer's growth and internationalization success was its partnership with research and teaching institutions. Worth mentioning is the participation of the Instituto Tecnológico da Aeronáutica (ITA), one of the best world schools of training of engineers. Casanova (2016, 33) states that, as a result of these partnerships, "Embraer can get quality at a low price".

Partnerships with foreign companies also contributed to the growth and internationalization of Embraer. The case of Italian Aermacchi, a partner from the start of activities, is notable, as are the cases of Piper, Northrop and Boeing, all North American companies. These partnerships have helped the company to both access new technologies and qualify Embraer's workforce, which occurred when foreign technicians came to the country and/or when Embraer's technicians worked at factories in Italy or in the United States.

Other international partnerships, such as with Gamesa (Spain), Sonaca (Belgium), Enaer (Chile) and C&I Interiors (USA), were important to provide parts for various products, which resulted in lower RD&I costs while at the same time streamlining production processes.

Regarding the internationalization process, Embraer followed the main steps described in traditional theories. It started sporadically exporting to neighboring and culturally similar countries, such as Uruguay and Chile, to whom its first products were sold six years after the company was founded. It then sent sales representatives to the United States and to Europe, to the extent that exports gained space in those markets. When these representatives no longer met the demands of after-sales services, the company established its own commercial subsidiaries

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and customer service. Finally, it implemented industrial plants in the United States, Europe and China.

On the other hand, Embraer is an example of a case that fits with discussions on new theories of internationalization. From the start, the company's creators conceived of it as a business whose goal was to serve the international market, since the Brazilian market would be insufficient to maintain its operations. In addition, the company began exporting six years after opening, another essential characteristic of the "born globals," one of the new theories of internationalization.

An important and, to a certain extent, critical factor to the internationalization of Embraer was certifications. If at first Uruguay, Chile and Togo accepted Brazilian CTA certifications, other countries required more recognized international certifications. As soon as Embraer managed to obtain certifications from the Federal Aviation Administration in the United States, the Diréction Générale de l'Aviation Civile in France, the Civil Aviation Authority in England and Australia's Department of Transportation, its export process took flight in the global market.

The statistical test showed the importance of internationalization for Embraer’s growth. The Granger causality test results are evidence that exports have an impact on the company's shareholders’ equity, which expresses its wealth. Despite taking into consideration the period of 2001-2016, an analysis of Embraer’s history clearly shows that internationalization has been a predominant factor in its growth during its existence. More than that, it was of utmost importance for its development, both from a technological and a marketing standpoint. Internationalization consolidated Embraer in diverse markets, enabled strategic partnerships with several companies in this industry, attracted financing, and brought together experienced

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professionals from around the world, to mention a few contributions. The result of all of these efforts is the importance and attention that this company has attained in the sector.

References

Andrade, Roberto Pereira de. 2013. *Construção Aeronáutica no Brasil. 100 anos de história*. São José dos Campos: JAC Editora.

Botelho, Antonio José J. 1999. "Da utopia tecnológica aos desafios da política científica e tecnológica: o Instituto Tecnológico da Aeronáutica (1947-1967)" *Revista Brasileira de Ciências Sociais* 14 (39): 139-154.

Buckley, Peter, and Mark Casson. 1976. *The future of the multinational enterprise*. London: Macmillan.

Buckley, Peter, and Mark Casson. 1985. "General theories of the multinational enterprise: A critical examination." In *Multinationals Theory and history*, edited by P. Hertner, and G. Jones. Aldershot & Brookfield, Vt.: Gower.

Cabral, Arnoldo Souza. 1987. "Análise do desempenho tecnológico da indústria aeronáutica brasileira." PhD diss., ITA, São José dos Campos.

Casanova, Lourdes. 2016. "Latin American multinationals facing the 'new reality'". In *Evolution of Family Business. Continuity and Change in Latin America and Spain*, edited by Fernández Pérez, Paloma and Andrea Lluch, 23-36. Cheltenham, UK – Northampton, MA, USA: Edward Elgar Publishing Limited.

Chesnais, François. 1996. *A Mundialização do Capital*. São Paulo: Xamã.

Chetty, Sylvie, and Desiree Blankenburg. 2000. "Internationalisation of Small to Medium-sized Manufacturing Firms: A Network Approach." *International Business Review 9* (1): 77-93.

Cyert, Richard M., and James March. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.

Davis, Peter S., and Paula D. Harveston. 2000. "Internationalization and Organizational Growth: The Impact of Internet Usage and Technology Involvement Among Entrepreneur- led Family Businesses." *Family Business Review* 13 (2): 107-120.

Dalla Costa, Armando, and Elson Souza Santos. 2011. "Embraer diversifica projetos na área militar: o novo cargueiro C-390." *Economia & Tecnologia* 24 (1):167-174.

Dunning, John. 1988. "The eclectic paradigm of international production: a restatement and some possible extensions." *Journal of International Business Studies* 19 (1): 1-31.

Dunning, John. 2000. "The eclectic paradigm as an envelope for economic and business theories of MNE activity." *International Business Review* 9 (2): 163-190.

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Embraer. *Annual Report 2006 to2017*. https://ri.embraer.com.br/.

Embraer. 2006. *Annual Report*.

Erramilli, M. Krishna, Sanjeev Agarwal, and Chekitan S. Dev. 2002. "Choice between non- equity entry modes: An organizational capability perspective." *Journal of International Business Studies* 33 (2): 223-242.

Greene, William H. 2008. *Econometric Analysis*, 6th ed. New Jersey: Prentice Hall.

Godfrey, Paul, Craig B. Merrill, and Jared M. Hansen. 2009. "The relationship between corporate social responsibility and shareholder value: an empirical test of the risk management hypothesis. *Strategic Management Journal* 30 (4):425-445. doi 10.1002/smj.750.

Hessels, J. and Parker, S. C. 2013. "Constraints, internationalization and growth: A cross-country analysis of European SMEs." *Journal of World Business* 48.

Hymer, S.H. 1970. "The efficiency (contradictions) of multinational corporations." *American Economic Review* LX (2):441-8.

International Civil Aviation Organization – ICAO. 2017. Accessed September, 2017. https://www.icao.int/publications/DOC8643/Pages/Manufacturers.aspx

Johanson, Jan, and Jan-Erik Vahlne. 1977. "The internationalization process of the firm: A model of knowledge development and increasing foreign market commitment." *Journal of International Business Studies* 8.

Johanson, Jan, and Jan-Erik Vahlne. 1990. "The mechanisms of internationalization." *International Marketing Review* 7 (4).

Johanson, Jan, and F. Wiedersheim-Paul. 1975. "The internationalization of the firm: four Swedish cases." *The Journal of Management Studies* 12 (3): 305-323.

Kyläheiko, K., Jantunen, A. Puumalainen, K. Saarenketo, S., and Tuppura, A. 2011. "Innovation and internationalization as growth strategies; the role of technological capabilities and appropriability." *International Business Review* 20.

Madhok, A. 1997. "Cost, value and foreign market entry mode: The transaction and the firm." *Strategic Management Journal* 18 (1): 39-61.

Madsen, T. K., and P. Servais. 1997. "The Internationalization of Born Globals: An Evolutionary Process?" *International Business Review* 6 (6).

Marinho, Pedro; Dalla Costa, Armando. 2013. "Embraer: a experiência de internacionalização de uma empresa brasileira." *Revista de Economia & Relações Internacionais* 13 (1): 99-109.

Mattos, Bento. 2006. *História da Embraer*. São Paulo: Embraer.

Mattos, Bento, and Paulo Lourenção. 2006. *História da Embraer*. São Paulo: Embraer.

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Morais, Fernando. 2006. *Montenegro: as aventuras do marechal que fez uma revolução nos céus do Brasil*. São Paulo: Editora Planeta.

Pensore Edith T. 1959. *The Theory of the Growth of the Firm.* New York: Wiley.

Pitelis, C. 2002. "A theory of the (growth of the) transnational firm: a Penrosean perspective." In *The Growth of the Firm: The Legacy of Edith Penrose*, edited by C. Pitelis, 127-145. Oxford: Oxford University Press.

Rodengen, Jeffrey L. 2009. *The history of Embraer*. N.P.: Write Stuff (Sic) Enterprises, Inc.

Salwan, P. 2011. "Growth & Internationalization: The Case of TATA Motors." *Indian Journal of Industrial Relations* 47 (1).

Sapienza, H.J., Autio, E., George, G., and S.A. Zahra. 2006. "A capabilities perspective on the effects of early internationalization on firm survival and growth." *Academy of Management Review* 31 (4): 914-933.

Schueffel, P., W. Amann, and E. Herbolzheimer. 2011. "Internationalization of new ventures: tests of growth and survival." The *Multinational business review* 19 (4).

Silva, Ozires. 2005. *A decolagem de um sonho: a história da criação da Embraer*. São Paulo: Lemos Editorial.

Silva, Ozires. 2008. *Nas asas da educação. A trajetória da Embraer*. Rio de Janeiro: Elsevier.

Silva, Ozires. 2009. *A Economia Verde*. São Paulo: Editora Gente.

Souza, Rafael Pereira Nunes de. 2012. "O mercado aeronáutico e a inserção brasileira: o caso Embraer." Trabalho de Conclusão de Curso. Faculdade de Engenharia da Produção. Universidade Federal de Juiz de Fora.

Tavares, Maria da Conceição. 1974. *Da substituição de importações ao capitalismo financeiro*. Rio de Janeiro: Zahar.

Versino, A. 2014. *História da Embraer*. São José dos Campos: Embraer.

Vinagre, Mário B. M. 2015. *Guido Pessotti. Mestre do design aeronáutico*. São José dos Campos: Somos Editora.

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Appendix

Table A.1. EMBRAER – Order history and delivery of aircraft - 2016

Customers	Firm orders	Deliveries made	Firm Orders in Portfolio
American Eagle (USA)	217	217	0
British Midland (United Kingdom)	12	12	0
City Airline AB (Sweden)	2	2	0
ExpressJet (USA)	275	275	0
Flandre Air (France)	8	8	0
Jet Magic (Ireland)	1	1	0
Luxair (Luxembourg)	11	11	0
Pan Européenne (France)	1	1	0
Proteus (France)	11	11	0
Republic Airways (USA)	90	90	0
South Africa Airlink (South Africa)	5	5	0
Aerolitoral (Mexico)	5	5	0
Air Caribes (Guadeloupe)*	3	3	0
Alitalia (Italy)	22	22	0
Axon (Greece)	3	3	0
British Reg. Airlines (United Kingdom)	23	23	0
Brymon (United Kingdom)	7	7	0
China Southern (China)	26	26	0
China Eastern Jiangsu (China)	5	5	0
Cirrus (Germany)	2	2	0
ERA (Spain)	2	2	0
GECAS (PB Air - Thailand)	2	2	0
KLM EXEL (Netherlands)	2	2	0
LOT Polish (Poland)	36	36	0
Mesa (USA)	36	36	0

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Customers	Firm orders	Deliveries made	Firm Orders in Portfolio
Potugalia (Portugal)	8	8	0
Regional (France)	38	38	0
Rheintalflug (Austria)	3	3	0
Rio Sul (Brazil)	16	16	0
Sichuan (China)	5	5	0
Skyways (Sweden)	4	4	0
Swiss (Switzerland)	25	25	0
Transtates (USA)	22	22	0
Satenta (Colombia)	4	4	0
Saudi Arabian Airlines (Saudi Arabia)	15	15	0
Finnair (Finland)	22	22	0
Gecas (USA)	53	53	0
US Airways (USA)	53	53	0
Air Canada (Canada)	60	60	0
Copa (Panama)	15	15	0
JetBlue (USA)	88	64	24
Flybe (United Kingdom)	29	25	4
Republic Airlines (USA)	48	48	0
TAME (Ecuador)	5	5	0
China Eastern Wuhan (China)	5	5	0
Aero Republica (Colombia)	5	5	0
Royal Jordanian (Jordan)	4	4	0
Hainan (China)	97	75	22
EgyptAir (Egypt)	12	12	0
Not disclosed	14	0	14
Sirte Oil (Libya)	1	1	0
Virgin Blue (Australia)	24	24	0
NorthWest (USA)	36	36	0

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Customers	Firm orders	Deliveries made	Firm Orders in Portfolio
M1 Travel (Liban)	8	8	0
Lufthansa (Germany)	43	43	0
Nigeria (Nigeria)	1	1	0
JAL (Japan)	30	15	15
Nasair (Saudi Arabia)	3	3	0
TACA (El Salvador)	11	11	0
Virgin Nigeria (Nigeria)	2	2	0
Suzuyo (Japan)	10	8	2
ECC (Ireland)**	8	8	0
Air Moldova (Moldova)	1	1	0
JetScape (USA)	14	14	0
TRIP (Brazil)	9	9	0
Azul (Brazil)	94	59	35
Aeromexico (Mexico)	12	12	0
KunPeng (China)	5	5	0
LAM (Mozambique)	2	2	0
NIKI (Austria)	7	7	0
Montenegro (Montenegro)	1	1	0
BA City Flyer (United Kingdom)	15	15	0
Globalia (Spain)	12	12	0
KLM (Netherlands)	39	22	17
Oman Air (Oman)	5	5	0
Augsburg (Germany)	2	2	0
Petro Air (Libya)	2	2	0
Austral (Argentina)	22	22	0
Air Lease (USA)	31	31	0
Republic (USA)	158	103	55
Dniproavia (Ukraine)	5	5	0

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Customers	Firm orders	Deliveries made	Firm Orders in Portfolio
Airnorth (Australia)	1	1	0
Air Astana (Kazakhstan)	2	2	0
BOC (Singapore)	15	15	0
CIT (USA)	11	11	0
Hebei (China)	7	5	2
Kenya Airways (Quenia)	10	10	0
Conviasa (Venezuela)	22	20	2
Azal (Azerbaijan)	22	20	2
Aldus (Irland)	20	4	16
United Airlines (USA)	40	30	10
Skywest (USA)	155	38	117
Air Costa (India)	50	0	50
Aurigny (Guernsey)	1	1	0
Belavia (Belarus)	2	2	0
ILFC (USA)	50	0	50
American Airlines (USA)	60	6	54
ICBC (China)	10	0	10
Ghizhou/Colorful (China)	7	0	7
Aircastle (USA)	25	0	25
TOTAL	2.580	2.047	533
Total Countries			50
Total Companies			98

* EMB 175 aircraft delivered by ECC Leasing to Air Caraibes.
** Aircraft delivered by ECC Leasing: one for Cirrus, two for Paramaunt and one for Satena.
Source: Authors elaboration from Embraer website. Accessed January 15, 2016.
http://ri.embraer.com.br/show.aspx?idCanal=I08bp4C7v0ZExON8xtTF3g