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GLOBAL EDUCATION DIALOGUES RESEARCH

BRAZIL
RESEARCH REPORT

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This research was commissioned as part of the British Council's Global Education Dialogue, From Catapults to Commercialisation: How can universities use their knowledge and research more effectively?

9, 10 March 2015, The Crawford School of Public Policy, Australian National University.

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“There is a big gap when you compare Brazil with the US and other countries, but if you compare us with ten years ago, we have made big strides in terms of the [innovation] ecosystem.”

Flaviano Faleiro,
Managing Director for Strategy and Innovation,
Accenture, Brazil

Key Features

Research Spending

- Brazil invests a relatively low percentage of its Gross Domestic Product (GDP) in Research and Development (R&D) when compared with the OECD (Organisation for Economic Development) and the other BRICS countries (Brazil, Russia, India, China and South Africa).
- Brazil also has comparatively low investment from the private sector.

Commercialisation of Research Ecosystem

- The development of a Brazilian research ecosystem is in its early stages.
- Steps have been taken to allow more flexibility in how research and knowledge is moved from universities into the private sector. However, the structures to facilitate technology transfer between universities and industry appear to have had limited impact to date.
- Red tape and bureaucracy continues to hinder progress.

Supply Side

- Brazil has a growing number of world-ranked universities with significant research talent, particularly in certain sectors.
- However, academics are still primarily motivated by publications and there remain many barriers for both researchers and institutions that discourage knowledge exchange and technology transfer, and inhibit an entrepreneurial culture.

Demand Side

- Most of the engagement and demand for R&D is currently from large, multinational corporations.
- While the Brazilian economy is dominated by small and medium-sized enterprises (SMEs), very few use research.
- Interest rates are high and there are many regulatory hurdles to access public funds and support for commercialising research.

Policy

- Over the last decade, various policies and initiatives have been introduced to facilitate commercialisation, attempting to change the relationship between universities and industry, and provide access to government financial incentives and wider support.

Key Talking Points

- With vast regional variation, should Brazil just focus on a few key states or spread its efforts around the country?
- What can be done to reduce the regulatory hurdles and ‘red tape’ that deter businesses from accessing government assistance and from commercialising research?
- How does Brazil create a more integrated approach to R&D so it can effectively leverage the expertise residing in its universities and research centres?
- How does the government encourage more SMEs to invest in research and partner with institutions and research centres to drive innovation in this significant segment of the economy?
- To what extent should the government intervene and identify industry segments of focus, rather than allowing market needs to drive areas of focus?

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1 Introduction

Background of this research project

In December 2014, the British Council (BC) engaged EduWorld to conduct a research project with the following objective:

- **To examine how national policies, as a sub-set of national pre-conditions, affect commercialisation outputs of research.**

This was to support the British Council's Global Education Dialogue (GED), a high-level discussion between higher education professionals and policymakers from Australia, the UK and the East Asia Region, held in Canberra, Australia in March 2015.

The Council identified four regions[1] on which to focus: the **United Kingdom** (primarily England and, to a lesser extent, Scotland), **South Korea**, **Brazil** and **Hong Kong**, each of which is actively looking at the commercialisation outputs of research, albeit at very different stages of development and, of course, within a different set of national conditions.

Following an initial consultation involving interviews with senior stakeholders in universities in the UK and Australia to direct and refine the focus of the research in line with the objectives of the GED, the research comprised two components conducted concurrently over the 10 weeks of the project.

1. Primary research in the form of in-depth interviews with between five and eight stakeholders in each of the four countries.[2]
2. Secondary research, namely a review of a wide range of publications from many sources including government departments, parliamentary reviews, universities, funding agencies, non-government organisations, businesses, consultancies and media relating to the commercialisation of research.

This report focuses on the findings in relation to Brazil.

While there is a wealth of literature about research and development, science and technology and innovation in Brazil, obtaining up-to-date insights pertinent to the key issue of this review (the commercialisation of research) has proved challenging. This situation is compounded by the vastness of the Brazilian research ecosystem and its myriad of agencies, research institutes and centres, and universities, as well as Federal and State Government bodies.

Consequently, in this paper, we have tried to synthesise the most appropriate documents and data to inform the audience and stimulate discussion. To achieve this, we conducted extensive secondary research reviewing a wide range of publications

[1] While Hong Kong is a Special Administrative Region of the People's Republic of China, it is referred to as a 'country' in this report for the purposes of comparison with the relevant countries.

[2] A list of the job titles and organisations of participants is provided within this report. Participants were assured that their names would not be used and that any comments would not be attributed to individuals.

from various sources including government departments, parliamentary reviews, universities, funding bodies, non-government organisations, businesses, consultancies and media. The complexity of the system is reflected in the length of this report. A full bibliography is provided as an appendix to this report.

To supplement the secondary research, we undertook interviews with key senior stakeholders involved in the commercialisation of research in Brazil. We would like to thank the interviewees for their time, insightful input and their referrals of relevant individuals for us to interview and suggestions regarding sources of further information.

This report is in three sections.

- The first section provides information about Brazil's performance in the latest Global Innovation Index.
- In the next section, we provide our overview of the Brazilian Government's policies relating to the commercialisation of research, including an overview of the government's strategy in this area and an outline of some of the relevant key funding schemes.
- The final section is built around the more subjective findings of our primary research in which we spoke with individuals with expertise on the topic of the commercialisation of research. We have included their opinions and insights, as well as additional relevant content from our literature review.

Comments about specific policies/funding schemes are reported in both sections.

It must be noted here that finding up-to-date, detailed data on the whole subject of R&D in Brazil has presented some major challenges. Much of the most recent, comparable economic data relating to expenditure from reliable sources is for 2011, and for the most part, that is only topline data. Furthermore, reliable data sources provide contradictory information about the same subject.

Report Limitations

EduWorld has taken all reasonable care in researching and preparing this report. EduWorld has necessarily had to rely and base opinions upon various external third party data and information sources when preparing this report and in reaching the opinions, views and assumptions expressed in this report.

To the extent that such reliance on third party source data and information has occurred, EduWorld has assumed the accuracy, reasonableness and reliability of the source data and information without independent verification.

While at the date of this report, EduWorld is not aware of any reason why any of the third party source data and information referred to or used in this report is not accurate, reasonable or reliable for the purposes for which this report has been prepared, EduWorld does not and is unable to represent that such third party information and data is accurate, reasonable or reliable and the report is released upon this basis.

2 Brazil and the Global Innovation Index

The Global Innovation Index (GII)

The Global Innovation Index (GII)[3] recognises the key role of innovation as a driver of economic growth and well-being. It aims to capture the multi-dimensional facets of innovation to be applicable to developed and emerging economies alike. In doing so, it sets out to help policymakers and business leaders move beyond one-dimensional innovation metrics towards a more holistic analysis of innovation drivers and outcomes.

Figure 1: Brazil GII Key Indicators 2013 and 2014

Brazil Statistics

Key Indicators

Population (millions)	**198.7**
GDP (US$ billions)	**2,242.9**
GDP per capita, PPP$	**12,220.9**

	2014		2013	
GII Indicator	**Value or score (0 - 100)**	**GII Rank**	**Value or score (0 - 100)**	**GII Rank**
Global Innovation Index (out of 143)	36.3	61	36.3	64
Researchers, headcounts/mn pop	1,202.8	52	1,189.6	49
Gross expenditure on R&D, % GDP	1.2	31	1.2	31
GERD performed by business, % GDP	n/a	n/a	0.4	36
GERD financed by business, %	n/a	n/a	45.4	29
University/industry collaboration^	49.7	46	51.7	42
GERD financed by abroad, %	n/a	n/a	n/a	n/a

In 2014, out of the 143 countries surveyed as part of the GII, Brazil ranked overall in the middle range, in 61st place. This is a slight improvement on its 2013 rank.

On some of the detailed indicators included in the GII, Brazil ranks slightly higher, though there is still plenty of room for improvement in a country whose government-wide 'Greater Plan' uses the slogan: *'Innovate to compete. Compete to grow'.*[4]

[3] The Global Innovation Index 2014: The Human Factor in Innovation is the result of collaboration between Cornell University, INSEAD, and the World Intellectual Property Organisation (WIPO) as co-publishers, and their knowledge partners.
[4] http://ec.europa.eu/enterprise/policies/innovation/files/countryreports/brazil_en.pdf

3 Brazil Background

3.1 Country Overview

Brazil is a continental country with an area of 8.5 million kilometres and a population in excess of 200 million.[5] The population is rising, up from 196.5 million in 2012 and 195.2 million in 2011. Brazil is currently the sixth most populous country in the world.

Brazil is a federation composed of 26 federal units (states) and one federal district, with 5,565 municipalities. São Paulo is by far the largest state in terms of population at 44 million.

In 2013, GDP was estimated at $2.245 trillion making Brazil the world's seventh largest economy.[6] Economic analysts group the country with the most promising emerging markets – Russia, India, China and South Africa – which together form the 'BRICS' countries. Brazil's estimated GDP per capita PPP in 2013 was $15,037 ranking it 74th in the world and ahead of all the BRICS countries except for Russia.[7]

Characterised by large and well-developed agricultural, mining, manufacturing and service sectors, with a rapidly expanding middle class, Brazil's economy outweighs that of all other South American countries and it is starting to really expand its presence in world markets.

In an overview on the country, the OECD reports that Brazil is an emerging economy that has weathered the global financial crisis well with a continuing upward growth trajectory.[8] Brazil has some well-known leading innovative firms and is at the forefront in high-technology fields such as deep-water oil extraction.

While a few universities undertake high-quality research, this performance does not spill over to the entire, very diversified Brazilian economy. In particular, the many small and medium-sized enterprises (SMEs) that make up the vast bulk of the Brazilian economy innovate very little. Challenging framework conditions and substantial social challenges, such as poverty, explain the generally weak Science, Technology, Innovation (STI) performance.[9]

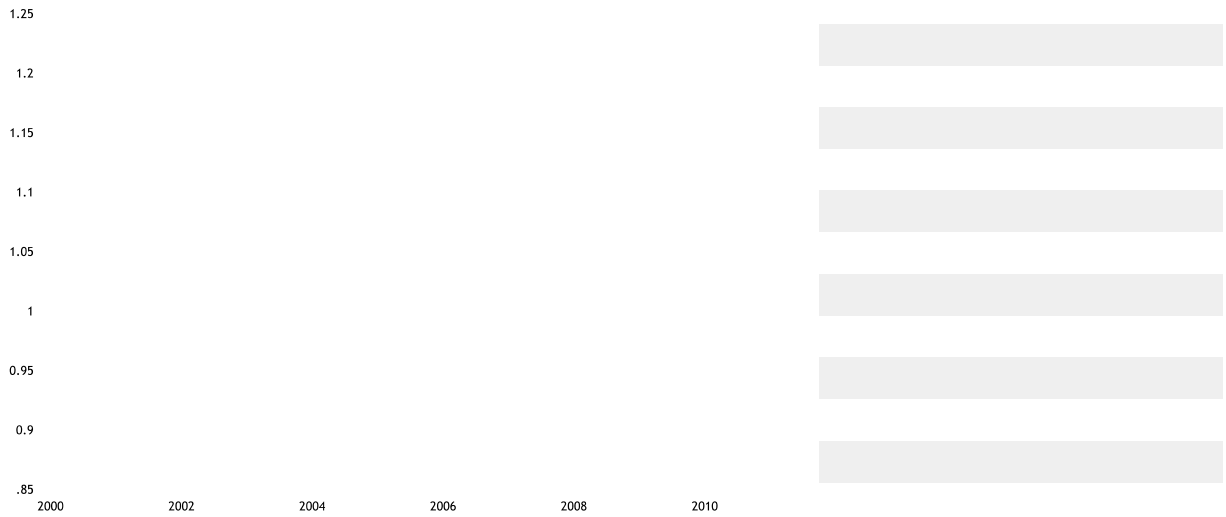
[5] CIA Year Factbook
[6] http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD
[7] *Ibid.*
[8] http://www.oecd.org/sti/outlook/e-outlook/sticountryprofiles/brazil.htm
[9] *Ibid.*

3.2 Brazilian Research and Development Spending

In 2011, Brazil invested 1.21 per cent of its GDP in R&D (compared to 1.72 per cent for the UK). The majority (approximately 55 per cent) of this investment is public. While this is the highest rate in the Latin American and Caribbean region, it is low by comparison to global data (the OECD median figure is around 2.4 per cent).[10]

However, while low, Brazil has been increasing its expenditure on R&D as illustrated in Figure 2. Following a decline early in the last decade, R&D as a proportion of GDP has been increasing steadily from 2004 to 2011 (the most recent point for which we have reliable, World Bank data).

Figure 2: R&D Expenditure in Brazil as a Percentage of GDP[11]



Recent estimates put total R&D expenditure in Brazil in 2014 at approximately US$25 billion – including federal, state and private sector funding.[12] This is still considerably lower than most BRICS (Brazil, Russia, India, China and South Africa) countries. The main difference in Brazil is the low investment from the private sector (explored further in the next section). While the private sector is responsible for around 70 per cent of R&D expenditure in OECD countries,[13] in Brazil private expenditure accounts for less than 50 per cent. In 2013, there was a decrease of 18.3 per cent in investments from the private sector, according to research done by an international consulting company (Booz & Company), compared with an average international increase of 5.5 per cent.[14]

[10] World Bank, *Op. Cit.*
[11] http://knoema.com/atlas/Brazil/topics/Research-and-Development/RandD-Expenditure/RandD-expenditure-percent-of-GDP
[12] Group of Eight (April 2014) Policy note, Funding in Selected Countries
[13] http://www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/02/05/index.html?itemId=/content/chapter/sti_scoreboard-2011-16-en
[14] Group of Eight, *Op. Cit.*

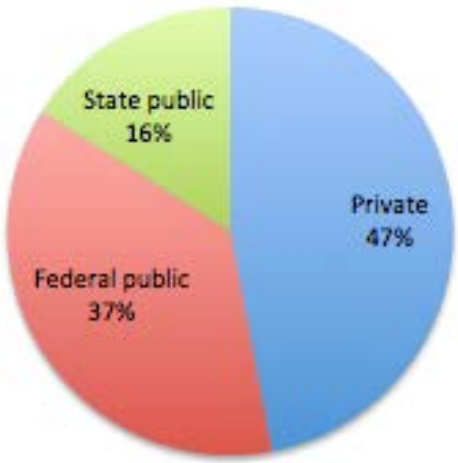
Various indicators point to recent growth in R&D investment in Brazil including:

- Gross Expenditure on Research & Development (GERD) in Brazil was forecast to reach R$35bn (US$12bn) in 2014, a major increase over the estimated R$20bn (US$7bn) in 2010 and a doubling over the R$15.5bn ($5bn) in 2008.[15]
- Government (Federal and State) spending on science, technology and innovation in 2013 is estimated to be in the region of US$31 billion, an increase of 8 per cent from 2012; this increase is second only to China's 11 per cent.[16]

As already mentioned, the majority of Brazil's research system is funded by the public sector, with the Federal Government the main source of public funds (36.7 per cent of GERD in 2010, versus 34.0 per cent in 2005). However, the share of private funds has been increasing slightly from 43.4 per cent of GERD in 2000, reaching an all time high of 50.3 per cent of GERD in 2005, to then experience a continuous decline in subsequent years to the lowest level of 47.3 per cent in 2010 (even though it accounted for a high 0.55 per cent of GDP in that year).

In spite of the efforts of the 27 units of the federation (26 states and one federal district) to increase R&D funding, their share of GERD rose slightly from 15.8 per cent of GERD in 2005 to 16.0 per cent in 2010 (see Figure 3). This is still far below the 20.7 per cent rate in 2000.[17]

Figure 3: GERD by Funding Source, 2010[18]



[15] http://ec.europa.eu/enterprise/policies/innovation/files/countryreports/brazil_en.pdf
[16] *Financial Times*, 22 October 2013, 'Brazil must embrace change to flourish'
[17] http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/br/country?section=Overview&subsection
[18] *Ibid.*

3.2.1 Business Expenditure on Research and Development (BERD)

Business Expenditure on R&D (BERD) – expenditure in the business sector that includes government grants – is considered important for innovation and growth.[19]

While Brazil's ratio of BERD has remained relatively stable over the last decade (see Figure 4), the absolute BERD level for Brazil (47.88 per cent in 2010) is considered to be anomalously low: for example, by comparison, in China in 2010 BERD was 74.45 per cent and in South Korea 74.80 per cent.

Figure 4: BERD as a Percentage of GERD in Brazil 2000–2010

BERD % of GERD	2000	2005	2010
Brazil	44.73	48.29	47.88

The Brazilian Government through its recent Greater Brazilian Plan (covered later in this report) aims to raise BERD as a percentage of GDP from its position in 2010 of 0.59 per cent to 0.90 per cent by 2014.[20]

3.2.2 Research in Brazil

Despite its relatively low spend compared to other countries, the impact and quality of Brazilian research is considered of a world-class standard in many areas. Brazil's research focus – measured by research publication output – has predominantly been on agricultural sciences and plant and animal science, as is evident in the number of citations it produces in the following sectors, each of which is at least three times greater than the world average:

- Agricultural Sciences
- Plant and Animal Science
- Environment and Ecology
- Biology and Biochemistry.

Pockets of excellence are also emerging in Avionics, Engineering and Oil and Gas. Furthermore, key Brazilian interests and priorities map closely onto a number of the Eight Great Technologies and the global challenges identified by the G8 science ministers. In fact, the Science and Innovation Network of the British Foreign and Commonwealth Office recently reported that Brazil is rapidly becoming one of the world's science powerhouses. [21]

[19] http://www.oecd-ilibrary.org
[20] ERAWATCH, Greater Brazilian Plan, http://ec.europa.eu/enterprise/policies/innovation/files/countryreports/brazil_en.pdf
[21] https://www.gov.uk/government/priority/uk-science-and-innovation-network-working-with-brazil

3.3 Policy Overview

To provide some context in which to view the Brazilian policy landscape relating to research, innovation and commercialisation, we consider it necessary to provide an overview of the Brazilian economy, its current state and some distinctive features.

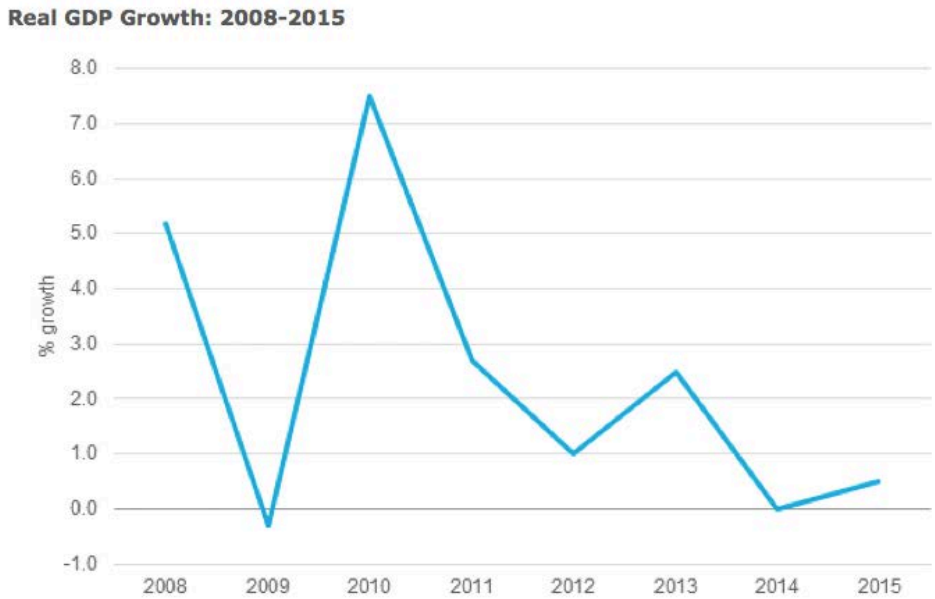
3.3.1 Economic Background

Brazil is Latin America's largest economy. It has maintained relatively high levels of employment, although recent protracted declines in commodity prices, weak growth in major trading partners, severe droughts in agricultural areas, election uncertainty and contracting investment have contributed to significant fluctuations in real GDP growth. The impact of these have meant that Brazil slipped back into recession in 2014 and is forecast to have real GDP growth of just 0.5 per cent in 2015 (see Figure 5).

The forecast is for inflation to remain high (forecast of 6.5 per cent), private consumption to be subdued and for unemployment to climb. Brazil's continued reliance on commodity exports will put pressure on the current account.[22]

Many observers, including the OECD, report that for Brazil to prosper, it will need to boost its productivity and cost competitiveness. The government knows that its economic model needs to change.

Figure 5: GDP Growth in Brazil 2008–2015[23]



[22] http://blog.euromonitor.com/2015/02/divergent-growth-the-economic-outlook-for-bric-in-2015.html
[23] http://www.oecd.org/brazil/Brazil%20brochureWEB.pdf

The Need to Innovate

Currently the world's sixth or seventh largest economy (depending on the exchange rate), Brazil is keen to ensure it does not fall behind on innovation, research and development in a world in which it is not sufficient to be a simple manufacturer or producer of commodities.

According to the *Financial Times*, Brazil's success will depend on whether, by becoming **more productive through innovation and the use of technology**, the country can offset high costs, changing demographics and the danger of 'Dutch disease' (when a country makes so much revenue from commodity exports that it de-industrialises). [24]

While the Brazilian economy has grown over the last decade, nearly three quarters (approximately 74 per cent) of this GDP growth was due to an increase in the number of people working, and only about a quarter (26 per cent) was attributable to productivity gains. This is very different from the productivity-driven growth of other rapidly developing economies. As the workforce expansion weakens, it will be critical for Brazil to increase productivity significantly to meet its aspiration of growing GDP by more than 4 per cent per year.[25]

The World Economic Forum classifies Brazil as in the final stage of transition towards a developed economy – **the phase of evolving from an efficiency-driven growth model to an innovation-inspired one**.

Barriers to Business

In 2015, Brazil ranks very low (120th out of 183 economies) on the World Bank's Doing Business project[26] and it performs even more poorly in terms of starting a business, ranking 167th. By way of example, the survey provides data on both Rio de Janeiro and São Paulo where starting a business in the latter city takes 12 steps (OECD average is 5) and on average 102 days, four times the average for Latin American and Caribbean countries (30 days), and more than 10 times the time for all OECD countries (9 days).

Brazilian entrepreneurs also face a complex tax system and difficulties in access to finance. Moreover, entrepreneurship education is lacking, according to Endeavor Brazil.[27] It points to statistics suggesting that less than 10 per cent of Brazilians aged 18–64 have received any type of entrepreneurship education.[28]

[24] http://www.ft.com/intl/cms/s/0/dbab1bd6-25ea-11e3-8ef6-00144feab7de.html#axzz3S7IGtZk
[25] Boston Consulting Group (2013) Brazil: Confronting the Productivity Challenge, https://www.bcgperspectives.com/content/articles/growth_value_creation_strategy_brazil_confronting_the_productivity_challenge/
[26] http://www.doingbusiness.org/data/exploreeconomies/brazil
[27] An organisation that supports entrepreneurship, https://endeavor.org.br/
[28] Jonathan Ortmans, Brazil's Entrepreneurship Boom, www.entrepreneurship.org/policy-forum/brazils-entrepreneurship-boom.aspx

Brazil's Small and Medium-sized Enterprises (SMEs)

Brazil currently has around 6.3 million small and medium-sized enterprises (SMEs).[29] As such, SMEs are a vital part of the Brazilian economy.

- They are responsible for 96 per cent of the jobs in Brazil (52 per cent of the formal jobs).[30]
- They comprise 98 per cent of all companies in the country,[31] totalling around 6.3 million.[32]
- SMEs are responsible for 20 per cent of Brazil's GDP.[33]
- São Paulo is home to 40 per cent of the fastest-growing SMEs in the country, with the Southeast Region (Espirito Santo, Minas Gerais, Rio de Janeiro and São Paulo) home to 57 per cent of the 250 fastest-growing SMEs. These businesses grew an average of 25 per cent between 2010 and 2012.
- Entrepreneurship is an increasingly appealing option for young Brazilians. A 2013 Global Entrepreneurship Monitor survey found that having a business is the third most common wish among Brazilians, after the desire to own a house and to travel. More than 80 per cent believe that opening a company is a desirable career path. Around 71 per cent of entrepreneurs said they started their business based on the opportunity, rather than necessity – a change from 2002, when 58 per cent of entrepreneurs began an enterprise out of need.

Brazil's efforts to boost its culture of innovation and entrepreneurship may help sustain its growth in the coming years. SMEs tend to create jobs more quickly than larger organisations and in emerging markets they help to accelerate the transition from agricultural to industrial economies.[34] For example in January 2014 alone, SMEs created 47,700 new jobs in Brazil.[35]

The importance of SMEs' use of innovation is discussed in a Boston Consulting Group (BCG) report showing that Brazilian SMEs which adopted new technologies grew their revenue 16 per cent more than their counterparts and generated 11 per cent more jobs.

[29] Classified by Brazil's National Development Bank as businesses with annual operational revenue of $38 million or less
[30] tp://www.as-coa.org/blogs/s%C3%A3o-paulo-2014-blog-six-facts-about-smes-brazil
[31] http://www.entrepreneurship.org/policy-forum/brazils-entrepreneurship-boom.aspx
[32] http://www.as-coa.org/blogs/s%C3%A3o-paulo-2014-blog-six-facts-about-smes-brazil
[33] Brazilian Institute of Geography and Statistics
[34] Economist Intelligence Unit (2012), *Emerging markets: SMEs capture growth in expanding markets*
[35] Brazilian Service of Support for Small and Micro Organisations

For a country with very high youth unemployment (young people between the ages of 18 and 24 comprise 36 per cent of the unemployed workforce), a greater entrepreneurial spirit is crucial. The Brazilian Government has recognised this and implemented initiatives to encourage entrepreneurs and startups.

- In 2006, the government passed a law to benefit SMEs through the 'individual micro entrepreneur', enabling businesses that make up to $25,000 a year to be brought into the formal economy, with a different tax system and simplified registration and operation.[36]
- Brazil's agency for innovation, FINEP, (see Section 3.4.4) launched PRIME, a significant project to support startups, which will disburse up to $65,000 to startups focused on innovation. FINEP expects to help 10,000 innovative companies over four years, creating 10 new jobs for each one directly generated by a new company.[37]
- Tecnova is a programme providing subsidies to support innovation for SMEs, with a goal of supporting 800 companies.

Start-Up Brasil[38]

Start-Up Brasil is a National Startup Acceleration Programme, an initiative of the Brazilian Federal Government, created by the Ministry of Science, Technology and Innovation (Ministério da Ciência, Tecnologia e Inovação – MCTI) to support new technology-based companies/ startups.

How it works: The programme operates through year-long editions. In every edition, there are two public calls for entries: one to evaluate and train accelerators, and another to select startups, with rounds every semester.

Phase one – accreditation of accelerators: In this phase, accelerators are evaluated, according to a specific edict, to be partners in the programme and be responsible for the process of accelerating startups. Startup acceleration is a quick process that seeks to develop a market-oriented product/service with the support of mentors, investors and business and technology investors.

Phase two – startup selection: After training the accelerators, national and international startups are selected to be supported by the programme (as many as 25 per cent are approved). This phase happens twice a year, once for each semester.

Phase three – acceleration: In this phase, the process of acceleration happens. Over a period of up to two months, the startups have access to as much as R$200K (around US$70k) in funding for research and development to be distributed among their professionals. They also participate in a series of events and activities promoted by the programme to train entrepreneurs and introduce them to clients and investors from the International Hub in Silicon Valley, USA.

The startups receive financial investments and have access to such services as infrastructure, mentoring and training in exchange for a percent of stock partnership.

[36] Milton Dallari, CFO SEBRAE-S www.sebraesp.com.br
[37] Erawatch, *Op. Cit.*
[38] http://www.startupbrasil.org.br/?lang=en

3.3.2 Greater Brazil Plan (Plano Brazil Maior)[39]

Launched in August 2010, the Greater Brazil Plan 2011–2014 (Plano Brazil Maior) was a government-wide policy, embodied in the slogan:

> *'Innovate to compete. Compete to grow.'*

The policy's drive is to spur Brazil's capability to develop innovative products and services, and prosper from exporting its technology skills rather than agricultural and mineral commodities. The aim of the Plan was for Brazil to:

1) Sustain inclusive economic growth in an adverse economic context; and
2) Leave the international crisis in a better position than entered.

The Plan focused heavily on innovation and on the productive consolidation of Brazilian industry, aiming at sustained gains in labor productivity. When it was introduced, it proposed significant changes in the innovation support legal framework, in particular:

- Allowing technological risk clauses in contracts in the area of technological procurement, as mentioned in the 2005 Innovation Law (Section 3.7.1);
- Allowing the funding of private non-profit Science and Technology Institutes (STI) in the incentives framework of the Good Law (Section 3.7.2);
- Permitting Science Technology and Innovation foundations to work with several STIs; and
- Creating incentives through a new law for investors in long-term financial instruments and mutual funds targeted to research, development and innovation investments by reducing the income tax rate on gains obtained.

Key goals of the plan have been to:

- Reduce costs, accelerate productivity growth and promote minimum basis of equality for Brazilian companies in relation to their international competitors; and
- Consolidate the national innovation system through the expansion of scientific and technological skills and their involvement in companies.

Additional information about the development of the Plan and the key goals are provided in Appendix 1, with the most relevant goal to this report being the second one listed: **to raise business expenditure on R&D (BERD) as a percentage of GDP from its position in 2010 of 0.59 per cent to 0.90 per cent by 2014.**

[39] http://ec.europa.eu/enterprise/policies/innovation/files/countryreports/brazil_en.pdf

3.3.3 Government Policy on Research[40]

To understand Brazil's current situation in relation to its innovation policy requires an understanding of how it evolved. A full description is beyond the scope of this project, but there are some useful resources that help to provide a perspective on the system's current structure.[41]

Brazil's research system has reportedly changed little of its basic institutional features and competitive funding pattern since the creation of its main research funding agency, the National Council for Scientific and Technological Development (CNPq) in 1951 which is linked to the Ministry of Science and Technology and Innovation (MCTI), created in the late 1980s and which added innovation to its name in August 2011.

Some of the changes that have occurred over the past 60 years include:

- The **privatisation of a few public research centres** in the 1990s; and
- The growth over the past decade in the **number and the volume of research funding by state research foundations** following the longstanding, highly regarded example of the São Paulo State Research Support Foundation (FAPESP).

Until the middle of the last decade, research policies in Brazil were geared mainly to public research, particularly individual researchers in universities and, to a lesser extent, public research institutes (PRIs).

The PRIs reportedly have often faced the problem of lack of financial resource continuity, due to cyclical budgetary constraints, and a generally fragmented disbursement due to a highly segmented policy with a multiplicity of disjointed target areas.

Government Policy on Research: Regional Differences[42]

As mentioned, Brazil is a federation comprised of 26 federal units (states), one Federal District (Brasilia) and 5,565 municipalities. While they are all equal to one another in terms of overall powers and responsibilities, they vary enormously in size, population, relative wealth and other indicators.

> *"One very big challenge is that the science and technology system is very heterogeneous. As in all aspects of Brazil, there are some that are rich and some that are poor, some that are less developed and some are more developed… But it is very difficult to talk about an average in Brazil – you are taking an average when you're talking about something that does not exist. That 'average', it does not happen anywhere."*[43]

[40] Erawatch, *Op. Cit.*
[41] For example, a piece by former Minister of State for Science and Technology Sergio Machado Rezende: Innovation Policy around the World: Brazil: Challenges and Achievements, http://issues.org/28-4/realnumbers-31/
[42] Erawatch, *Op. Cit.*
[43] Carlos Henrique de Brito Cruz (2012), *The view from Brazil: The Knowledge Economy and Higher Education in Brazil and Beyond*, Universities UK Annual Conference, https://www.youtube.com/watch?v=75wccmeOFhQ

In terms of research, while the states have no specific and articulated responsibility to do so, they all fund S&T, mainly scholarships and research projects, through their so-called research support foundations (FAP).

Their resources for research funding come from state constitutions that mandate a percentage on gross fiscal revenues (1 per cent in case of FAPESP in São Paulo, formed in 1960 and which also has revenues from a state endowment).

FAPs in several states are legally linked to a state secretariat of S&T, development or planning.

In recent years, several FAPs have supported thematic network-based projects and even more recently, innovation projects, in cooperation with universities and research organisations or in the form of direct grants to firms. About half have passed their own state innovation law and a handful has established innovation funds to provide competitive grants to firms.

In spite of recent efforts towards research decentralisation, the research system is still somewhat centralised in terms of execution in two states of the federation: São Paulo and, to a lesser extent, Rio de Janeiro.[44]

- **São Paulo**, because of its highly developed state university system, including two of the largest and most productive public research universities in the country (University of São Paulo USP and University of Campinas UNICAMP), as well as some key state government agricultural research centres and the majority of Brazil's private enterprise R&D centres and, as mentioned, FAPESP.
- **Rio de Janeiro** because as the country's former capital, it inherited several government research institutes and is home to the largest federal university (Federal University of Rio de Janeiro UFRJ). It is also home to the largest public and overall enterprise, the oil and gas exploration company, Petrobrás, which has its corporate research centre in the state and incurs significant research expenditures in-house and externally, mainly in thematic university-network research and more recently university-based thematic corporate labs.

[44] *Ibid*

3.4 Government Departments Involved in Funding R&D

A number of key government departments and ministries fund R&D in Brazil, most notably:

- Ministry of Science, Technology and Innovation (MCTI); and
- National Council for Scientific and Technological Development (CNPq).

Also relevant are:

- National Fund for Scientific and Technological Development (FNDCT); and
- Financier of Studies and Projects (FINEP)

3.4.1 Brazilian Ministry of Science, Technology and Innovation (MCTI) Annual Budget for 2014: US$3.0 billion[45]

MCTI[46] is responsible for national policy on scientific and technological research and innovation, including:

- planning, coordination, supervision and control of scientific and technological activities;
- policies for developing information technology and automation;
- national policy on biosecurity;
- nuclear policy; and
- control of exports of sensitive goods and services.

A number of key agencies come under MCTI[47] including:

- National Council of Scientific and Technological Development (CNPq) (see below); and
- Brazilian Innovation Agency (FINEP) (see below).

Other agencies under MCTI include national research centres and laboratories focussing on subjects such as nuclear energy, physics, space, pure and applied mathematics.

[45] Group of Eight, *Op. Cit.*
[46] Org Chart at: http://www.mct.gov.br/upd_blob/0220/220527.pdf
[47] http://www.worldheritage.org/articles/Ministry_of_Science_and_Technology_%28Brazil%29

3.4.2 National Council for Scientific and Technological Development (CNPq) Budget: $677m in 2010 (most recent data available)

Founded in 1951, CNPq is Brazil's Science Council.[48] An agency of MCTI, it is the country's oldest research financing agency, and aims to:

- Foster scientific and technological research; and
- Train the human resources for research in the country.

Since it was established, CNPq has been one of the major public institutions for the support of science, technology and innovation (ST&I), contributing directly to the training of researchers (masters, doctors and specialists) in various fields of knowledge.[49]

CNPq is a complex structure. The agency has two instruments available to enable it to fulfill its mission: training grants and a financial resource provision for scientific research. These instruments are applied using three mechanisms:[50]

1. Annual calendar for permanent activities (grants, organisation of scientific events)
2. Calls for proposals for specific activities (occasional grants or financial packages)
3. Agreements and partnerships in support of specific actions carried out by the CNPq itself.

CNPq is also responsible for coordinating and funding a national network of research clusters organised by theme. Currently there are over 120 clusters in operation.

3.4.3 National Fund for Scientific and Technological Development (FNDCT)[51] Budget: $1.7 billion in 2013

The main source of funding for research in universities and higher education institutes is the National Fund for Scientific and Technological Development (FNDCT). FINEP (detailed in the next section) manages the resources of FNDCT.

The FNDCT resources are used to support innovation and research activities in enterprises and scientific and technological institutions in various forms of investment, and repayable, non-repayable funding arrangements[52] implemented directly or in a decentralised manner.

[48] Research Brazil Ireland, http://rbi.ie/
[49] Erawatch, *Op. Cit.*
[50] Research Brazil Ireland, *Op. Cit.*
[51] Erawatch, *Op. Cit.*
[52] A relatively new development: nonreturnable investment in companies was previously forbidden by law

3.4.4 Agency for Innovation (FINEP)[53]
Budget: $8 billion in 2013

FINEP is a public company linked to the MCTI that administers the funding of science and technology. FINEP manages the resources of FNDCT (see above) and also receives additional funds for its own innovation programmes.[54]

Its support covers all stages and dimensions of the scientific and technological development cycle: basic research, applied research, development and improvement of products, services and processes.

FINEP also supports the incubation of technology-based companies, the implementation of technology parks, structuring and consolidation of research processes and the development of markets.

FINEP promotes and encourages innovation and scientific and technological research in universities, institutes of technology, research centres, and other public or private institutions. In the last decade, FINEP has begun to offer the possibility of economic support for business, which has been described as the greatest innovation in the Ministry's range of instruments to encourage innovation.[55]

3.4.5 State Funding[56]

Referenced earlier, the Estate Research Funding Agencies play an important role in the development of research, science and technology in Brazil. They are called Fundação de Amparo a Pesquisa (Foundation to Support Research) and each state funds its own agency.

The main one is FAPESP, the research Funding Agency of the State of São Paolo, which receives 1 per cent of the total GDP of the state to support the development of research, national and international scholarships, as well as the promotion of the research produced in São Paulo. In 2012, the total investment in research in the state of São Paulo was over R$1bn (~AU$ 488m).

[53] http://www.finep.gov.br/pagina.asp?pag=programas_apresentacao; http://publicaciones.caf.com/media/38121/tomo_5_-_finep_english.pdf
[54] Research Brazil Ireland, *Op. Cit.*
[55] Rezende, *Op. Cit.*
[56] Group of Eight, *Op. Cit.*

3.4.6 National Associations and Organisations

In addition to the Government Departments, there are many other associations and organisations involved in R&D in Brazil. Some key organisations are listed below.

FORTEC (The National Association Forum of Innovation Managers and Technology Transfer)[57]
FORTEC is a civil, private, non-profit association representing people working at universities, research institutes and institutions of management innovation, as well as individuals involved in the management of innovation policies and activities related to intellectual property and technology transfer, including the technological innovation centres (NITs), agencies and offices.

National Association for Research and Development of Innovative Companies (ANPEI)[58]
ANPEI was established in 1984 to work with government, industry and influencers to stimulate innovation in business and support the competitiveness and productivity of companies and economic policy, industrial, scientific and technological developments in Brazil. At the end of 2012, ANPEI had 250 members, representing US$10 billion in investment in R&D in the country.

The organisation comprises companies of all sizes and sectors that invest in R&D, including universities, public and private research institutes, industry associations and government agencies. There are also individual members who work or have an interest in the areas of policy and innovation management.

The association played an important role in the discussions that guided the creation of tax incentives for innovation (discussed later in this report) and the Innovation Law. In addition to lobbying, the association promotes the diffusion of innovation culture. One of its main actions in this regard is the ANPEI Conference on Technological Innovation, the biggest annual event on innovation in Brazil. ANPEI is also active in training human resources for innovation, through its EducAnpei programme.

Embrapii[59]
This social organisation founded in December 2013 signed a management contract with the Federal Government, represented by MCTI and MDIC.

The new entity's objective is to raise the **volume of investment and the number of companies doing industrial innovation**. The organisation's partner, the National Industrial Confederation (Confederação Nacional da Indústria – CNI) believes that Embrapii will have a key role in preparing Brazilian companies to become more competitive to participate in a more demanding market, both in Brazil and abroad.

Embrapii does not have its own research infrastructure, but rather accredits research groups in Science and Technology Institutions (ICT), university innovation poles or Senai innovation institutes.[60]

[57] Website: www.fortec-br.org
[58] http://www.anpei.org.br/web/anpei/sobre-anpei
[59] Erawatch, *Op. Cit.*

These entities receive resource grant resources from Embrapii while attracting private companies and assisting them to innovate. They also contribute research infrastructure, machinery and human resources as counterpart resources, representing a minimum of one-third of the corporate innovation project.

In 2014, Embrapii had a budget of US$270m to launch the programme's structure and operations.

3.5 Recent Research Policy Developments

In recent years, the government has initiated a number of strategies and policies designed to enhance the overall performance of science, technology and innovation in Brazil and the commercialisation of research.

3.5.1 National Science Technology Innovation Strategy Goal (2012–2015)[61]

In December 2011, the **National STI Strategy 2012–2015 (*Estratégia Nacional de Ciência, Tecnologia e Inovação 2012–2015* ENCTI)** was launched, highlighting the importance of science, technology and innovation as a structural axis of the development of Brazil, and establishing guidelines for national and regional actions from 2012 to 2015.[62]

The strategy's overarching goal is to achieve sustainable development with science, technology and innovation as its main driver. The strategy addresses five challenges to:

1. Reduce the scientific and technological gap that still separates Brazil from developed nations
2. Expand and consolidate Brazilian leadership in the natural knowledge economy
3. Enlarge the basis for environmental sustainability and the development of a low carbon economy
4. Consolidate a new pattern of international insertion for Brazil
5. Overcome poverty and reduce social and regional inequalities.

To address these issues, the Strategy's three main drivers are the:

1. Promotion of innovation
2. Human resources training and capacity-building
3. Strengthening of S&T research and infrastructure.

[60] A nationwide organisation that provides training in industrial technologies
[61] https://www.gov.uk/government/priority/uk-science-and-innovation-network-working-with-brazil
[62] *Ibid.*

3.5.2 Amendment to the Federal Constitution of Brazil[63]

In December 2014, an amendment was passed (and now awaits President Rousseff's sanction) to the Federal Constitution of Brazil that aims to change several provisions to ensure that research and technological innovation are considered as priorities for Brazil.

The constitutional changes include some elements which appear to be of relevance, such as:

- The differentiated system of purchases of universities;
- The equalisation of rights between public and corporate researchers;
- Extension of the time of dedication by teachers to the cooperative projects of innovation;
- Implementation of Technological Innovation Nucleus (NIT);
- The expansion of the 'Lei do Bem' (a law that creates tax incentives for legal entities that undertake R&D inside Brazil – covered later in this report); and
- Encouraging the involvement capital markets.

3.6 Public Sector Research: Universities, Research Institutes etc.

3.6.1 Brazil's Universities

For an emerging economy, Brazil has an impressive number of universities in the QS World Rankings, many of which have climbed significantly in recent years. In fact, a total of 17 Brazilian universities make the QS world's top 800 in 2013/14, including four featured in the top 500.

Brazil has a diverse range of higher education institutions. While over 2,300 are recognised by its Ministry of Education (MEC), only about 80 of these have any real research capabilities.[64] That said, the majority of research is undertaken at universities, followed by public research institutes, and the majority of researchers reside within universities (57 per cent). Again though, high quality research is limited to a relatively small proportion of universities.

Overall, Brazil's research performance has been steadily improving: as President Rousseff recently noted, between 2000 and 2012, the number of articles published by Brazilian researchers in international journals quadrupled.[65]

[63] BBICE, http://www.b-bice-plus.eu/approval-of-pec-122014-a-breakthrough-for-innovation-in-brazil/
[64] QS Top Universities
[65] BBICE, *Op. Cit.*

Science Without Borders Programme
Budget: $1.36 billion

Worthy of mention in terms of university initiatives given its size, global reach and the currency of the programme, is Brazil's Science without Borders[66]. A student mobility programme, it is designed to promote the **consolidation and expansion of science, technology and innovation in Brazil by means of international exchange and mobility**.

The programme provides scholarships to Brazilian undergraduate and graduate students for study at the world's best colleges and universities in the fields of Science, Technology, Engineering and Mathematics (STEM). After completion of an academic year, students must return to Brazil to complete their degrees. In addition to providing for Brazilian students to study abroad, the programme aims, through its Special Visiting Researcher component, to attract senior researchers to perform joint projects with Brazilian research groups and to work in Brazil for up to three months every year for two to three years.

The budget for the first phase of the programme is $1.36 billion, of which approximately one-fourth has been contributed by the private sector.

To date, relationships have been established with host institutions in 43 countries.

3.6.2 Public Research Institutes

After universities, the next most likely place where research occurs is in Brazil's public research institutions (PRIs). Around 6 per cent of Brazil's researchers are based in public research institutes[67] and 7 per cent of GERD is spent in these PRIs.

The majority of PRIs – also the largest – are found at the federal level. Each is attached to a ministry: for example, the MCTI manages more than 16 units of scientific, technological and innovation research, covering Brazil's highest-priority fields of knowledge.[68]

The public agricultural research company, Brazilian Enterprise of Agricultural and Husbandry Research EMBRAPA (linked to the Ministry of Agriculture, Husbandry and Supply MAPA) plays a major role, with research centres spread around the country, as does the Oswaldo Cruz Foundation FIOCRUZ (linked to the Ministry of Health MS), mostly based in Rio.[69]

[66] http://monitor.icef.com/2014/07/brazil-extends-science-withoutborders-with-100000-new-scholarships/; http://www3.weforum.org/docs/WEF_Competitiveness_Lab_Latin_America_15.pdf; http://www.cienciasemfronteiras.gov.br/web/csf-eng/
[67] Erawatch, *Op. Cit.*
[68] http://rbi.ie/research-in-brazil/public-sector-research-organisations/
[69] A list of public research institutes is available here: http://www.access4.eu/brazil/322.php

There are also state-based PRIs, of which some of the most famous are located in São Paulo state, such as the Institute of Technology Research of the State of São Paolo (IPT), Butantan Institute for Biomedical Research (ITAL – Institute of Food Technology) and the Campinas Institute of Agronomy (IAC).

3.7 Legislation on Technology Transfer and Commercialisation of Research

Albeit somewhat outdated, ERAWATCH's review of policies impacting on the commercialisation of research reports that, with the exception of a programme to support incubators that was introduced in the 1980s, most polices to support innovation in Brazil have been introduced subsequent to the 2004 Technological Innovation Law (detailed below).

Over the last decade, Brazil has been promoting legislative reforms to the national system of science and technology in order to create an institutional environment that supports technological innovation by Brazilian companies. These initiatives have focused on reducing the cost or risks associated with R&D and promoting technological innovation through fiscal benefits and financial incentives. Some of these key initiatives are discussed below.

3.7.1 The Technological Innovation Act[70]

The Technological Innovation Act of 2004 was introduced to create incentives for scientific and technological innovation in a productive environment. The law established special measures for technological development, including support for the establishment of strategic alliances and the development of cooperation projects involving Brazilian companies.

Specifically, the law created several tools in order to allow, among other factors:

- The sharing of laboratories among very small and small companies;
- Federal Government participation in the stock capital of companies aiming at developing scientific projects as a way of injecting money in such enterprises;
- Differentiated remuneration system for public employees who participate in such research;
- A guaranteed minimum of 5 per cent of the royalties on the profit for the inventor;
- Partnerships between scientific and technological institutions and private companies for the development of new and innovative technologies; and
- Other important incentives for the creative environment in the scientific area.

[70] http://www.mondaq.com/x/226542/technology/The+New+Technological+Innovation+Act+In+Brazil

The new innovation law importantly mandated the establishment of a Technology Transfer Office (TTO) (now called 'Technological Innovation Nucleus' – NIT) at all government universities and R&D centres to manage and administer their innovation policies, including taking care of intellectual property, which as a result, dramatically increased patenting and licensing activities in public universities and R&D centres.

Brazil still reports a significant gap in the number of patents it generates compared to leading nations. In 2013, 85 per cent of the worldwide 205,300 Patent Cooperation Treaty applications were filed by firms, and over 75 per cent of these came from the United States, Japan, China, Germany and the Republic of Korea. By contrast, Brazil filed only 233 applications (~0.004 per cent of the total).[71]

3.7.2 *Lei do Bem* ('Good Act') Law and Incentives[72]

The Federal Government through the MSTI established the *Lei do Bem*, a law that creates tax incentives for legal entities which undertake R&D inside national (Brazilian) borders. The legislation aimed to incentivise companies, universities and research institutes to undertake R&D through:

- Offering reduced income tax and social security tax levies for R&D expenditures;
- Halving the sales tax (IPI) on machines and equipment designated for R&D;
- Accelerating amortisation and immediate depreciation of machines and equipment designated for R&D; and
- Offering exemptions on income tax on overseas remittances for registration and maintenance of branches, patents and plant varieties.

However, according to MSTI's 2012 annual report on the utilisation of financial incentives, from 2006 to 2011, among the 1,475 companies participating in *Lei do Bem*, only 46 actually demonstrated results in technological innovation (i.e. only 3 per cent of the companies benefited). Overall, it is reported that fiscal incentives for innovation in Brazil account for only between 0.03 per cent and 0.05 per cent – this is very low when compared with other countries, including South Korea, where the corresponding value is in the region of 0.1 per cent to 0.2 per cent.[73]

[71] http://www3.weforum.org/docs/WEF_Competitiveness_Lab_Latin_America_15.pdf
[72] http://thebrazilbusiness.com/article/tax-incentives-for-technology-innovation-in-brazil
[73] Tax Incentives for Technology Innovation in Brazil: The Brazil Business; July 2013

3.8 Interactions between Business, Universities and Governments

There are numerous examples of organisations, structures and platforms in Brazil designed to facilitate collaboration between business, universities and governments to assist in the development and commercialisation of research. Some of the key ones are profiled below.

3.8.1 Research Institutes

In addition to the PRIs (Section 3.6.2), there are other research institutes, such as IPT.

Case Study: IPT – Institute for Technological Research[74]
Budget: R$153 million (2013)

Mission: Create and apply technological solutions to increase company's competitiveness and to promote life quality.

IPT, one of Brazil's largest research institutes, works in four major areas: innovation; R&D; technological services and metrological support; and information and education in technology. IPT is reportedly highly integrated, attuned to the opportunities and demands of technological development and maintains its collaborative role in Brazil's development, acting as a qualified link between universities, research centres and the business sector.

Founded in 1899 as the Material Resistance Laboratory, IPT was one of Brazil's first applied R&D&I institutes. In 1976, it became a public private corporation with annual revenue targets. Today it comprises 11 research centres and 37 laboratories and technical sections, with a staff of over 1,000. The research centres act in a broad range of multidisciplinary fields, encompassing segments such as energy, transportation, oil and gas, environment, cities, health and safety.

In 2013, IPT produced 26,951 technical documents, 338 papers in journals and congresses and 11 patents. In 2013, only a third (32 per cent) of IPT's annual revenue came from the State Government with the balance from R&D contract services. IPT's recent investments have helped modernise the Institute and support new areas of focus.

3.8.2 Business Incubators and Science Parks

Although many of the policies designed to support innovation have increased in scope and number over time, particularly following the launch of the 2005 Innovation Law, support for business incubators in Brazil dates back to the late eighties. Since then, the programme has grown and enlarged its scope to include support to technological parks.

[74] http://www.ipt.br

Established in 1987, **Anprotec (the Brazilian Association of Science Parks and Business Incubators)** has approximately 280 members, including business incubators, science parks, education and research institutions, government bodies and other entities focused on entrepreneurship and innovation. As the leader of the movement in Brazil, the association operates through training activities and the articulation of public policies, as well as the generation and propagation of knowledge.[75]

A study conducted by Anprotec in partnership with MCTI in 2011 showed that at that time Brazil had 384 incubators in operation, benefitting 2,640 companies and generating 16,394 jobs. These incubators had graduated 2,509 projects, in total generating revenue of R$4.1 billion and 29,205 jobs.

Today, Brazil has 400 business incubators and approximately 30 science parks.

In July 2013, FINEP issued a R$640m (US$1,452m[76]) call to support incubators and technological parks, as well as resident companies in both incubators and technological parks. By substantially raising the investment level to support projects with technological risk, the call was touted as important leverage to the development of innovative entrepreneurship in Brazil. The resources will be distributed through three instruments.

1. **Technological parks** (operational and to-be-implemented parks) will receive R$90m (US$204.3).
2. R$500m (US$1,135) will be offered through loans under the eligibility and financing terms of the **Innovate Company Brazil Programme**.
3. A new R$50m (US$ 113.5) risk investment fund, **Innovate MSE Company Fund** will make equity investments and provide managerial support to companies in incubators and parks, as well as those that left them up to two years ago.

It has been reported that universities in Brazil are assuming an important and necessary role in the country's entrepreneurial and innovation ecosphere and, in turn, university-based incubator programmes are flourishing.[77]

In its series on the future of the Brazilian economy, the *Christian Science Monitor* wrote about startups created from these programmes, such as business school graduate Andre Averbug's company that provides software for mass-transit services, PV Inova. The company is one of 47 companies that 'graduated' from the Genesis Institute at the Pontifícia Universidade Católica in Rio de Janeiro. Together, they have so far created 887 jobs. According to the World Bank's sponsored Infodev partnership of aid agencies, 75 per cent of companies supported by incubators are still operating three years later.

Furthermore, a Networks Financial Institute working paper argues that Brazil leads one of the most successful incubation movements in Latin America, with incubator models that are bottom up or suited to indigenous needs.

[75] http://anprotec.org.br/site/en
[76] Converted as of July 2013 xe.com
[77] Ortmans, *Op. Cit.*

Case Study: Porto Digita (Digital Port) Recife[78]

In 2000, in an effort to address the decline in the prosperity of Recife due to decreases in global sugar prices (the city had been the centre of the region's lucrative sugar trade), the Recife Government worked with the private sector and the Federal University of Pemambuco (UFPE) to create an ICT park in the city's historic centre. The park, Porto Digita, has attracted a cluster of more than 200 companies including MNCs such as IBM and Microsoft, with a collective revenue of more than R$1 billion ($460 million). This area is increasingly becoming known as Brazil's Silicon Valley.

To lure technology companies away from the more developed areas of the south, the government offers a series of fiscal incentives to participating companies, a big attraction with a country with one of the most onerous tax systems in the world (Brazil has among the highest statutory corporation tax rate in the world.[79]) One of the biggest incentives is a discount of up to 60 per cent on the so-called ISS services tax paid to the State Government.

The local government has also created public employment agencies to make it easier for companies to hire the highly trained staff that they need without the difficulty of dealing with Brazil's bureaucratic employment laws. The park's link to UFPE has provided a steady supply of trained workers for Porto Digita, and many UFPE graduates do not need to move cities to secure employment.

Despite the positive feedback and progress of Porto Digita, it apparently still lacks the private and foreign sector investment needed to bring the scale, expertise and international distribution channels.

3.8.3 International Collaboration between Government Industry and Universities[80]

While not the focus of this paper, much has been written about the collaboration and bilateral trade between China and Brazil. China has been Brazil's largest trading partner since 2009 and Brazil is the second-largest destination for Chinese energy investments, primarily oil-related.[81]

However, the establishment of the **China–Brazil Centre for Climate Change and Innovative Technology for Energy (CBCCCIT)** is pertinent to this review as an example of interaction between industry, governments and universities, with one of the goals being the commercial outputs the collaboration produces. The centre brings together experts from the leading research and engineering universities – Tsinghua University and the Federal University of Rio de Janeiro (UFRJ). Through this centre, the two countries intend to build technology cooperation and develop partnerships in

[78] *Financial Times*, 23 October 2013, Brazil, Innovation, Research & Development: FT Special Report
[79] According to the corporate tax ranking 2012, published by the Oxford University Centre for Business Taxation
[80] http://www.iea.org/publications/freepublications/publication/PCS_ChinaBrazil_FINAL_WEB.pdf
[81] Brazil–China Cooperation Could Influence Other Countries' Clean Energy Choices Centre for International Governance Innovation (CIGI), 18 September 2013

four initial areas: biofuels; wind energy; deep-water oil; and carbon capture and storage (CCS) technologies.

These activities are designed to foster academic and business links, support new technology development and identify areas for the creation of economic clusters. The centre is sponsored by the Brazilian MCTI and supported by funds for research from ANEEL (Brazil's National Agency of Electric Energy). Its board and advisory council comprise both academics and industry representatives from both countries and institutions.

3.8.4 National Programme of Knowledge Platforms (*Programa Nacional de Plataformas do Conhecimento*, or PNPC)

The PNPC aims to support STEM innovation and commercialisation in Brazil. It was launched in June 2014 to help create favourable conditions to foster more **positive integration between enterprises and scientific research to generate innovation.** The platforms structure **public–private arrangements** to connect newly developed infrastructure and scientific knowledge generated in universities and research institutions with the needs of government, companies and other organisations capable of bringing new research to the markets.

The platforms hinge upon the logic of scaling-up science and technology to solve large-scale problems and strategic priorities in Brazil. Platforms will be launched in agriculture, technology, energy, aerospace, advanced manufacturing, IT and the Amazon. The initial platform will consider health. Some essential features of the programme's operation are that all platforms need to:[82]

- Combine the participation of excellence in research groups and one or more companies or consortium of companies;
- Have economic relevance, be oriented to produce science, technology and innovation to strategic areas for Brazil's productive development, and contribute to the development of technologies relevant to the improvement of the Brazilian population's quality of life;
- Have a research institute with ability to anchor the process of technological development; and
- Have a flexible institutional framework and proper governance. Although the transformation of science into innovation requires time and persistence, it cannot be barred by cumbersome and costly bureaucratic procedures.

[82] Portal Brazil

4 Perspectives on Commercialisation of Research in Brazil

Numerous stakeholders interact with government to advise and influence on policy affecting business–university collaborations and the commercialisation of research. In our primary research for this project, we spoke with senior stakeholders working in the following organisations and institutions:

- IP Manager, Agency of Innovation at Unesp (AUIN/ São Paulo State University)
- International Relations Manager, Technology Centre of Regional Development of Viçosa (CenTev)
- Education Sector (Science Technology Innovation and Culture) Brazilian Embassy, Canberra
- Coordinator, International Cooperation, ANPROTEC (Association of Business Incubators and Science Parks)
- External Relations Manager, education institute of a large global mining company with a large research and postgraduate teaching institution
- Officer of Coordination of Business and Contracts, Embrapa (Brazilian Agricultural Research Organisation)
- Deputy Director Science and Innovation, UK Foreign and Commonwealth Office
- Dean, Architecture/Urban Planning and Supervisor, Environmental Management, University of São Paolo.

We have used the insights gleaned from talking to these industry experts and supplemented them with relevant findings from our literature review to provide an additional perspective on how the process of commercialisation of research is proceeding in Brazil. This includes identifying any barriers to commercialisation and some commentary on the impact and effectiveness of government policy in this area.

Throughout this section, we have included verbatim comments from the interviews. We believe that this serves to provide authenticity to our reporting, as well as enabling for a subtlety of meaning that might be lost in our summary comments. The language used by the articulate and highly experienced respondents who took part in the primary research was not always succinct and there seem to be two main reasons: firstly for some of our interviewees English is not their first language; and secondly (and even for those respondents who do speak native, fluent English) the enormity of the subject matter and its complexities mean it seemed difficult for them to always provide concise responses.

4.1 Overall Perspective

While there is a significant push from the Federal Government for innovation and the recognition of the need for innovation as a driver of economic development, supported by legislation, initiatives and improvements in technology transfer systems, the concept is not necessarily understood or translatable.

> "*We need to have a social dimension of innovation. It's far from reality. People don't know what innovation means. We need to spread the word, but how to express innovation?"*

The president of FINEP, Glauco Arbix, recently stated that the Brazilian economy is still not very innovative and that the country has a "giant" need for investment, at least £50 billion a year, on research and development (R&D).

> *"This is a key issue that rubs against the fiscal adjustment agenda. Education, science and technology do not deserve to enter the cutting line as is usually done by adjustment programs. We are defending very hard to keep at least the pace [of investments] to meet the demand of companies and universities."*[83]

Arbix pointed out that **Brazil needs to double investment in innovation by 2018** and suggested that FINEP and FIESP (Federation and Centre of Industry in São Paulo (**FIESP**) – a mediator between the private sector and government entities in the state of São Paulo – consolidate a fund of venture capital for various startups.

This call for greater investment in research and development is echoed in a recent World Economic Forum report. Among the 10 recommendations to bridge Brazil's (and all of Latin America's) skills and innovation gap is the need to ensure a sufficient level of investment for new and existing skills and innovation policies and instruments. Private sources of funding, in particular, must be encouraged to support innovation research and entrepreneurialism in the region.[84]

4.2 Perceptions of Commercialisation

There is recognition that over the past decade, Brazil has, indeed, improved its productivity in terms of commercialising research, helped by federal policy initiatives and legislative changes. As noted by one respondent who has been involved at a Technology Transfer Office (TTO) in São Paolo for over seven years:

> *"The Innovation Law is one of the activities [that has improved things]. There are other laws regarding the innovation system, another law provides tax incentives for companies to pursue R&D with universities. It's had a positive impact."*

A 2013 OECD survey[85] conducted on the public perception of scientific research benefits showed that Brazilian public opinion proved to be the most supportive of the 32 countries surveyed with almost 80 per cent of respondents believing that the benefits of the research outweighed any potential harm.

[83] http://www.finep.gov.br/imprensa/noticia.asp?noticia=brasil-precisa-investir-r50-bi-ao-ano-em-pd-diz-glauco-arbix
[84] January 2015 report: Bridging the Skills and Innovation Gap to Boost Productivity in Latin America The Competitiveness Lab: A World Economic Forum Initiative, http://www3.weforum.org/docs/WEF_Competitiveness_Lab_Latin_America_15.pdf
[85] http://www.oecd.org/sti/sti-scoreboard-2013-brazil.pdf

A 2014 study across Brazilian universities' TTOs revealed that this group thought that the interpretation of commercialisation might be too narrow as the Brazilian market matures. According to the report, early conversations on technology transfer and commercialisation focused quite heavily on patenting, both as a process that could be monitored and measured, and in a belief that this was the best way to package new knowledge to take it from universities to companies. That view is no longer dominant as other routes, including spinouts and consultancy, are also considered to be valuable means to take the knowledge from the academic to the industrial.[86]

4.3 Barriers to Collaboration

The respondents talked about some of the barriers to collaboration, highlighting the fact that the government has its limitations in terms of overcoming some of them. For example:

> *"Ninety per cent of PhD researchers stay in universities. They don't go to companies. Universities lack the human resources that can talk to industry. Government should improve this, move the PhDs to companies. But the power for fostering that by the government is limited."*

Another respondent noted that the government is indirectly attempting to change the culture amongst academics via the TTOs:

> *"Our professors are very traditional, the government is telling us to change their mind, interact more to see the research becoming a product. We want to work more intensively with transfer of technology."*

It was also highlighted to us that numerous layers of process required by government (its agencies, legislation and/or policies) continue to present significant barriers to productive and efficient collaboration, for example:

> *"For pharma research, during the patent application process the application must go to be analysed by the VISA [equivalent to US FDA] and then if approved by VISA, it comes back to the Brazilian patent office. It doesn't matter if the technology was developed by a university or a company, it must go to VISA."*

> *"In Brazil anyone who pursues R&D in biodiversity must apply for authorisation. They must present the project…with the agency of environmental ministry. It's been 13 years of discussing the issues, it affects all developments…congress has approved new rules…I hope the new bill is clear and simple so it's no longer difficult to work with organisations. So we can transfer this kind of technology with no problems."*

[86] Dr Finbarr Livesey (2014) Report on survey of Brazilian Technology Transfer Offices (TTOs), FCO/University of Cambridge, http://www.inova.unicamp.br/sites/default/files/images/FCO_BrazilTTOsurveyReport_0.pdf

Barriers to commercialisation in Brazil comprise a familiar set of challenges, most notably red tape. There are also government and industry protectionist tendencies, which stifle competition and reduce the incentives to be creative.

> *"A real burden is…we enter into cooperation with a partner abroad, in Europe, the US wherever. Then we have to declare if there is any transfer of funds from outside or from us to do research with them…It's even worse if you hire people outside. You are punished for not doing business in Brazil."*

In addition, and explored further in the subsequent section, one of the key barriers to collaboration appears to be issues within universities and in particular: the incentives (or lack thereof) for academics to collaborate; and the right skills within universities, especially within TTOs, to facilitate that collaboration.

4.4 Supply Side Considerations

The Scientific Director of FAPESP, São Paolo's state research foundation has commented:

> *"We tend to believe that the contribution of universities to development comes mostly through graduates and to some extent through the ideas and consultation."*[87]

Brazilian academics are, reportedly, primarily motivated by how much work they can publish and how many patents, and are more likely to be concerned with basic research than how it might be applied in an external setting.

> *"Professors are measured by number of publications, not if he opens a spin off – that's not within the metrics of ranking of professors. It isn't an incentive for innovation."*

> *"Most of the time we do research FOR the university, we publish the results. NOT to sell in the market…[academics] just want to get knowledge, knowledge, knowledge. Not to get to an application, not to make a difference."*

Even if academics did want to commercialise their output, for example by collaborating with business, it was unlikely they would receive support from their institution.

> *"If they do research but they want to go also to a business outside, then they have many things to do. Just for one person, they have to do it all themselves. In our university, we don't have the department to do this and the department to do the bureaucracy work."*

However, respondents recognised the opportunities and benefits to academics of forging links with industry.

[87] Carlos Henrique de Brito Cruz, *Op. Cit.*

"Professors who interact with industry, they have all the tools to work, they have freedom to research, they are surrounded by students to help them, they have connections to get money to help their labs and increase their research – the most outstanding are those who interact with the industry."

"People can profit from this type of university industry relationship. There is a personal financial incentive involved. The research group in the university, if they have cooperation with industry, they can get financial rewards. These incentives will create a lot of energy and dynamic activity."

We were given conflicting information about whether academics were able to be involved with the commercialisation of their research – particularly those in publicly funded institutions – and if they were able to receive any financial incentive.

"Legally professors from public universities are not allowed to have a role outside the universities, they are public employees, need to be full time committed to researching and teaching. There is no incentive…no possibility to take research and turn it into a product. The contract with professors doesn't encourage innovation."

"There is a rule that the money received from the product in the university has to be invested in new equipment in the lab. So university can't use the money to pay the employees, it must be used to improve the lab."

One person offered some possible clarification: academics are able to engage with industry and government so long as it takes place through an intermediary foundation.

"We work with the private sector through foundations. So private enterprise contract foundations and the foundations then contract the public institution. We need the foundation to intermediate [sic]. It is completely legal. The foundation gets 5 to 20 per cent of the contract budget. In the case of USP, we have 15 foundations working this way, economic, architecture, and so on. Professors use foundations to get jobs with government and private sectors."

These foundations provide an important 'bridge' between the academic staff and the external market.

"The government can contract the university directly but only for up to [a limited figure]. Beyond that they have to go through open call. But they can contract directly with high amounts of funding using foundations…We also commercialise research using the foundation."

The coordinator of the research project within the university allocates any funds received from the commercialisation of research.

It was reportedly more difficult to gain additional income through public sector work.

"You can pay professors but only if research is with private sector. If it is with the public sector, it is very difficult [to receive extra money]."

There is variation between the faculties – and presumably universities – in the extent to which they are involved in these commercialisation activities.

> *"It depends on the board of the school – some don't incentivise this way. In the civil engineering and law school and economic school they incentivise innovation – it's not a written policy but…It depends on the philosophy of each school. Sociology, architecture, the human schools – they don't incentivise much…Engineering, economics, law: they [have] a big footprint on the private sector. "*

While some schools may be motivated by financial profit, others have broader reasons for taking on external projects.

> *"In my school, if you have research with public companies such as government, the results has more value than if you do research for private markets."*

These broader goals were reflected in the comments of FAPESP's Scientific Director:

> *"The main challenge for us now is to raise the impact of the scientific work we do. By impact we have at least three meanings: intellectual impact, which might relate to citations; economic impact and the social impact of the research."*[88]

A 2013 study (based upon interviews with experienced academic scientists and managers from four universities in Brazil) investigated what motivates Brazilian academic researchers to get involved in University–Industry Technology Transfer (UITT), as well as the deterrents to contributing to this process.

The study showed that the major motivators for academics were: to generate resources; to solve problems; for professional challenge; for personal gains/personal gratification; for academic prestige; to compete; and to help solving problems of society. Factors that discouraged researchers included: time required for UITT; lack of incentives; the innovation environment; and a fear of contravening university rules.[89]

A respondent highlighted again the challenge of limited connections with industry and the overall culture of the institution.

> *"We see that bigger, stronger faculty that have research already that is developed is better. They make better connections with the companies. They are older, have more tradition, better in establishing these partnerships. It doesn't depend on the area, because it happens in chemistry or any other area. It depends on the culture of the university and quality of science made there."*

[88] *Ibid.*
[89] http://www.scielo.cl/scielo.php?pid=S0718-27242013000500008&script=sci_arttext

The University of Cambridge study referenced earlier provides insights into to how TTOs in Brazil perceive their environment as a key to their effectiveness. Some key findings include the following points.[90]

- **Many TTOs are weakly integrated and supported into their institutions.** While the Innovation Law makes it mandatory for each university to have a TTO, this does not automatically mean that all TTOs will be created equal. Most importantly the level of support for the TTO will vary depending on the scale, focus and culture of each university. There are very high levels of concern regarding how well integrated technology transfer and the TTOs are within their universities:
    - 54 per cent believed they did not have the necessary support and funding; and
    - 63 per cent believed that technology transfer was not an established part of the university's strategy.

  This, combined with a majority agreeing that **researchers are inadequately incentivised** to bring disclosures to the TTO, paints a picture of the TTOs feeling marginalised and disconnected from the organisations they are trying to serve.

- **Weak links to financing.**
  Half the sample did have some formal links to incubators, but only 26 per cent have formal links to venture capital companies and there are no formal links to angel investors. Even accounting for informal links to both venture capital companies and angel investors, it appears that over **two-thirds of the TTOs who responded to the survey have no links at all to follow on funding**.

- **TTOs may not have the necessary commercial and technical skills**:
    - 29 per cent of TTOs felt that they did not have the necessary legal skills;
    - 45 per cent of TTOs believed they did not have the necessary technical skills; and
    - 13 per cent felt they had the necessary commercial skills to be effective.

Highlighted earlier in this report are the significant differences in terms of research and the commercialisation of research across different regions in Brazil. The survey provided further evidence of some significant differences amongst TTOs by region.

The survey's findings are supported by comments from our respondents who also queried the efficacy of many TTOs. While some did a good job, they were in the minority.

> *"I do know several good examples where technology transfer is being well organised, places where they have a spin-off centre and several of them have already been promoted out to the market. USP, their outsourcing centre is*

[90] Livesey ,*Op. Cit.*

doing great things: they have a taste for it [technology transfer] and are doing it on a massive scale. But for many of them, I never really understood what they were doing and what was the benefit."

Another respondent emphasised that TTOs are, by their 'public' nature, somewhat handicapped at attracting and maintaining the right talent for innovation:

"TTOs face bureaucratic and legal issues, who to hire, and their salaries are not competitive. We don't have a culture of innovation – so it's difficult for someone to understand – but it's hard to hire from the private sector into TTOs which are publicly funded at mostly publicly funded universities. It's hard to get talent, people who are interested in working in TTOs where salaries are not attractive, with procurement processes and bureaucracy."

This respondent continued by stating that TTOs in Brazil were truly disadvantaged by comparison with their British counterparts.

"*If you look at the UK – the Knowledge Transfer Network (KTN) funded by government [Innovate UK], they have obligations to build links, to introduce people to each other. The KTNs are divided by areas of expertise: energy, food and so on. Each KTN has a specialist who knows about their sector and companies in that field. They are able to connect different partners. So TTOs in UK universities, their role is to know what's going on in the university and make links to industry. In Brazil, companies are not seeking out unis for technology, government is not giving or changing legislature to help with the legal system. So much is underdeveloped and a university has limited resources…so their roles are different – they have to work to develop the network, bring companies to innovate, take part in public events – they have ongoing work of following the system. But in the UK, they can negotiate the technology and startups. In Brazil, TTOs lose their focus because they have to do other stuff."*

Another respondent cited an erroneous focus on patents as a key metric of commercialisation success at the university that inherently distracts a TTO from accomplishing successful commercialisation of research.

"*Patents are not good measures because patents don't equate productivity of commercialised research. Just because something is patented doesn't mean it is produced and on the market."*

Indeed, as this respondent went on to explain, patent law in Brazil requires that products be brought to market within a short timeframe or else the patent will expire.

"There is a law in Brazil…the product must be developed and used, not just put on a shelf. If a product is developed through partnership in R&D and that product is not produced and on the market in two years, the company must give the patent back to the university. This is the main reason patents are not good metrics for success."

4.5 Demand Side Considerations

Our respondents highlighted the diversifying nature of Brazilian corporate demand for R&D and the growing role of SMEs in Brazil and their specific R&D needs.

> *"We had always dealt with the major companies in Brazil, that have R&D, but now we are starting to deal with SMEs also. So it is growing…"*

The commercialisation of R&D requires a commercially driven/customer-focused approach to business development.

> *"We need to connect research capacity with market demand – we go the other way. We see research a professor is working with and we try to find a need in the market. We should go to market and get their demand and go to lab to find solutions."*

Interestingly, in the survey of TTOs[91] mentioned earlier, a significant percentage (66 per cent) of TTOs who participated in the study thought that **there was a perceived lack of demand for Brazilian research outputs.**

This sentiment was echoed in our interviews: SMEs, we were told, did not have a culture of investing in research.

> *"The SMEs, they're not prepared to get involved in the innovation project. They are not so capitalised. There is no culture of innovation at that level."*

It was queried the extent to which government policy could impact on this kind of barrier.

> *"It's not only the policy: it's the whole cultural, the whole macro thing. Most of them, [companies] they just buy the technology that's already there. They don't think in the long term."*

The cost and availability of finance are among the barriers faced by businesses wishing to invest in research.

> *"If the private company does want to get the money from the bank, the interest is still high – and the funding, they are quite limited."*

A recent Economist Intelligence Unit survey noted that Brazil, while indeed creative, has a "risk averse mentality for business" – which is considered to be a significant deterrent to innovation.[92]

One of our respondents summarised the mentality:

> "*Brazil does not have lot of venture capital funds. Why do that when you can just sell products! When you look to conduct business right now due to middle-class growth, you can easily make money selling refrigerators because more people now have money for the products they haven't been able to purchase.*

[91] Livesay, *Op. Cit.*
[92] Economist Intelligence Unit (2012), *Emerging markets: SMEs capture growth in expanding markets*.

Another example, it has been a hot summer, factories have run out of fans, so just sell fans. Why innovate when you can make money now?"

4.6 Ecosystem to Commercialise Research

A strong message that came through the research is that in many fields, Brazil is undertaking excellent research, but that it is often not being put to good use as it is disadvantaged by a poorly or under-developed ecosystem to support the commercialisation of research.

> *"It is not that Brazil lacks talent...The question is do you have it organised in a fashion where it can be collaborative and multi-disciplinary."* [93]

> *"The problem is not the R&D projects – there's a lot in Brazil – it's how you get it into the outside world. So how can I transfer my technology to someone who doesn't have it? There's two problems: one, the interest to take it up and improve it; and two, they don't have the tools, the financial situation and the support from the government."*

> *"[Compare] the Brazilian innovation with the UK innovation ecosystem – the biggest difference here in Brazil is lack of communication between industry and the government and the fact there aren't middle men or networks established to promote such interaction. The ecosystem is missing this. The key players don't talk to one another – one of the biggest problems is the lack of dialogues and interaction. Because the whole process and system development was not done naturally over time as it has within the UK."*

Universities had only limited involvement with companies and discussions reportedly sometimes stall due to disagreements over licensing fees.

> *"Still in Brazil, the university does not talk that much to the companies. They do research that could be useful, but then sometimes they have maybe the patents question, the IP questions: How it should be distributed? Maybe there is some disagreement, the universities they say the income should be theirs, the businesses they don't agree."*

One respondent spoke of an ideal situation in which rather than innovation happening because of government policy, instead that there be support available on a project basis.

> *"I would like to see cooperation established around concrete projects, themes and subjects. Rather than having to respond to a policy, it would be better to have each case built individually and policy works around that to get the best results."*

[93] Nicholas M. Donofrio of NMD Consulting http://im.ft-static.com/content/images/913b48b6-3bcd-11e3-9851-00144feab7de.pdf

Overall, though, most of our respondents were fairly positive and believe a thriving ecosystem to support commercialisation in Brazil is inevitable.

> *"This whole applied research is not yet very developed. Brazil is still learning how science and universities feed themselves. Research is still governed by pure science. It's a matter of time and ones' whole perception of how to act and develop. Things will change. The people here, they have an energy and a belief... we will soon have businesses that realise that this is the way to be successful."*

> *"There are more and more examples of where you can go and see spin-offs are being created. The beginning is already done. And it's something that will catch up more dynamics over the years as people see how it has worked."*

More generally, the Scientific Director of FAPESP has laid out the overall approach to finding the right balance of research within his foundation.

> *"We value science which makes business more competitive, heals the sick person and especially that helps poor people become richer. But we also value strongly the science that makes mankind wiser and we do not ask more questions beyond that. We try to have a portfolio of research that does those four things."*[94]

4.7 Government Policy

The Brazilian Government is perceived to be, in principle, highly supportive of research and innovation.

> *"It has two major federal and state funding organisations that are well organised. They have a good reputation because they really dedicate their funds to the research, they promote research in Brazil and give a lot of young talent the opportunity to come back and encourage them to work here."*

Some respondents correlate the country's pockets of innovation excellence – *"where it is recognised as a world leader – agriculture and aerospace and tropical disease and biofuel"* – directly to national policy.

> *"These areas were prioritised by the Brazilian Government and supported for last 15 years."*

Brazil, it was pointed out, has invested in specific companies to bring innovation in specific sectors to Brazil, such as, EMBRAER an aerospace public company, supported by public research universities and the Oswaldo Cruz Foundation FIOCRUZ – owned by the Ministry of Health – which provides all vaccinations.

[94] Carlos Henrique de Brito Cruz, *Op. Cit*

However, getting financial support for specific programmes can be challenging.

> *"We have been fighting to get more finance for three to five years. We have a lobbyist who fights for us, who fights for innovation. Finally, we get a good amount of money to give incentives to businesses."*

There were differing perceptions as to the levels of funding available. Some thought that the government was providing more support (albeit through many layers of bureaucracy). Others thought that money going into research and innovation had been reduced. Another perspective was that the funding was spread too thinly to have a long-term impact.

As mentioned earlier in this report, the 2004 Innovation Law was seen as a turning point in terms of legislation designed to positively impact the commercialisation of research in universities. However, one of our respondents voiced some skepticism about the law.

> *"The Innovation Law 2004 is only an obligation to set up a TTO. It was positive overall, it did encourage unis to get this [TTO], many did set up offices and started to try to innovate. But just because the law is there, it doesn't mean every university is committed to innovation."*

A recent survey of TTOs in universities across Brazil reveals that many professionals working within the transfer of technology believe the current legal framework is not working effectively. When asked to agree or disagree with the statement *"The current structure of national law regarding technology transfer (Innovation Law in 2004) works well and does not need to change",* three quarters of the sample disagreed.[95]

Sometimes policies were changed due to party politics before they had a chance to play out.

> *"You establish some programme, the next government comes and disrupts it. There is no stability. But it's a law: it should be that you can't just stop it before it develops its full strength."*

Moreover, the focus was still too much on basic research.

> *"They already provide a lot of research funding. I think they could put more into industry related funds, more applied research funds."*

Some indicated that the Brazilian Government had been forced to step in to invest in R&D because of the lack of willingness on the part of private business.

> *"The private sector, they don't invest in R&D. They don't have departments and researchers and machines, so the government is driving the line to say what sector is important? What sector can be more developed? What kind of research? If we have a strong private sector with R&D projects going on and with full investments, you wouldn't need the government."*

[95] *Ibid.*

This reliance on government funding was a concern.

> *"As soon as funds are made available directly for industry, it causes disruption, because these are things that industry should pay for itself. Industry has the responsibility to use and pay for the knowledge of the groups. If industry pays, they [researchers] can get extra funding from some other source. But the government should not be funding it."*

It was suggested that government should be more strategic with its funding.

> *"On the other hand, government can be and should be investing into the research landscape and strengthen it in specific ways. So if you have five or ten outstanding mining research organisations, and they are developing themselves into strong partnerships, then industry will come."*

With high tax a key barrier to the commercialisation of research, government (both federal and state) policies that mandate tax reductions or exemptions for technology collaborators with research institutions were welcomed.

> *"The most important change I would tell the government to make would be the reform of your tax issue because this is a very old one that you're using and the government is taking up too much taxes from the company."*

> *"We have state law and municipal law of innovation, brings tax exemption to resident companies in the technology park, they [companies in the park] receive benefits for innovation. We transfer technology from the university to industry, and we license the technology, belongs to half to university and half to the company. Tax exemption varies from 8 to 15 per cent…the difference to belong to a technology park is huge."*

The state-based research support foundations (FAPs) were perceived to be instrumental in the commercialisation of research, though there was concern that perhaps too much of their funding went towards the larger companies that had the resources to put in applications and wait for the funding to come through.

> *"Sometimes the small companies don't have the time to wait or the people to do the work to get the money."*

However, the FAPs were sometimes reportedly unable to match the funding offered by the Federal Government in a timely fashion.

> *"Some of the states don't have the money to go for 50 per cent. Sometimes when the project is already approved, it turns out that the money wasn't available…they actually get the money itself one or one and a half years later on."*

Government (it was not indicated if this meant federal and/or state) brought in external advisors to help ensure that funds were distributed to the projects with the greatest potential.

"They have a board and a committee: they are composed by association representatives. They are mostly government and representatives of private sector to choose and evaluate these projects."

Some even thought that government was **too** consultative in its process.

"It is too democratic in many ways and open to too many discussions until compromises can be found. It takes a lot of time, this the thing that makes it slow: it's partly the bureaucracy and the very democratised institutions."

4.8 General Considerations

Perhaps the strongest theme that emerged through the primary research was that Brazilian bureaucracy and red tape continues to present significant obstacles to the government's push for innovation.

"We have many barriers. If you need to import any equipment it takes time, if you need money it takes time, we don't have this time when we talk innovation."

"The private companies, year by year are receiving more and more rules, additional laws and regulations…[But] when you are talking about innovation, you need to be fast without regulations."

"You go to the board [to get funding] and it takes 1.5 years, and by then the technology is out of date already."

"It is not an environment that supports innovation because of its regulatory environment and bureaucracy. Starting a new company is not easy…it takes long time to get permits. In the UK by comparison you can open a company in two days and close the company in one day. In Brazil it takes months or years."

"The Good Law – the way that law works it is not easy to understand, not clear if recipients will get the funding or the exemptions or reimbursements. The Good Law does not guarantee much to companies."

This sentiment is highlighted in many reviews of the Brazilian system. For example with regard to intellectual property, patent approval process has been an issue due to the long backlog. The government agency in charge, the National Institute of Industrial Property (INPI) under the Ministry of Development, Industry and Foreign Trade (MDIC) is making structural changes to help address this, although a solution to the bureaucratic red tape seems more complicated.[96]

[96] http://www.inova.unicamp.br/sites/default/files/images/FCO_BrazilTTOsurveyReport_0.pdf

The EIU survey on SMEs shows that bureaucracy is a particularly heavy burden in Brazil with 90 per cent of respondents stating that it is an obstacle to their firm's growth and half (50 per cent) describing it as a major obstacle.[97]

[97] EIU, *Op. Cit.*

Appendix 1: Goals of the Greater Innovation Plan (2010–2014)

Guideline #	Description
1: **Strengthening of Productive Chains**	Coping with the national production replacement process in industries heavily affected by competition from imports. Seeks to increase the productive efficiency of domestic enterprises, increase value addition in the country and curb unfair practices of competition.
2: Expansion and Creation of New Technology and Business Skills	Encouraging activities and companies with the potential to join dynamic markets and high technological opportunities and use the purchasing power of the public sector to create knowledge-intensive businesses and scale.
3: Development of Supply Chain in Energy	Use of environmental and business opportunities in the energy sector, for the country to occupy a privileged place among the largest global suppliers of energy and technology, capital goods and related services. The priorities include opportunities identified in oil and gas and renewable energy, such as ethanol, wind, solar and charcoal.
4: Diversification of Exports (markets and products) and Corporate Internationalisation	Focussed on the following objectives: o Promotion of manufactured goods of intermediate technologies and critical frontier in knowledge o Deepening of business internationalisation effort via product differentiation and value. o Rooting of foreign companies and encouraging the installation of R&D centres in the country.
5: Skills Consolidation in Economics of Natural Knowledge	Use the advancements made by the knowledge economy to expand scientific and technological content-intensive sectors in natural resources, allowing the country to take advantage in the production of commodities to advance product differentiation.

Appendix 2: Bibliography

B-BICE, Promoting Research and Innovation between Europe and Brazil, http://www.b-bice-plus.eu/approval-of-pec-122014-a-breakthrough-for-innovation-in-brazil/

Boston Consulting Group, (2013), *Brazil: Confronting the Productivity Challenge,* https://www.bcgperspectives.com/content/articles/growth_value_creation_strategy_brazil_confronting_the_productivity_challenge/

CIA, The World Factbook, https://www.cia.gov/library/publications/the-world-factbook/

Clean Energy Choices Centre for International Governance Innovation (CIGI), (2013), 'Brazil–China Cooperation Could Influence Other Countries', 18 September

de Brito Cruz, CH, (2012), *The view from Brazil: The Knowledge Economy and Higher Education in Brazil and Beyond*, Universities UK Annual Conference, https://www.youtube.com/watch?v=75wccmeOFhQ

Economist Intelligence Unit (2012), *Emerging markets: SMEs capture growth in expanding markets*

European Commission ERAWATCH, (2011), Mini Country Report / Brazil, http://ec.europa.eu/enterprise/policies/innovation/files/countryreports/brazil_en.pdf

Financial Times, (2013), 'Brazil must embrace change to flourish', 22 October
Financial Times, (2013), Brazil, Innovation, Research & Development: FT Special Report, 23 October

Global Innovation Index 2014: The Human Factor in Innovation, Cornell University, INSEAD, and the World Intellectual Property Organisation (WIPO), https://www.globalinnovationindex.org

Group of Eight, (2014), Policy Note: Funding in Selected Countries, April

Livesey, F, (2014), *Report on Survey of Brazilian Technology Transfer Offices (TTOs),* FCO/University of Cambridge, http://www.inova.unicamp.br/sites/default/files/images/FCO_BrazilTTOsurveyReport_0.pdf

OECD, (2013), The OECD and Brazil, http://www.oecd.org/brazil/Brazil%20brochureWEB.pdf

OECD Directorate for Science, Technology and Industry, (2013), http://www.oecd.org/sti/sti-scoreboard-2013-brazil.pdf

OECD/International Energy Agency, (2013), Energy Investments and Technology Transfer across Emerging Economies: The Case of Brazil and China http://www.iea.org/publications/freepublications/publication/PCS_ChinaBrazil_FINAL_WEB.pdf

Ortmans, J, (2010), Brazil's Entrepreneurship Boom, www.entrepreneurship.org/policy-forum/brazils-entrepreneurship-boom.aspx

QS Top Universities, http://www.topuniversities.com/

Research Brazil Ireland (RBI), http://rbi.ie/

Rezende, S, *Innovation Policy around the World: Brazil: Challenges and Achievements*, http://issues.org/28-4/realnumbers-31/

Start-Up Brasil, http://www.startupbrasil.org.br/?lang=en

The Brazil Business, (2013), Tax Incentives for Technology Innovation in Brazil, July http://thebrazilbusiness.com/article/tax-incentives-for-technology-innovation-in-brazil

UK Government, (2013), Tackling Global Challenges through Science and Innovation in Brazil, (updated 11 February 2015), https://www.gov.uk/government/priority/uk-science-and-innovation-network-working-with-brazil

World Bank, data, http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD

World Bank, (2015), Doing Business, Brazil, http://www.doingbusiness.org/data/exploreeconomies/brazil

World Economic Forum, (2015), *Bridging the Skills and Innovation Gap to Boost Productivity in Latin America*, The Competitiveness Lab: A World Economic Forum Initiative, January, http://www3.weforum.org/docs/WEF_Competitiveness_Lab_Latin_America_15.pdf