



# HIGHLIGHTS OF THE APPLIED **RESEARCH PROJECTS**

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Praia de Botafogo, 190 - Rio de Janeiro - Brazil.

CEP: 22250-900

Tel.: (55 21) 3799-6149

(55 11) 3799-3292

E-mail: [rpcap@fgv.br](mailto:rpcap@fgv.br)

[www.fgv.br](http://www.fgv.br)

Fundação Getulio Vargas (FGV), founded in 1944 in Rio de Janeiro, Brazil, has the mission of contributing to the socioeconomic development of Brazil by carrying out innovative studies with high social impact. In 2018, FGV was considered to be one of the six most important think tanks and one of the best 100 institutions of higher learning in the world. Besides this general classification among the top think tanks, FGV was also ranked as the best institution in this category in South and Central America and the tenth leading institution in the world with focus on production of applied research with impact on the implementation of public policies. Finally, in the specific area of social policies, FGV occupies fifth place in the world.

To accomplish its mission, FGV participates in various international alliances. In this respect, FGV is a member of the International Development and Public Policy Alliance (IDPPA), a global initiative established in 2012 with the objective of connecting researchers in the BRICS and other emerging countries to collaborate in the areas of teaching, research and public policy formulation. Besides being a member of this global alliance, FGV has more than 200 partnership agreements for joint research and student exchange programs around the world. In 2016 alone, about 10% of FGV's graduate students participated in exchange programs through these international partnership arrangements.

In 2018, the director of the Research Network, Goret Paulo, was appointed as the National Contact Point (NCP) for Brazil of the Horizon 2020 Program of the European Commission, in the areas of "Inclusive, Innovative and Reflective Societies" and "Science with and for Society".

As a teaching organization, FGV offers a series of undergraduate and graduate programs in the areas of public and business administration, economics, law, social sciences and applied mathematics. In 2018, these programs served 4,841 undergraduate students, 1,879 master's students and 443 doctoral candidates, drawn from six continents. In the period from 2013 to 2016, the graduate students had the opportunity to take classes given in a foreign language in 302 disciplines and 10 graduate programs developed by FGV in partnership with foreign institutions. These students also had the chance to participate in research developed in partnership with foreign institutions that resulted in 201 published articles and other academic texts.

Research Network				
Schools and Research Centers	Brazilian Institute of Economics – IBRE	Institute for Educational Development	FGV Projetos	FGV Press
Schools of Public and Business Administration Schools of Economics Law Schools School of Social Sciences School of Applied Mathematics School of International Relations National School of Management and Economics	Indexes and Indicators Center for Applied Economic Policy	Executive Education	Consulting	

The schools and research centers of FGV have complete academic and operational independence. Each year, the 716 researchers affiliated with these units are responsible for producing hundreds of articles and other academic texts which serve as a base for public debates among researchers and representatives of the public and private sectors. As a result of FGV's policy to encourage dissemination of the knowledge generated by its research activities, in the past two years its researchers have participated in more than 250 congresses, seminars and other events abroad to present

articles and posters. In Brazil in the past two years, FGV has sponsored more than 400 congresses, seminars and other events, with strong participation of foreign researchers.

In the area of administration, FGV has a school that is internationally accredited by the Association of MBAs (AMBA), Association to Advance Collegiate Schools of Business (AACSB), European Foundation for Management Development (EFMD EQUIS) and International Commission on Accreditation of Public Administration Education and Training Programs (ICAPA). The school is also a participant in the Global Alliance in Management Education, Global Network for Advanced Management (GNAM), Council on Business and Society (COBS), Global Public Policy Network (GPPN), International Partnership of Business Schools (IPBS), Business Association of Latin American Studies (BALAS), Global Alliance in Management Education (CEMS), Chartered Financial Analyst Institute (CFA Institute), Consejo Latinoamericano de Escuelas de Administración (CLADEA), Partnership in International Management (PIM), Principles for Responsible Management Education (PRME) and Global Learning Network (SUMAQ).

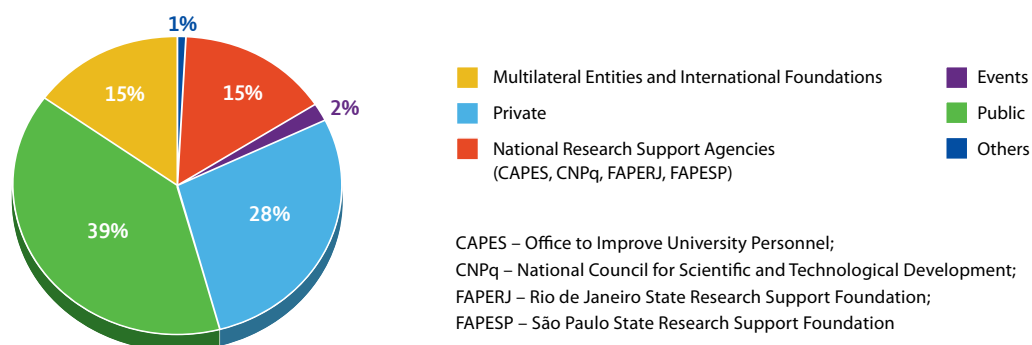
In the area of economics, since 2010 seven winners of the Nobel Prize for Economics have participated in international workshops and seminars sponsored by FGV. Additionally, alumni of FGV's Schools of Economics have been chosen for leading positions in the Brazilian government (Finance and Planning Ministers, Presidents and Directors of the Central Bank) and in multilateral organizations.

The law schools of FGV are members of the Law Schools Global League, which has the objective of mapping common interests, facilitating cooperation in research and teaching methods, developing new talents in the academic area to increase international exposure, and creating teaching and training methods to meet the demands of globalization of the legal profession. At present, the LSGL is formed by the following institutions: FGV Law Rio and FGV Law SP (Brazil), Tilburg University (Netherlands), EBS Law School (Germany), Catholic Global School of Law (Portugal), IE Law School (Spain), McGill University (Canada), Tsinghua University School of Law (China), National University of Singapore (Singapore), Northwestern University (USA), Jindal Global Law School (India), IDC Radzyner (Israel), Moscow Higher School of Economics (Russia), University of Cape Town (South Africa), University of Pretoria (South Africa), Facultad de Derecho Universidad de los Andes (Colombia), King's College London (England), Koç University (Turkey), Università di Torino (Italy), ITAM (Mexico), Universidad de Palermo (Argentina) and China University of Political Science and Law (China). According to a ranking published by Financial Times in 2016, in the area of law FGV was considered one of the most innovative schools in the world in the previous four years.

In the area of applied mathematics, mention should be made of the structuring of a research center in partnership with New York University and USP São Carlos involving data science, with the main objective of structuring studies for application of information modeling techniques in the social sciences.

The resources (grants) received from national and international research support entities, private organizations and the public sector can be considered an indicator of the recognition of the applicability (impact) of this research by the various sectors of society.

### Production of Knowledge: Total Research Cost Reimbursement 2018



With the strategic objective of encouraging the development of outstanding and innovative applied research, in 2016 FGV created the Network for Applied Research and Knowledge Network ("Research Network"), with the following objectives:

1. management of the application of resources from the Applied Research Fund – FPA FGV (internal fund to support applied research set by the Presidency of FGV);
2. mapping of opportunities for external financing of research projects of FGV;
3. approximation of the research activities with the public and private sectors;
4. contributing to the dissemination of the knowledge produced by the schools and applied research centers of FGV;
5. connection of researchers and encouragement of the formation of research networks in Brazil and abroad;
6. support for the development and monitoring the execution of applied research projects.

Besides the Research Network, the governance structure of the research activities of FGV includes the Committee for Ethical Compliance in Research Involving Human Beings (CEPH) and the Research and Innovation Commission.

The Committee for Ethical Compliance in Research Involving Human Beings, created in 2016, is one of the first ethics committees in the country with focus on the social sciences area. With the goal of assuring the highest ethical standards in the development of studies, the Committee adopts the strictest standards established by the national and international scientific community. Therefore, FGV is qualified to meet the demands of European and American institutions for publication of articles and development of research projects in partnership.

Also established in 2016 for the purpose of analyzing the methodological rigor and potential impact of the applied research projects conducted by the different units of FGV, the Research and Innovation Commission works to increase the institution's applied research production capacity.

An essential component of the process of enabling multidisciplinary projects with high social impact is the existence of a structure of incentives with focus on development of this type of project. In the case of FGV, an internal fund exists to finance the applied studies selected by the Research and Innovation Commission (FPA FGV).

The selection process of the Commission starts in the middle of each year with the announcement to the institution's researchers of an invitation to present applied research project proposals. In the last months of the year, the projects submitted are evaluated by the Research and Innovation Commission according to the following criteria:

1. the clarity and objectivity of the research question the project aims to answer;
2. the project's technical and scientific merit and methodological rigor;
3. the project's innovation and originality;
4. the project's ability to contribute to the socioeconomic development of Brazil;
5. the estimated social impact of the study, by contributing to the formulation of public policies, development of new business management models or creation of new applied methods;
6. the interdisciplinary nature of the team;
7. institutional support from entities and companies in the public and private sectors to the project, variously by providing access to databases, participation of employees or declaration of interest in using the research results, among other aspects;
8. participation of young researchers of FGV's programs and other research institutions.

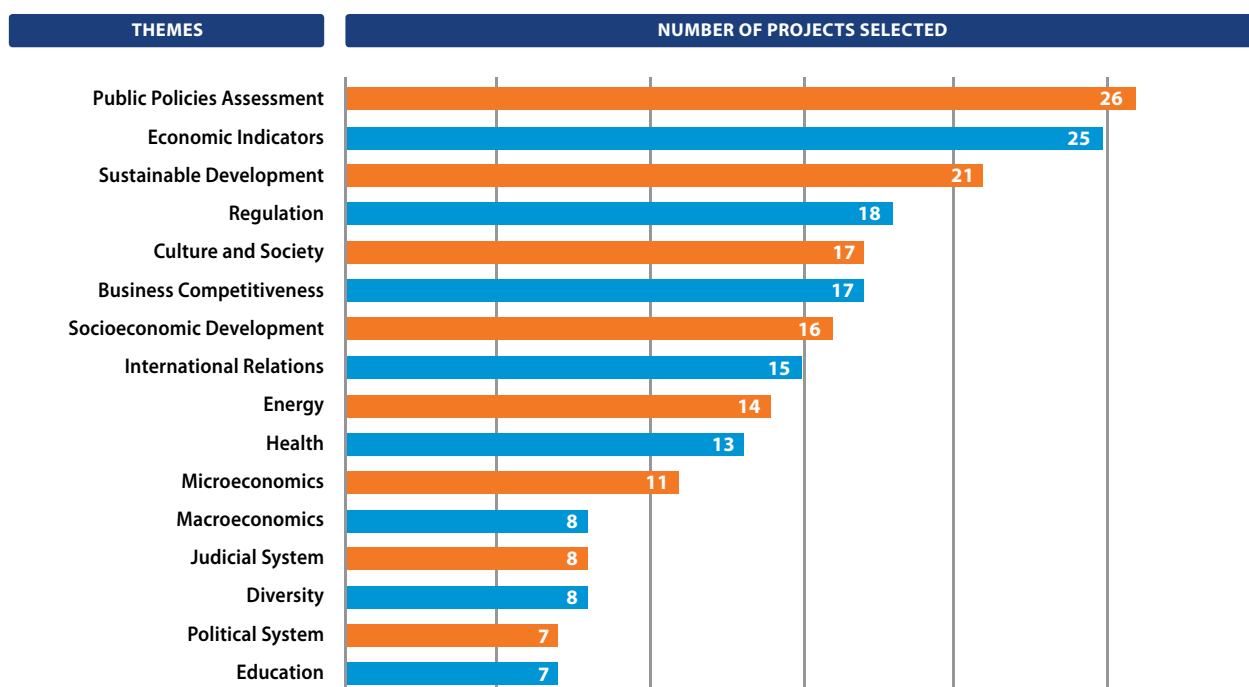
Since 2014, the FPA FGV has financed over 210 applied research projects selected by the Research and Innovation Commission. The table and graph below identify the number of projects presented to and selected each year, as well as the main themes addressed by the projects financed by the FPA FGV.

Cycle of the FPA	Number of projects presented	Number of projects financed
2014	67	47
2015	97	40
2016	115	52
2017	121	49
2018	65	31
<b>TOTAL</b>	<b>465</b>	<b>219</b>

Among the positive results of the investment in applied research projects, the following stand out:

- development of new **research themes that contribute to the socioeconomic development of Brazil and other countries** whose researchers participate;

### Highlights of Applied Research (2014 to 2018)



- **development of 26 interdisciplinary projects** where the team was formed by researchers from FGV and other research institutions in Brazil and other countries. Among these the following projects stand out:
  1. Waterproofing Data: Engaging stakeholders in sustainable flood risk governance for urban resilience – Belmont Forum.
  2. Understanding innovative initiatives for governing food, water and energy nexus (FWEN) in Cities – Belmont Forum.
  3. Fair Tax Project – H2020.
  4. Economic sustainability of civil society organizations – Europe Aid.
  5. Big data for sustainable urban development – IDB – partner cities: São Paulo, Montevideo, Xalapa, Miraflores and Quito.
  6. Evaluation and measurement of the socioeconomic impact of the breach of Fundão Dam (Mariana) – Federal Prosecution Service, Samarco.
  7. Territorial governance plan and governance mechanism along the BR-329 Corridor in Amazonas State and national policy framework for amazon-wide replication – Gordon and Betty Moore Foundation.
- involvement of **164 lead researchers** from FGV to coordinate financed research projects;
- encouragement to create **research networks among researchers** from Brazil and other countries, enabling exposure of researchers to new ideas for production of knowledge, thus created in scenario favorable to the production of innovative studies;
- expanded opportunities for **training and improvement of young researchers** from the programs of FGV and other Brazilian and foreign research institutions;
- better quality of the applied research projects by **participation in teams of researchers from various Brazilian and foreign universities**;
- **increased scientific production** of researchers.

The actions of the Research Network also led FGV to become the only Brazilian research institution with a partnership agreement signed with FAPESP <sup>1</sup>. In 2018, FGV was one of the teaching and research institutions selected to participate in the CAPES <sup>2</sup> PRINT Internationalization Programme through a project that counts with the collaboration of seven of its schools. FGV is also developing extensive research activity in order to evaluate the socioeconomic impacts of one of the biggest mining disasters in the world – the breach of Fundão Dam in the municipality of – Mariana, Minas Gerais state. On the international side, FGV and Fiocruz <sup>3</sup> are partners to Newton Fund – British Council in the Institutional Links initiative.

To learn more about the applied research projects, access [www.fgv.br/bibliotecadigital/rededepesquisa](http://www.fgv.br/bibliotecadigital/rededepesquisa).

## Applied Research and Knowledge Network

1. São Paulo Research Foundation (FAPESP) is an independent public foundation with the mission to foster research and the scientific and technological development of the State of São Paulo. <http://www.fapesp.br/en/>

2. The Office to Improve Higher Education Personnel (CAPES) is a foundation under the Ministry of Education (MEC). CAPES plays a fundamental role in the expansion and consolidation of graduate studies (masters and doctorates) throughout Brazil. <http://www.capes.gov.br/>

3. Promotion of health and social development, generation and dissemination of scientific and technological knowledge, and promotion of good citizenship are the concepts that guide the actions of the Oswaldo Cruz Foundation (Fiocruz), under the Ministry of Health, the most prominent institution of science and technology in health in Latin America. <https://portal.fiocruz.br>

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# Cryptography and law: a compared perspective

**Author:** Alexandre Pacheco da Silva (alexandre.silva@fgv.br)

**Researchers:** Carlos Augusto Liguori Filho, Guilherme Kenzo dos Santos, João Pedro Favoretto Salvador and Tatiane Guimarães

**Organization:** São Paulo School of Law of Fundação Getulio Vargas (FGV Direito SP)

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The use of cryptography techniques for data storage and online transmission of information for private purposes has created controversies regarding requests to obtain data by authorities in the context of criminal investigations. This has prompted debates and legislative responses in various countries for legal regulation of cryptography, with different approaches, in some cases imposing restrictions on its use and in other facilitating access of law enforcement authorities.

## **OBJECTIVE**

- To map the international debate about regulation of cryptography, with special focus on identifying the different responses of countries regarding requests for access by law enforcement authorities to encrypted data and communications, seeking to identify trends and regulatory models for cryptography around the world.
- To understand how cryptography is treated in different legal systems, to help qualify the legal debate in Brazil over the advantages and disadvantages of each of the regulatory models and the possible impacts of Brazilian regulation of cryptography – stimulating or restricting it – to situate Brazil in the international debate.

## **RESEARCH METHODOLOGY**

- The study was structured in four phases:
  - (i) Definition of the research sample, with establishment of the time frame and selection of the countries for analysis;
  - (ii) Consultation of sources, involving search for bibliographical materials of different types (standards, scientific articles, reports, official pronouncements, judicial decisions, etc.) and organization of the material found;
  - (iii) Preparation of short descriptive texts – called “descriptive pills” – to map the international debate on the theme; and
  - (iv) Categorization of the regulatory models of countries that have legal rules related to cryptography and access to data.
- With respect to the timing of the recent debate about the regulation of cryptography, two milestones were identified: the year 2013, after the scandal over the revelations by Snowden, and the 2015, after the terrorist attack in San

Bernardino (USA), which gave rise to the Apple v. FBI case. This time frame was subsequently expanded to the period from 2010 to 2017, to encompass prior periods with room to spare.

- Considering the duration of the study (12 months), the final sample was limited to 40 countries, leaving out those that possibly have taken steps to regulate cryptography from 2018 onwards.
- With respect to the debate in Brazil – motivated by the successive blockages of the application WhatsApp in 2015 and 2016 – the normative/regulatory framework regarding encryption technologies and information security in the country was identified, followed by particular comparison with the debate in the United States.

## RESULTS

- To make the results of the study accessible, a wiki was developed – CryptoPedia (<http://www.fgv.br/direitosp/cryptomap/criptopedia.html>) dedicated exclusively to the publication of the “descriptive pills” (short documents containing references that describe the existing regulations in countries and the recent movements involving the theme).
- An interactive map was also developed, the CryptoMap (<http://www.fgv.br/direitosp/cryptomap/>), in which users can intuitively visualize the countries studied according to the regulatory model adopted by them. By clicking on a country, it is possible to access the respective CryptoPedia page.
- Of the 40 national legal systems studied in the period between 2010 and 2018, 31 have rules that in some way affect the development, implementation and/or utilization of cryptographic mechanisms for communication or storage of information. In 18 of these countries, proposed legislation for this purpose was debated or enacted after 2010, revealing that the discussion of the subject is relatively recent.
- Among the existing laws, patterns or models of regulation were classified in seven categories (each country can adopt one or more models concomitantly).
  - (a) 4 countries prohibit or criminalize the use of cryptographic technologies.
  - (b) 1 country limits the size of encryption keys.
  - (c) 17 countries establish general obligations for assistance (which although not specifically dealing with cryptography, can be invoked to solicit the supply of encrypted information in readable form or support in the process of decryption in the context of criminal investigations).
  - (d) 13 countries establish specific assistance obligations (which specifically deal with cryptography).
  - (e) 11 countries require governmental authorization or license to use cryptography.
  - (f) 5 countries stimulate the use of encryption tools.
  - (g) 6 countries regulate alternative mechanisms for investigation/exploitation of vulnerabilities of cryptographic systems by the government.

## WHAT'S NEW

- Among the countries that have alternative investigation mechanisms, a trend was identified for so-called governmental hacking (or lawful hacking), i.e., the exploitation of the vulnerabilities of encryption systems carried out or authorized by governments in the context of criminal investigations.
- What this trend reveals is that the debate over governmental access to encrypted data, which in recent years has

focused on regulation of cryptographic technologies per se, can migrate to the study of alternative mechanisms for investigation, which like other approaches pose risks to the exercise of fundamental rights not yet comprehensively mapped.

- In the Brazilian legal system, there is no normative provision that directly deals with access to encrypted data by investigatory authorities. Curiously, the decree to regulate the Internet Civil Framework Law, enacted in 2016, suggests encryption techniques as a protective measure to be adopted by providers in the safekeeping, storage and treatment of personal data and private communications. This is not a specific body of rules to promote the development or implementation of cryptography, but the legal text itself indicates its importance in the security and privacy of users.

## **APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY**

- It is necessary for legislators and other legal practitioners to adopt an interdisciplinary approach to the conduction of discussions about the regulation of cryptography, be it to understand the impacts of possible regulation on other rights enabled by cryptography, such as privacy and protection of data, be it to understand the limits of the efficacy of determined impositions.
- The mismatch found in the debate over regulation of cryptography in the United States and Brazil – here the focus is on the real-time interception of messages, while in the USA the discussion today involves whether or not companies must weaken their encryption to satisfy the need for investigation by authorities – not only affects the Brazilian judiciary, but also has reflections in Brazil's legislative production on the theme. For example, a bill of law under debate in Congress (PL 9,808/18) does not present any solution to the problem of the technical inability to supply data by providers. Priority should be given to overcoming this mismatch as soon as possible, to permit the Brazilian debate to proceed intelligently, based on the latest technological developments.





# Demographic dynamics and public spending in Brazil

**Authors:** Afonso Arinos de Mello Franco Neto (afonso.arinos.neto@fgv.br) and Fernando de Holanda Barbosa Filho (fernando.filho@fgv.br)

**Researcher:** Cássio Maldonado Turra

**Organization:** Brazilian School of Economics and Finance (FGV EPGE) and Brazilian Institute of Economics (FGV IBRE), both part of Fundação Getúlio Vargas (FGV)

**Support:** Applied Research Fund of Fundação Getúlio Vargas (FPA FGV)



The demographic changes occurring in Brazil are causing an increase in the share of elderly people (older than 65 years old) and reduction of the fractions of young people (up to 17 years old) and working-age people in the population. These patterns are causing serious problems to pay expenses for health and social security. On the other hand, the demographic evolution can reduce the demand for spending on education in the future.

## **OBJECTIVE**

- To evaluate the impact of the demographic changes that Brazil will experience in future years on the main components of the public budget.
- To develop long-range projections of the demands for expenditures on social security, health and education based on the demographic evolution.

## **RESEARCH METHODOLOGY**

- Growth rates are estimated of gross domestic product (GDP) under the hypothesis that over the long run the natural unemployment rate will prevail. Two estimates are presented, based on distinct methods. The first is based on an aggregate production function of the economy with capital and labor factors, while the second assumes that labor productivity is fixed.
- The projection for public spending on health combines the profiles by age of this spending with changes in the population age structure.
- The projection of spending on education is based on the behavior of three components: public spending per student and per grade level, obtained from data tabulated by the Anísio Teixeira National Institute of Educational Studies and Research (INEP); demographic projections developed by the Brazilian Institute of Geography and Statistics (IBGE) for the school-age population; and enrollment rates (net and gross) and proportion of people using the public school system broken down by age, according to the National Household Survey (PNAD). The targets of the National Education Plan (PNE) are adopted for prediction of the evolution of future demand for enrollments.
- The projection for social security spending is based on demographic factors, in particular the determinants of evolution of retirement for age, but ignores aspects related to the dynamics of retirement for time of contribution or the criteria for eligibility of the systems existing now in the country. Separate projections are made for the General Social Security

Regime (RGPS) and the Specific Social Security Regimes (RPPS). The method applied, similar for the two systems, is based exclusively on demographic projections and the profiles of retirement benefits for age.

- The projections for spending on Ongoing Benefits of the Organic Social Assistance Law (BPC-LOAS) and on the Family Stipend (Bolsa Família - BF) program are based on the current rules, taking into consideration the demographic changes, specifically the evolution of the size of the cohort between 0 and 17 years old, which determines expenses for BF, and the size of the population older than 65 years, on which BPC-LOAS spending is based.
- Estimates are made of the spending necessary for possible implementation of a public service covering long-term care of the elderly/disabled. In the absence of an experience with this type of policy in the country, data were used related to the costs of these services in countries of the European Union, as a proxy for the projected Brazilian case.

## RESULTS

- The demographic transition will substantially reduce the supply of labor, and this constraint will have an important impact on GDP growth, calculated based both on the production function and on the estimated growth of labor productivity. In the two projections, the long-term annual growth rate will be decreasing until the 2050.
- The effects of the demographic transition in Brazil on public expenditures will be substantial, indicating an increase, as of 2014, on the order of 6.7 percentage points of GDP, possibly reaching 7.2 points with the creation of a public system of long-term care for the elderly/disabled. All the additional resources will have to be allocated to pay social security benefits or income transfers to the elderly.
- The demographic evolution will also cause a steep rise in total public spending on health. Without considering any alteration of the coefficients of spending per capita broken down by age group, the expectation is that total spending will rise by 40% in real terms by 2050.
- In contrast, the total spending on education will decline considering only the demographic dynamics. The explanation is based on the expected reduction in the number of births per female of reproductive age, and consequently of the school-age population. This measure will start to decline in 2020. Therefore, education expenditures should not put pressure on public spending over the long run, especially as of 2025, when births will decline in absolute terms as well.
- RGPS spending will rise from roughly 9% of GDP now to about 14% of GDP in 2050, while RPPS spending will double, from 2.1% of GDP in 2014 to 4.1% in 2050.
- With maintenance of the current eligibility rules, spending on the Bolsa Família program, which today amounts to approximately 0.5% of GDP, will decrease to slightly over 0.2% of GDP in 2050.
- The population growth will cause BPC-LOAS spending to increase more than twofold as a proportion of GDP, rising from 0.8% of GDP in 2014 to almost 1.7% of GDP in 2050.
- Besides this, the creation of a system for long-term care of the elderly/disabled would cost about 1.8% of GDP in 2050.

## WHAT'S NEW

- The projections show that the total spending on social security and programs for income transfer to the elderly will absorb 23% of Brazil's GDP in 2050, in comparison with an average of 12.6% in countries of the Organization for Economic Cooperation and Development (OECD). In other words, they indicate that the already high spending related



to social security programs in Brazil, on average 3 percentage points of GDP higher than in OECD countries, would probably climb 10 percentage points if the current rules were maintained in that period.

- Brazil still spends relatively less on public health than do other countries. The country allocates some 4% of GDP on the public health system. Even with the projected aging of the population up to 2050, this spending category will remain lower than in other countries, which can reflect a more complex set of factors that affect demand for health care (e.g., income level) or the distribution between private and public health services in each country.
- The demand for better quality of public education and health in Brazil suggests that the profiles of spending by age category currently observed in Brazil will be unlikely to remain fixed, which will raise the expenditures projected in the study, based exclusively on the changes in the demographic dynamics.

## **APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY**

- This study contributes to the debate on management of public policies, by transparent presentation of the tradeoffs of public and social policies to be faced by Brazilian society in the coming years. The theme is in the limelight now due to social and political awareness about the budgetary restriction, and the study extends the conception and rationality of political decisions to a longer horizon, independent of the present political dispute.
- The pension reform recently approved by congress will reduce the eldery impact on social security spending and it is being treated in a simplifying way in a new version of this study.



# Long-term effects of social security reform in Brazil

**Authors:** Pedro Cavalcanti Ferreira (pedro.ferreira@fgv.br) and Rafael Parente

**Researcher:** João Victor Issler

**Organization:** FGV Growth and Development of Fundação Getulio Vargas (FGV)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV), National Council for Scientific and Technological Development (CNPq) and Rio de Janeiro State Research Support Foundation (FAPERJ)



In most countries, the rules governing public and private pension systems are different, and so are hiring procedures and job contracts. The tenures of government employees are longer and their wages, in general, higher. Moreover, several countries, Brazil among them, should face – or are already facing – problems in their social security systems due to ageing population and the financial fragility of their current systems. This article studies the macroeconomic and occupational impacts of social security reforms in an economy with multiple pension systems.

## OBJECTIVE

- We study, in a life-cycle economy with three sectors – formal, informal and public – and endogenous retirement, the macroeconomic and occupational impacts of social security reforms in an economy with multiple pension systems. In a model calibrated to Brazil, we simulate and assess the long-run impact of reforms being discussed and/or implemented in different economies. Among them, the unification of the public and private pension systems and the increase of minimum retirement age.

## RESEARCH METHODOLOGY

- We created a life-cycle model of occupational choice and retirement behavior. Individuals can work in the private or public sectors or be retired. All the decisions are endogenous: an individual will only apply to retirement or to a position in the public sector if this is worthwhile. In the aggregate, a three-sector economy exists, with public and private production, in the last case formal or informal.
- The government pays wages (not competitive) to its workers in exchange for the production of a public good, and administers a pay-as-you-go system for retirees from the public and private sectors. To pay benefits and wages, the government taxes consumption, capital and labor income. Private firms in the formal economy use a simple technology with capital and labor, while firms in the informal economy use a linear production function involving labor. All firms act competitively.
- The model is calibrated to the Brazilian economy in 2013 aiming to reproduce in detail data related to decisions on occupational sector, labor and retirement, as well as the deficit of the social security system and the decision to apply for a job in the public sector.
- In a first counterfactual exercise, we adjust the population growth rate to simulate the impact of demographic changes

on the economy in 2060, based on the projection for significant aging of the Brazilian population. Next, we evaluate the consequences of three scenarios: i) only the demographic change, without any pension reform; ii) unification of the public and private social security systems (plus the demographic change); and iii) increased minimum retirement age, besides the reforms of scenario (ii).

## RESULTS

- If nothing is changed, population aging alone will increase Brazil's social security deficit from around 2% today to 8% in less than 45 years. Given the necessary increase in taxation, the impact on the economy – measured, for example, by the reduction of consumption – will be huge.
- The unification of the pension systems – from a setting where civil servants have extremely generous retirement conditions – is able to reduce the social security deficit considerably (indeed, by half). Besides this, civil servants will retire later in life, increasing their savings to offset the reduction of benefits.
- When the minimum retirement age is raised and larger (and longer lasting) contributions are introduced, the deficit has an additional reduction of 2 percentage points of gross domestic product (GDP). Early retirement, thus, has a very high cost: today a large portion of workers retire before the age of 60 years, and the change in the system will require them to work until reaching 65 years of age.
- In the long run, the changes have positive effects on aggregate savings and production, while considerably altering the decision to work in the public sector. People will apply for civil service jobs at a younger age, with higher qualifications on average. Social welfare also increases on average. Therefore, society as a whole has much to gain from modifications of the social security system close to those that are being implemented or discussed at the moment.

## WHAT'S NEW

- The innovative feature of this study is the development of a model to study the choices of economic agents that face multiple labor and retirement sectors. Besides this, there are no general equilibrium and life-cycle models for Brazil with different types of agents and sectors, applied to the reform of the social security system.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- Many countries around the world are undergoing the same process of population aging. Several of them have generous dual systems, generally favoring public employees. Demographic changes will sharply increase the social security deficit. The increase of the tax burden necessary to finance it will result in less consumption and savings and higher unemployment, and most probably large welfare losses.
- It is clear that the political resistance of civil servants and part of the populations against pension reforms in most countries make it very hard, if not impossible, to implement some of the changes evaluated here in the short run. . Nevertheless, the figures estimated in this study show that the gains in the future are substantial, making it worthwhile to overcome the opposition of interest groups.



# Responses of young people to income transfers: Evidence from the Family Allowance Program on education, employment and economic self-sufficiency

**Author:** Cecilia Machado (cecilia.machado@fgv.br)

**Researchers:** Christiane Szerman and Valdemar Neto

**Organization:** Brazilian School of Economics and Finance of Fundação Getúlio Vargas (FGV EPGE)

**Support:** Applied Research Fund of Fundação Getúlio Vargas (FPA FGV)



The aim of the research program is to shed more light on the mechanisms associated with the transmission of poverty between generations and the future emancipation of the beneficiaries of income transfer programs. The empirical strategy relied on the discontinuity resulting from the age limit for eligibility for the benefit to estimate the effect of additional exposure of one year to Brazil's Family Allowance Program (Programa Bolsa Família, PBF).

## OBJECTIVE

- To investigate the possible effects of receiving the benefit of the Family Allowance Program (PBF) by adolescents and young adults on their educational choices, situation in the labor market and economic self-sufficiency.

## RESEARCH METHODOLOGY

- The econometric strategy employed is regression with discontinuity, where the discontinuity is the birth date of individuals from households that received the monetary benefit while they were adolescents or young adults, and as counterpart needed to satisfy some educational conditions.
- The sample is restricted to beneficiaries with ages around the limit of eligibility (18 years old), with comparison of individuals born at the end of the year (November and December) and those born at the beginning of the following year (January and February).
- All told, eight groups are being accompanied according to the birth year between 1989 and 1997. Using data from the Unified List together with the PBF payment sheets, it was possible to explore this discontinuity and longitudinally accompany these groups from 2004 to 2015.
- We first checked whether an extra year of exposure to the program encouraged the subjects to attend school for another year. This was carried out to evaluate the impact of this additional year on the probability that the beneficiary did not enroll in school and to have graduated from high school; on the level of schooling in primary or secondary school; and the probability of being enrolled in a university within two years of completing 18 years of age (age limit for receiving the benefit).
- In the second place, we examined the case of additional exposure to the monetary transfers and if this had an impact on the initial results in the formal job market. In this scenario, it was possible to investigate if there was a disincentive to work in the formal sector due to eligibility for extension of an income transfer program.
- Based on the information contained in the payment sheets, we also examined the probability of an individual who received the benefit as a dependent becoming the reference person (or head) of a household receiving benefits from the program in the future.

## RESULTS

- With respect to the effect of one more year of exposure to the program in terms of encouragement to attend school, the preliminary results suggest small effects, although positive, on school enrollment – reduction of 2.6 percentage points in the probability of not being enrolled – but no significant effect on educational level.
- Regarding the impact of an additional year of benefits on the probability of working in the formal labor market, the findings indicate that longer exposure to the program is associated with lower participation and lower earnings in the formal labor market, suggesting that beneficiaries are induced not to work in the formal sector while they are still eligible to receive the income transfer. The beneficiaries who complete 18 years of age immediately after the limit date for eligibility are less likely to be employed in the formal market than those who completed 18 years of age immediately before the limit date. However, this effect is not persistent, and becomes positive five years later. When dividing the analysis by gender, these effects are concentrated among men.
- An important limitation must be mentioned: due to the lack of data, it was not possible to track individuals working in informal jobs, to investigate, for example, if lower participation in the formal sector is counterbalanced against higher participation in the informal sector.
- With respect to the persistence of poverty between generations, we did not find any relevant effect of an additional year of exposure on the probability of beneficiaries depending on support from the program in subsequent years.

## WHAT'S NEW

- The study makes a contribution to the incipient national and international evidence on the medium and long-term effects of income transfer programs.
- The advantage of the empirical approach employed over most of the other literature is the fact that it does not depend on per capita income thresholds for eligibility used to identify potential beneficiaries of social assistance programs.
- The study uses comprehensive administrative data on the PBF, covering the universe of all beneficiaries. These data contain details about various characteristics of the households and individuals. The universe of young beneficiaries during the period from 2009 and 2014 was combined with other administrative data on education and the labor market, enabling the construction of a data panel with details on cash payouts of the PBF, as well as the results regarding educational attainment and participation in the formal job market of each beneficiary. The study is a pioneer in using these sources.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- The quantitative and qualitative results of the study can contribute to improved management of governmental intervention programs, as well as actions targeted at people in socially vulnerable situations throughout the country.
- The cross-referenced administrative data obtained from various sources can serve as a reference to evaluate the effectiveness of public policies in Brazil.





# The effects of home ownership: An analysis of the My Home My Life Program in Rio de Janeiro

**Author:** Cesar Zucco (cesar.zucco@fgv.br)

**Co-authors:** Felipe Nunes and Natalia Bueno

**Organization:** Brazilian School of Public and Business Administration of Fundação Getulio Vargas (FGV EBAPE)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV), National Council for Scientific and Technological Development (CNPq), Rio de Janeiro State Research Support Foundation (FAPERJ) and Yale University





This study evaluates the political effects of being chosen to participate in a government housing program. It examines how the preferences, perceptions and aspirations of the future beneficiaries differ from those of a comparison group of non-beneficiaries with similar personal profiles, after the beneficiaries were selected, but before receiving the residential units.

## OBJECTIVE

- To identify and measure how the perspective of becoming a home owner affects individuals' attitudes, political preferences and expectations.

## RESEARCH METHODOLOGY

- The study took advantage of the fact that many of the beneficiaries of the My Home My Life Program (Programa Minha Casa Minha Vida - PMCMV) are chosen by a lottery, and that the personal data about both lottery winners and losers are publicly available. The use of a lottery generated a "treatment" group (beneficiaries) that is very similar to the control group (people enrolled but not chosen), enabling a very precise estimation of the effects of the public policy.
- The study examined four main hypotheses:
  1. The beneficiaries would have electoral preferences more skewed to incumbents than non-beneficiaries, measured by the respondents' opinions of former presidents Luiz Inácio Lula da Silva and Dilma Rousseff; former mayor of the city of Rio de Janeiro, Eduardo Paes; and Michel Temer and Luiz Fernando Pezão, at the time of the survey the president of Brazil and the governor of the state of Rio de Janeiro.
  2. The expectations of the beneficiaries about the future would be more positive than those of non-beneficiaries, measured by an index composed of four variables designed to measure the opinions of the respondents about long-term intergenerational mobility and expectations of financial improvement.
  3. The satisfaction with life (happiness) of the beneficiaries would be more positive than that of the non-beneficiaries, measured by indexes recognized in the literature.
  4. The social and political attitudes of the beneficiaries would not differ from those of the non-beneficiaries, measured by indexes of belief in the market.
- The data were collected from a survey of 1,041 beneficiaries and non-beneficiaries who participated in five drawings in "Faixa 1" of the PMCMV, conducted in Rio de Janeiro between October 2016 and March 2017 (the most recent at the time of designing the study), where the beneficiaries had not yet received the residential unit (or signed the contract). The interviews were conducted between May 2017 and January 2018, both by telephone and in person.
- Although the study was based on only four general hypotheses, each of them implied measurement and analysis of several outcome variables. All the result variables were operationalized based on the responses to the questions posed.

## RESULTS

- The theory underpinning the study predicted that becoming a home owner would affect the preferences of the beneficiaries in relation to incumbent politicians associated with the program, viewing them more favorably than other politicians. It also predicted that future beneficiaries and non-beneficiaries would not differ in their viewpoints about social and political questions. The results confirmed some of these predictions and contradicted others.
- The beneficiaries had different evaluations of the incumbents in relation to the non-beneficiaries. The beneficiaries penalized the incumbents associated with the PMCMV: they had lower opinions of former presidents Lula and Rousseff than the non-beneficiaries. This result contradicted the initial predictions.
- The beneficiaries reported lower satisfaction with life than the non-beneficiaries, and also were less likely to see home ownership as “a dream”, and much less likely to say they would move into a home of the PMCMV if they were selected to receive the benefit. These results are surprising, but mutually consistent and in accordance with the additional analyses carried out with administrative data.
- Besides this, consistent with the hypotheses, being selected to participate in the program did not influence broader social attitudes of the beneficiaries about redistribution of wealth, the role of the State and self-confidence.

## WHAT'S NEW

- Although there are many studies showing that governments distribute resources strategically, few works have analyzed either the effective gain these expenditures bring to the well-being of voters or the resilience of the gratitude of voters to political officeholders. This study, considering the association between improved welfare and electoral reward, evaluated the role of the promise of a benefit, the gratitude for its receipt, and the effect of variation over time living conditions on political preferences.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- Although some of the results contradict the underlying hypotheses, they are logically consistent with each other and suggest that the program in fact had negative effects on the attitudes regarding politicians among those who were selected as beneficiaries. Whether these negative effects will fade when the individuals receive a new home is an empirical question that will be addressed in a second phase of the study. For the time being, however, the evidence reveals a situation of dissatisfaction with the program, at least with the way it was executed in Rio de Janeiro after 2016.
- The most plausible explanation for these effects is that the program was seen as not fulfilling its promise. Future beneficiaries might well become frustrated with the bureaucratic requirements to obtain the contract for a residence under the PMCMV, with the longer time frame for delivery than expected, or with news stories of gangs that occupy housing projects. A qualitative follow-up survey was conducted with beneficiaries and non-beneficiaries to investigate which aspects of the program are generating these negative results, but the qualitative data have not been analyzed yet.
- Based on the results of the study, in particular what was stated in the interviews, it appears fitting to adopt the following measures in the process of selecting the beneficiaries of the PMCMV (some possibly already implemented): carry out sorting of eligibility at the time of enrolling for the drawing; request more contact information at the time of enrolling (Facebook, WhatsApp, relatives); integrate the waiting list with the Annual List of Social Information (RAIS), General List for Social Programs, etc.; create an online or telephone channel so people can obtain information on the drawings; improve the system of geographic preferences; analyze demand; give those whose names are drawn an option for location of the unit or territorialize all the drawings; and make it clearer that the waiting time does not affect the chances of being selected.



# 3D Repository – Artworks in public spaces of Rio de Janeiro: an eye on modernism

**Authors:** Asla Medeiros e Sá ([asla.sa@fgv.br](mailto:asla.sa@fgv.br)) and Vivian Luiz Fonseca ([vivian.fonseca@fgv.br](mailto:vivian.fonseca@fgv.br))

**Researchers:** Adolfo Bartolome Ibañez Vila, Américo Freire, Daniel Reis, Daniela Lucas da Silva, Karina Rodriguez Echavarria, Marília Alves de Carvalho e Silva, Mayara Baptista Silveira, Paulo Cezar Carvalho, Renato Rocha Souza, Ricardo Marroquim, Suemi Higuchi and Vera Lucia Dias Oliveira

**Organization:** School of Applied Mathematics (FGV EMap) and School of Social Sciences (FGV CPDOC), both of Fundação Getulio Vargas (FGV)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV)



The ultimate aim is to create a 3D digital repository of artworks present in public spaces in Rio de Janeiro, available to researchers, public officials associated with preservation of heritage and the public in general, to enable better awareness of these cultural assets.

## OBJECTIVE

- To prepare a pilot plan to create a 3D digital repository of the works of art present in public spaces in Rio de Janeiro.

## RESEARCH METHODOLOGY

- The study will involve technical analysis of the feasibility, potentials and impacts of forming a 3D digital repository of artworks present in public spaces in Rio de Janeiro, including analysis of technology, documents, history and legal aspects, culminating with digitization of a set of preselected artworks.
- Due to the approach of the 100th anniversary of the Modern Art Week of 1922, we chose a set of works pertaining to the modernist movement.
- We initially selected six works, based on criteria such as: a) representativeness of the work and its author in the modernist movement; b) technical parameters for digitization, to improve this technology; c) state of preservation of each work, to prioritize those that are most degraded; d) impact and relevance of the work in the urban space where it is found; and e) accessibility for digitization.
- Based on the material available online regarding the city of Rio de Janeiro – at <http://inventariodosmonumentosrj.com.br/> – we mapped the artworks in the city's public spaces, with emphasis on modernism.
- After testing and considering technical and technological questions, we decided to employ photogrammetry for the digitization process.
- Based on analysis of the computer programs to be used for documentation and dissemination of the 3D digital models produced as part of the project, as well as considering the suitable metadata specification, we performed tests using the programs 3DHOP and Tainacan to prepare for implementation of the repository.

## RESULTS

- We developed a pilot augmented reality application for the works *Evangelista* and *Mulher*, which demonstrated good potential to be developed as a product.
- We investigated the digital heritage category as defined by international and national entities, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Brazil's National Institute of Historic and Artistic Heritage (IPHAN), besides a set of cultural diffusion actions related to national and international projects to digitize cultural heritage.

## WHAT'S NEW

- The project aims to promote not only the theoretical and methodological discussion of the use of digital technologies for preservation of historic and cultural heritage, but also to disseminate practices to safeguard Brazilian heritage.
- The discussion about metadata standards to describe digital files of 3D models to document artworks in public spaces in Rio de Janeiro, created during the modernist period is novel and highly relevant in the Brazilian context.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- Legal study of the status of copyrights allowed the project to go forward with greater legal certainty. However, it demonstrated the difficulties related to actions for dissemination of digitized works in 3D, which is still incipient in Brazil and abroad, making a deeper analysis necessary in the second step of the project.
- The project team led an initiative to establish synergy among the main national research institutions, collections and museums, seeking to enhance the use of varied technologies by these institutions. In this respect, FGV is establishing working arrangements with the National Museum/UFRJ, National History Museum (MHN), National Center for Folklore and Popular Culture/IPHAN, Moreira Salles Institute (IMS), Institute for Technology and Society (ITS), Museum of Tomorrow, Oi Futuro, and University of Brighton (United Kingdom), among others.

# Regulatory agenda in practice: The policies adopted by Brazilian regulatory agencies in the past twenty years

**Coordinator and author of the project:** Alketa Peci ([alketa.peci@fgv.br](mailto:alketa.peci@fgv.br))

**Leaders of the project:** Alketa Peci ([alketa@fgv.br](mailto:alketa@fgv.br)), Joisa Dutra ([joisa.dutra@fgv.br](mailto:joisa.dutra@fgv.br)) and Renato Rocha ([renato.souza@fgv.br](mailto:renato.souza@fgv.br))

**Researchers:** Aline Santos, Fabiola Fernandes, Flavio Fontanelli and Luiz Geron

**Organization:** Brazilian School of Public and Business Administration (FGV EBAPE), Center for Regulation and Infrastructure Studies (FGV CERI) and School of Applied Mathematics (FGV EMAp), all of Fundação Getulio Vargas (FGV)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV) and Rio de Janeiro State Research Support Fund (FAPERJ)



The study of the types of decisions made by four Brazilian federal regulatory agencies reveals that a good mix of expertise – from the market, regulated industries and the federal public sector – and a smaller presence of political appointees in the composition of their governing boards appears to be associated with greater consistency in performing regulatory activities.

## OBJECTIVE

- To identify the principal types of decisions adopted by a set of federal regulatory agencies in Brazil (National Petroleum Agency - ANP, National Electric Energy Agency - ANEEL, National Land Transportation Agency - ANTT, and National Supplementary Health Agency - ANS), since their creation.

## RESEARCH METHODOLOGY

- We adopted a perspective that comprehends the agencies as public bodies that make decisions in a context of ambiguity of public policy objectives. This was based on the premise that differences exist between what the agencies should do – based on the laws creating them, their mission and other legal pillars – and what they have adopted in practice.
- To measure the main types of decisions reached by the Brazilian federal independent regulatory agencies (IRAs) over the past 20 years, the news items posted at the websites of a group of IRAs in the period from 2002 to 2017 were analyzed.
- The mapping of the main types of decisions reached over this period relied on machine learning techniques, in particular topic modeling.
- To explore the differences in terms of decision types adopted by the agencies, indicators were developed related to the technical and political composition of the IRAs' governing boards, budgets and human resources, as well as changes in government policies.

## RESULTS

- The result of the analysis indicate the existence of three types of decisions conceptually classified and validated based on interviews with staff members of each agency as: regulatory, bureaucratic and other policies.
- During their history, the agencies reached decisions beyond regulatory activities related to the promotion of competition and revision of concession contracts and rates paid for public services. Indeed, a good portion of the decisions fell into other typology categories: a) bureaucratic – decisions reflecting institutional aspects of the agency or the use of police power, such as inspection or certification of products and services; and b) other policies – varied



decisions encompassing promotion of the regulated industry in the country, research and development (R&D), rate subsidies for low-income consumers, or support for sectorial policies (such as public health), among others.

- Purely regulatory decisions are not a constant feature of the repertoire of the regulatory agencies studied. The composition in terms of technocrats versus political appointees to compose their governing boards, as well as the characteristics of their technical staff, appears to influence the adoption by the agencies of distinct logics for action.
- Despite the changes in political bearings, some agencies, such as ANEEL, have been more consistent in adopting regulatory policies. This consistency appears to be related to a good composition of the governing board in terms of the mix of expertise – from the market, regulated industries and the federal public sector – and a smaller presence of political appointees.
- With respect to the market expertise, understood as the previous experience of the directors in the private sector, the results indicate that people with this profile still occupy a relatively small space in the agencies studied. Despite the growing participation of directors with this type of expertise, there is still predominance of experience acquired in government-controlled companies in the regulated sector (although with a good deal of variation during the period). The expertise in the federal public administration was found to wax and wane in nearly all the agencies during the period analyzed.
- The patterns of politicization also vary from one agency to another.
- The results suggest that the presence of technocrats can not only guide the action of the agencies in a more regulatory direction, but also insulate the agencies from short-term interference of political parties, represented by high proportions of directors appointed for political reasons.

## WHAT'S NEW

- The study relied on a novel research method. Considering that a good portion of the IRAs were created in the information age and follow the principles of transparency, the study concentrated on the news items published at the institutional websites of a group of IRAs in the period studied (2002-2017). The agencies have disclosed thousands of news items during their histories, which can be considered a good proxy for their most important decisions – since these are typically prioritized for disclosure.
- Unlike previous studies, this one did not focus on regulatory capture. Instead, it considered the dimensions of expertise, politicization and vacancy of directors on the governing boards to verify if these aspects are associated with the regulatory types identified.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- The study indicates that differences in expertise are associated with different logics for action of the IRAs. Higher levels of expertise from the private sector or from government-controlled companies, for example, favor the regulatory logic. On the other hand, greater presence of political appointees tends to weaken the regulatory logic. But none of these profiles alone has a positive influence on the good performance of the regulatory decisions.
- On the contrary, there are indications of the existence of a system of “checks and balances” in the make-up of the governing boards. That system favors regulatory consistency in the actions of the agencies and also provides more protection against political meddling.
- It is therefore important to encourage a suitable mix of types of expertise on the governing boards of the IRAs as a more realistic way to assure autonomy in decision-making and shield the regulators from pressures of special interest groups.



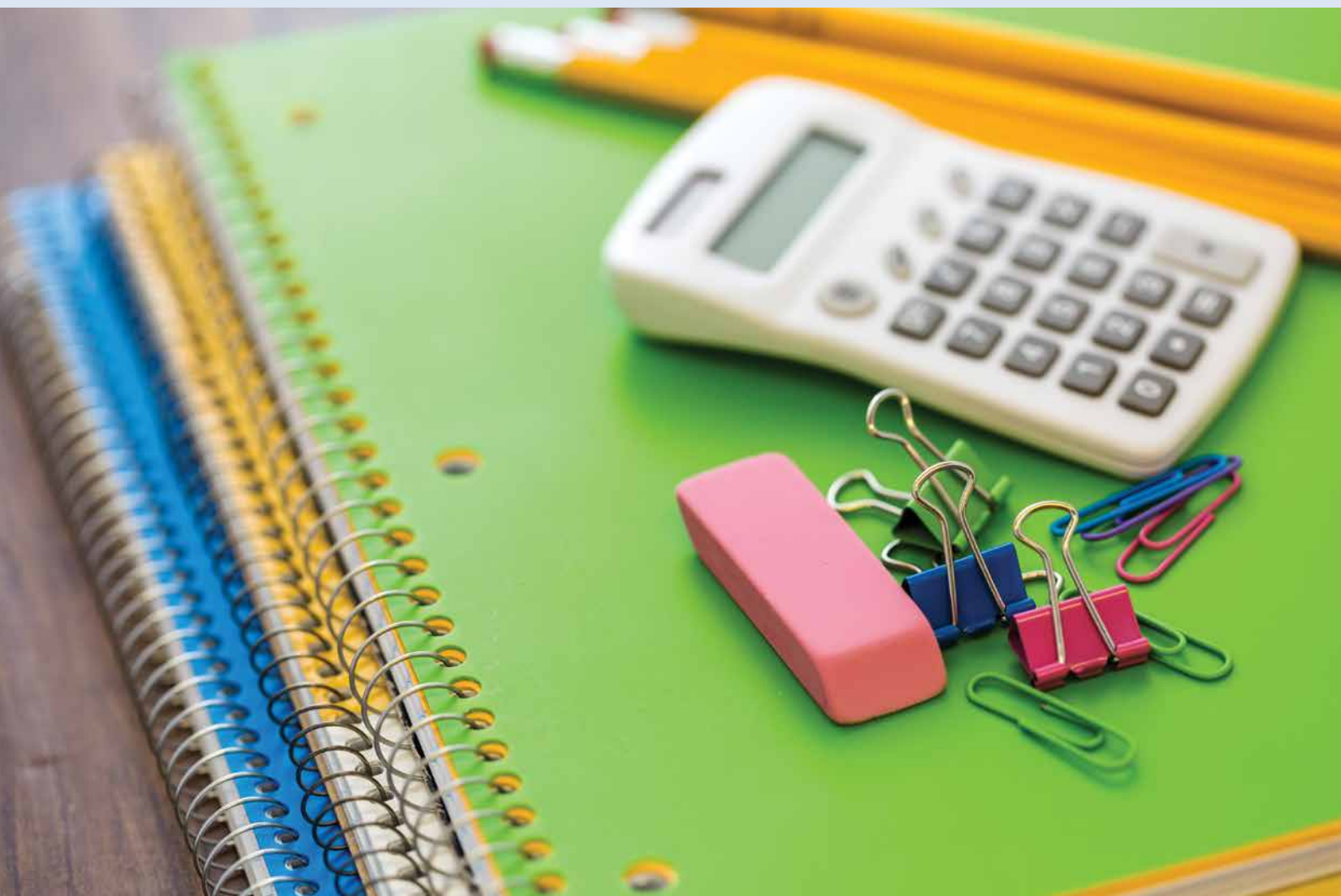
# Economic consequences of the educational backwardness in Brazil in the twentieth century

**Author:** Samuel Pessoa ([samuel.pessoa@fgv.br](mailto:samuel.pessoa@fgv.br))

**Researchers:** Edmilson de Siqueira Varejão Neto and William Summerhill

**Organization:** Brazilian Institute of Economics of Fundação Getulio Vargas (FGV IBRE)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV)



The historic deficit in education in Brazil poses a hurdle for the country to make the transition from a middle-income to a high-income economy and to raise productivity in the service sector. This study evaluates what the country's situation would be today if society in the past had adopted an economic strategy with intensive investments in human capital rather than physical capital.

## OBJECTIVE

- To apply counterfactual methods to estimate the growth paths of the economy, population, gross domestic product (GDP) per capita and schooling level, among other macroeconomic variables, in response to increased investment in education.

## RESEARCH METHODOLOGY

- The study models the Brazilian economy so that output depends not only on capital, labor and productivity, but also on the improvement of labor productivity that arises with investment in human capital. Based on the average schooling level as a proxy for human capital, the study uses counterfactual scenarios to estimate the impact of higher schooling levels on per capita GDP.
- The economic effects are evaluated of higher schooling levels taking into consideration a demographic component, in which more years of schooling reduces the fecundity rate, and a production component, by which more schooling increases labor productivity.
- These effects are quantified by specifying counterfactual scenarios of higher public spending on education and measurement of the economic impact of educational level in a basic closed-economy model.
- First, historical data are used as inputs to test the model's adherence. Second, three hypotheses about public spending are tested – increases of 1%, 2% and 4% of GDP – earmarked for primary schooling in the period from 1933 to 1985, with analysis of the effect in 2004.
- Three sets of premises are adopted: the first only considers the effects on productivity gains; the second adds the impacts of the demographic component; and the third further adds a "No Child outside School" policy, in which priority is given to teaching grade-repeating students before creating more school capacity.
- The counterfactual educational paths for the Brazilian population are structured so that when the counterfactual public spending on education is increased, two hypotheses appear. The first involves the origin of the additional money and the second the imposition of a rule on how school enrollments are allocated according to school level and year of schooling in response to an increase in educational spending. It is assumed that the added spending for

enrollments is directed with priority to primary education. In primary schools, the openings for students are allocated to each grade according to the proportion of the age group of that grade in the total population.

## RESULTS

- Increasing the public spending on education by 1% of GDP a year increased the counterfactual estimate of GDP per capita by 26% above the level observed in 1985 and reduced the estimated population by 14%. In turn, increasing the educational spending by 2% of GDP increased the per capita income by nearly 32% and reduced the counterfactual population by 19%. In a scenario of 4% increase of educational spending, per capita income and population would respond by 35% and -22% respectively. For the same counterfactual scenarios described above, considering the policy of focusing on grade-repeating students, the estimated results for growth of per capita GDP rose to 42%, 78% and 101%, respectively. Thus, investing more in education was very effective, with rising effects.
- These results are consistent with the research hypothesis and suggest that the low levels of spending on primary education in the twentieth century were costly for Brazil. Although the focus is on the “quantity” of schooling, evidence exists suggesting that the quality of education can have even greater effects.
- The estimates made, using various counterfactual scenarios of higher spending on primary education, show that the gains to the economy of only moderately higher spending at this educational level would have been substantial at the start of the twenty-first century. The implication is clear: Brazil’s educational policies were very costly in terms of lower productivity and income of the population.

## WHAT’S NEW

- This study is the first to construct estimates of human capital for Brazil over a long time period, and the first to estimate the gains in per capita output caused by a reduction of fecundity after an increase in the years of schooling. It also innovates by including grade repetition and dropout rates as relevant variables for formation of human capital.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- The study reveals that guaranteeing that education really results in learning is just as or more important than simply increasing investment in education. Leaving children to their own devices is very costly to a nation. The result is intuitive: focusing on grade-repeating students increases the efficiency of public spending on education. Before investing in new infrastructure and older students, the maximum must be instilled in students at the initial grade levels. Additionally, the policy of higher spending should be put into practice in the first years of teaching because the cost per student is lower and the return in productivity is higher.
- Besides the impacts on macroeconomic variables, an extension of this study would be to investigate the impacts of Brazil’s educational backwardness in the twentieth century on income inequality and welfare. Based on the same methodological framework and data produced, other questions can be addressed: 1) Besides the average impact measured by GDP, what would be the heterogeneity of the effect on income, i.e., what would be the impact on income inequality?; 2) Without altering the amount invested, what would be the economic, demographic and educational effects of having shifted allocation of public money from college to primary schooling? 3); Besides the impacts on per capita GDP, what would be the intertemporal effects on welfare, measured by the flow of consumption?



# Homicide and criminal adulthood: A density discontinuity approach

**Authors:** Francisco J. M. Costa (francisco.costa@fgv.br), João S. de Faria, Felipe Saraiva Iachan (felipe.iachan@fgv.br) and Bárbara Caballero

**Organization:** Brazilian School of Economics and Finance of Fundação Getúlio Vargas (FGV EPGE)

**Support:** The Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES)



This study evaluated the dissuasive effect of criminal adulthood in Brazil using the violent death rate as a proxy for involvement in violent crimes.

## OBJECTIVE

- To assess the dissuasive effect of more severe punishments resulting from criminal adulthood in Brazil, employing a density discontinuity approach.

## RESEARCH METHODOLOGY

- The starting point of the study was that heavier punishments, by reducing the net benefits of participation in crimes, should discourage participation in infractions and crimes.
- Using data based on criminal records has the potential for creating under-reporting bias, with unknown magnitude, which compromises any estimate of criminal involvement based on age. To overcome this bias, we propose a new proxy to measure the involvement of individuals in crimes: the number of violent deaths by age, i.e., the propensity to be a victim of homicide, broken down by age of the individual.
- The Brazilian Penal Code sets the age of criminal majority at 18 years. This discontinuity in the age for responding to criminal charges as an adult serves as a natural quasi-experiment, which we exploited to measure the degree to which the risk of heavier punishment can influence the decision to engage in criminal activity around the age of criminal adulthood. We sought evidence of greater propensity to be involved in criminal activities in Brazil by means of the effect this can have on violent death.
- We applied a discontinuous density approach to the frequency of violent deaths (among males) by age, using national death records from 1996 to 2013.
- An abrupt change in the number of violent deaths around the age of 18 would indicate a change in the involvement of crimes after reaching that age.
- The identification assumption is that all the factors that affect violent mortality have continuous effects on the number of violent deaths around a cutoff age, except the violent death rates around the 18th birthday, due to the lesser propensity to participate in crimes because of the sudden increase in the potential punishment at that age. This research strategy does not require a large part of violent deaths to coincide with criminal behavior by the decedent; it only requires continuous behavior of other determinants of the probability of death.

- The treatment group was formed by adults who just completed 18 years of age, while the control group for a counterfactual exercise for comparison was youths slightly younger than 18.
- To evaluate the behavior of the criminal data around the age of majority, we performed a study of the police arrest records in the state of Rio de Janeiro, using restricted data on arrests by police from 2010 to 2014. The data came from 118 police stations, covering an area holding 74.5% of the state's population according to the latest census data.
- We only used records that contained at least the following information: skin color, sex and birth date of the suspect. The crimes were divided into four categories: violent crimes; crimes against property; unclassified crimes related to drugs; and other crimes. This study also provides new evidence of the under-reporting bias of violent crimes and its magnitude.

## RESULTS

- The analysis of all the deaths of males in Brazil between 1996 and 2013 in nearly all the metropolitan regions and state capitals revealed little evidence of the theoretical starting point of the study – that heavier punishments reduce the net benefits of participation in criminal activities, a reduction that should be reflected in a lower number of deaths by homicide soon after reaching the age of 18.
- We did not find any discernible change in the density of violent deaths among young men soon after attaining criminal adulthood in Brazilian metropolitan regions. This result provides further evidence of the weak deterrence effects of the threat of greater penalties on violent criminal behavior of young people.
- The results are consistent with the general theory of crime of Gottfredson and Hirschi<sup>1</sup>, according to which criminal behavior is often impulsive and reflects a lack of self-control. Moffitt<sup>2</sup> and other researchers have shown that individuals with weak self-control commit more errors as adolescents, such as committing crimes. In these cases, the threat of stronger punishments would have a lower dissuasion effect in practice.
- We also found evidence of an under-reporting bias by using records of arrests. Due to the limited availability of data, this analysis was restricted to the state of Rio de Janeiro from 2010 to 2014.

## WHAT'S NEW

- This is the first study of the deterrence effects of criminal adulthood in an emerging country using a method for causal identification.
- The approach adopted complements previous studies that have suggested the use of a new measure for criminal involvement: the number of violent deaths broken down by age. The main difference between analysis adopted here and traditional discontinuous regression design is the fact that the dependent variable used is not a function of other covariables that determine the attribution of the treatment. Instead of this, we used data on violent deaths by ages of the victims and investigated if the frequency changes at 18 years of age.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- Although the current discussion of criminality in Brazil is focused on policies based on punishment, a series of policies exist aimed to increase the benefits of not being involved in criminal activity, which are equally important in the rational calculations. Many policies exist that can reduce criminal involvement by increasing the incentives to shun criminal activity, such as education programs and efforts to increase social inclusion and labor market participation. Therefore, future studies can make an important contribution by analyzing the efficacy of specific policies guided by this logic.

1. Gottfredson, Michael R.; Hirschi, Travis (1990). A General Theory of Crime. Stanford University Press.

2. Moffitt, Terrie E. et al. (2011). "A Gradient of Childhood Self-Control Predicts Health, Wealth, and Public Safety". Proceedings of the National Academy of Sciences 108(7): 2693-98.

# Results of the “More Doctors Program” (*Programa Mais Médicos*, PMM) on municipal health indicators

**Author:** Paulo Roberto Arvate (paulo.arvate@fgv.br)

**Researchers:** André Leonardo Pruner da Silva, Cleberson Williams dos Santos, Dante Dianezi Gambardella, Gisele Walczak Galilea, Rodrigo Bandeira-de-Mello, Sergio Pinheiro Firpo and Vladimir Pinheiro Ponczek

**Organization:** São Paulo School of Business Administration of Fundação Getulio Vargas (FGV EAESP)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV), Ministry of Health and Hospital Samaritano





The PMM was created in 2013 for the purpose of strengthening the basic health care in regions of the country with a shortage of doctors. This study evaluates the program's impact on the supply of physicians and the health and testing services provided by Basic Health Units (*Unidade Básica de Saúde* - UBS).

## OBJECTIVE

- To investigate empirically if there was a change in the number of doctors and the effects on consultations with patients and tests performed on those patients drawn from the population served by the UBS between 2008 and 2016.

## RESEARCH METHODOLOGY

- The indicators were computed for each establishment per month. Thus, it was possible to learn the number of health procedures performed at each establishment per month (consultations and tests) and also to identify the number of physicians (both associated with the PMM and in general) allocated to the establishments in the period analyzed.
- The variables constructed for health procedures took into consideration the focus of the PMM – improvement of basic care – and the increase of diseases resulting from aging of the population, and the incidence of nontransmissible chronic diseases, such as cardiovascular and respiratory diseases, cancer and diabetes mellitus.
- Besides the general number of consultations carried out in the basic health establishments by doctors, we also investigated the participation of other health care professionals, because a large portion of these consultations were performed by family health professionals, physiotherapists, nurses and social assistants, among others.
- We used the difference-in-differences method, where the treatment group consisted of the establishments that received doctors from the PMM in at least one quarter analyzed and the control group was composed of the other establishments.
- To support the empirical exercises, we developed two equations:
  - a) an equation to observe the differences in behavior between the UBS that did and did not receive doctors from the PMM. This equation produced three results: 1) the effect on the supply of doctors of the addition of one physician from the PMM to the establishment in question in relation to others that never received a doctor from the PMM in any time interval; 2) the effect on the results above and below the median of the number of doctors in the sample; and 3) the same effect on the municipalities according to seven profiles defined as priorities of the program (indigenous areas were excluded).
  - b) an equation to observe the effect of the number of doctors (from the program, not from the program, and within the program between Cuban and non-Cuban doctors) on the consultation and testing services of the UBS.

## RESULTS

- There was a positive and significant effect on the number of doctors at the establishments after the start of the program. Those that adhered to the PMM had on average 0.3 additional doctor, an important effect considering the average of 1.8 doctors per establishment before the PMM.
- Despite this positive effect on the total number of doctors, there was a substitution effect: there was a reduction of the number of doctors not from the program, which explains the small difference in the total number of doctors between the establishments that did and did not receive doctors from the program.
- The total number of doctors grew more in the most vulnerable municipalities and the number of doctors not associated with the PMM declined in the less vulnerable municipalities.
- In general, establishments that received one or more doctors from the PMM had an increase in the proportion of consultations performed by physicians after the program, both in basic and urgent consultations, such as emergency prenatal services.
- In terms of production of consultations and tests, the results did not allow stating that PMM doctors were more effective than those not from the program. Doctors from the PMM performed more basic consultations and required more examinations by other specialists (consultations by non-physicians), performed fewer emergency consultations, more prenatal consultations and requested more hemoglobin tests, while doctors not from the PMM requested more electrocardiogram tests.
- In general, Cubans were more effective than non-Cubans in terms of emergency consultations and requests for tests (hemoglobin and electrocardiogram). On the other hand, they were less effective than non-Cubans in basic and prenatal consultations.

## WHAT'S NEW

- This is the first study to assess the impact of the More Doctors Program at the level of individual establishments (UBS).

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- In terms of public policies, one point is particularly relevant. In the period analyzed, there was a large reduction in the number of doctors from the municipal health services at the UBS that received doctors from the PMM: as doctors from the PMM arrived, those not from the program were dismissed or decided to leave. This substitution effect is reflected in the general data on supply of doctors. Without this effect, the results obtained from the program would have been much more positive.

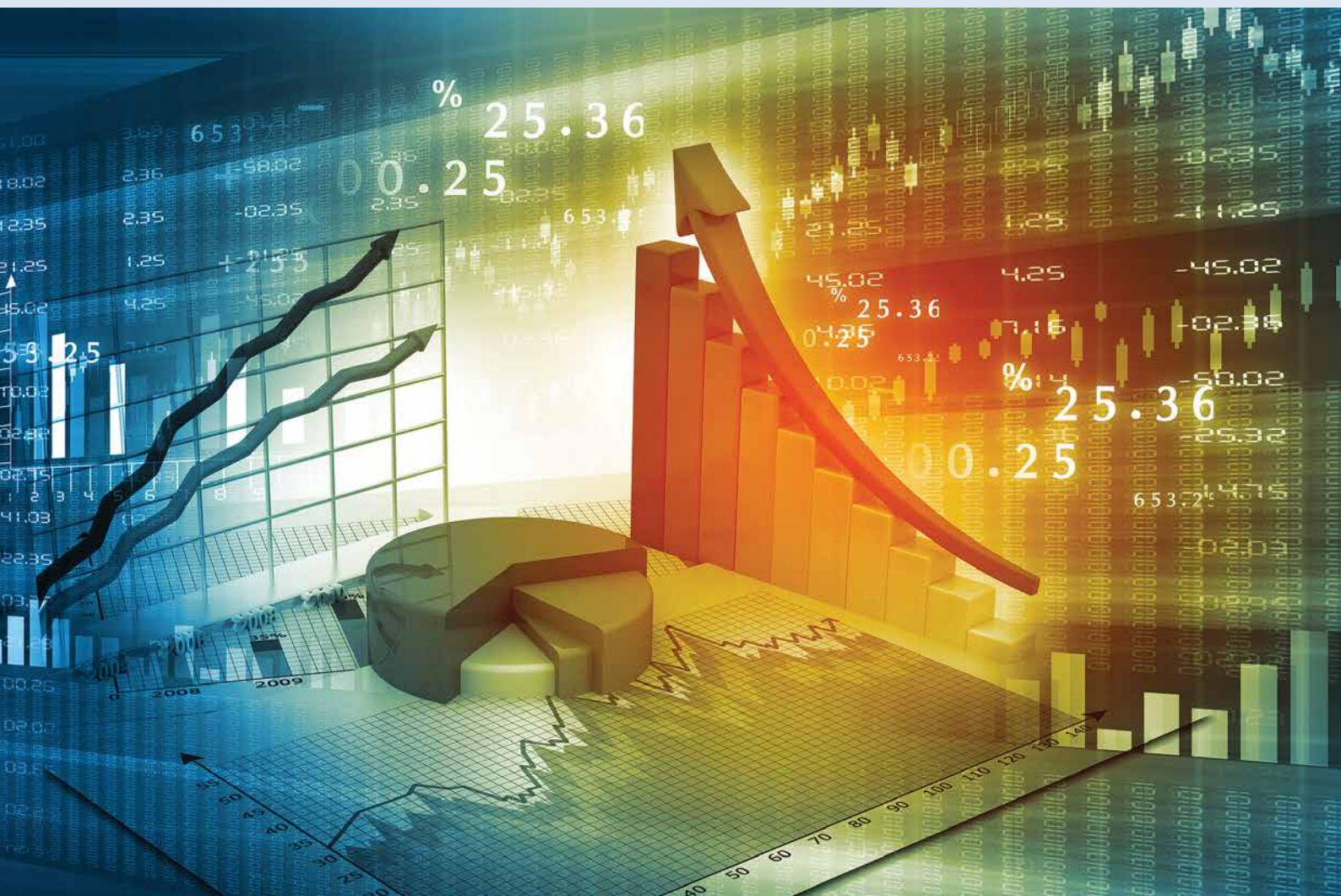
# Macroeconomics in moments of quasi-fiscal dominance: model and simulations

**Author:** Aloisio Pessoa de Araujo (aloisio.araujo@fgv.br)

**Researchers:** Paulo de Carvalho Lins and Rafael Santos

**Organization:** Brazilian School of Economics and Finance of Fundação Getulio Vargas (FGV EPGE)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV)



A policymaker facing a situation of high indebtedness will occasionally have to decide between: (i) raising the interest rate to guide inflation to the announced target; or (ii) accepting higher inflation. This study describes a formalization of this tradeoff and shows that a high level of public debt opens the door to adverse expectations, putting pressure on nominal interest rates and leading to failure to meet the inflation target. The article uses the model to explain the failure to meet the inflation target in Brazil in 2002 and 2003.

## OBJECTIVE

- To develop a model that captures the tradeoffs between monetary and fiscal policies during a period when the economy is in a situation of “quasi-fiscal dominance”, i.e., when monetary policy remains active, but loses efficacy due to an unsustainable public debt path.

## RESEARCH METHODOLOGY

- A model was built to capture the intertemporal tradeoffs of fiscal and monetary policies that incorporates: (i) the short-term incentive of obtaining money by issuing sovereign debt versus higher nominal interest rates, determined by rational expectations; and (ii) the long-run benefit of respecting the announced inflation target and having a reliable target in the next periods versus the short-run temptation of using inflation to reduce the public debt.
- In terms of monetary policy, a policymaker decides on the target and real inflation according to a three-stage game. In the first stage, he announces the target; in the second, private agents form their expectations; and in the third, the policymaker decides whether or not to deliver the target. Since he faces fiscal constraints, the private agents can doubt his capacity to meet the target that was announced. Consequently, the policymaker can announce a low target to pursue low inflation and run the risk of suffering a crisis of expectations; or announce a moderate target to seek better coordination of expectations.
- Since this three-stage game occurs in only one period, but repeats indefinitely, the policymaker must decide, besides the inflation target, the debt policy for the next period. A loss function, which penalizes both inflation and taxation, guides this intertemporal decision.

- In all periods, it is assumed that the policymaker has an imperfect commitment to a given inflation rate, i.e., he announces the target but can ignore it and use inflation to reduce the debt.

## RESULTS

- Fiscal fragility opens the door to crises of confidence, i.e., expected inflation higher than the target and nominal interest rate higher than the risk-free rate (real interest rate plus the inflation target).
- It can be optimal for the policymaker to combat fiscal fragility by reducing the public debt gradually. This fiscal prescription corresponds to Brazil's fiscal results between 2004 and 2014, when the net fiscal debt in relation to GDP declined from 45% to nearly 30%.
- Surprisingly, for a low inflation target and moderate debt level, depending on the preference parameters of the policymaker, it can be optimal to remain in the fiscal fragility region and avoid a costly fiscal adjustment. In this case, it is better simply to increase the public debt level, making the inflation targeting regime unsustainable. This fiscal prescription corresponds to the Brazilian case from 2014 to 2018, when the net debt in relation to GDP rose from 30% to almost 60% (in 2015, the upper limit of the interval containing the target was 6.5% and the government delivered inflation of 10.67%).

## WHAT'S NEW

- The models developed previously to study the interaction of the fiscal and monetary sides of the economy are useful to analyze extreme cases: models of fiscal dominance, in which the central bank loses its ability to coordinate inflation expectations; or orthodox models that sideline the limits imposed by fiscal policy on monetary policy. But little has been said about how the economy behaves in cases of "quasi-fiscal dominance", when the central bank still has the ability to coordinate inflation expectations. The model reported in the study can be used to analyze monetary policy and the actions of the central bank in a situation of fiscal fragility.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- The focus of the model developed is to understand how fiscal policy impacts the actions of the monetary authority, and hence the efficacy of monetary policy. The comprehension of this aspect of the interplay between the two policies is fundamental to describe the current risks of conducting Brazil's monetary policy. The further development of the theoretical model will allow better planning by central banks by revealing the risks and limits of their actions. Civil society will also benefit, by having a model that can be applied to analyze the conduction of monetary policy.

# The importance of learning in the new peer-to-peer economy

**Authors:** André Trindade ([andre.trindade@fgv.br](mailto:andre.trindade@fgv.br)), Edson Wu and Leandro Gorno ([leandro.gorno@fgv.br](mailto:leandro.gorno@fgv.br))

**Organization:** Brazilian School of Economics and Finance of Fundação Getulio Vargas (FGV EPGE)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV)





With the growing facility of access to the internet and the perception that transactions by virtual means are secure, the peer-to-peer markets are becoming increasingly popular and important. But they operate in highly uncertain environments due to the constant presence of shocks, to which sellers need to make adjustments.

## OBJECTIVE

- To study the learning process in peer-to-peer markets, by means of dynamic pricing model, using data from an accommodation rental platform, Airbnb.

## RESEARCH METHODOLOGY

- The data utilized – about the prices and characteristics of properties for rent and the characteristics of the hosts – are available to the public at the site of Airbnb. They can be recovered by web scraping the Airbnb website. Generally speaking, the online platform allows a person to procure an accommodation with certain characteristic in a given place on a specific date.
- A dynamic pricing model was developed in which the host posts an advertisement at the site to rent a property on a specific future date. In each period, a potential host decides whether or not to rent the property, based on observable and unobservable (to the host) characteristics, in a discrete choice model.
- The host only observes whether or not his property was rented. Whenever it was not, he receives an indication about the specific quality of the advertisement and chooses the prices based on the latest information about that quality, so as to maximize his value.
- The dynamic pricing model is simulated in three scenarios: a) with learning; b) without learning; and c) with complete information. The first assumes that the host does not know ex-ante the specific quality of his advertisement, but knows the distribution and learns about it with time. In the second scenario, he does not learn anything in the selling process. The last assumes that the host knows ex-ante the specific quality of his advertisement.

## RESULTS

- The results indicate that information is a relevant characteristic in peer-to-peer rental markets. Besides this, learning is important for hosts to improve their profits.
- A reduced-form linear regression revealed that the property rental advertisements where the hosts had less experience (shorter than six months in the Airbnb platform) charged higher prices. This is consistent with a learning history in



which hosts that have just recently started using the platform charge higher average prices to collect more information about their advertisements. As time passes, they tend to charge lower average prices.

- Both demand and supply are strongly affected by shocks. The hosts at first may not know how these shocks will potentially affect their demand. For this reason, they need to learn so as to optimally price their advertisements.
- The simulations performed showed, as expected, that information and learning increase the average profits of hosts.

## WHAT'S NEW

- This is one of the first works to explore learning as an important question in peer-to-peer markets.
- To extract the necessary information from the Airbnb site in Brazil, an innovative database was used, constructed using the SQL language.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- For future studies, an important question that needs to be examined is the estimation of demand.
- Additionally, the proposed models do not incorporate the specificities of peer-to-peer markets, since different types of agents were not modeled. Therefore, in a future work it will be important to incorporate the difference between professional and non-professional sellers to better document how learning affects these markets.

# Public housing policies: an evaluation of the "My Home My Life Program"

**Author:** [Ciro Biderman \(ciro.biderman@fgv.br\)](mailto:ciro.biderman@fgv.br)

**Researchers:** Claudia Acosta, Frederico Ramos, Gabriela Terentim, Julio Caldeira, Martha Hiromoto and Tainá Pacheco

**Organization:** São Paulo School of Business Administration of Fundação Getulio Vargas (FGV EAESP)

**Support:** Fundação Tide Setúbal and Lincoln Institute of Land Policy



Social Housing Programs tend to follow the logic of “more is better”, leading to the construction of housing projects on the outskirts of cities, where land prices are lower. This study evaluates the “My Home My Life Program” (*Programa Minha Casa Minha Vida* - PMCMV), assessing the impact of this logic on beneficiaries’ quality of life and on the urban structure of Brazilian metropolitan areas.

## OBJECTIVE

- To investigate whether the PMCMV has contributed to the sprawl of Brazilian urban areas, and with this, has aggravated their problems. It also analyzes whether the quality of life of the beneficiaries of the PMCMV has improved after moving into residential units financed by the program.

## RESEARCH METHODOLOGY

- The monetary and non-monetary costs of residing far from the central areas of the São Paulo Metropolitan Area (SPMA) were analyzed, along with the land price, Basic Educational Development Index (IDEB), health, pollutant emissions, commuting time and probability of homicides.
- The institutional aspects of the program were investigated, such as the supply and administration of credit, requirements regarding location of the undertakings, approval of construction, and enrollment and selection of beneficiaries.
- The impact of the PMCMV on the location within urban areas was analyzed using measures of urban sprawl proposed in the literature. Comparisons were carried out between (1) municipalities that received investments from the program with municipalities that did not; and (2) the number of residential units produced for the municipalities in the selected metropolitan regions.
- The analysis covered 20 metropolitan regions: Belém, Belo Horizonte, Brasília, Campinas, Cuiabá, Curitiba, Florianópolis, Fortaleza, Goiânia, Manaus, Palmas, Porto Alegre, Rio de Janeiro, Recife, Salvador, Santos, São Luís, São Paulo, Teresina and Vitória.
- Two datasets were constructed of new developments for each metropolitan region: one for the variation between 1995 and 2005; and the other for the new developments that happened between 2005 and 2015.
- To investigate why someone would accept living in a place with worse location than the previous residence, two extreme cases in terms of location were studied and compared: a housing project located 16 km far from downtown São Paulo, in the municipality of Diadema; and another located 80 km far from downtown, in the outlying municipality of Guararema. In these two cases, the land price was considered, which is theoretically a key variable to explain decisions on where to live.
- To verify the existence of international experiences that can contribute to improve the PMCMV, a comparative analysis was carried out of the program with the strategies adopted in similar housing programs in Chile, Mexico and Colombia.

## RESULTS

- In the metropolitan areas where more PMCMV projects were built, in general the location was worse in terms of the supply of public utility services in comparison to the average of the residents beforehand and this is not true for metropolitan areas less intense in PMCMV units. Hence, there are indications that “more was worse”. Only in São Paulo, Porto Alegre, and on a lesser scale, Curitiba, were the projects located in areas originally with better coverage than the average for the region.
- On average, the housing projects of the PMCMV are not located in areas very distant from the city center. What the program is doing is reducing the incentive to use land plots located more centrally. In other words, the more central locations are losing their attractiveness in function of demand more concentrated on the periphery.
- The municipalities with relatively more units of the PMCMV experienced faster land occupation than those with a smaller number of units in proportion to population, suggesting that the PMCMV consumes land intensely and might be generating greater sprawl in the metropolitan regions analyzed.
- The comparison between what happened in the municipalities from 1995 to 2005 and what happened from 2005 to 2015 in terms of land occupation shows that the program changed the way metropolitan areas were filling their empty space: the greater the number of PMCMV units' the smaller the infill and the larger the leapfrog of new developments.
- Based on the comparison with similar programs in other countries, the Mexican program appears to be considerably worse than the Brazilian one, and the results of the mass programs in Chile and Colombia are also not very sound. In those two countries, there are some smaller and more promising programs, but there is doubt about whether or not these can be scaled up. What can be concluded from these cases is that there is no clear model to be followed for possible reformulation of the PMCMV. The only way to find it out is experimenting with different housing policies that were implemented in small scale and attempting some new models.

## WHAT'S NEW

- Since the PMCMV is on balance not achieving what is desired of a housing program – better quality of habitation for low-income people – so it winds up being an income distribution program, which probably could be done more efficiently by simply distributing income directly.
- It is necessary to think about a program that incorporates the landholding element, reducing the volume of units to guarantee better housing quality, and mitigating the negative externalities in cities.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- The study found that one of the main flaws of housing programs is that they wind up opting essentially for the public investment component, ignoring that the program should focus essentially on landholding and urban design aspects. Besides this, it is clear that the scale of the undertakings should be carefully controlled.
- It is thus possible, albeit very difficult, to design a better program, provided it includes the land ownership element and controls the scale of the program, both in terms of total number of units and number of units per project.
- A major challenge to the PMCMV is how to change it so as to increase instead of diminish the opportunities for families. For this purpose, besides bringing the landholding component to the design of the program, it is necessary to give families greater power in the decisions, by increasing their level of information as much as possible.

# Fragmentation without cleavages? Ideology, preferences and political polarization in Brazil

**Author:** Cesar Zucco ([cesar.zucco@fgv.br](mailto:cesar.zucco@fgv.br)) and Timothy Power

**Co-authors:** Nathalia Passarinho and Rodrigo Lentz

**Organization:** Brazilian School of Public and Business Administration of Fundação Getulio Vargas (FGV EBAPE)

**Support:** Applied Research Fund of Fundação Getulio Vargas (FPA FGV) and University of Oxford



The number of political parties in Brazil is incredibly large and growing. This study evaluates possible explanations for this phenomenon in light of the literature on party fragmentation, investigating systemic characteristics of the Brazilian party system, in particular the distances between the parties and the preferences of political elites.

## OBJECTIVE

- To evaluate whether the exaggerated proliferation of parties in Brazil can be related to the existence of issue-cleavages of coalitions, and if not, to offer an alternative explanation.

## RESEARCH METHODOLOGY

- To test the hypothesis of whether the high party fragmentation in Brazil can be related to the representation of the interests of particular groups, we evaluated the presence of evidence of multidimensionality (or increased dimensionality) in the Brazilian political system. For this, we used data from the Brazilian Legislative Survey (PLB), which has been conducted among members of Brazil's Congress since 1990. The eighth version of this survey was conducted in 2017, and supported by FGV and the University of Oxford.
- In particular, legislators' responses to a series of 20 questions in the last two versions of the survey, conducted in 2013 and 2017. These questions were grouped into five issue sets: "traditional" left-right issues (which elicits opinions of the degree of governmental intervention in the economy); "classic liberalism" issues (with questions about effort, competition, meritocracy and entrepreneurship); "new themes" (with questions about abortion, gay marriage and affirmative action based on race); "fiscal themes" (preferences about expenditures and taxation in five political areas); and "international questions" (items about the role of the National Bank for Economic and Social Development (BNDES) in supporting internationalization of Brazilian companies and opinions about treaties to protect foreign investments in Brazil).
- Since no evidence of multidimensionality was found, we examined how unidimensional polarization of the party system varied in Brazil over the period studied.
- In order to examine the levels of polarization, it was necessary first to develop estimates of the ideological positions of parties over time. The estimates of the ideological positions of the parties were obtained by rescaling the responses given by the lawmakers to questions that required them to locate their own place and those of the main parties of the political system in the ideological spectrum, on a scale ranging from 1 (left) to 10 (right). Although these questions lacked the substantive depth of the previous analysis, they were included in all eight versions of the PLB, conducted in each Congress since redemocratization. We considered the polarization measured only among the 11 parties with estimates of ideology in all eight rounds of the PLB (in effect, the "oldest" parties).
- We then assessed the presence of an association (positive or negative) between polarization and fragmentation and

investigated: 1) if fragmentation affected the center versus the extremes of the political spectrum in different ways; and 2) if this was spurred by new entrants.

- The examination of these empirical questions allowed discriminating among various possible impellers of hyperfragmentation in Brazil.

## RESULTS

- Brazilian politics is one-dimensional, more so now than before. Over time, polarization has risen and fallen, but fragmentation has increased almost continuously.
- There is evidence that polarization, at least regarding economic preferences, reached a low point in 2013. In this sense, the data used in this study showed a steadily declining variation of the responses of the lawmakers during the period covered by the first seven rounds of the PLB, and an increase in the last period (2013-2017). The left-right polarization decreased during most of the period analyzed, but increased again in the most recent Congress polled (2014-2018). In short, ideology surged again.
- Considering the polarization measured among the 11 parties for which ideological estimates are available in all eight rounds of the PLB (i.e., the “oldest” parties), the entry of new parties did not offset the reduction of polarization observed in the period, nor did it contribute to increase this phenomenon in the two most recent Congresses. In other words, in general the party system became less polarized.
- If a process based on preferences were behind the increased fragmentation, the majority of the new entrants would have appeared at the ideological extremes. But the data show this did not happen. It seems improbable, in this scenario, that the proliferation of Brazilian parties is impelled by policy questions.

## WHAT’S NEW

- Somewhat surprisingly, given the very large number of legislative parties in Brazil, the optimal number of parties based on the preferences of legislators would be just two. The two resulting parties would be highly consistent in terms of their preferences: this would assure good separation in the first three sets of questions – “traditional”, “classic liberalism” and “new themes” – and a bit less so in fiscal and international questions.
- We also argue, based on additional evidence, that increased hyperfragmentation has been propelled as of late by changes in funding and by rules about the formation of joint electoral lists that provide a very strong incentive for politicians to be in control of parties at the state level. In Brazil, in short, it is better to be the leader of a small state party than to be a low-ranking member of a large party.

## APPLICATIONS OF THE RESULTS AND POSSIBLE EXTENSIONS OF THE STUDY

- There is no project in any developing country that has surveyed legislators over such a long period of time as the PLB. The numerical estimates about the relative position of the parties over time are extremely useful to students of politics, economics and public policies desiring to understand the process of political decisions in Brazil.
- The data will be made available to the public in consolidated form, along with the data from the seven previous versions (available at <https://dataverse.harvard.edu/dataverse/bls>), serving to support many national and international studies in the areas of politics, economics, public policies and related areas.



