PUERTO RICO: 2016 - 2030

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* Business confidential, for discussion only

COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF
ECONOMIC DEVELOPMENT
& COMMERCE
DDEC

Estudios Técnicos Inc.
Investigación | Estrategias | Soluciones

Executive Summary

The current economic landscape has limited the government's ability to develop counter measures to halt the dramatic generational, social and economic changes that the Island has experienced. Halting population decline or mitigating the accelerating effect of the aging population, are ambitious endeavors. Nonetheless, the state can develop several policy interventions that will adapt or transform Puerto Rico's public institutions. Low-cost interventions such as promoting healthier lifestyles, adapting services and industrial sectors to older age requirements, promoting continuous education and extending retirement age, placing adequate incentives for value-added services, adapting to generational preferences and revitalizing urban centers, are all plausible mechanisms that have been well documented in other jurisdictions. Understanding the underlying circumstances of Puerto Rico's population decline, such as free labor mobility with an advanced economy, will support delineating potential courses of action.

This report provides a series of scenarios that will guide the future undertakings of our society and economy. Scenarios provide both, a temporal and a qualitative dimension. Three main time periods have been selected, illustrating short, medium and longer term perspectives. Also, potential outcomes were divided between baseline, optimistic and pessimistic views, in order to provide a broader range of strategies and recommendations.

Description of Scenarios by Time Period and Perspectives on Key Indicators
2016-2030

	2016-2020	2021-2025	2026-2030
Optimistic	Readjustment Period	On the Path to Recovery	Modest Growth
Base	Contraction Period	Critical Stabilization Period	On the Path to Recovery
Pessimistic	Lost Period	Readjustment Period	Stabilization Period

As can be seen, the scenarios reflect a trajectory in terms of change: stagnation for the 2016-2020 period, stabilization from 2021 to 2025, and a growth period from 2026 to 2030. The depth of the economic and demographic factors affects the magnitude of these changes.

Trend #1: The Economy Will Be Smaller

In almost all of the scenarios, Puerto Rico will have a substantial downsizing in its demographic and economic base, with higher percentages of elderly population and a challenging labor market. Coupled with the starting point of a decade-long deep economic contraction, these changes will have multifaceted repercussions upon the economy. The major challenge remains designing institutions suitable for a context very different from the one that prevailed until fairly recently. .

Trend #2: Policy Reforms Will Be Indispensable to Achieve Economic Growth

It is clear that for the short and medium term, uncertainty is the defining factor in Puerto Rico's economy. A large number of external and internal variables are subject to change, and there remains a desperate need for policy and institutional reforms to address long-standing structural weaknesses in the economy.

Trend #3: Fixed Capital Investment Will Have to Increase

A growing economy is associated with high levels of investment. Between fiscal 2000 and fiscal 2004 the GNP share of gross fixed capital investment (GFCI) averaged 27.9%; during the same period, the economy grew at an average rate of 1.8%. In contrast, the share in GNP of fixed capital investment declined to 12.6% in fiscal 2015, with a corresponding decline of 0.7% in real GNP.

If we assume the total requirements of fixed capital investment in the island to be the average during fiscal years 2000 to 2004 (27.9%), we find that none of our scenarios point to an increase in the GFCI share anywhere near that level. In fact, the highest real share of GFCI to GNP in our scenarios was 18% by 2030.

What could change the above conclusion is an aggressive program of infrastructure rehabilitation and a successful promotion program for new economic activities.

Trend #4: The Recovery Path Will Likely Take Longer than 2030

Even with economic reforms in place, the path to recovery is expected to take more than 15 years. This is the result of an exercise conducted to determine the approximate time period during which a scenario would attain a non-recessionary level of economic output.

Key Facts:

1) In a general sense, the economy will undergo several profound transitions during the period 2016-2030 that are dependent upon institutional, demographic and, of course, economic variables, both internal and external.

2) The baseline scenario contemplates a continued contraction in the years 2016 to 2020, followed by stabilization from 2021 to 2025 and finally resuming a growth path from 2026 to 2030. The economy is not expected to recover to the 2006 real GNP pre-recessionary level until 2034.

3) GNP growth will fluctuate from an average decline of between 1.4% and 2.2% for the 2016-2020 period to growth between 1.0% and 3.4% for the 2026-2030

period. In all cases, except the optimistic scenario, the economy is expected to be smaller by 2030 than the economy in the last pre-recessionary year (2006).

4) The population is expected to fall in all scenarios. In the optimistic one, it is expected to be around 3.3 million. In the baseline scenario, population is expected to reach 3.14 million inhabitants. The pessimistic scenario assumes a population of 2.9 million by 2030, a decline of more than 600,000 inhabitants from 2015.

5) Employment in mid-level wage occupations has declined, whereas employment in higher-wage occupations has been increasing, particularly jobs in computer and mathematics operations that increased at a 3% compound rate between 1999 and 2015.

6) The expected challenges in the labor market and changing occupation structures in labor demand place much greater emphasis upon lifelong learning and increasing individual skills.

7) Various policy reforms and economic initiatives are assumed to be implemented at different times in the scenarios, as these are recognized as necessary to shift the economy away from the spiral of economic contraction, emigration and job loss.

8) Even with economic reforms in place, the growth path for Puerto Rico's economy is likely to take longer than 2030 to achieve full recovery. Only in the optimistic scenario does the economy return to the GNP level in fiscal 2006, the last pre-recessionary year. In the pessimistic scenario, economic growth to fiscal 2006 levels is not expected until 2041, shifting the growth period by more than a decade with respect to 2030. For the baseline scenario, parity with the 2006 GNP level is achieved in 2034.

The tables below provide a detailed description of the main socioeconomic variables throughout the 15 year period. Variables are presented in terms of percentage points for each scenario, with the exception of total population. As noted in the tables, the 2016 – 2030 period highlights an economy much different than previous years (2006 –

2015). Yet, the 2016 – 2020 seems as a transitional period to deeper changes in 2021 an onward.

Comparison of Key Indicators Across Time Periods -- Optimistic Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,308,045	3,266,901	3,300,194
Gross National Product (Growth)	-1.5%	-1.4%	2.2%	3.4%
Personal Consumption Expenditures (Growth)	0.2%	-1.0%	1.3%	1.8%
Investment (Growth):	-3.6%	-2.4%	1.3%	2.9%
Public Construction	-9.0%	-4.9%	3.1%	2.9%
Private Construction	-8.0%	-3.3%	1.9%	3.1%
Machinery & Equipment	-0.5%	-1.9%	1.0%	2.8%
Government Expenditures (Growth)	-1.2%	-1.0%	1.0%	1.7%
Employment (End of Period)	984.0	940.5	966.7	1,008.4
Unemployment Rate	13.3	12.2	11.1	10.8
Labor Participation Rate	39.9	38.9	40.5	42.9

Comparison of Key Indicators Across Time Periods -- Baseline Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,283,022	3,161,742	3,145,964
Gross National Product (Growth)	-1.5%	-1.8%	1.1%	1.9%
Personal Consumption Expenditures (Growth)	0.2%	-1.5%	1.0%	1.3%
Investment (Growth):	-3.6%	-3.8%	0.5%	2.4%
Public Construction	-9.0%	-6.7%	2.6%	1.8%
Private Construction	-8.0%	-4.4%	1.2%	2.5%
Machinery & Equipment	-0.5%	-3.3%	0.1%	2.4%
Government Expenditures (Growth)	-1.2%	-2.9%	0.3%	1.6%
Employment (End of Period)	984.0	930.1	932.9	962.3
Unemployment Rate	13.3	14.3	13.6	11.9
Labor Participation Rate	39.9	39.2	39.4	42.1

Comparison of Key Indicators Across Time Periods -- Pessimistic Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,203,964	2,961,732	2,926,361
Gross National Product (Growth)	-1.5%	-2.2%	-1.1%	1.0%
Personal Consumption Expenditures (Growth)	0.2%	-1.7%	-0.9%	0.9%
Investment (Growth):	-3.6%	-4.8%	-1.9%	1.3%
Public Construction	-9.0%	-7.2%	-2.8%	1.1%
Private Construction	-8.0%	-6.0%	-2.8%	2.1%
Machinery & Equipment	-0.5%	-4.2%	-1.6%	1.1%
Government Expenditures (Growth)	-1.2%	-4.0%	-1.1%	1.2%
Employment (End of Period)	984.0	917.0	903.3	911.1
Unemployment Rate	13.3	15.0	14.9	14.3
Labor Participation Rate	39.9	37.9	37.0	38.1

Main Actions

With the potential implementation of austerity measures by the Oversight Board created in PROMESA, the Island should expect traditional structural adjustment programs which are centered on the supply side of the equation; however, a stronger focus must be placed on the demand side, which is the main dilemma for a smaller economy and a smaller population. This focus requires:

- Outward orientation
- Strengthening Internal linkages
- Mobilizing stakeholder integration
- Long term vision
- Innovation driven development
- Strong emphasis on core competences
- Effective management of the economy's openness
- Strategic competence
- Network creation as a key competence

As explained in the benchmarking exercise, there is no one specific route for reconstructing an economy that has suffered both economic contraction and severe loss of population. There are, however, initiatives that are common to many of these success stories. In the case of Ireland, Finland and Pittsburgh the shift to a high value added service economy based on technology and innovation is present in all three, as is the importance of mobilizing society's stakeholders in support of an agreed upon vision. In Finland's case the creation of the *Committee for the Future* as a permanent fixture in the policymaking system, and in Ireland the *Social Partnership*, both played a key role in the reconstruction of their economies.

Introduction

The economic history of Puerto Rico has been characterized by a series of rapid and profound transformations. The sheer speed of these changes often gave little room for adjusting to a changing economic landscape and, for the most part, Puerto Rico's policymakers bowed to the urgency of addressing short-term challenges, leaving significant structural and development gaps unaddressed. Over the last decade, the economic model on which Puerto Rico based its growth has been exhausted, due to the model's inability to resolve the fundamental weaknesses which were left unattended in previous periods and to changes in the global context. This has resulted in more than ten years of economic contraction, a steady decrease of the quality of life in the island, massive outmigration and a collapse of the institutional framework.

At the same time, the world experienced an unprecedented rate of change. Technology redefined the worldwide supply chains, shifting the developed world away from manufacturing and towards service-led economies, although some reversal of this trend is beginning to develop. Emerging economies disrupted the political and economic landscape, causing new geopolitical disequilibria and refashioning international trade. Most importantly, there has been an inevitable and profound shift away from the conditions that existed at the time Puerto Rico's initial economic strategy was conceived. The variables which governed the growth path of Puerto Rico from 1950 to 2015 must be reevaluated from a 21st-century perspective in order to regain competitiveness and assure an effective insertion in new global trends.

This report provides a comprehensive outlook at the past, present and future trends of Puerto Rico's economy, with an emphasis on the long-term implications for sustainable growth and development. The report is organized in three parts. The first part contains an analysis of Puerto Rico's economy up to 2015, its position as a regional economy within the United States economy and its competitiveness in the broader international context. The second part analyzes three different scenarios of long-term growth up to 2030, the growth possibilities of the island's economy with respect to 2015, and the structural transitions that are expected to affect these scenarios up to and beyond 2030. Finally, the third part contains challenges, strategies and recommendations to develop sustainable growth by 2030, in light of the expected scenarios and our current and expected resources and socio economic conditions.

PART 1: THE ECONOMY OF PUERTO RICO IN 2015

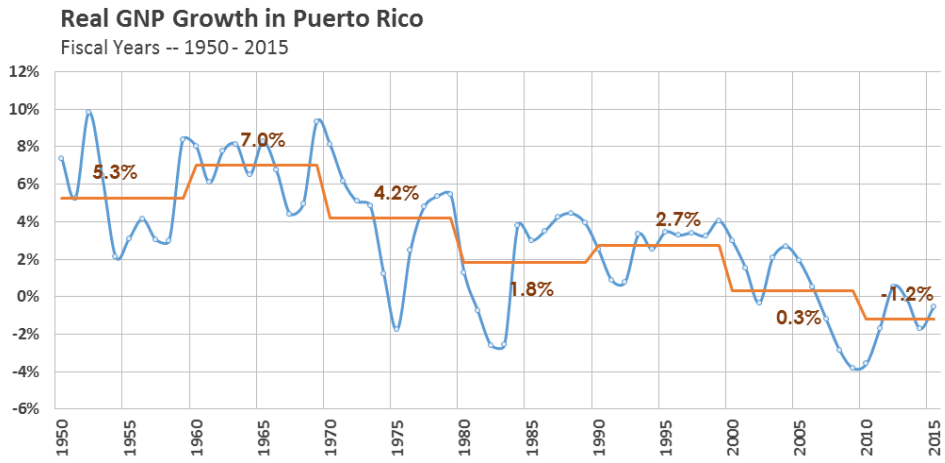
Chapter 1: Key Developments and Recent Trends in the Economy of Puerto Rico

This chapter summarizes the status of Puerto Rico's economy in 2015 from a historical perspective. It analyzes the core trends that have contributed to the current economic and social conditions in the island.

Trend #1: Economic Stagnation and Demographic Downsizing

Real GNP growth in Puerto Rico has experienced long-term stagnation from fiscal 1970 onwards, with the average annual growth in real GNP per decade since 1950 becoming progressively smaller for almost the entirety of the 1950-2015 period. The fiscal 2010 – fiscal 2015 period experienced an average annual contraction of 1.2%, with declines of 1.7% in fiscal 2014 and of 0.6% in fiscal 2015.

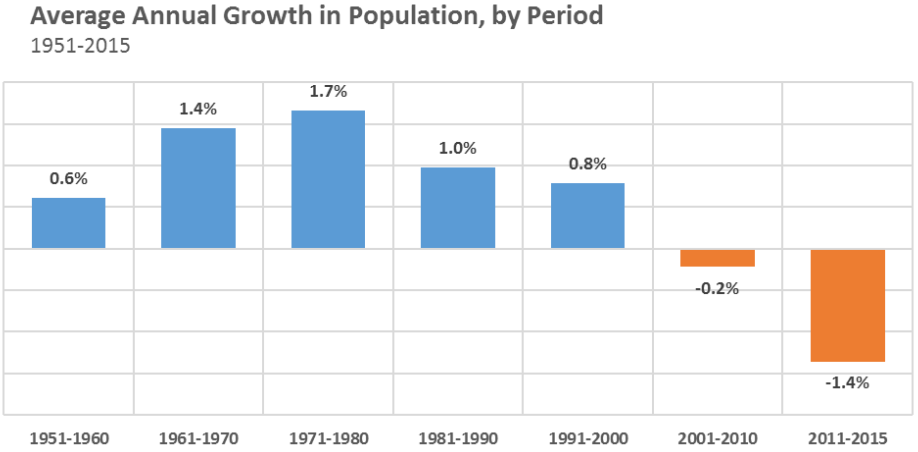
FIGURE 1



Source: PR Planning Board (2016). *Statistical Appendix (Various Years)* [Table 1]. *Growth at constant 1954 prices.

The long-term population trend remained consistent with GNP growth during the period, with high population growth during the expansionary phase of the economy, and declines as the economic condition weakened. Average population increases began to falter from 1981 onwards, coinciding with the structural reduction in average GNP growth for the same period.

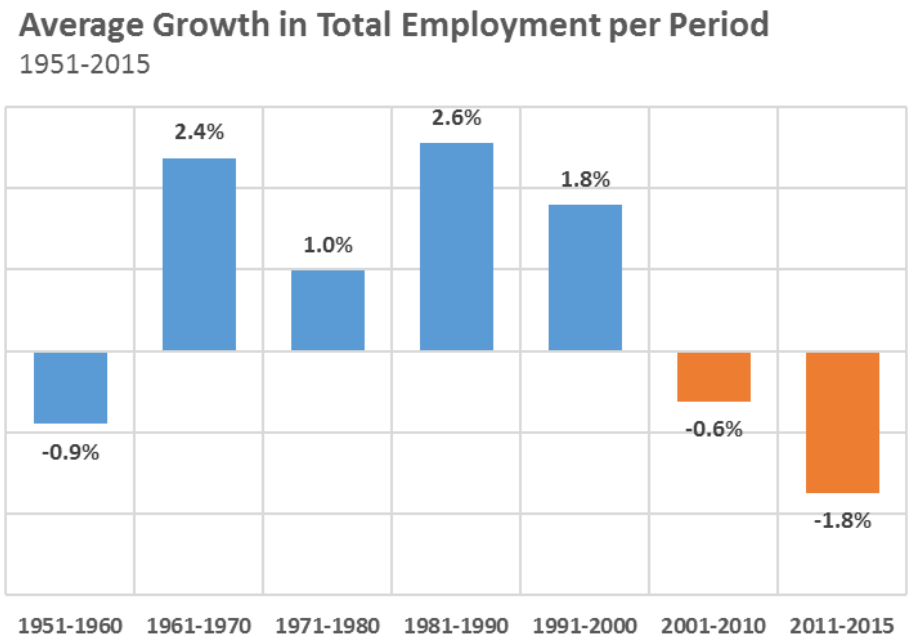
FIGURE 2



Source: US Census Bureau (2016). *Decennial Census (Various Years)*

Employment shows a trend similar to those of other variables, particularly after 2000, where the average declines in population and employment are similar in percentage terms.

FIGURE 3



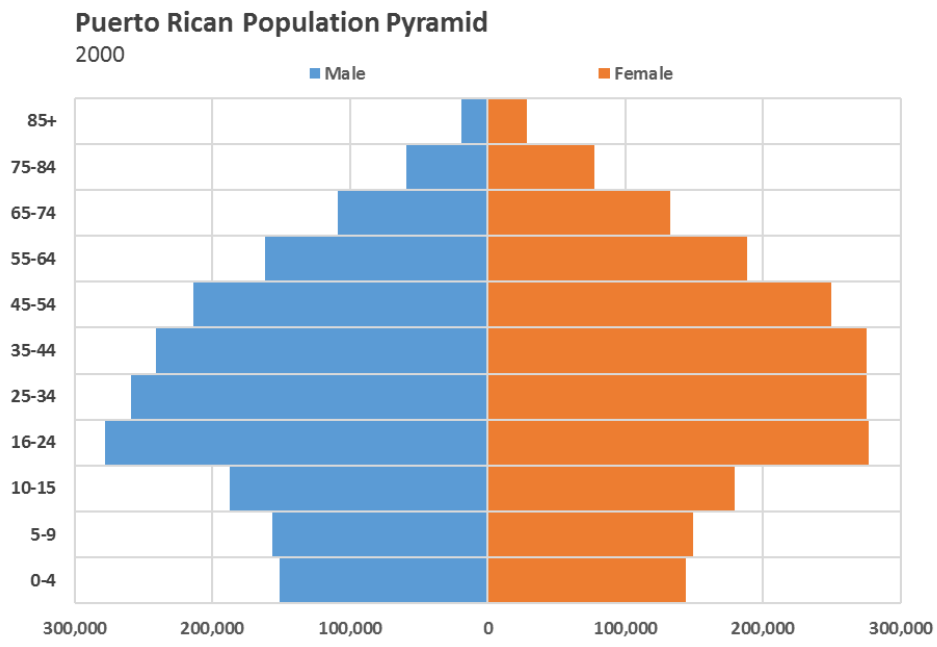
Sources: PR Planning Board (2016). *Series Históricas (Años Fiscales) -- 1950-2011*. PR Department of Labor and Human Resources (2016). *Serie Histórica del Grupo Trabajador, Empleo y Desempleo*.
*Not Seasonally Adjusted.

In conjunction, these three variables present a significant downsizing trend in the economy occurring after 2001. Weak economic growth lowered job market prospects, prompting the exit of individuals from the labor force and from the Island altogether. The negative demographic trend adds downward pressure to the economy, fostering the economic contraction and thus reinforcing the aforementioned cycle. *Unless significant changes in the labor market or the economy occur, the self-reinforcing spiral of economic contraction, job market weakening and emigration will erode future growth prospects.*

Trend #2: Accelerated Population Aging

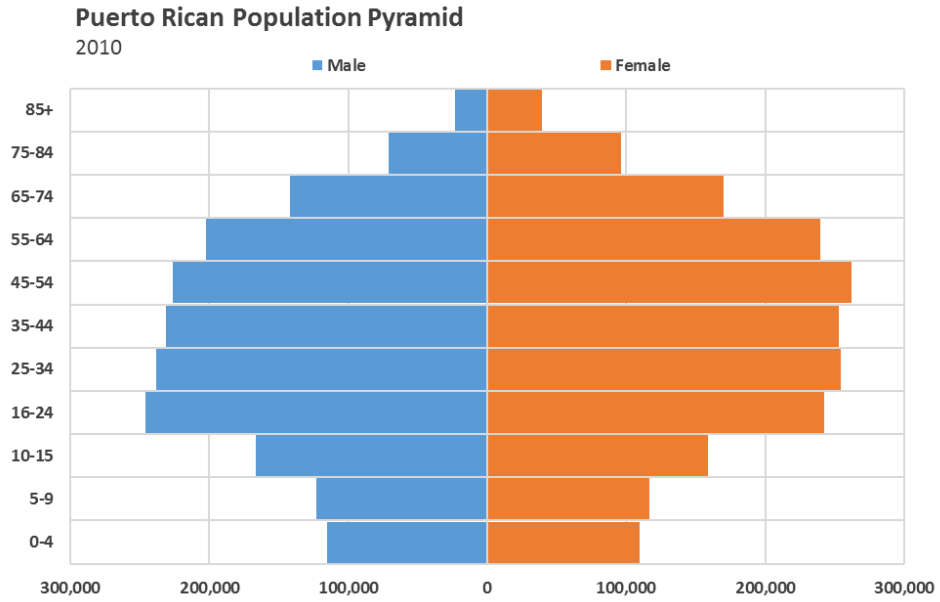
At the beginning of the 21st century, the population in Puerto Rico remained relatively young, with a high percentage in the 25 to 34-year cohort, and a noticeable decline in older cohorts. By 2010, the population showed signs of a profound and accelerated aging process; the population younger than 34 years old had declined by approximately 243,000 individuals, while the population 45 years and over increased by almost the same amount (233,000 individuals). From 2000 to 2014, the median age of the population increased by 6 years and is now 40.

FIGURE 4



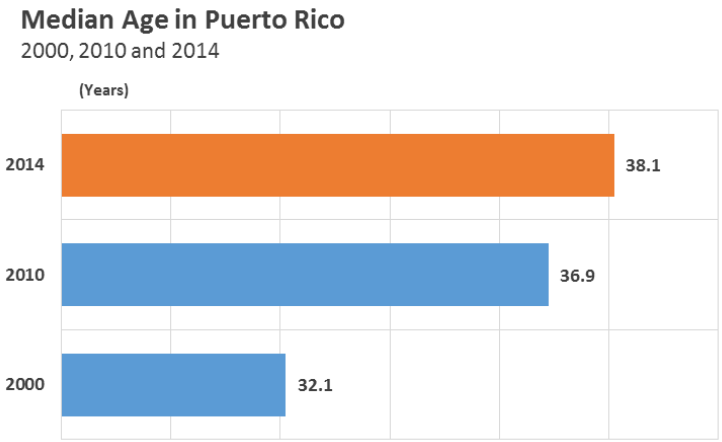
Source: US Census Bureau (2016). *2000 Census* [Table PCT012]

FIGURE 5



Source: US Census Bureau (2016). *2010 Census* [Table QT-P2].

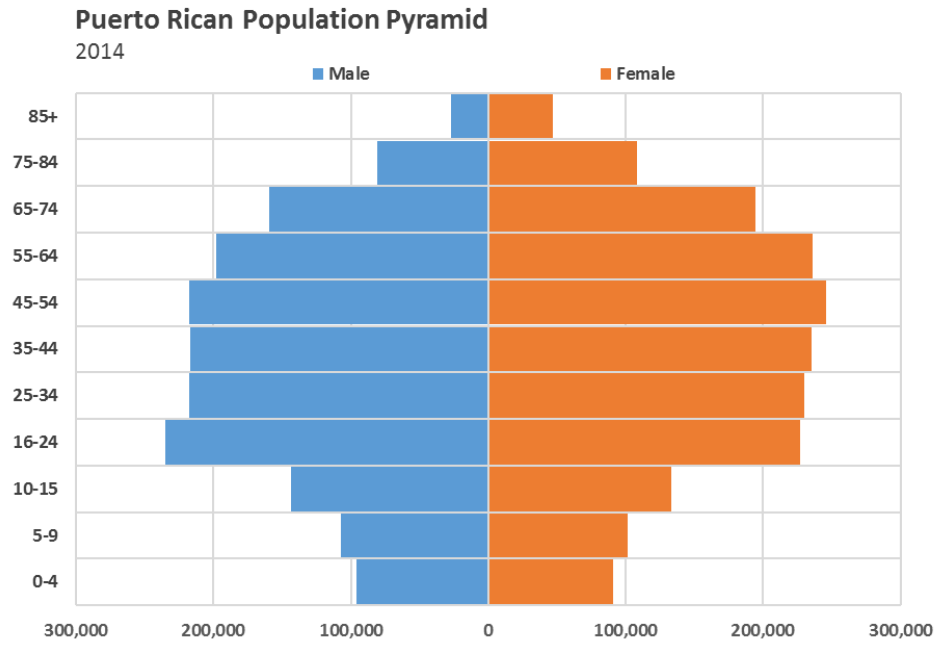
FIGURE 6



Sources: US Census Bureau (2016). *2000 Census* [Table P013]. US Census Bureau (2016). *2010 Census* [Table P13]. US Census Bureau (2016). *American Community Survey 5-Year Estimates* [Table B01002].

This tendency became more intense after 2010, as can be seen in the population pyramid for 2014 (Figure 7). The population 65 years or older almost equals the population younger than 16 years old in number, while significant shrinkage of the working-age population cohorts has been experienced.

FIGURE 7

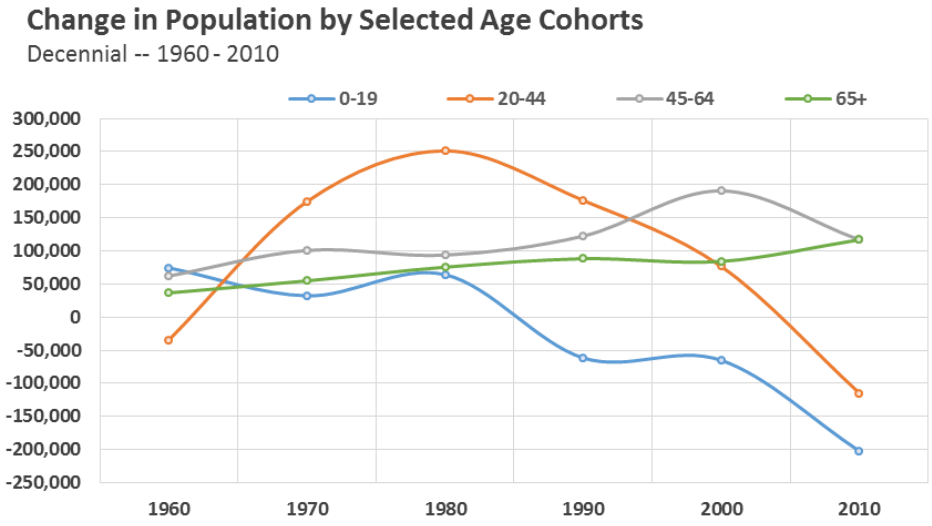


Source: US Census Bureau (2016). *Annual Estimates of the Resident Population for Selected Age Groups by Sex* [Table PEPAGESEX].

Reduction in the Younger Population

The economic decline accentuated a long-term reduction in the younger population since 1970. From 1960 to 1980, there was an upsurge in the young workforce (population 20-44 years old), coinciding with an economic boom in that period; however, the change in number of individuals 19 or younger had already begun trailing the expansion of the workforce, signaling a weaker future growth in the population. This trend accentuated from 1990 onwards, where the aging population 65+ continued to rise while the population 44 years or younger began experiencing a downward trend. By 2010, both major cohorts of the younger population (individuals under 19 and individuals 20-44 years old) were in negative territory.

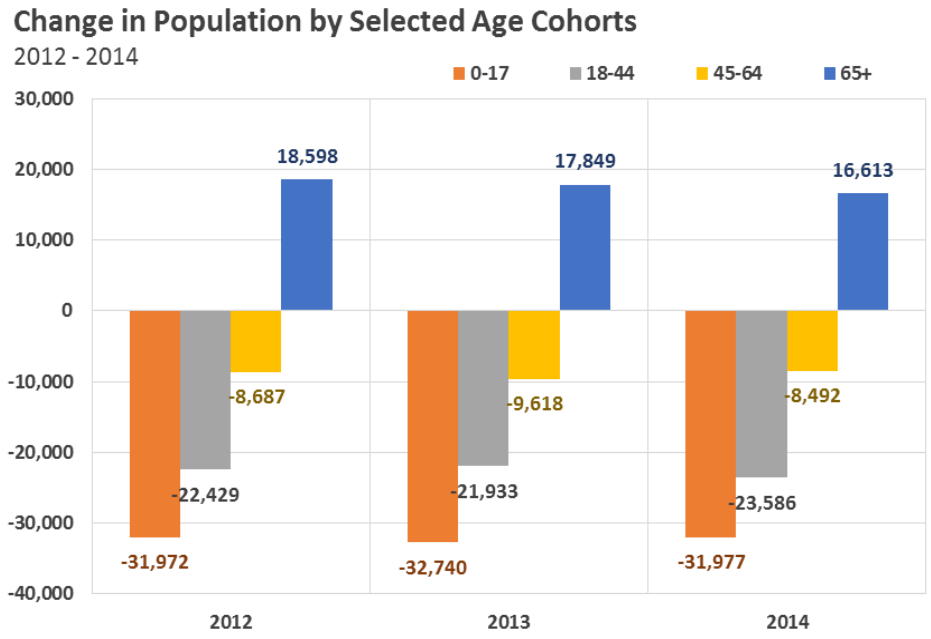
FIGURE 8



Source: US Census Bureau (2016). *Decennial Census (Various Years).*

From 2001 to 2010, the population 17 years old or younger showed an accumulated loss of more than 188,000 individuals. This decrease was followed by declines in the younger workforce (18 to 44 years old), which declined by almost 130,000 individuals. In contrast, the population 65 years or older increased by approximately 75,000 individuals during the same period.

FIGURE 9

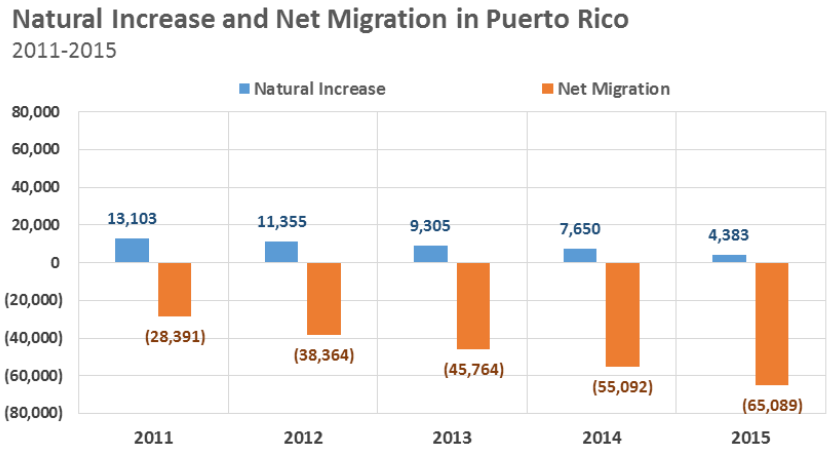


Source: US Census Bureau (2016). *Annual Estimates of the Resident Population by Age and Sex* [Table PEPANNRES].

Trend #3: Reduced Natural Increase and Increased Emigration

One of the main drivers of the economic contraction in population is the steadily increasing outmigration. From 2011 through 2015, an accumulated net migration of 232,700 people completely overshadowed the natural increase during the same period (45,796 individuals).

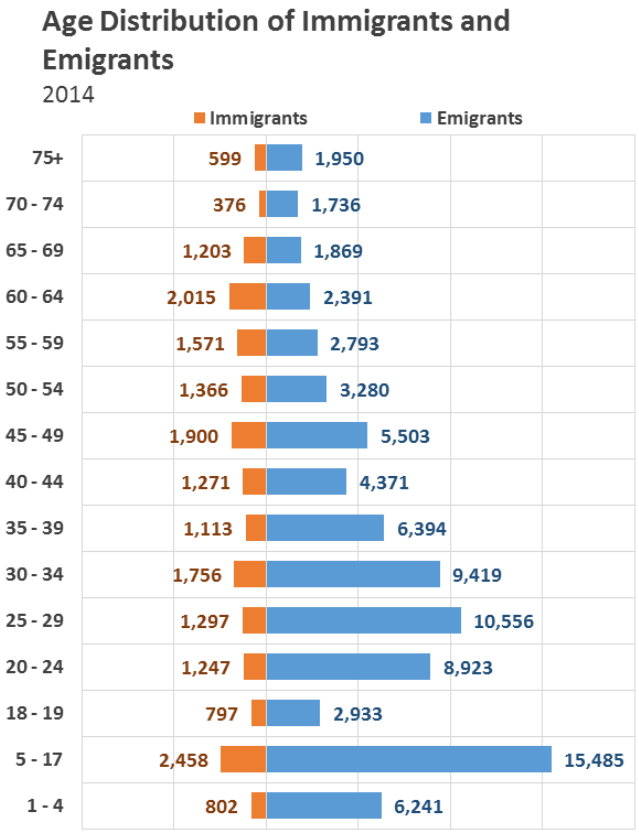
FIGURE 10



Source: US Census Bureau (2016). *Annual Estimates of the Components of Resident Population Change (Various years).*

The high emigration also catalyzed the aging trends in the island. According to the PR Migrant Profile 2014, 50.8% of the emigrant population belonged to the 18-44 years or older age cohort, which is consistent with the previously noted reduction in the younger population. It is also in this age cohort where the ratio of immigrants to emigrants is lowest.

FIGURE 11

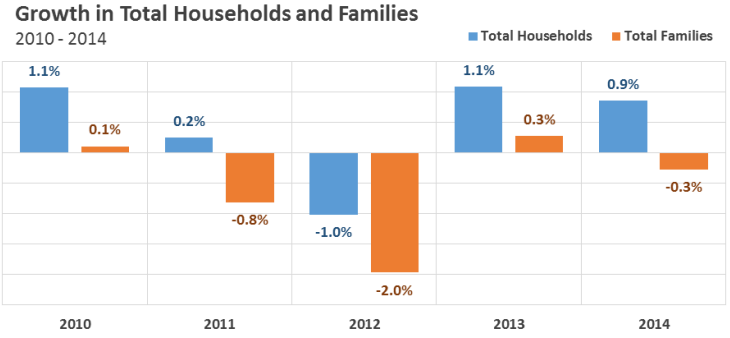


Source: PR Statistics Institute (2014). *Perfil del Migrante* [Table A1].

Reduction of Household and Family Size and Formation

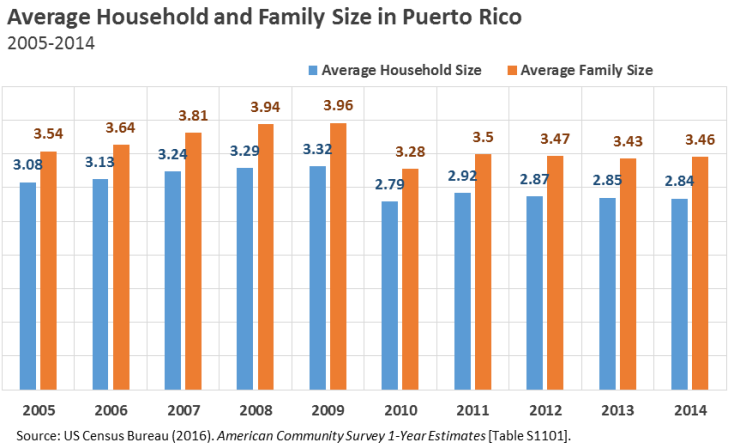
The declining and aging of population also impacted household size and formation. Growth in the number of families decreased from 0.1% in 2010 to a decline of 0.3% in 2014. Household and family size decreased significantly after 2009, reaching less than 3.5 individuals per family on average and below 3 per household in 2010.

FIGURE 12



Source: US Census Bureau (2016). *American Community Survey 5-Year Estimates* [Table S1101].

FIGURE 13



Source: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table S1101].

Trend #4: Erosion of Important Economic Growth Engines

A byproduct of Key Trend #1 is that some sectors with a historically important contribution to Puerto Rico's economic growth have contracted significantly in recent years. In particular, four (4) sectors have shown the most severe deterioration: construction, manufacturing, the financial sector and the public sector.

Construction and Real Estate

Construction investment in Puerto Rico declined significantly as a share of GNP, from 14.8% in fiscal 2000 to 4.6% in fiscal 2015. The largest decrease occurred in the private sector; from fiscal 2000 to fiscal 2015, private construction investment lost approximately $3,000 million, or 55.6% of its fiscal 2000 volume.

TABLE 1

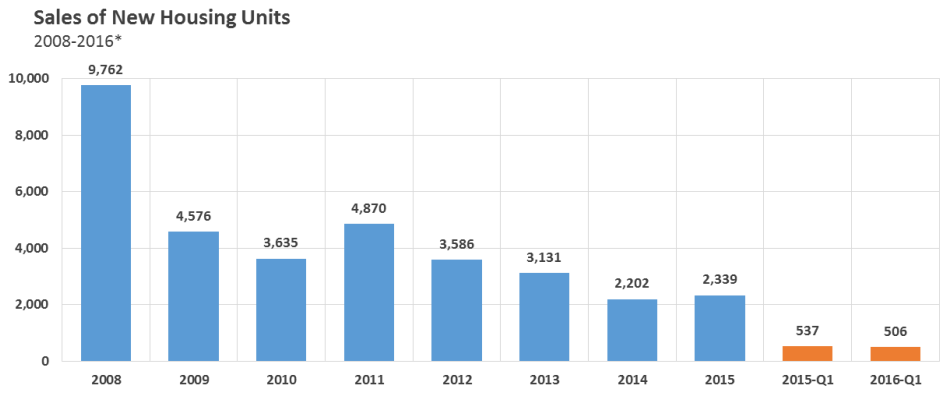
Construction Investment in Puerto Rico
Fiscal Years -- 2000 - 2015

Concept	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GNP (Current-Price):	46,428.8	55,731.2	56,103.6	62,962.5	66,393.1	68,552.5	57,854.3	60,642.7	62,703.1	63,617.9	64,294.6	65,720.7	68,085.7	68,944.9	68,461.2	68,520.6
Construction Investment:	6,849.3	6,756.9	6,491.2	6,334.6	6,595.9	6,513.6	6,028.6	5,750.1	5,390.5	4,255.8	3,668.5	3,860.3	4,558.5	3,978.1	3,400.2	3,157.3
Private	4,254.2	4,248.9	4,087.2	3,809.2	3,872.8	3,641.1	3,324.3	3,278.7	2,686.7	1,922.9	1,830.6	1,801.7	2,056.3	1,920.9	1,849.8	1,888.0
Public	2,595.1	2,508.0	2,404.0	2,525.4	2,723.2	2,872.5	2,704.3	2,471.4	2,703.9	2,332.9	1,837.9	2,058.6	2,502.2	2,057.2	1,550.4	1,269.3
As % of GNP:																
Total	14.8%	12.1%	11.6%	10.1%	9.9%	9.5%	10.4%	9.5%	8.6%	6.7%	5.7%	5.9%	6.7%	5.8%	5.0%	4.6%
Private	9.2%	7.6%	7.3%	6.0%	5.8%	5.3%	5.7%	5.4%	4.3%	3.0%	2.8%	2.7%	3.0%	2.8%	2.7%	2.8%
Public	5.6%	4.5%	4.3%	4.0%	4.1%	4.2%	4.7%	4.1%	4.3%	3.7%	2.9%	3.1%	3.7%	3.0%	2.3%	1.9%
As % of Total Construction Investment:																
Private	62.1%	62.9%	63.0%	60.1%	58.7%	55.9%	55.1%	57.0%	49.8%	45.2%	49.9%	46.7%	45.1%	48.3%	54.4%	59.8%
Public	37.9%	37.1%	37.0%	39.9%	41.3%	44.1%	44.9%	43.0%	50.2%	54.8%	50.1%	53.3%	54.9%	51.7%	45.6%	40.2%

Source: PR Planning Board (2016). *Statistical Appendix (Various Years)* [Table 2].

One of the most significant factors contributing to the decline in private investment is the contraction in the real estate sector. According to the Construction & Sales Activity Report, prepared by Estudios Técnicos, Inc., sales of new housing units barely reached 2,339 units in 2015, compared to 9,762 housing units in 2008 and 13,400 in 2005. As of 2016-Q1, the number of new housing units sold is 5.8% lower than the number in 2015-Q1.

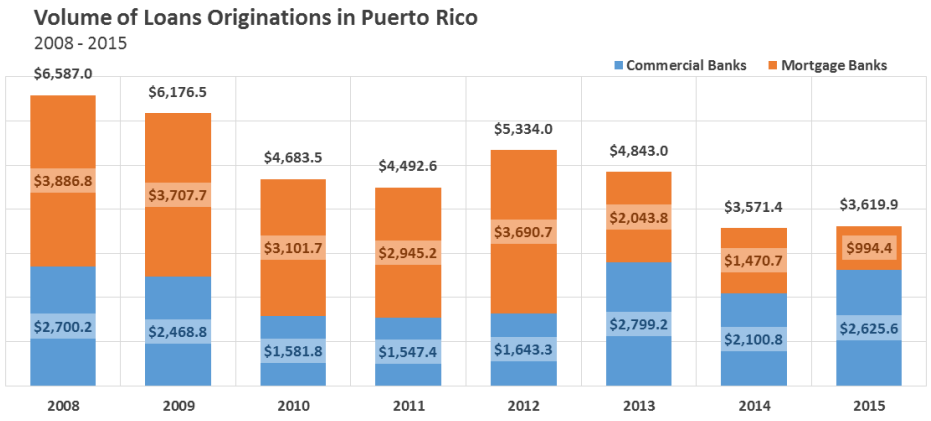
FIGURE 14



Source: Estudios Técnicos, Inc. (2016). *Construction & Sales Activity Report.* *First quarter of 2016 only.

Not only did the number of new housing unit sales decline to historic lows: the trend of mortgage originations suggests further deterioration in upcoming years. The total volume of mortgage loan originations declined from $6,587 million in 2008 to $3,169.9 million in 2015. Additionally, mortgage delinquency rates increased from 6.8% in 2008 to 12.4% in 2015.

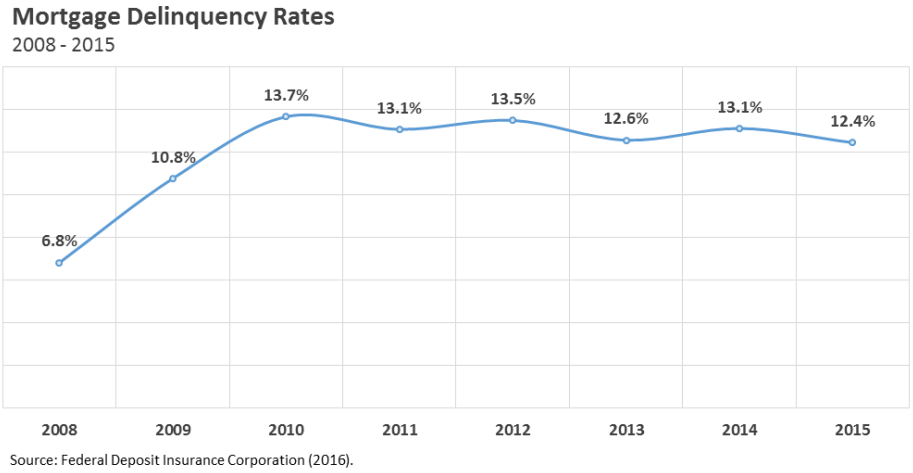
FIGURE 15



Source: Office of the Commissioner of Financial Institutions (2016). *Schedule D Mortgage Loans Origination (Various Years).*

The weakness of the housing sector is also reflected in the fact that the number of foreclosed residential units increased from 2,357 in 2008 to 4,459 in 2015, an 89.2% increase.

FIGURE 16

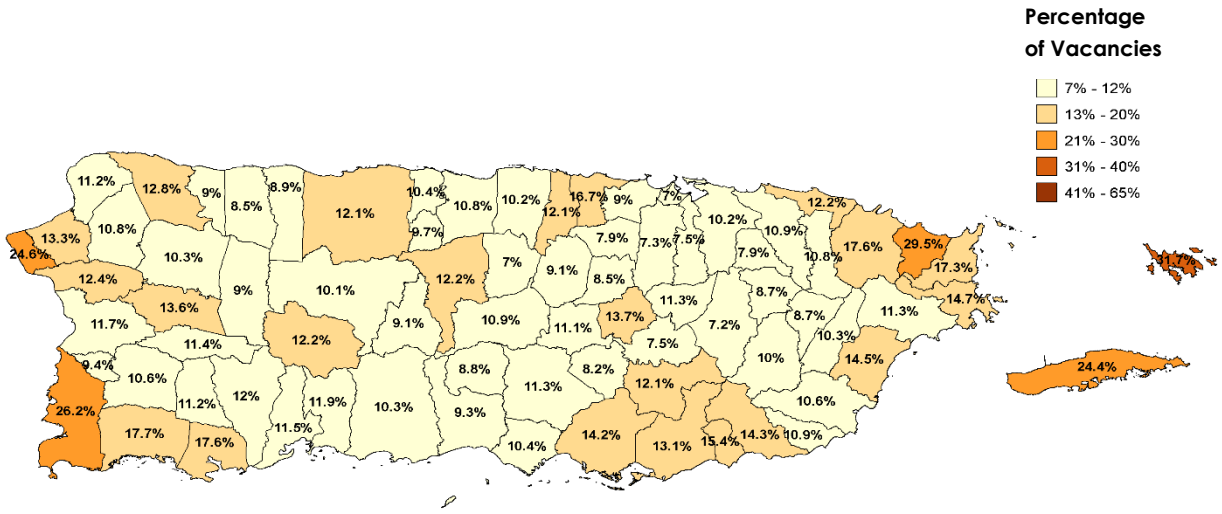


Source: Federal Deposit Insurance Corporation (2016).

Large Inventory of Vacant Housing Units

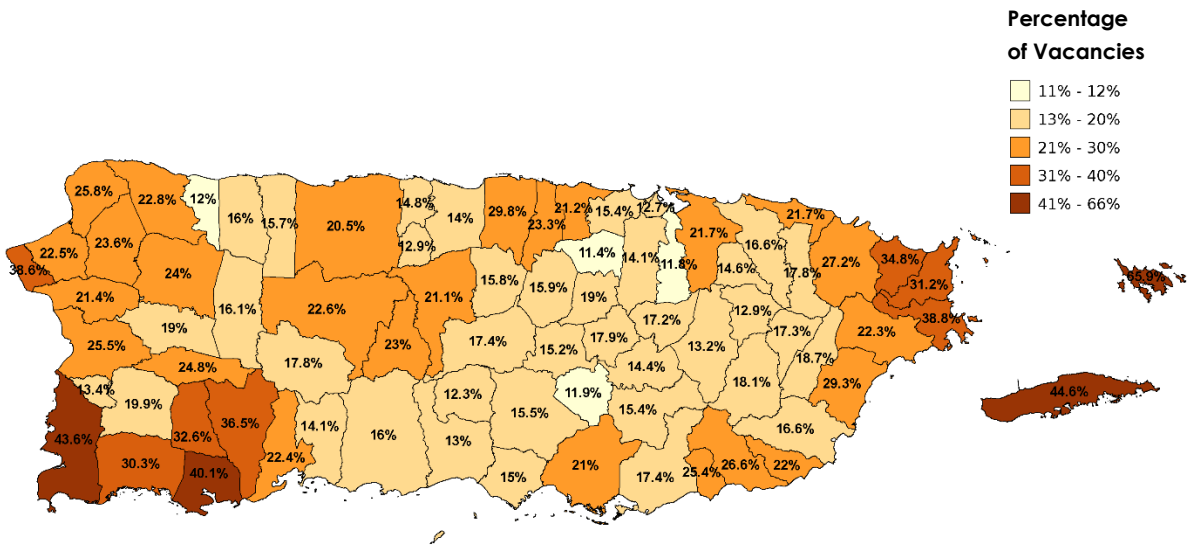
The reduction in population and average family size has resulted in a steep increase in the percentage of vacant housing units. In 2000, 51 municipalities had a vacancy rate of 12% or less; in 2014, only 4 did. The large vacant inventory in the island constitutes a significant structural shift with respect to the construction and real estate sectors.

Vacant Housing Units, as Percentage of Total Housing Units
2000



Source: US Census Bureau (2016). *2000 Census* [Table DP-4].

Vacant Housing Units, as Percentage of Total Housing Units
2014

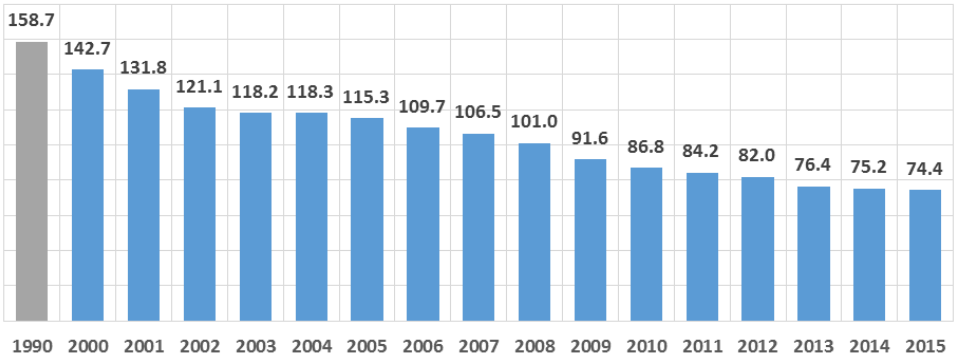


Source: US Census Bureau (2016). *American Community Survey 5-Year Estimates* [Table DP04].

The Manufacturing Sector

The industrialization of Puerto Rico during the last half of the 20th century provided a strong industrial base, particularly during the 1980s and 1990's when Puerto Rico benefited from a tax incentive in the US Internal Revenue Code. However, the manufacturing sector has lost a substantial amount of jobs (over 84,000) during the last 20 years. Moreover, during the 1990s manufacturing represented almost 19% of total employment, yet today this number plummeted to 8%. The reduction in the relative importance of this sector, vis-à-vis other sectors in the economy, has caused a structural shift in the labor market, international trade, and capital flows.

Nonfarm Employment in Manufacturing
1990 & 2000 - 2015



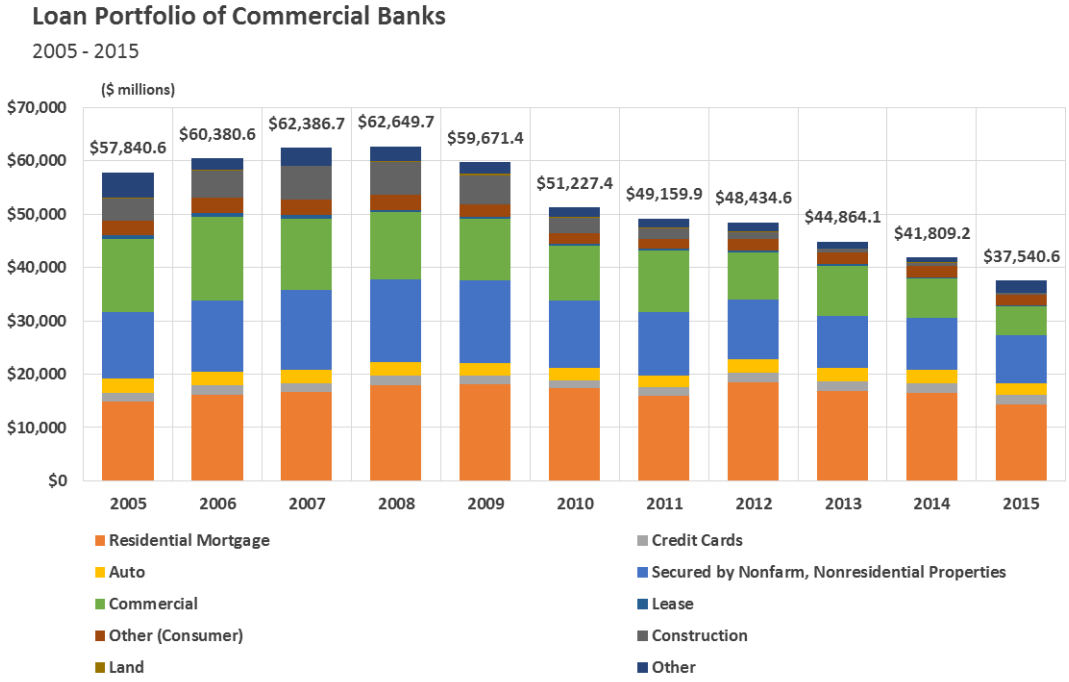
Source: US Bureau of Labor Statistics (2016). *Current Employment Statistics -- State & Metro Area*. *Seasonally Adjusted.

Source: US Bureau of Labor Statistics (2016). *Current Employment Statistics -- State & Metro Area*. *Averages of the monthly shares by year. **Seasonally Adjusted.

The Finance Sector

Following 2009, the loan portfolio of commercial banks has shrunk considerably, led by a reduction in nonfarm, nonresidential loans and commercial loans. The total loan portfolio declined from $57,840.6 million in 2005 to $37,540.6 in 2015, a decrease of 35.1%.

FIGURE 17



Source: Office of the Commissioner of Financial Institutions (2016). *Loans & Leases of Commercial Banks*.

The Public Sector

Puerto Rico's government has experienced many consecutive years of large budgetary imbalances. The total sum of the budgetary imbalances from 2005 onwards was approximately $17.8 billion.

TABLE 2

Net Revenues to the General Fund and Central Government Expenditures
Fiscal Years -- 2005 - 2015

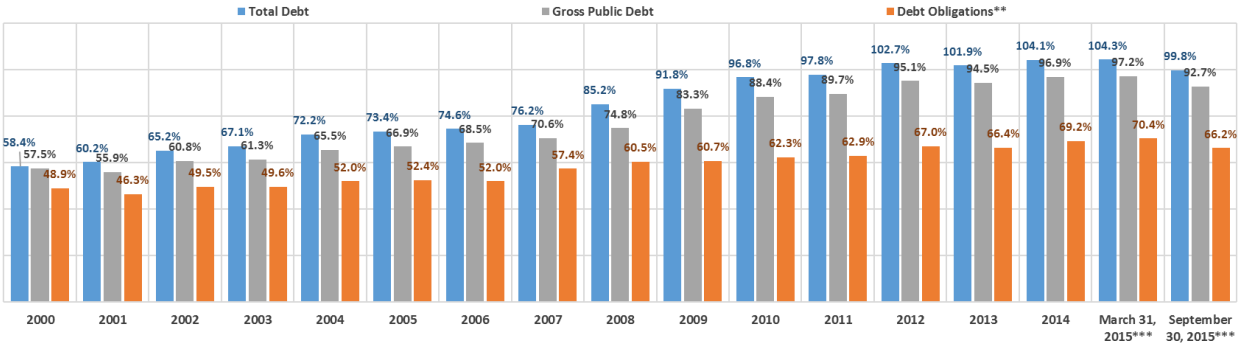
Fiscal Year	General Fund Net Revenues	Government Expenditures (chargeable to the General Fund)	Budgetary Imbalance	Structural Deficit*
2005	$8,305.7	$9,318.7	-$1,013.0	
2006	$8,541.2	$10,397.0	-$1,855.8	-$1,419.0
2007	$8,862.4	$9,707.0	-$844.6	-$746.0
2008	$8,359.0	$9,324.0	-$965.0	-$1,326.0
2009	$7,710.2	$10,890.3	-$3,180.1	-$3,306.0
2010	$7,716.1	$10,368.0	-$2,651.9	-$2,775.0
2011	$8,158.3	$10,065.0	-$1,906.7	-$1,801.0
2012	$8,667.4	$10,987.9	-$2,320.5	-$1,528.0
2013	$8,562.2	$9,872.4	-$1,310.2	-$1,290.0
2014	$9,037.9	$10,065.4	-$1,027.5	-$783.0
2015**	$8,960.9	$9,691.9	-$731.0	-$933.0

Sources: PR Office of Management and Budget (2016). *Budget Petition (Various Years).* PR Treasury Department (2016). *General Fund Net Revenues.* Government Development Bank (2016). *Commonwealth Quarterly Report dated May 7, 2015.* *Includes the University of Puerto Rico and the PR Highways and Transportation Authority. **Estimates by Estudios Técnicos, Inc. (2016).

At the same time, the public sector debt rose to unprecedented levels since 2001: the total outstanding public debt from fiscal 2014 onwards rose to more than 100% of the island's GNP. The annual growth of total public debt averaged 7.3% from 2000 to 2015; in comparison, the compound annual growth in fiscal revenues was 1.7% during said period, and the compound growth of real GDP was 3.6%.

FIGURE 18

Outstanding Debt in Puerto Rico, as % of GNP
Year to Date in Fiscal Years -- 2000 - 2015*



Sources: PR Office of Management and Budget (2016). *Budget Petition (Various Years).* Government Development Bank (2015). *Commonwealth Quarterly Report dated May 7, 2015.* Government Development Bank (2016). *Commonwealth Financial Information and Operating Data Report dated November 11, 2015.* PR Planning Board (2015). *Statistical Appendix 2014.* *Year to date as of March 31, 2015 and September 30, 2015 only. **Consists of General Obligations and obligations made by public corporations and other instrumentalities. ***Estimates by Estudios Técnicos, Inc. based upon the *Commonwealth Quarterly Report* and the *Commonwealth Financial Information and Operating Data Report.*

TABLE 3

Total Outstanding Debt in Puerto Rico
Fiscal Years -- 2000 - 2015*

Fiscal Year	Constitutional	Extra-Constitutional[1]	SUT (COFINA)	Subtotal -- Central Government[2]	Public Corporations	Municipal	Gross Public Debt	Other Debt[3]	Total
2000	$5,348.9	$3,576.8		$8,925.7	$13,431.6	$1,464.4	$23,821.7	$367.1	$24,188.8
2001	$5,573.4	$4,310.1		$9,883.5	$13,699.1	$1,632.2	$25,214.8	$1,944.8	$27,159.6
2002	$5,853.8	$5,192.7		$11,046.5	$15,124.1	$1,795.8	$27,966.4	$2,046.2	$30,012.6
2003	$6,222.1	$5,640.0		$11,862.1	$15,889.8	$1,955.1	$29,707.0	$2,817.5	$32,524.5
2004	$6,878.7	$6,977.3		$13,856.0	$18,040.6	$2,046.0	$33,942.6	$3,491.0	$37,433.6
2005	$7,307.1	$7,980.5		$15,287.6	$19,234.1	$2,181.3	$36,703.0	$3,565.3	$40,268.3
2006	$7,276.3	$9,557.5		$16,833.8	$20,449.5	$2,330.3	$39,613.6	$3,522.7	$43,136.3
2007	$8,167.2	$5,203.5	$2,825.2	$16,195.9	$24,159.4	$2,463.0	$42,818.3	$3,365.0	$46,183.3
2008	$8,758.7	$2,683.1	$6,328.6	$17,770.4	$26,342.4	$2,819.4	$46,932.2	$6,460.7	$53,392.9
2009	$9,006.4	$2,759.6	$11,575.9	$23,341.9	$26,640.8	$2,997.3	$52,980.0	$5,434.9	$58,414.9
2010	$9,511.2	$2,574.9	$14,217.6	$26,303.7	$27,287.9	$3,231.4	$56,823.0	$5,383.2	$62,206.2
2011	$9,681.6	$3,070.0	$14,535.4	$27,287.0	$28,118.1	$3,537.0	$58,942.1	$5,337.1	$64,279.2
2012	$10,945.0	$3,160.0	$15,982.0	$30,087.0	$30,801.0	$3,872.0	$64,760.0	5,188.00	$69,948.0
2013	$10,599.0	$4,043.5	$15,223.8	$29,866.3	$31,208.8	$3,882.0	$64,957.0	5,086.01	$70,043.0
2014	$13,400.7	$3,943.7	$15,224.0	$32,568.4	$30,311.8	$4,193.0	$67,073.2	$4,993.8	$72,067.0
March 31, 2015[4]	$12,906.4	$3,318.2	$15,224.0	$31,448.6	$31,681.6	$4,114.0	$67,244.2	$4,959.8	$72,204.0
September 30, 2015[4]	$12,494.2	$3,345.9	$15,213.0	$31,053.1	$30,022.9	$3,907.0	$64,983.0	$4,926.0	$69,909.0

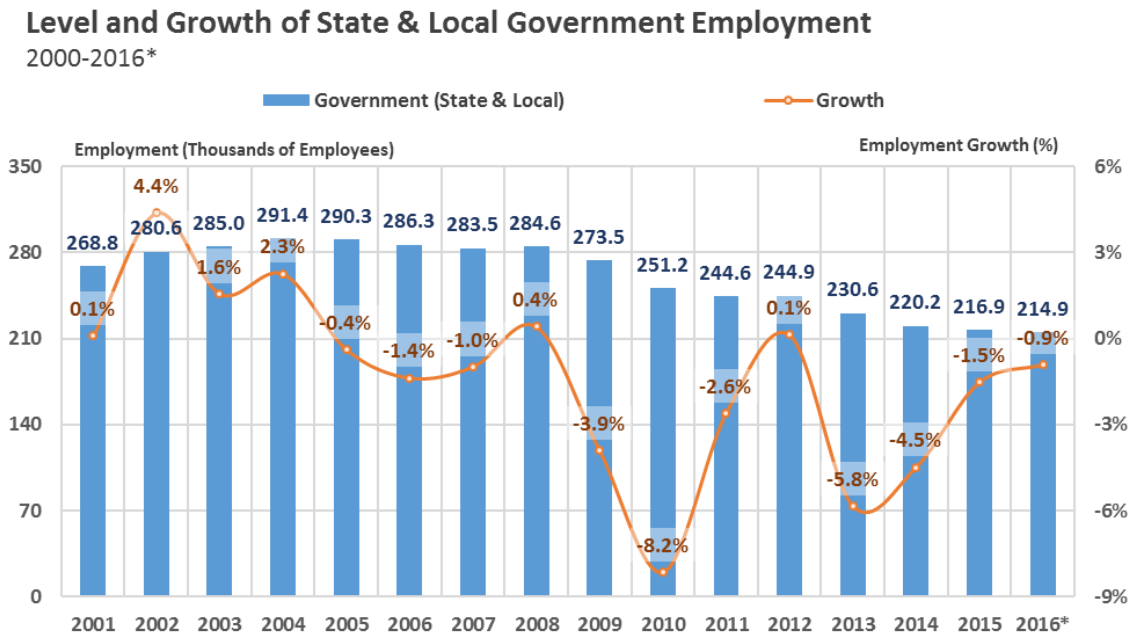
Compound Annual Growth (Fiscal 2000 - September 2015) by Debt Type

Time Period	Constitutional	Public Corporations	Municipal	Extra-Constitutional[1]	SUT (COFINA)	Subtotal -- Central Government[2]	Gross Public Debt	Other Debt[3]	Total
Fiscal 2000 - September 30, 2015	5.8%	5.5%	6.8%	-0.4%	23.4%	8.7%	6.9%	18.9%	**7.3%**
Compound Annual Growth in General Fund Net Revenues (Fiscal 2000 - September 2015)			**1.7%**						
Compound Annual Growth in Real GDP (Fiscal 2000 - Fiscal 2014)			**3.6%**						

Sources: Office of Management and Budget (2016). *Budget Petition (Various Years).* Government Development Bank (2015). *Commonwealth Quarterly Report dated May 7, 2015.* Government Development Bank (2016). *Commonwealth Financial Information and Operating Data Report dated November 11, 2015.* PR Treasury Department (2016). *General Fund Net Revenues.* PR Planning Board (2015). *Statistical Appendix 2014.* [1]Extra-constitutional debt, also known as legislative appropriations debt, comprises obligations payable from resources of the General Fund and the Capital Improvements Fund, and includes financings from the Central Government, Public Corporations with the GDB and other entities/instrumentalities. [2]Comprises constitutional debt, debt from SUT (COFINA) and extra-constitutional debt. [3]Debt payable from federal funds of the Housing and Urban Development Administration and tobacco funds. [4]Estimates by Estudios Técnicos, Inc. based upon the *Commonwealth Quarterly Report* and the *Commonwealth Financial Information and Operating Data Report* . The remaining years come from the *Budget Petition.*

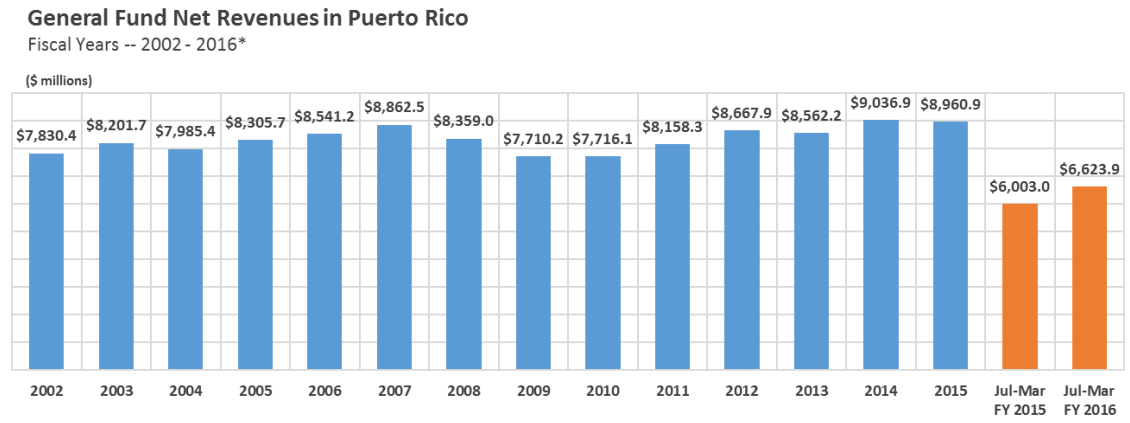
The significant indebtedness and the many years of budget deficits have prompted the enactment of austerity measures such as reduction in the number of employees and tax increases, certain to be augmented in the coming years. From 2009 to 2015, the public sector contracted by an accumulated 20.7% in the number of wage-earning workers. Tax revenues also increased consistently during said period.

FIGURE 19



Source: US Bureau of Labor Statistics (2016). *State & Metro Area Employment, Hours, and Earnings.* *January-March 2016 average.

FIGURE 20

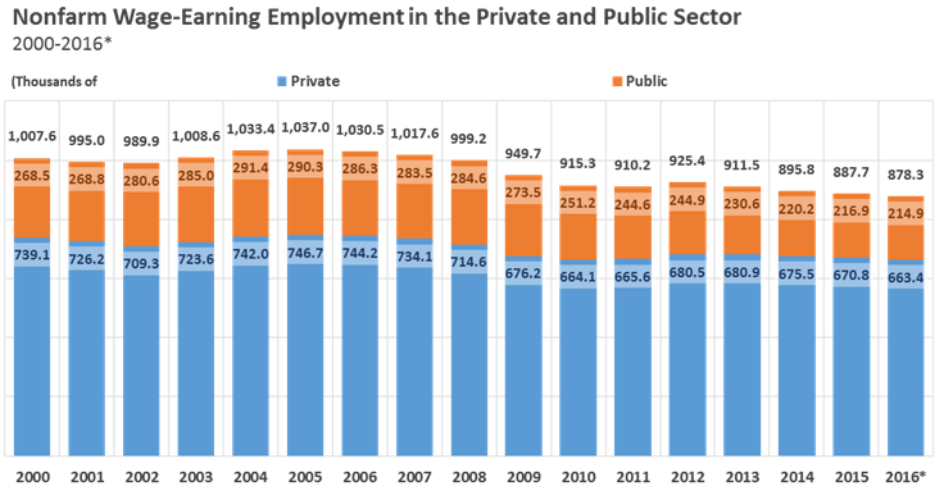


Source: PR Treasury Department (2016). *General Fund Net Revenues.* *Up to March 2016 only.

Trend #5: Weakened Labor Market

Nonfarm salaried employment has declined to lows unseen since before 2000. For 2015, it averaged 887,700 employees, with close to 671,000 being in the private sector. Compared to 2000, private employment in 2015 decreased by 68,300 employees and public employment decreased by 48,300, respectively.

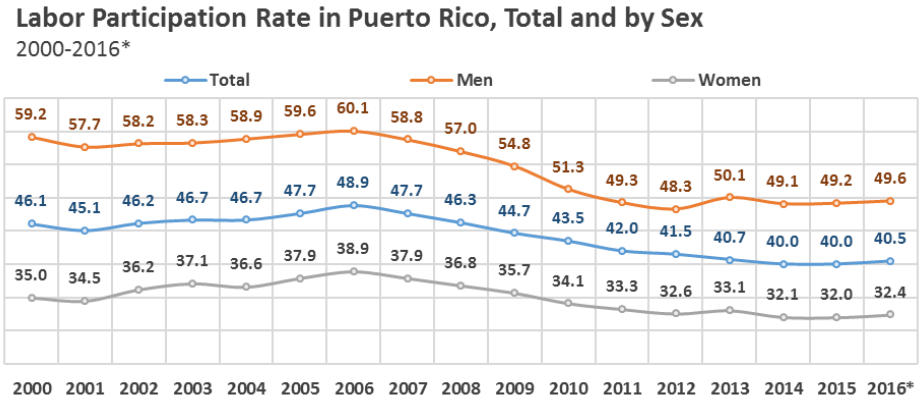
FIGURE 21



Source: US Bureau of Labor Statistics (2016). *State and Area Employment, Hours and Earnings.* *January-March 2016 average.

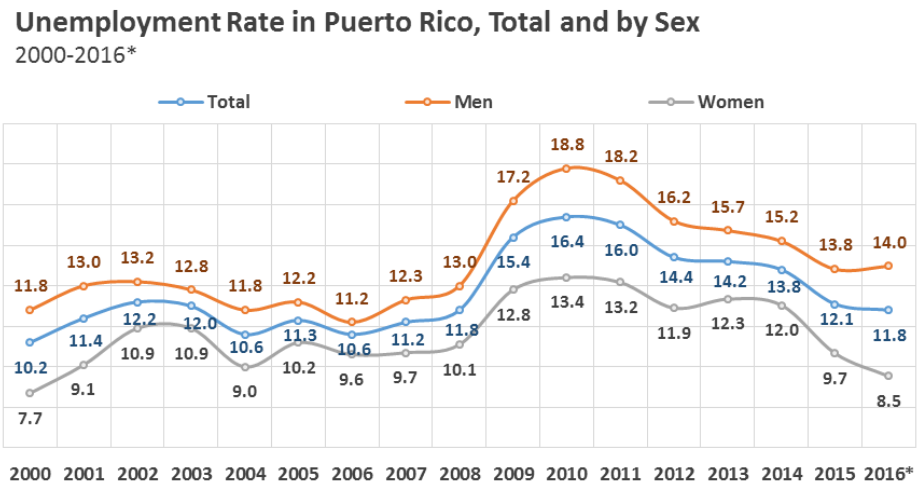
Historical drops in labor participation and unemployment rates have ensued, partly due to negative population trends and the deteriorated economic conditions. Labor participation in the island dropped from 46.1% in 2000 to 40.0% in 2015. Female labor participation is even lower, at 32.4%.

FIGURE 22



Sources: PR Department of Labor and Human Resources (2016). *Empleo y Desempleo de Puerto Rico (Various Years)* [Table 3]. Data prior to 2010 provided by the PR Department of Labor and Human Resources (2016). *January-March 2016 average.

FIGURE 23

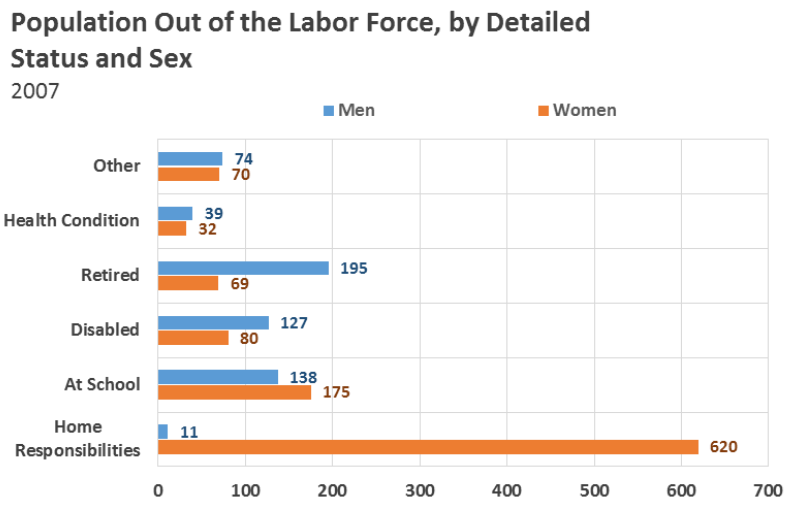


Sources: PR Department of Labor and Human Resources (2016). *Empleo y Desempleo de Puerto Rico (Various Years)* [Table 3]. Data prior to 2010 provided by the PR Department of Labor and Human Resources (2016). *January-March 2016 average.

More Retirees and Disabled

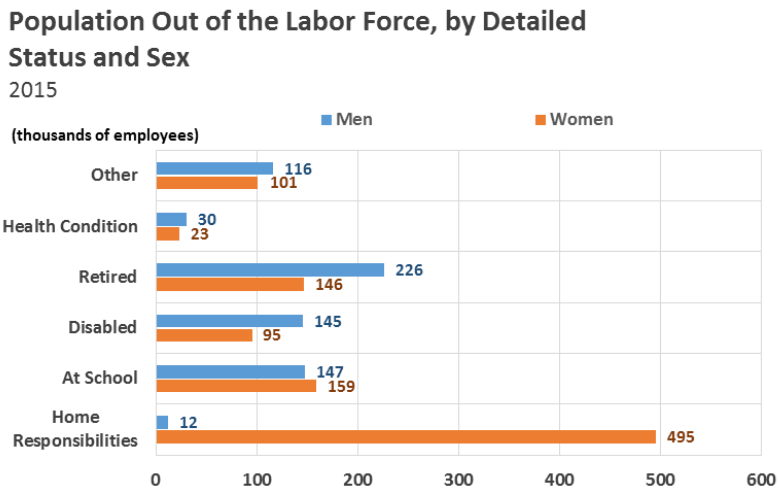
The significant drop in labor participation in recent years is partly explained by an increase in the number of retirees and disabled. Between 2007 and 2015, the population of retirees and disabled increased by 108,000 and 33,000 individuals, respectively. In contrast, the numbers of individuals under unpaid household work and at school, declined by 7,000 and 124,000 individuals during the same period. The disabled and retired population is expected to remain permanently out of the labor force, thus adding downward pressures to the participation rate.

FIGURE 24



Source: PR Department of Labor and Human Resources (2008). *Empleo y Desempleo en Puerto Rico 2007.*

FIGURE 25



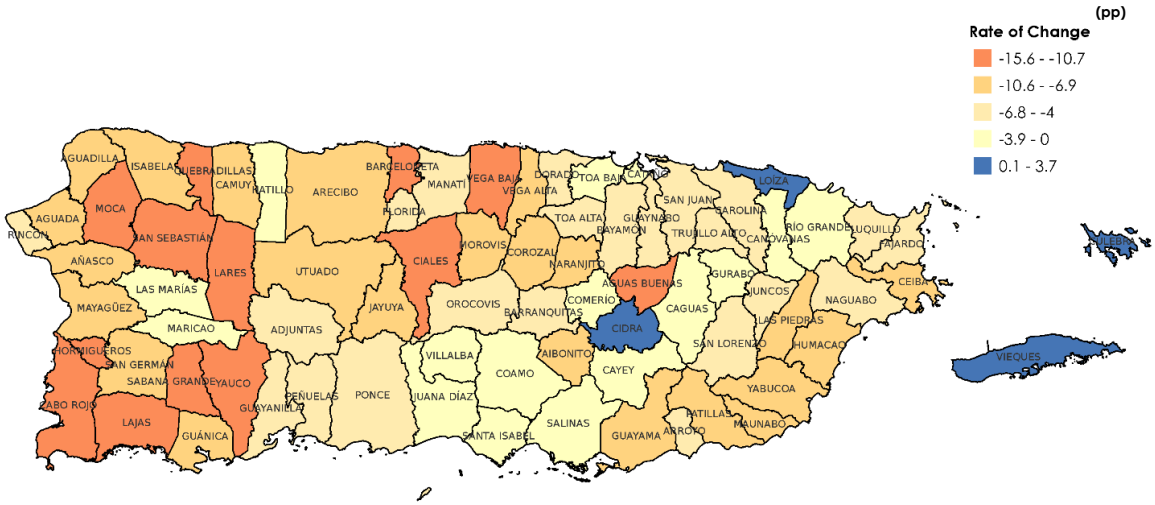
Source: PR Department of Labor and Human Resources (2016). *Empleo y Desempleo en Puerto Rico 2015.*

Employment Rate

The following map presents the change in percentage points (pp) of the employment rate (the ratio of employed to the civilian non-institutionalized population) between 2000 and 2014 for municipalities in Puerto Rico. As can be seen, the majority of municipalities did not experience increases in their employment rate, with the exceptions of Vieques, Culebra, Loíza and Cidra. In addition, there were 13 municipalities with more than 10 percentage point losses in their employment rate, mostly in the western part of the island.

FIGURE 26

Change in Employment Rate
2000-2014

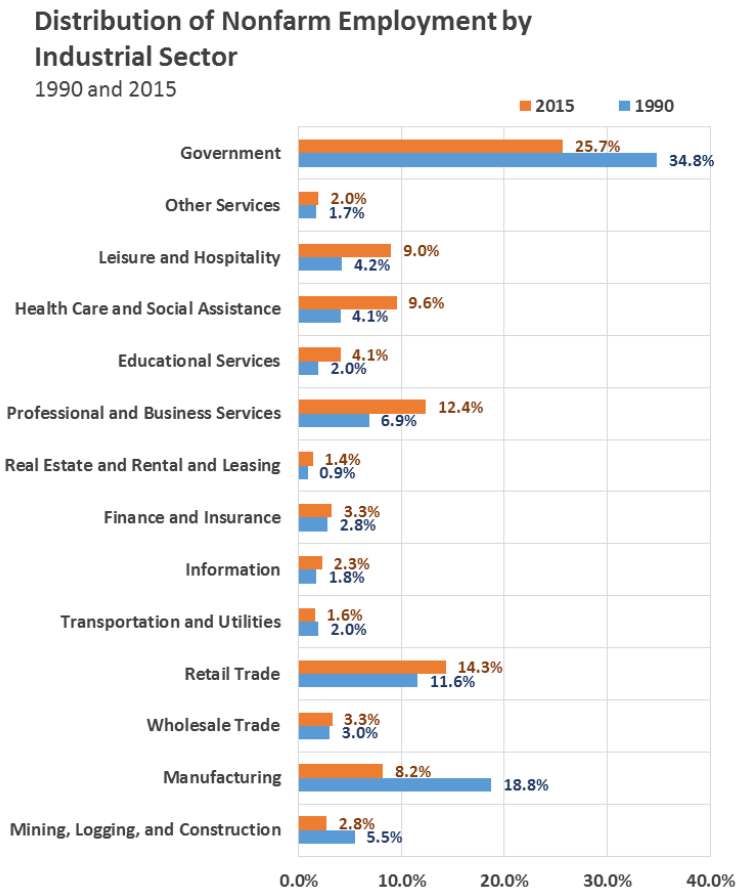


Source: US Census Bureau (2016). 2000 Census [Table P043]. US Census Bureau (2016). 2014 American Community Survey 5-Year Estimates [Table S2301].

Trend #6: Shift from Manufacturing to the Service Sector

There is a significant shift in the industrial composition of Puerto Rico's economy, led by a reduction in the manufacturing sector and an increase in services. Whereas in 1990, manufacturing represented 18.2% of all employment, in 2015 it represented 8.2%. At the same time, the share in almost all the service sectors increased significantly. Key factors that contributed to this change were the loss of labor-intensive manufacturing, global technological changes and internal readjustments in the local manufacturing industries.

FIGURE 27



Source: US Bureau of Labor Statistics (2016). *Current Employment Statistics -- State and Metro Area.* Not Seasonally Adjusted.

Chapter 2: Impacts of Recent Trends

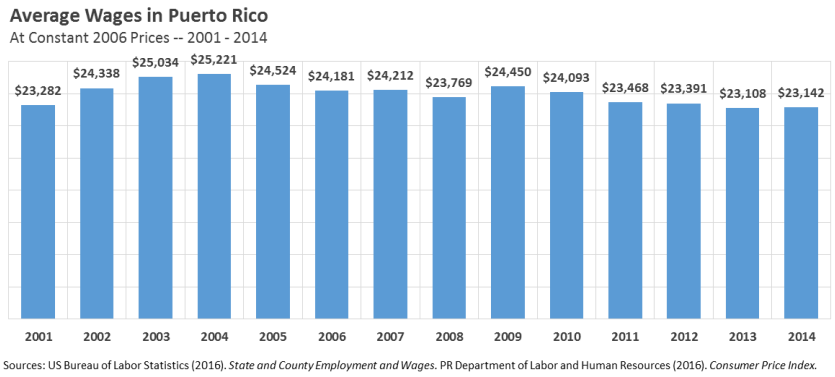
The trends mentioned in Chapter 1 have far-reaching consequences not only on the economic dimension, but also on social conditions. This chapter analyzes several important impacts of the key social and economic trends.

Impacts in Income and Poverty

Stagnation in Income and Wages

Income and wages have been negatively affected by recent trends. Real wages in Puerto Rico remained stagnant from 2001 to 2014. The value for 2014 ($23,142) is virtually the same as the average wage for 2001, implying more than a decade of wage stagnation. The value for 2014 is also lower than the average wage experienced throughout most of the period.

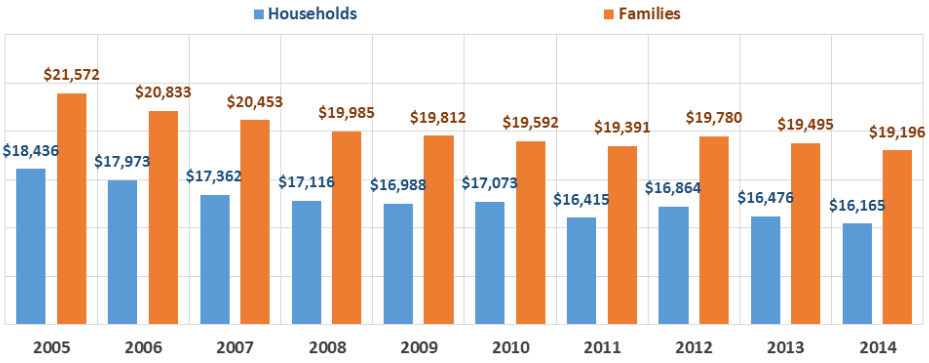
FIGURE 28



Sources: US Bureau of Labor Statistics (2016). *State and County Employment and Wages.* PR Department of Labor and Human Resources (2016). *Consumer Price Index.*

Median household and family incomes declined as a result of economic contraction in the 2005-2014 period. In 2014, the median family income stood at $19,196, down from the $21,572 experienced in 2005. Likewise, the median household income declined from $18,436 in 2005 to $16,165 in 2014. Even though the private sector has experienced a decline in wages, in constant-price terms, the public sector has shown a smaller change.

Real Median Household and Family Income
At Constant 2006 Prices -- 2005 - 2014



Sources: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table S1901]. PR Department of Labor and Human Resources (2016). *Consumer Price Index.*

TABLE 4

Average Real Wages of Nonfarm Salaried Employees, by Main Sector
At Constant 2006 Prices -- 2001 - 2014

Year	Total	State Government	Local Government	Private
2001	$23,282	$25,740	$14,979	$22,614
2002	$24,338	$27,266	$16,462	$23,372
2003	$25,034	$29,119	$17,296	$23,605
2004	$25,221	$30,169	$17,705	$23,648
2005	$24,524	$29,196	$17,271	$23,091
2006	$24,181	$29,345	$16,803	$22,659
2007	$24,212	$29,523	$16,367	$22,650
2008	$23,769	$28,645	$15,819	$22,375
2009	$24,450	$29,681	$17,456	$22,740
2010	$24,093	$29,624	$17,039	$22,460
2011	$23,468	$28,164	$16,567	$22,023
2012	$23,391	$28,694	$16,287	$21,869
2013	$23,108	$27,964	$16,655	$21,716
2014	$23,142	$27,764	$16,211	$21,857

Sources: US Bureau of Labor Statistics (2016). *State & County Employment and Wages.* PR Department of Labor and Human Resources (2016). *Consumer Price Index.*

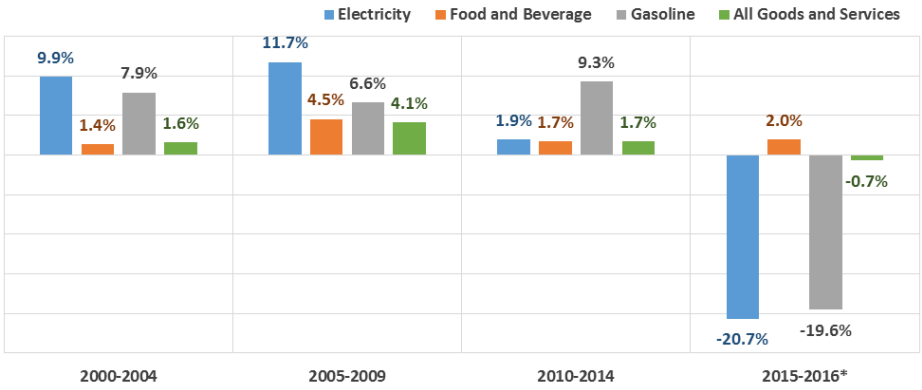
Keeping Up With Inflation

Overall, price levels rose at basically the same pace as wages. Price levels in 2014 were 38.2% higher than in 2001, while average wages were 37.4% higher. This has resulted in stagnation, as growth in average wages did not cover inflationary pressures.

The main components of price increases from 2000 to 2014 were gasoline and electricity, that increased significantly during said period. In the past two years, these components have experienced steep price drops, due to a readjustment of the oil

markets, new technology and slower-than-expected worldwide demand. It must be noted as well that food and beverage prices kept increasing in recent years, even as other components experienced declines.

Average Inflation Rate in Selected CPI Components
Quinquennial -- 2000 - 2016*



Source: PR Department of Labor and Human Resources (2016). *Consumer Price Index.* *Inflation in 2016 for the January-March 2016 average only.

Increase in Inequality and Poverty

Puerto Rico has consistently ranked as one of the most unequal jurisdictions in the US. In 2006, it ranked second in the top 10 jurisdictions with the highest GINI coefficient,[1] whereas in 2014 it is the US jurisdiction with the highest GINI.

[1] According to the US Census Bureau, the GINI coefficient is a statistical measure of income equality ranging from 0 to 1. A measure of 1 indicates perfect inequality; i.e., one person has all the income and the rest have none. A measure of 0 indicates perfect equality; i.e. all people have equal shares of income.

See US Census Bureau (2016). *Poverty – Definitions* [Web Page]. Retrieved from https://www.census.gov/hhes/www/poverty/methods/definitions.html for more information.

TABLE 5

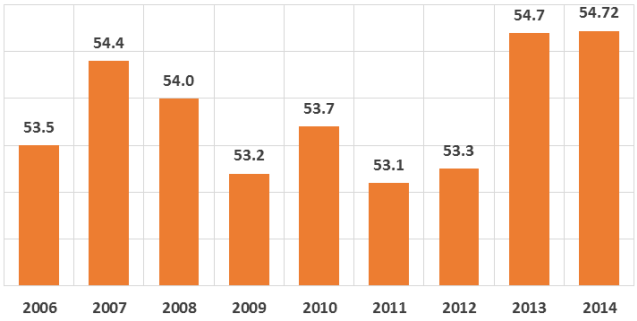
Top 10 US Jurisdictions with the Highest GINI Coefficient
2006 and 2014

State	2006	State	2014
Washington, D.C.	53.7	Puerto Rico	54.7
Puerto Rico	53.5	Washington, D.C.	52.2
New York	49.5	New York	51.1
Connecticut	48.0	Connecticut	50.1
Louisiana	47.5	Louisiana	49.0
Texas	47.4	California	48.9
Alabama	47.2	Massachusetts	48.6
Mississippi	47.1	Florida	48.3
Tennessee	46.8	Rhode Island	48.3
Florida	46.7	Texas	48.3

Source: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table B19083].

FIGURE 29

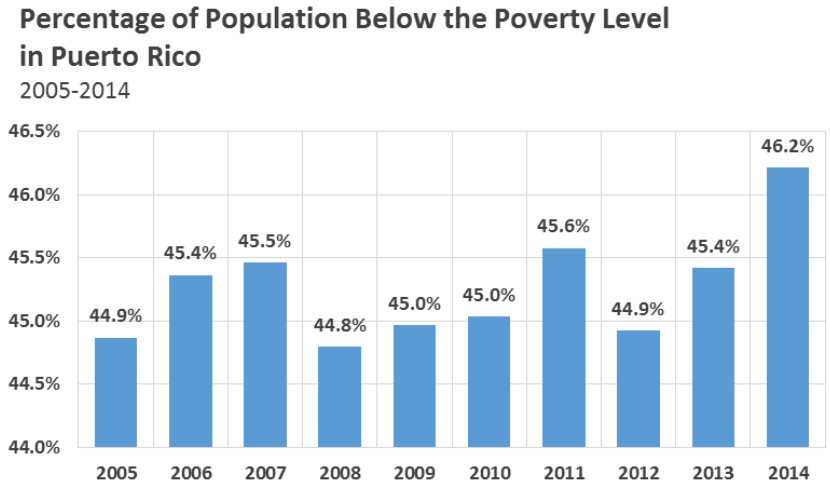
GINI Coefficient in Puerto Rico
2006 - 2014



Source: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table B19083].

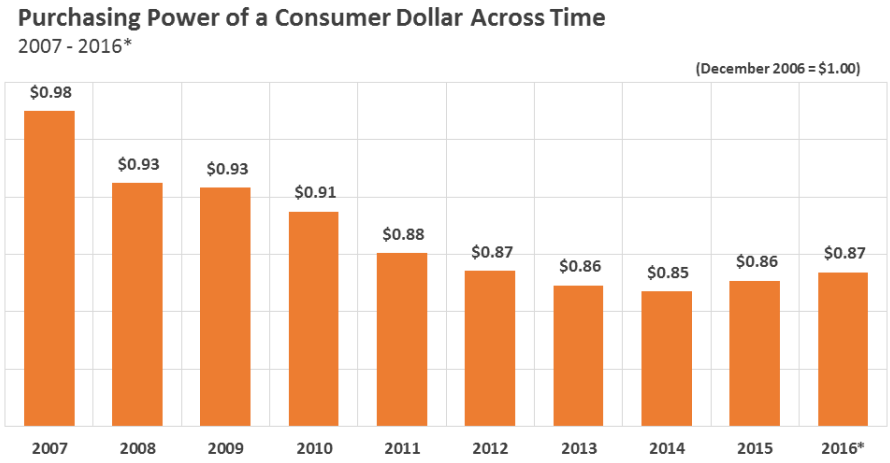
Not only is the GINI coefficient at its highest, but the percentage of population below the poverty line in Puerto Rico has also increased. In 2005, 44.9% of the population reported being below the poverty level, whereas in 2014 it was 46.2%. The working population receiving the federal minimum wage has seen its condition worsen, as a consumer dollar in 2015 was worth 14 cents less than the same dollar in 2006.

FIGURE 30



Source: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table S1701].

FIGURE 31

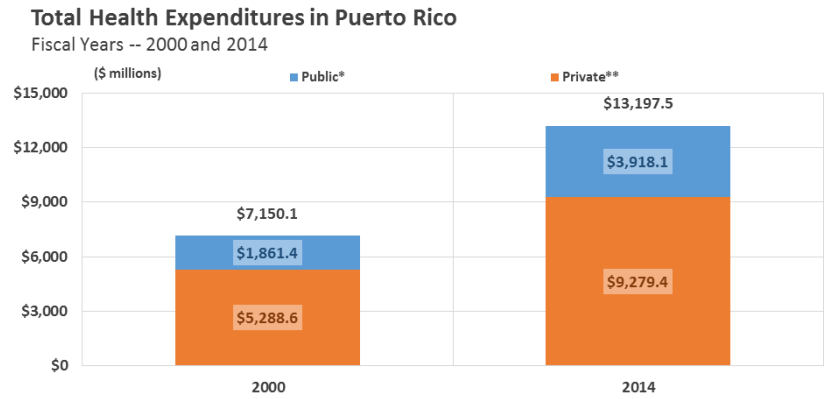


Source: PR Department of Labor and Human Resources (2016). *Purchasing Power of a Consumer Dollar for all Families in Puerto Rico.*
*January - April 2016 average.

Impacts on Health Care

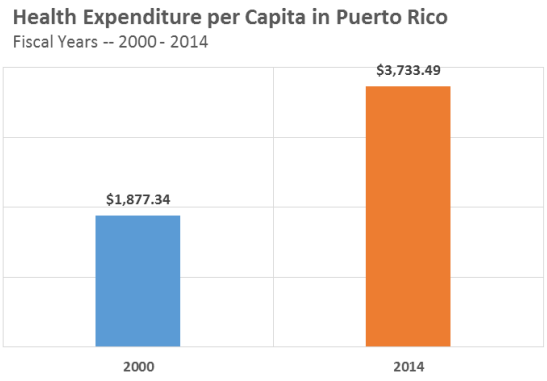
Health expenditures in Puerto Rico almost doubled from fiscal 2000 to fiscal 2014, with a significant expansion of both public and private sector expenditures. On a per capita basis, health expenditures more than doubled, taking into account the smaller population in 2014.

FIGURE 32



Source: PR Office of Management and Budget (2016). *Budget Petition (Various Years).* *Public expenditure consists of expenditures in the following agencies: PR Healthcare Insurance Administration, PR Medical Services Administration, Mental Health and Anti-Addiction Services Administration, PR Corporation of Industries for the Blind, Mentally Retarded and other Impaired Individuals, Corporation of the Cardiovascular Center of Puerto Rico and the Caribbean, PR Medical Emergency Corps, PR Health Department, and PR Correctional Facilities Health Program. **Private Expenditure was adjusted to avoid double-counting of Reforma-funded expenditures, which were already counted as public expenditures from ASES.

FIGURE 33

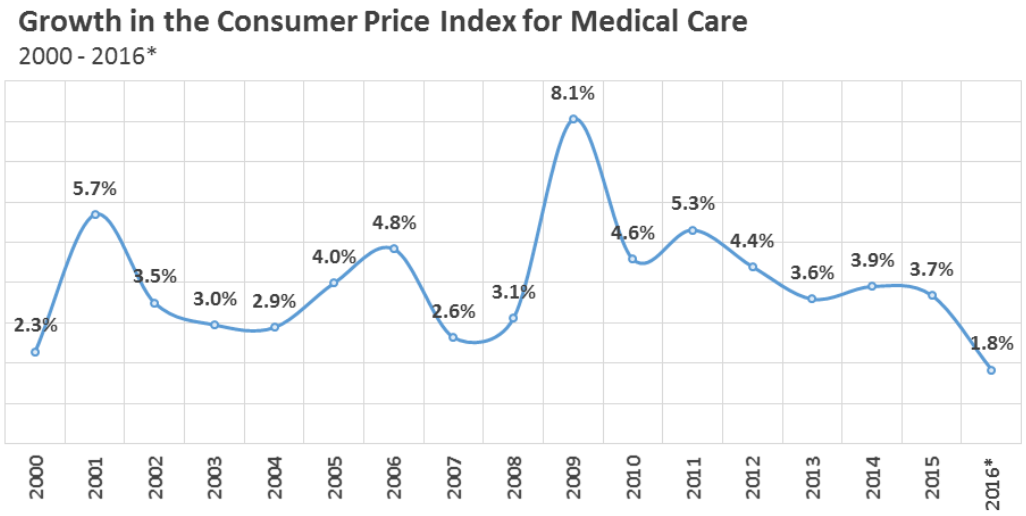


Sources: PR Office of Management and Budget (2016). *Approved Budget -- Fiscal 1999-2000 and 2013-14.* US Census Bureau (2016). *Annual Estimates of the Resident Population* [Table PEPANNRES]. *Public expenditure consists of expenditures in the following agencies: PR Healthcare Insurance Administration, PR Medical Services Administration, Mental Health and Anti-Addiction Services Administration, PR Corporation of Industries for the Blind, Mentally Retarded and other Impaired Individuals, Corporation of the Cardiovascular Center of Puerto Rico and the Caribbean, PR Medical Emergency Corps, PR Health Department, and PR Correctional Facilities Health Program. **Private Expenditure was adjusted to avoid double-counting of Reforma-funded expenditures, which were already counted as public expenditures from ASES.

Significant Price Increases

From 2000 to 2015, the medical care price index increased by 85.3%, due to two (2) significant factors: increases in the health insurance cost and increases in the cost of vaccines and prescription medications. From 2000 through 2013, health insurance costs were the most significant driver of the total increase vis a vis other periods were prescriptions medications had a greater impact in healthcare costs.

FIGURE 34

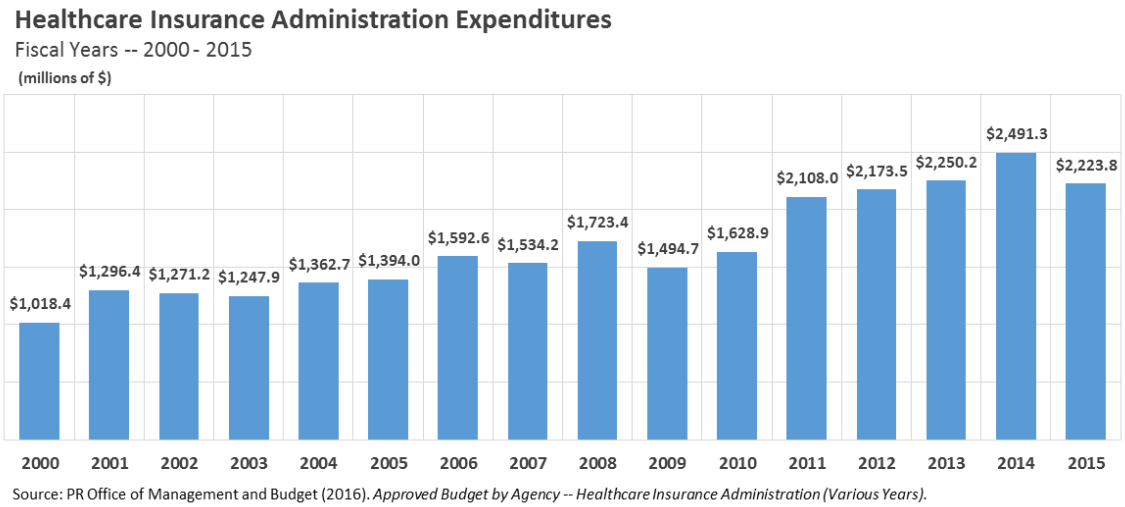


Source: PR Department of Labor and Human Resources (2016). *Consumer Price Index.* *January-March 2016 average.

Increases in Public Health Insurance Cost

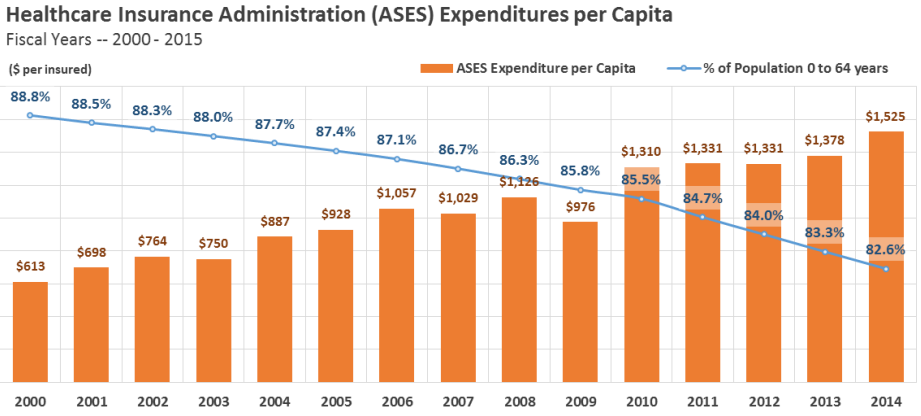
Compared to 2000, expenditures in public healthcare insurance more than doubled in 2015. On a per capita basis, they increased by 2.5 times with respect to 2000, which was accentuated by the total population loss. The government fiscal condition will limit the state's ability to cope with the demand for public health services.

FIGURE 35



Source: PR Office of Management and Budget (2016). *Approved Budget by Agency -- Healthcare Insurance Administration (Various Years).*

FIGURE 356

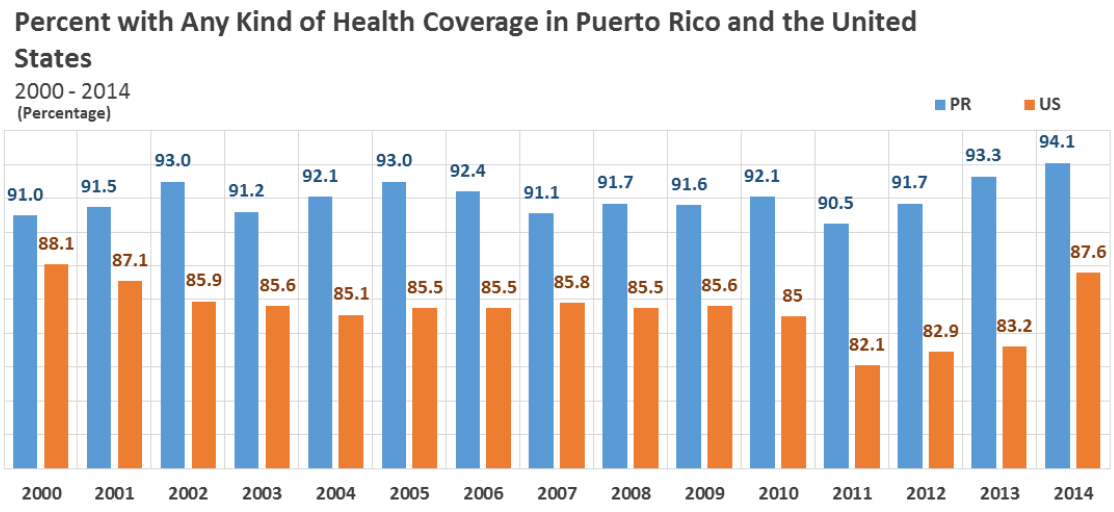


Sources: PR Office of Management and Budget (2016). *Approved Budget by Agency -- Healthcare Insurance Administration (Various Years).* US Census Bureau (2016). *State Intercensal Estimates, 2000-2010.* US Census Bureau (2016). *Annual Estimates of the Resident Population by Age and Sex* [Table PEPAGESEX].

Additional Increases in Health Coverage

The percent of persons with any kind of health coverage in Puerto Rico increased significantly since 2013 due to the introduction of the Affordable Care Act, that expanded healthcare coverage to previously excluded segments of the population. Compared to the United States, Puerto Rico has had a significantly higher percentage of people with health insurance coverage throughout the 2000-2014 period; the gap widened significantly from 2000 to 2003, and then stabilized until further widening from 2011 to 2013, and finally contracting in 2014, although still much higher than in the U.S. as a whole.

FIGURE 37



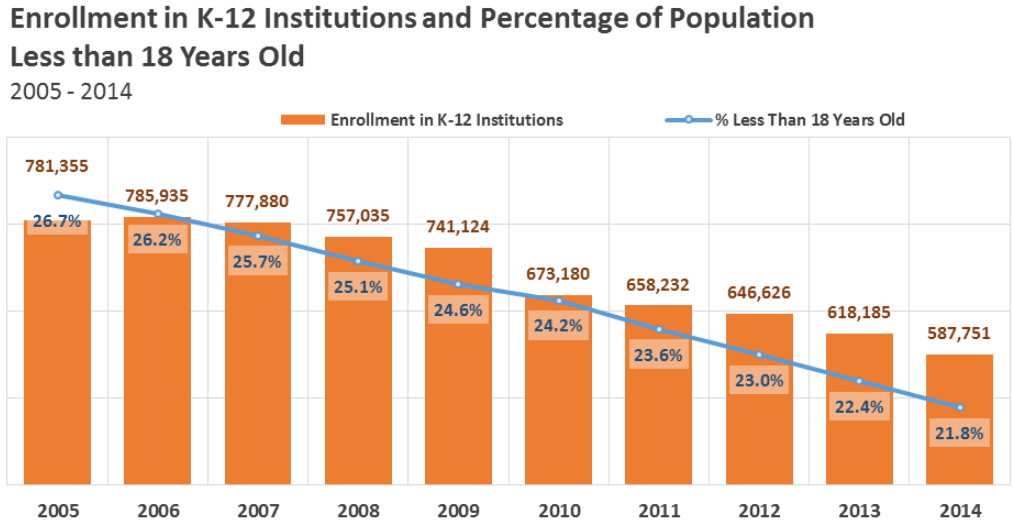
Source: US Centers for Disease Control and Prevention (2016). *Behavioral Risk Factor Surveillance System.*

Impacts on Education

Decline in K-12 School Enrollment

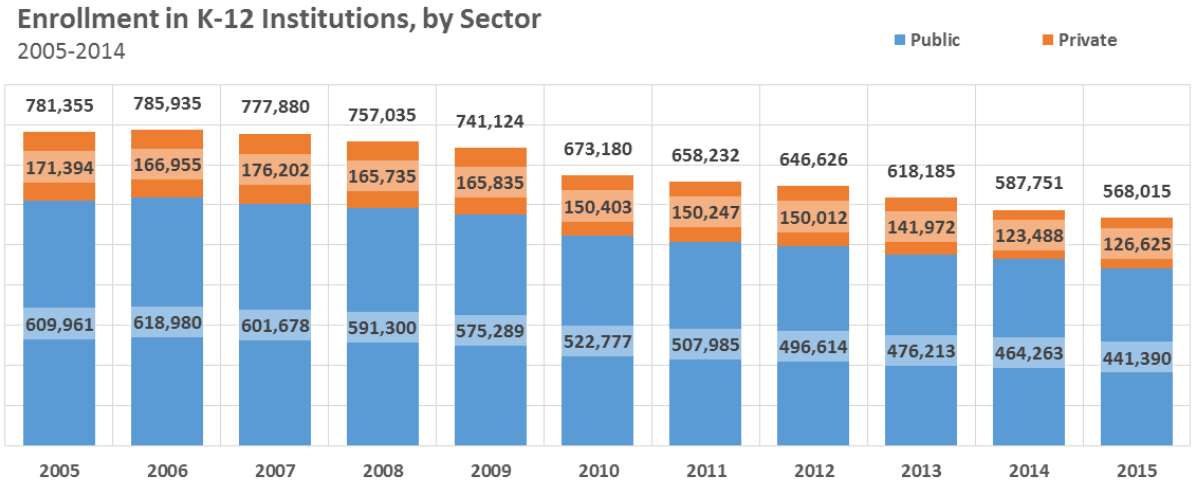
Almost a direct result of declines in the younger population, total K-12 enrollment in both public and private sectors has contracted. In 2014, K-12 enrollment declined by 193,604 individuals with respect to 2005. This decrease has been experienced in both public and private sectors, reflecting the importance of the demographic component in explaining this trend.

FIGURE 368



Sources: US Census Bureau (2016). *State Intercensal Estimates, 2000-2010.* US Census Bureau (2016). *Annual Estimates of the Resident Population by Age and Sex* [Table PEPAGESEX]. US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table B14003].

FIGURE 3937

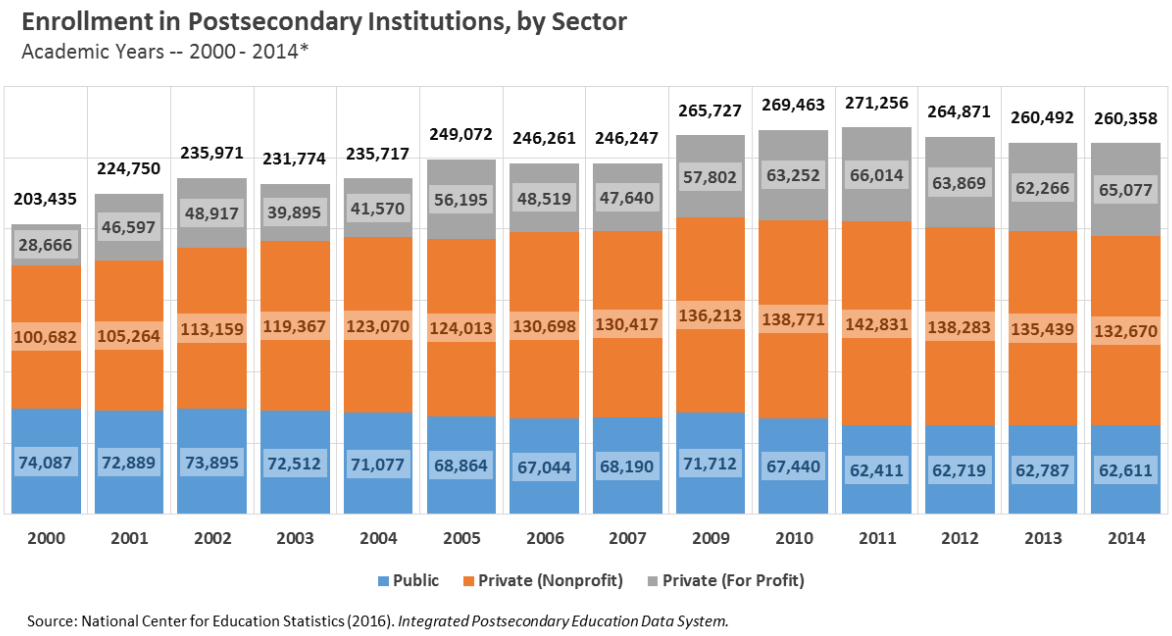


Source: US Census Bureau (2016). *American Community Survey 1-Year Estimates* [Table B14003].

Increase in Postsecondary Enrollment

A significant increase in postsecondary enrollment has been experienced in recent years. In 2014, postsecondary enrollment totaled approximately 260,000, which is 57,000 more than the enrollment in 2000. The compound annual growth rate in enrollment from 2000 to 2014 was 1.8%. This is increase is partially attributed to the economy's inability to add new economic opportunities. Under these circumstances the labor markets tends to shift towards further education or staying a longer time within the educational system. This provides greater incentives for seeking job opportunities outside the Island.

FIGURE 380

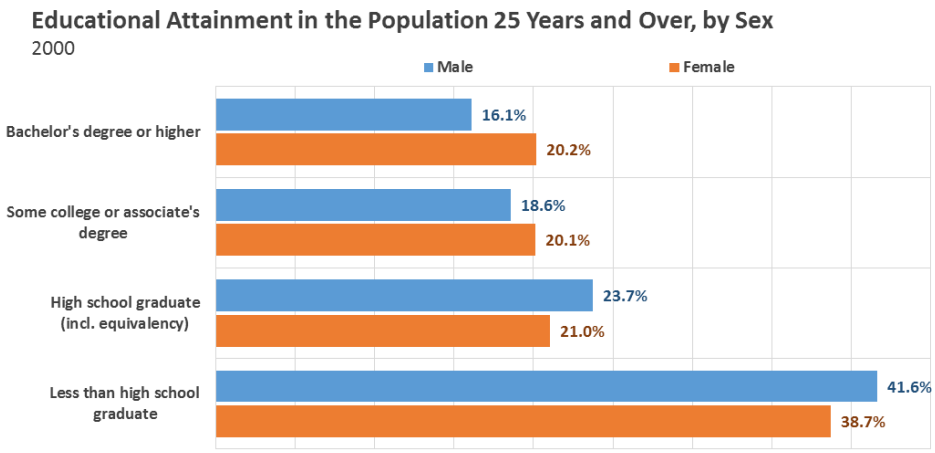


Source: National Center for Education Statistics (2016). *Integrated Postsecondary Education Data System.*

Higher-Education Levels

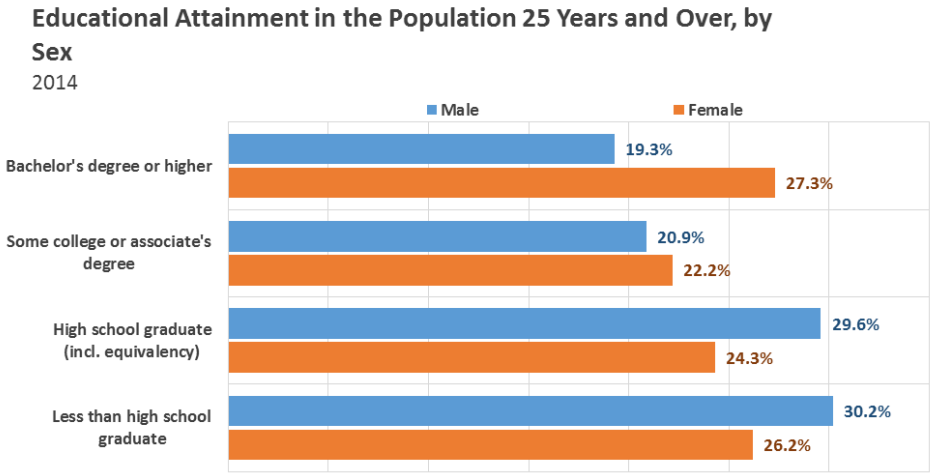
Coinciding with the shifts in labor demand towards advanced services requiring higher skills, more of the population had some type of college education in 2014 than in 2000. During said period, the percentage of individuals 25 or older with a bachelor's degree or higher increased from 16.1% to 19.3% for males, and from 20.2% to 27.3% for females. Similar increases were also seen in other educational categories. In contrast, the percentage of persons with less than a high school diploma declined from 41.6% for males and 38.7% for females in 2000 to 30.2% for males and 26.2% for females in 2014. This trend highlights the fact that even the labor market tends to polarize within a stagnant post-industrial economy. Further specialization provides the greatest marginal increase in economic well-being vis a vis middle class jobs associated with a lower educational level.

FIGURE 391



Source: US Census Bureau (2000). *2000 Census* [Table QT-P20].

FIGURE 402



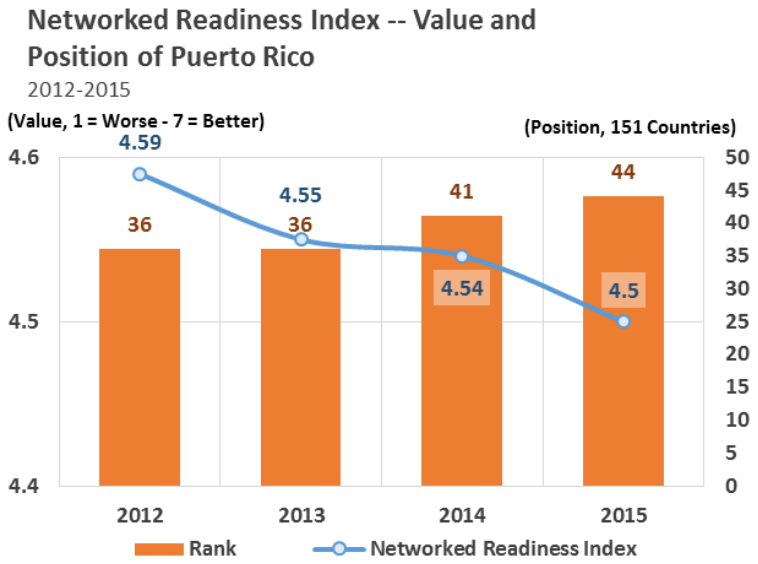
Source: US Census Bureau (2015). *American Community Survey 5-Year Estimates* [Table S1501].

Impacts on Competitiveness

Competitiveness in the Knowledge Economy

Between 2012 and 2015, Puerto Rico's technology sectors suffered the consequences of the prolonged contraction in the economy. As a result the World Economic Forum's *Networked Readiness Index*, Puerto Rico's international ranking fell by 8 places, during that period (from 36 to 44).

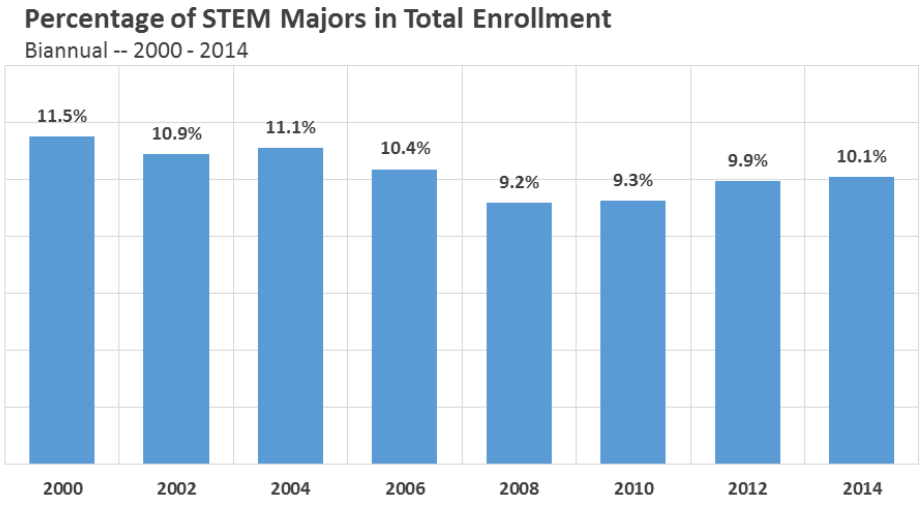
FIGURE 413



Source: World Economic Forum (2015). *Networked Readiness Index.*

From 2010 to 2014, however, the percentage of STEM majors in total enrollment experienced a recovery, although it still remains 1.4 percentage points below its 2000 level. In absolute numbers, STEM graduates have grown since 2010.

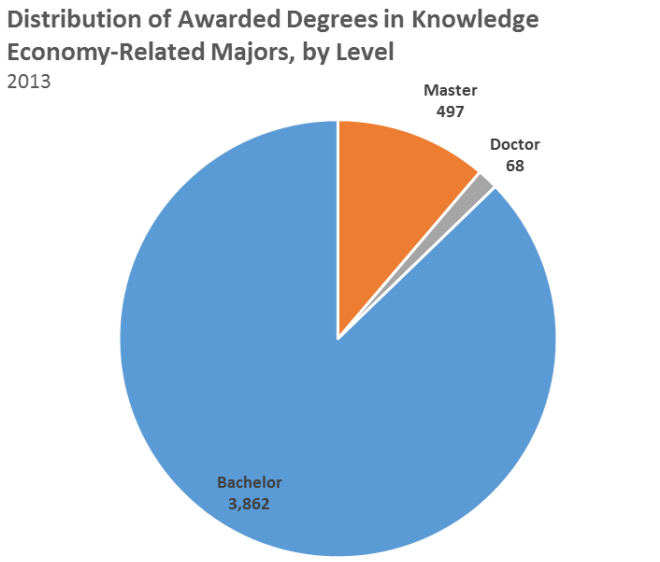
FIGURE 424



Source: National Center for Education Statistics (2016). *Integrated Postsecondary Education Data System.*

The vast majority of awarded degrees are bachelor's degrees, with 11.2% of all degrees related to knowledge economy disciplines being master's degrees.

FIGURE 435



Source: National Center for Education Statistics (2015). *Integrated Postsecondary Education Data System.*

Nonfarm salaried employment in Information, Communications and Technology (ICT) remained stable in spite of prevailing economic conditions that would have suggested a major drop. This is a reflection of efforts to migrate to a knowledge based economy by stimulating R&D and promoting exports of advanced services through Law 20 of 2012, for example.

TABLE 6

Employment in Information, Communications & Technology Occupations: Value and Share
2012-2014

Occupational Group	2012		2013		2014	
	Employment	% Share	Employment	% Share	Employment	% Share
Computer and Information Systems Managers	1,000	7.3%	1,030	7.6%	980	7.2%
Computer Systems Analysts	1,030	7.5%	1,010	7.5%	1,070	7.9%
Information Security Analysts	160	1.2%	190	1.4%	230	1.7%
Computer Programmers	1,290	9.4%	1,340	9.9%	1,260	9.3%
Software Developers, Applications	390	2.9%	320	2.4%	470	3.5%
Software Developers, Systems Software	550	4.0%	470	3.5%	210	1.6%
Web Developers	110	0.8%	90	0.7%	110	0.8%
Database Administrators	350	2.6%	400	3.0%	450	3.3%
Network and Computer Systems Administrators	910	6.7%	680	5.0%	650	4.8%
Computer Network Architects	390	2.9%	390	2.9%	390	2.9%
Computer User Support Specialists	2,920	21.4%	2,850	21.1%	2,900	21.4%
Computer Network Support Specialists	530	3.9%	540	4.0%	590	4.4%
Statisticians	230	1.7%	250	1.8%	240	1.8%
Computer Hardware Engineers	170	1.2%	280	2.1%	450	3.3%
Computer Operators	860	6.3%	780	5.8%	700	5.2%
Data Entry Keyers	2,780	20.3%	2,900	21.4%	2,750	20.3%
Total	**13,670**	**100.0%**	**13,520**	**100.0%**	**13,450**	**100.0%**

Source: US Bureau of Labor Statistics (2015). *Occupational Employment Survey.*

From 2012 to 2014, a total of 100 patents were issued, of which the majority were utility-type patents[2].

TABLE 7

Distribution of Patents by Year
2012-2014

Type of Patent	2012	2013	2014
Design	5	1	3
Plant	0	0	0
Reissue	0	0	0
Utility	34	19	38
Total (less SIRs)	**39**	**20**	**41**
SIRs	0	0	0
Grand Total	**39**	**20**	**41**

Source: US Patent and Trademark Office (2015).
Calendar Year Patent Statistics: by Geographic Origin.
SIRs = Statutory Intervention Registrations.

[2] According to the US Patent and Trademark Office (USPTO), a utility patent is:
"Issued for the invention of a new and useful process, machine, manufacture, or composition of matter, or a new and useful improvement thereof, it generally permits its owner to exclude others from making, using, or selling the invention for a period of up to twenty years from the date of patent application filing... subject to the payment of maintenance fees."
See US Patent and Trademark Office (2016). *Types of Patents* [Web Page]. Retrieved from http://www.uspto.gov/web/offices/ac/ido/oeip/taf/patdesc.htm for more information.

Erosion of the Human Resource Pool

Migration of the working-age population implies a reduction in the human capital pool currently in the island. This has also accelerated aging trends. As previously mentioned, approximately half of the emigrant population belonged to the 18-44 years or older age cohort. The influx of immigrants, on the other hand, was far older; only 37.9% of the immigrant population belonged to the 18-44 cohort, and the median age of immigrants was 41 years old. In any case, the influx of immigrants was clearly not enough to compensate for the migration losses in almost every age group (see Figure 11).

Approximately 24.4% of emigrants in 2014 had a bachelor's degree or higher education, and 44.0% were at 150% or above the poverty line. Immigrants had almost the same composition, with a notable exception in homeownership rate: whereas the large majority of emigrants were renters, to be expected due to their age composition, immigrants were mostly split between rental and homeownership.

TABLE 8

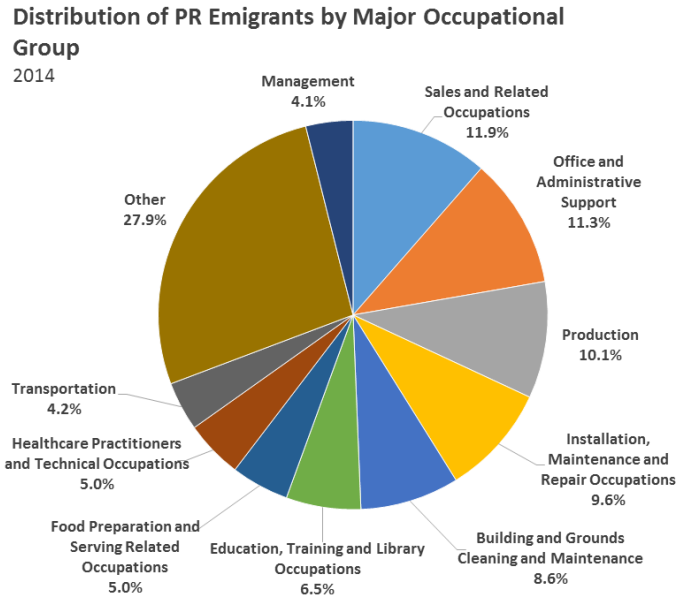
Educational Attainment, Poverty Status and Home Ownership Status of Migrants To/From Puerto Rico
2014

Educational Attainment	Emigrants	Immigrants
Less than high school	25.4%	27.3%
High school	27.6%	24.7%
Some college	22.6%	22.7%
Bachelor's degree	16.0%	18.2%
Master's degree and above, or equivalent	8.4%	7.1%
Poverty Status	**Emigrants**	**Immigrants**
Less than 100% of poverty level	41.7%	46.1%
100% to 149% of poverty level	14.3%	18.4%
150%+ of poverty level	44.0%	35.5%
Home Ownership Status (Tenure)	**Emigrants**	**Immigrants**
Homeowner	17.9%	48.4%
Renter	82.1%	51.6%

Source: PR Statistics Institute (2014). *Perfil del Migrante.*

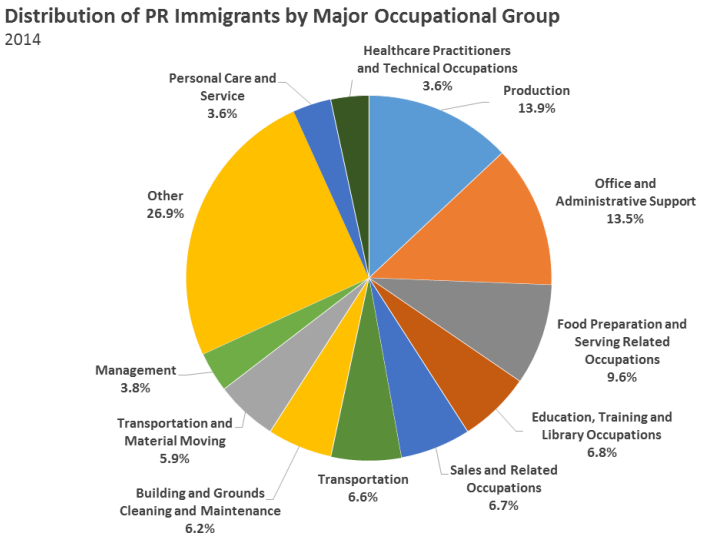
The largest occupational group of employed emigrants was sales, followed closely by office and administrative support occupations and production occupations. On the other hand, the largest occupational groups for immigrants were those of production occupations and office and administrative support occupations.

FIGURE 446



Source: PR Statistics Institute (2014). *Perfil del Migrante* [Table 2].

FIGURE 457



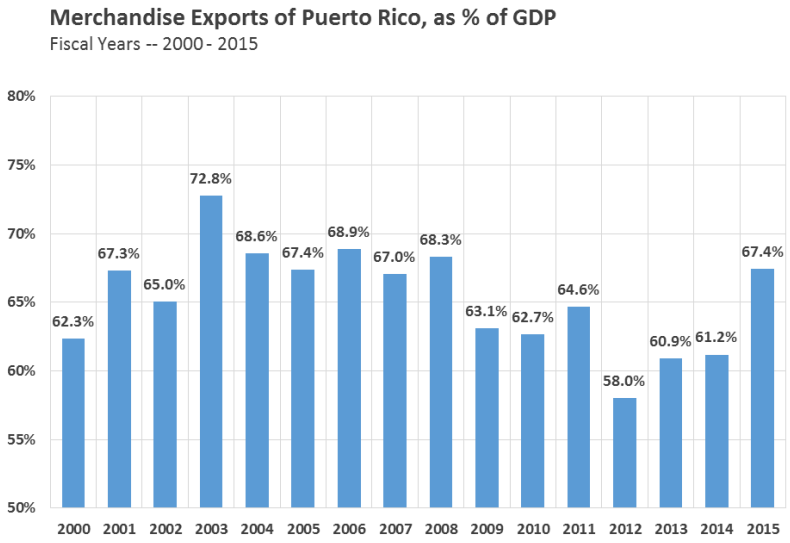
Source: PR Statistics Institute (2014). *Perfil del Migrante* [Table 2].

Contraction in the External Sector

While Puerto Rico is a very open economy – merchandise exports amount to more than 60% of its GDP – fiscal years 2009 to 2014 experienced a significant contraction before rebounding in fiscal 2015. This is partially attributed to exports of high value-added goods. The percentage of merchandise imports in GDP experienced a contraction in

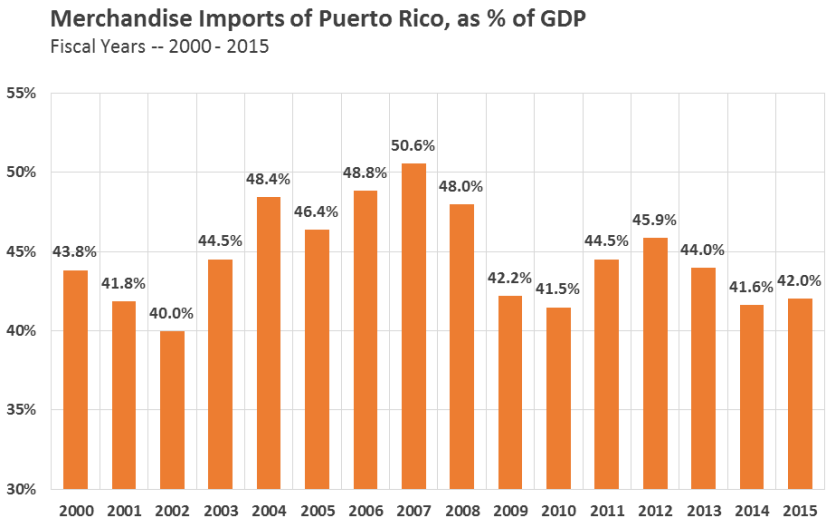
fiscal years 2009 and 2010, but increased temporarily in fiscals 2011 and 2012. However, this percentage dipped again from fiscal 2013 to fiscal 2015, contrary to exports.

FIGURE 48



Source: PR Planning Board (2016). *Statistical Appendix (Various Years)* [Table 23].

FIGURE 49



Source: PR Planning Board (2016). *Statistical Appendix (Various Years)* [Table 24].

The main destination of Puerto Rico merchandise exports is the United States, followed by Belgium and the Netherlands. Pharmaceutical products and chemicals, make up over half of exports since most export transactions corresponds to intra-industry exchanges, rather than sales to final consumers..

Top 10 Destinations of Puerto Rico Merchandise Exports

Fiscal Years -- 2003 and 2015

(millions of $)

Country	2003	Country	2015
United States	$47,647.0	United States	$51,433.1
Netherlands	$1,153.2	Belgium	$3,925.5
Belgium	$1,103.6	Netherlands	$2,519.2
France	$693.9	Spain	$1,445.5
Dominican Republic	$650.8	Austria	$1,375.0
Germany	$519.1	Japan	$1,153.9
Italy	$435.0	United Kingdom	$1,109.0
Singapore	$326.5	China	$815.4
Japan	$298.6	France	$752.4
United Kingdom	$271.1	Dominican Republic	$725.4

Source: PR Statistics Institute (2016). *Tablas Resumen del Comercio Externo* [Exhibit 10].

Top 10 Exported Commodities of Puerto Rico

Fiscal Years -- 2003 and 2015

(millions of $)

Commodity	2003	Commodity	2015
Pharmaceutical Products	$29,720.9	Pharmaceutical Products	$44,171.7
Organic Chemicals	$8,667.0	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments and Apparatus; Parts and Accessories Thereof	$7,759.2
Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof	$5,002.9	Organic Chemicals	$6,640.6
Miscellaneous Edible Preparations	$2,992.7	Miscellaneous Edible Preparations	$2,663.0
Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments and Apparatus; Parts and Accessories Thereof	$2,627.4	Essential Oils and Resinoids; Perfumery, Cosmetic or Toilet Preparations	$1,492.4
Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Reproducers, Television Recorders and Reproducers, Parts and Accessories	$1,967.7	Electrical Machinery and Equipment and Parts Thereof; Sound Recorders and Reproducers, Television Recorders and Reproducers, Parts and Accessories	$1,451.0
Miscellaneous Chemical Products	$830.6	Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts Thereof	$1,341.9
Essential Oils and Resinoids; Perfumery, Cosmetic or Toilet Preparations	$402.6	Miscellaneous Chemical Products	$957.1
Mineral Fuels, Mineral Oils and Products of Their Distillation; Bituminous Substances; Mineral Waxes	$396.3	Mineral Fuels, Mineral Oils and Products of Their Distillation; Bituminous Substances; Mineral Waxes	$547.5
Special Classification Provisions, Nesoi	$354.6	Special Classification Provisions, Nesoi	$344.5

Source: PR Statistics Institute (2016). *Tablas Resumen del Comercio Externo* [Exhibit 10].

To Sum up…

As noted in the information presented throughout the previous graphs and tables, the economy of Puerto Rico has experienced dramatic changes, particularly within the last 15 years. The majority of indicators are at the same or at worse levels than at the beginning of the last decade, and some have even reached historical lows. However, the economy has also experienced significant changes in response to global trends. The accelerated effects of globalization and technological change, along with the economy's inability to adapt and modify its social and economic institutions, have resulted in a system that is unable to cope with the current pace of change, that will not be resolved unless a strong (long-term) planning effort is put into place, and execution capacity is improved. As will be highlighted in this report, halting the economic downward spiral is the most important and urgent task.

Bringing to a halt population decline and mitigating the accelerating effect of the aging population are ambitious endeavors. Nonetheless, the state can develop several policy interventions that will adapt or transform Puerto Rico's public institutions. Low-cost interventions such as promoting healthier lifestyles, adapting industries to older age requirements, promoting continuous education and extending retirement age, placing adequate incentives for value-added services, adapting to generational preferences and revitalizing urban centers, are all plausible mechanisms that have been well documented in other jurisdictions. Understanding the underlying circumstances of Puerto Rico's population decline, such as free labor mobility with an advanced economy, will support delineating potential courses of action.

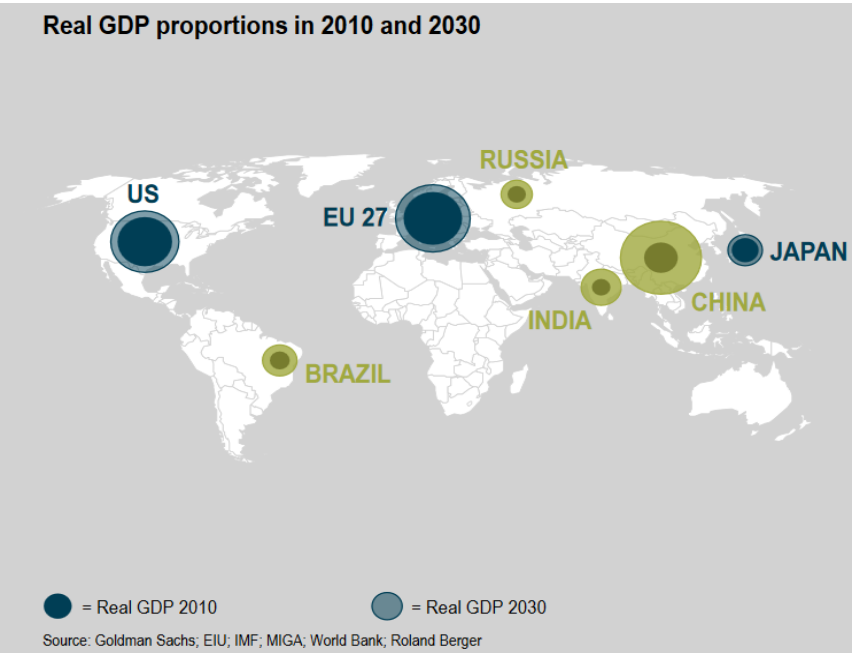
The following sections provide valuable information on global trends and specific policy interventions from other jurisdictions that will delineate the path for potential future strategies and recommendations.

Chapter 3: The International Context and Puerto Rico

This chapter examines the main developments in the world economy and how they relate to Puerto Rico. It assesses the key trends in the global economy and their future perspectives. Subsequently, it examines important trends in the US economy and their impacts. The final section summarizes fundamental interactions of the regional and global contexts with the economy of Puerto Rico.

Fundamental Trends of the Global Economy

In late 2001, Jim O'Neil, a Goldman Sachs employee, coined the term BRIC (Brazil, Russia, India and China). He argued that the four countries, specifically China's, share of world output would increase sharply in the following decade.[3] Another Goldman Sachs report in 2003 projected that the BRIC economies would be larger than that of the G-6 (USA, Japan, United Kingdom, Germany, France and Italy) by 2039.[4] It was not until a few years later, when the Great Recession (2007-09) hit, that governments realized that the world economy was in a process of unexpected and radical change.



[3] O'Neill, Jim *(30 November 2001).* Building Better Global Economic BRICs, Global Economics Paper No: 66. *Goldman Sachs.*

[4] Goldman Sachs Global Economics Paper No: 99, *Dreaming with the BRICs: The Path to 2050.* October 1, 2003.

Halfway through the second decade of the 21st century, it is clearer than ever that the world economic order is changing. Six main global trends were identified: (1) shifts in international trade and finance; (2) changes in the demographic composition of developing and developed nations; (3) individual empowerment; (4) urbanization; (5) mass accumulation of public debt; and (6) climate change. These tendencies not only help explain the globe's present situation but also hold strong economic implications for the years to come.

Trend #1: Shifts in International Trade and Finance

Since World War II, the world has, without doubt, become more interconnected. International negotiation and agreements played a major role in the growth of trade and are still crucial in trade policy creation. Despite the fact that the Doha Round's future success is uncertain, the World Trade Organization (WTO), along with international cooperation, managed to lower the global average tariff rate by 15% and help boost trade by $14 trillion from 1996 to 2013.[5] The rise of emerging economies, the growing importance of regional trade and the expansion of high technology exports also played a key role in the growth of trade.[6]

Developed nations dominated the volume of trade for most of the 20th century. As observed in Figure 1, the United States, Japan and Germany were the world's top exporters in 1995. Yet, in less than a decade, Japan was overshadowed by China, the current world leader in exports. China's quick ascension in volume of world trade summarizes the current pattern of trade, one focused on developing nations. In 1990, developing nations accounted for 23% of global trade; twenty years later (2010), the figure rose to 45%, that meant that developing countries were responsible for almost half of all trade, an unexpected development.[7] Figure 2 shows how the percent of world exports for developed nations, such as the United States, Japan, UK and

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5 World Trade Organization, *Trade and Tariffs*, (n.p.: WTO, 2012), https://www.wto.org/english/thewto_e/20y_e/wto_20_brochure_e.pdf.

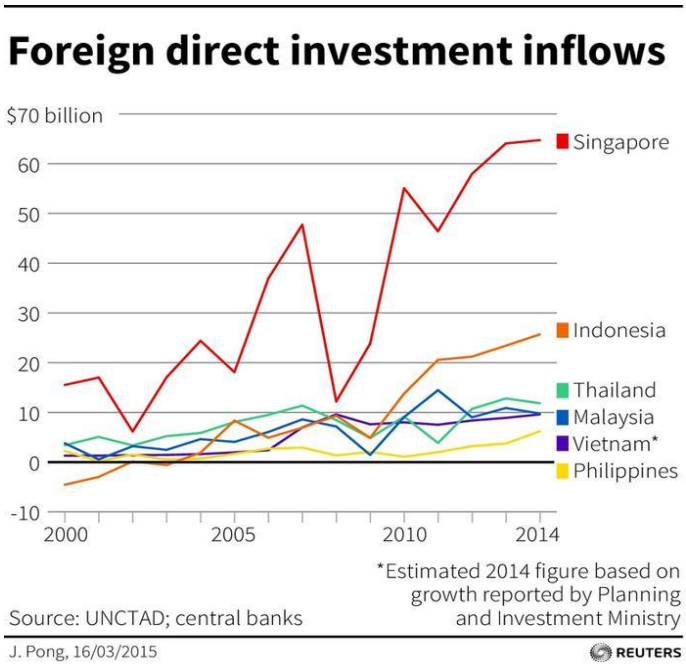
6 IMF Strategy Policy, and Review Department, *Changing Patterns of Global Trade*, (n.p.: International Monetary Fund, 2011).

7 Uri Dadush and William Shaw, *Juggernaut: How Emerging Markets Are Reshaping Globalization*, (Washington DC: Carnegie Endowment, 2011).

Germany, has decreased while the percent has increased for developing nations, such as China, Mexico, Singapore and Korea.

Since the late 20th century, developed countries have been in a post-industrial phase. Jobs in manufacturing began to decrease as early as 1950, while employment in the service industries increased substantially. This shift in the composition of employment is criticized because it is believed to generate job losses and, to a lesser extent, income inequality. Recent research has found that jobs in developing countries are also moving towards the service sector. Harvard Professor Dani Rodrik termed this phenomenon premature deindustrialization since developing countries were, and still are, turning into service economies without having experienced full scale industrialization.[8] This sort of economic dislocation weakens local industry and does not allow for the proper development of a global market economy, leaving poverty and competitive job levels as key problems.

The shift in trade patterns can be attributed to the movement of global manufacturing from developed to developing economies. The direction of the movement is concentrated towards Asia, specifically China, driven by outsourcing and off-shoring of



8 Dani Rodrik, *Premature Deindustrialization*, (Camebridge, MA: Harvard University, 2015).

production as well as low labor costs.[9] The change in production strategy led to an increase of intermediate manufactured goods exports from this region. Also, high commodity demand spurred trade between developing nations, further lowering the role of developed nations in world trade. In 2008, trade between developing nations represented 20% of global trade, increasing 11% since 1990.[10]

Currently, the Trans-Pacific Partnership (TTP) is the most important piece of global trade policy due to its strong implications for the future of trade. Negotiated by Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, United States, and Vietnam, the TTP aims to: (1) improve market access by lowering trade barriers, (2) facilitate the development of production and supply chains, (3) enhance job creation and living standards by promoting efficient trade systems, (4) aid the development of a digital economy, and (5) create a platform for regional integration.[11] Negotiations for the partnership, which is awaiting ratification as of mid 2016, ended on October of 2015. If it were ratified, global gains are estimated to be around $295 billion annually.[12] Unfortunately, non-participating Asian economies will most likely be negatively impacted by the agreement, primarily China whose income is predicted to decrease $35 billion annually.[13] The TTP is unlikely to be ratified because both presidential candidates of the United States, Donald Trump and Hillary Clinton, have shown opposition to the partnership. This is also true of some European leaders.

The TTP is not the only attempt towards further trade liberalization. The Transatlantic Trade and Investment Partnership (TTIP) and the Regional Comprehensive Economic Partnership (RCEP) are two examples of other efforts with important implications. Yet, because of past negotiations' success, the potential gains from further trade liberalization are modest when compared to those of past agreements; most gains would come from the liberalization of trade in agricultural products, that happens to be

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9 Raymond J Ahearn, *Rising Economic Powers and the Global Economy: Trends and Issues for Congress*, (Washington DC: Congressional Research Service, 2011).

10 Ibid.

11 "Summary of the Trans-Pacific Partnership Agreement," Office of the United States Trade Representative, October 2015, https://ustr.gov/about-us/policy-offices/press-office/press-releases/2015/october/summary-trans-pacific-partnership.

12 Joshua P. Meltzer, "From the Trans-Pacific Partnership to a Free Trade Agreement of the Asia-Pacific?," *Brookings Institution*, May 5, 2015.

13 Ibid.

a politically sensitive topic.[14] Many attribute the current standstill of the Doha Round to nations' failure to agree on agricultural trade policy. Regardless, global trade is expected to grow at an average of 5% annually through 2030.**[15]**

Like trade, global wealth and asset holdings are moving towards developing nations. In 2010, developing economies held 67% of total foreign exchange holdings. [16] These countries are also holders of a large part of developed nations' debt. For instance, China held 7.2% of the United States debt in 2014.[17] However, private capital flows in developing nations are dominated by foreign direct investment.[18] The investment rate in emerging countries now stands at about 33% of GDP. In 2000, developing economies accounted for about 20% of the total global investment; by 2030 it is expected that developing countries' share of investment will rise to above 60%.[19] Figure 3 shows how FDI levels rose in developing Asian countries like Singapore, which has seen the biggest increase. Singapore's surge of investment is concentrated in its financial and insurance industry, 86.4% coming from investment holding companies as of 2014.[20] In contrast, FDI in Latin America has been in decline, decreasing 16% in 2014.[21] Most investment in this region goes to natural resources and manufacturing, a rare trajectory for the 21st century.

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14 Paul R Krugman, Maurice Obstfeld, and Marc Melitz, *International Economics: Theory and Policy*, 10th ed. (United States: Prentice Hall, 2014), chap. 10.

15 KPMG International (2013). *Future State 2030: The global megatrends shaping governments*. KPMG/The Mowat Centre. Available at: https://www.kpmg.com/ID/en/IssuesAndInsights/ArticlesPublications/Documents/Future-State-2030.pdf.

16 Raymond J Ahearn, *Rising Economic Powers and the Global Economy*.

17 Mike Patton, "Who Owns the Most U.S. Debt?," *Forbes* (Forbes), October 28, 2014, http://www.forbes.com/sites/mikepatton/2014/10/28/who-owns-the-most-u-s-debt/#4aa4a2b1907c.

18 "Finance and Development," International Monetary Fund, March 1, 2007, http://www.imf.org/external/pubs/ft/fandd/2007/03/kose.htm.

19 Daniel Gros and C. Alcidi (2013). *The Global Economy in 2030: Trends and Strategies for Europe*. Centre for European Policy Studies, Brussels. (November). Available at: https://www.ceps.eu/publications/global-economy-2030-trends-and-strategies-europe-0.

20 Department of Statistics Ministry of Trade & Industry, Republic of Singapore, *Foreign Direct Investment in Singapore 2014*, (Singapore, 2014).

21 Shannon K O'Neil, "Foreign Direct Investment in Latin America," *Latin America's Moment, Council on Foreign Relations*, June 4, 2015, http://blogs.cfr.org/oneil/2015/06/04/foreign-direct-investment-in-latin-america/.

Trend #2: Changes in Demographic Composition

In a 2004 report, the United Nations projected that the world population would peak at 9.22 billion in 2075.[22] Even though the overall population will continue growing for the next 50 years, the population growth rate, as noted by Figure 49, will be in steady decline.

FIGURE 46

The UN also found that the increase in population would be concentrated in nine countries: India, Nigeria, Pakistan, Democratic Republic of Congo, Ethiopia, Tanzania, the United States, Indonesia and Uganda.[23] Eight of these nations are classified as developing, two being in Asia and the rest in Africa. This observation sheds light on the fact that the majority of population growth will be found in the developing world, specifically Asia and Africa and primarily attributed to their high fertility rates. The fight against poverty will become even more challenging as the population in already poor countries expands. Moreover, cities will play a large role in this growth, a topic which will be elaborated on later.

According to Gros and Alcidi (2013), there are three demographic tendencies with long term implications in some, mostly developed, economies today: (1) population

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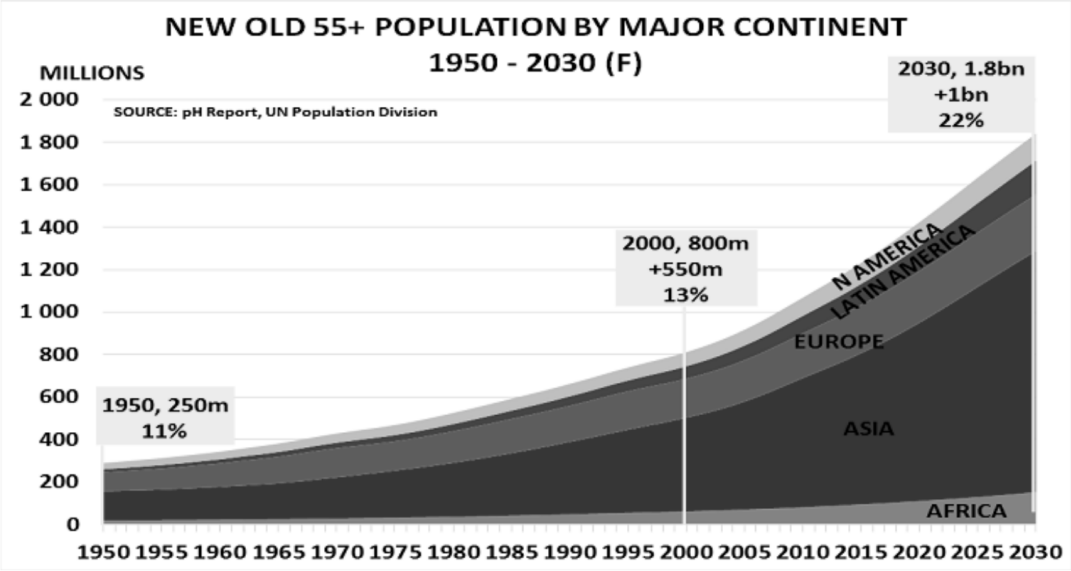
22 UN Department of Economic and Social Affairs, *World Population to 2300*, (New York: United Nations, 2004).

23 "UN Projects World Population to Reach 8.5 Billion by 2030, Driven by Growth in Developing Countries," News, July 29, 2015, accessed July 14, 2016, http://www.un.org/sustainabledevelopment/blog/2015/07/un-projects-world-population-to-reach-8-5-billion-by-2030-driven-by-growth-in-developing-countries/#prettyPhoto.

growth is slowing sharply due to declines in fertility, (2) life expectancy among the younger population is increasing and is thought to peak by 2030, and (3) the proportion of elderly people is increasing, in some places at a very fast pace.[24]

The rise in life expectancy and fall in birth rates translates into an increase in the proportion of elderly people, putting serious pressures on social welfare, health, and retirement systems. It also has serious implications for aggregate demand since the elderly lack the income to stimulate it. The United Nations estimated that the number of people in the 55+ cohort will rise 1.8 billion by 2030, a 1 billion increase since 2000, with over half living in Asia.[25] (See Figure 7). Furthermore, China is facing rapid ageing of its workforce. The dependency ratio is estimated to quadruple by 2060. A similar tendency is predicted for developed countries due to a future decline in the working age population, driven mainly by the decline in fertility rates and gains in longevity.[26] In the US, for example, 20% of the population will be aged 65+ by 2019.[27]

FIGURE 47



Source: Paul Hodges (2016), p. 1.

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24 Gros and Alcidi (2013), p. 4.

25 Paul Hodges (2016), "1bn people joining New Old 55+ mean pension promises turn sour," *Chemicals & The Economy* (January 28, 2016). Available at: http://www.icis.com/blogs/chemicals-and-the-economy/2015/10/1bn-people-joining-new-old-55-generation-just-pension-promises-turn-sour/.

26 ESPAS (2015). *Global Trends to 2030: Can the EU meet the challenges ahead?*, p. 14. Available at: http://europa.eu/espas/pdf/espas-report-2015.pdf

27 P. Hodges (2016).

The changing demographic composition discussed above will most likely impact the labor market in the future, if it has not already. The labor force will expand disproportionately across the world, declining in most advanced economies. The relative size of the working-age population will contract from 63.0% (2009) to 52.0% in 2050.[28] The labor force will also shrink in developing countries but by a small amount when compared to the change in developed economies. Moreover, the reduction in the global labor force participation rates (LFPR), a shift observed since 2007, will continue with a decline of 0.5% to 1.0% by 2030.[29] Pension and labor market reforms, such as the increase of the retirement age in many European countries, will also affect the LFPR. However, healthy life expectancy is increasing, in other words a growing number of older people are willing and able to remain active in the labor market. Employers will have to adapt and be more accommodating to the need of the ageing workforce. Establishing elderly training programs has become more common, allowing old age workers to stay up to date with certain skills, specifically e-technology ones. Unfortunately, studies have found that only a limited number of employers are establishing structures that allow for an elderly workforce.[30] The training programs represent a cost that some companies might not be willing to take, so they instead focus on hiring from a younger age group.

Trend #3: Individual Empowerment

As the world becomes more interconnected, the empowerment of the average individual expands.[31] The World Bank defines empowerment as the process of enhancing the capacity of individuals or groups to make choices and to transform

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28 RAND Corporation (2015). *Employment and the changing labour market: Global societal trends to 2030*. Available at: http://www.rand.org/pubs/research_reports/RR920z5.html.

29 Ibid.

30

31 Central to this process are actions, which both build individual and collective assets, and improve the efficiency and fairness of the organizational and institutional context which govern the use of these assets. In essence, empowerment speaks to self-determined change.

It implies bringing together the supply and demand sides of development – changing the environment within which poor people live and helping them build and capitalize on their own attributes. Empowerment is a cross-cutting issue. From education and healthcare to governance and economic policy, activities that seek to empower poor people are expected to increase development opportunities, enhance development outcomes and improve people's quality of life. "Definition of Empowerment," World Bank website, 2013. Available at:

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTEMPOWERMENT/0,,contentMDK:20272299~pagePK:210058~piPK:210062~theSitePK:486411~isCURL:Y,00.html

those choices into desired actions and outcomes. The continued process is driven by: (1) global emergence of the middle class, particularly in Asia, (2) near-universal access to education, (3) further development of ICT, and (4) improvement in the status of women around the world.[32]

The increasing access to e-technologies, expansion of mobile communication, and development of the ICT sector, have led to a remarkable increase in communication through social media. As these technologies develop, there is a visible trend of empowerment through the access of easy and widespread communication. For starters, social media enhances citizen participation in democratic governmental processes as well as public communication. Governments are able to transmit messages and transmit live events among other things in order to reach out to a wider variety of the citizenry. Moreover, they can track the public's response to the transmitted messages or ideas and, to a farther extent, surveil people they deem important or a possible threat.[33] Yet, the most widespread consequence of social networking is its capacity of enabling citizens to coalesce and challenge established political institutions. In Spain in 2004, a massive text campaign generated protests that led to the quick removal of the Spanish Prime Minister.[34] With the power to spread messages quickly through e-mail, text message, facebook, twitter and/or other e-tools, underrepresented groups of citizens, or basically any individual, can make themselves heard. Governments will need to adapt to increasing amounts of citizen participation and create platforms that respond to potential demands. President Obama's administration has already taken measures to create a more direct and controlled public method of challenging institutions or policies in place. *We the People,* an online petition system, allows anyone to create a petition on practically any government related subject and once it reaches 100,000 signatures, the government is forced to respond.

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[32] RAND Corporation (2015). *Individual empowerment: Global societal trends to 2030*, p. 13. Available at: http://www.rand.org/pubs/research_reports/RR920z3.html.

[33] Eileen Guo, "5 Ways Social Media Is Changing 'business as usual' for Governments," *Huffington Post*(The Huffington Post), January 20, 2016, http://www.huffingtonpost.com/eileen-guo/5-ways-social-media-is-ch_b_9021526.html.

[34] "The Political Power of Social Media," Foreign Affairs, January 21, 2016, https://www.foreignaffairs.com/articles/2010-12-20/political-power-social-media.

According to KPMG (2013), by 2030 about 60.0% of the world's population will be part of the middle class, up from 27.0% in 2007. 80.0% of it will reside in developing regions, increasing the share by 22% since 2010.[35] This implies a much more educated population, with higher incomes and better access to technology. Moreover, governments will have to address the demands for services from a "more connected" middle class.

Although individuals are gaining a stronger presence in the world, inequality and poverty remains as major problem areas. The global socio-economic impacts of the Great Recession brought attention to the problem of income inequality.[36] As observed in the well-known and extensive research by Thomas Piketty (2014), inequality is projected to grow and have dire effects on the accumulation and development of capital.[37]

Yet, it is important to note that inequality has not evolved equally worldwide. For instance, in South America it declined since 2000s. On the other hand, in the United States 37% of the total sum of income is paid to the top 1%, while less than 3% is paid to the bottom 50% of the population. The US is a country in which income inequality is steadily increasing.

Income inequality has the following effects:[38]

1. It depresses demand since consumption levels depend more on the wages of those at the lower end of the income scale.

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35 KPMG (2013), p. 18.

36 There are several definitions of income inequality, and frequent misunderstandings about their meaning. Top income inequality is measured as the share of total income that goes to the income earners at the very top of the distribution. It does not measure the income that reaches the pockets of the wealthy; instead it captures what is paid to the wealthy *before* taxes are deducted. There is a considerable difference between incomes before and after taxes – inequality of the disposable income, which tends to be lower. It is important to be aware of this difference as government policies (taxes, subsidies, transfers) reduce inequality.

Another measure of inequality is the well-known Gini Index, which looks not only at the top of the income distribution but captures the whole distribution (The index varies from 0 to1, with 0 indicating perfect equality, where there is a proportional distribution of income, and 1 indicating perfect inequality). There is also a Gini of both pre-tax income and the lower inequality of disposable income, which is the income that remains after taxes have been paid and transfers have been received. See Mark Roser (2016), op.cit.

37 Thomas Piketty (2014). *Capital in the Twenty-First Century*. Boston: Belknap Press of Harvard University Press.

38 See the report by Alice Martin, H. Kersley and T. Greenham (2014), *Inequality and financialization: a dangerous mix*, NEF (December 14). Available at: http://www.neweconomics.org/publications/entry/inequality-and-financialisation.

2. In the face of stagnating wages, households rely increasingly on debt to maintain their lifestyles in part due to rising asset prices, particularly in residential housing.

3. Financial liberalization allows money to flood into countries with trade deficits, providing funds for debt-led consumption.

4. The fast accumulation of wealth at the top of the socio-economic hierarchy increases risky financial speculation.

5. There is a strong correlation between income inequality and poverty growth in the United States.[39]

As presented in the previous section, Puerto Rico reflects significantly more polarization in terms of income inequality.[40]

Trend #4: Urbanization

One characteristic that describes many parts of the world is the growth of the urban sector. As industrialization and modernization accelerated in the last three decades, urban growth rates were extremely high. Urbanization is usually defined as the process where an increasing percentage of a population lives in cities and suburbs, often linked to modern forms of development. By 2013 it was estimated that more than 50.0% of the world's population lived in urban areas.[41] By 2030, it is expected that 60.0% of the world's population will live in cities.[42]

Most global urban growth by 2030 will be concentrated in less-developed regions. Higher than average population growth will also be experienced in developing

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39 Elise Gould et.al. (2015), *Broad-Based Wage Growth Is a Key Tool in the Fight against Poverty*, Economic Policy Institute (May 20). Available at: http://www.epi.org/publication/broad-based-wage-growth-is-a-key-tool-in-the-fight-against-poverty/.

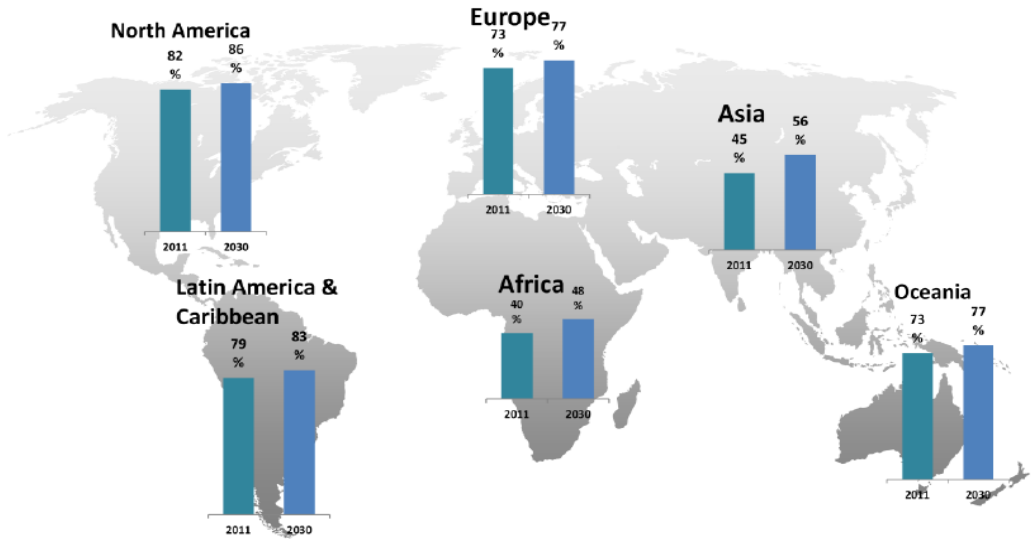
40 US Bureau of the Census (2014). *Household Income*, Table 1. Available at: https://www.census.gov/content/dam/Census/library/publications/2014/acs/acsbr13-02.pdf.

41 Daniel Gros and C. Alcidi (2013), p. 12. The definition of urban varies considerably, and there is no commonly agreed definition. So, although a significant part of the world population lives in urban areas, the proportion that lives in very large cities is smaller. See Population Reference Bureau (2009), What Is a City What Is Urbanization? Available at: http://www.prb.org/Publications/Articles/2009/urbanization.aspx.

42 KPMG (2013), Future State 2030, p. 46.

economies (See Figure 15).[43] As the number of people living in urban areas increases, urban centers will generate a greater share of economic growth because of the potential to apply new technologies and the existence of modern infrastructure in these new urban centers.

FIGURE 48



Source: Daniel Gros and C. Alcidi (2013), p. 13.

The role of cities as drivers of growth will increase due to not only the increasing number of megacities (those with a population of 10 million or more) but also the expansion of smaller cities. The traditional measures of metropolitan regions will change, as suburban or 'rurban' areas will grow faster as they are integrated into a megacity. The rural population of the world, now around 3.4 billion, is expected to peak by 2020 and decrease to 3.1 billion by 2050.[44]

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43 Daniel Gros and C. Alcidi (2013), pp. 6 and 13. For example, the target of the Chinese government is to transform 60% of its population into urban residents by 2020.

44 "World's Population Increasingly Urban with More Than Half Living in Urban Areas," United Nations, July 10, 2014, http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html.

Challenge for San Juan - Miami at the forefront

The 15 Best Cities for Business in Latin America, 2016

	Index		
City	General	City	Infrastructure and physical connectivity
Miami	100.0	Miami	100.0
Santiago	87.0	Sao Paolo	63.1
Mexico City	81.0	Mexico City	62.8
Sao Paolo	80.1	Bogotá	61.9
Bogotá	77.4	Panamá City	59.1
Buenos Aires	75.0	Santiago	47.3
Panamá City	74.9	Lima	43.4
Lima	70.9	**San Juan**	**42.2**
Montevideo	70.7	Buenos Aires	40.5
Valparaíso-Viña del Mar	70.3	Medellín	39.2
Medellín	68.3	Rio de Janeiro	38.4
Rio de Janeiro	67.2	San José	35.7
Monterrey	66.7	Monterrey	31.8
San José	64.9	Montevideo	31.4
San Juan	**64.2**	Valparaíso-Viña del Mar	28.1

Source: AméricaEconomía (2016). Las mejores ciudades para hacer Negocios 2016. http://rankings.americaeconomia.com/mejores-ciudades-2016/. For the methodology see source.

In 2010, 259 large US cities generated 85% of US GDP. By 2025, these cities, such as New York City and Los Angeles, will contribute more to global growth than the 355 largest cities of other developed economies combined.[45] Among developing economies, metropolitan China accounted for 78% of its GDP.[46] The number of megacities is expected to increase from 20 in 2012 to 37 in 2025.[47]

Interestingly, the modern urban model includes the expansion of innovation districts, areas where research institutions connect with start-ups and other business

[45] Gros and Alcidi (2013), p. 13.

[46] McKinsey Global Institute (2012), p. 2.

[47] KPMG (2013), *Future State 2030*, p. 47

development groups, within cities.[48] In the United States, cities like Boston, Detroit and Pittsburgh have developed innovation districts, composed mostly of 20 to 40 year olds, in their respective somewhat abandoned industrial areas. In fact, district entrepreneurs have managed to re-invent and re-define the urban setting. Other cities, such as Raleigh-Durham and Atlanta, have innovation districts concentrated in more traditional work spaces. Cities around the world have also developed innovation districts to boost growth and promote economic diversification. A Brookings Institution study found five drivers of growth within these innovative communities: (1) collaborative leadership network, (2) vision for growth, (3) new talent and technology, (4) promotion of inclusive growth, and (5) enhancement of capital accessibility.[49]

All these developments have put serious strains on resources and support systems, meaning that "megacities" will be burdened by scarcity issues that will limit their expansion. This suggests that while urbanization might be creating opportunities for social and economic development, it is exerting pressure on infrastructure and resources at a much faster pace.[50]

Trend #5: Accumulation of Public Debt

Since the 2008-2009 international financial crisis, the accumulation of debt, specifically public debt, has become one of the most pressing global issues. A 2015 report by the McKinsey Global Institute highlights how the situation had developed to that year: "Global debt has grown by $57 trillion and no major economy has decreased its debt-to-GDP ratio since 2007. High government debt in advanced economies, mounting household debt, and the rapid rise of China's debt are areas of potential concern."[51] In other words, the world has accumulated a volume of debt at a faster pace than income, as measured by Gross Domestic Product.

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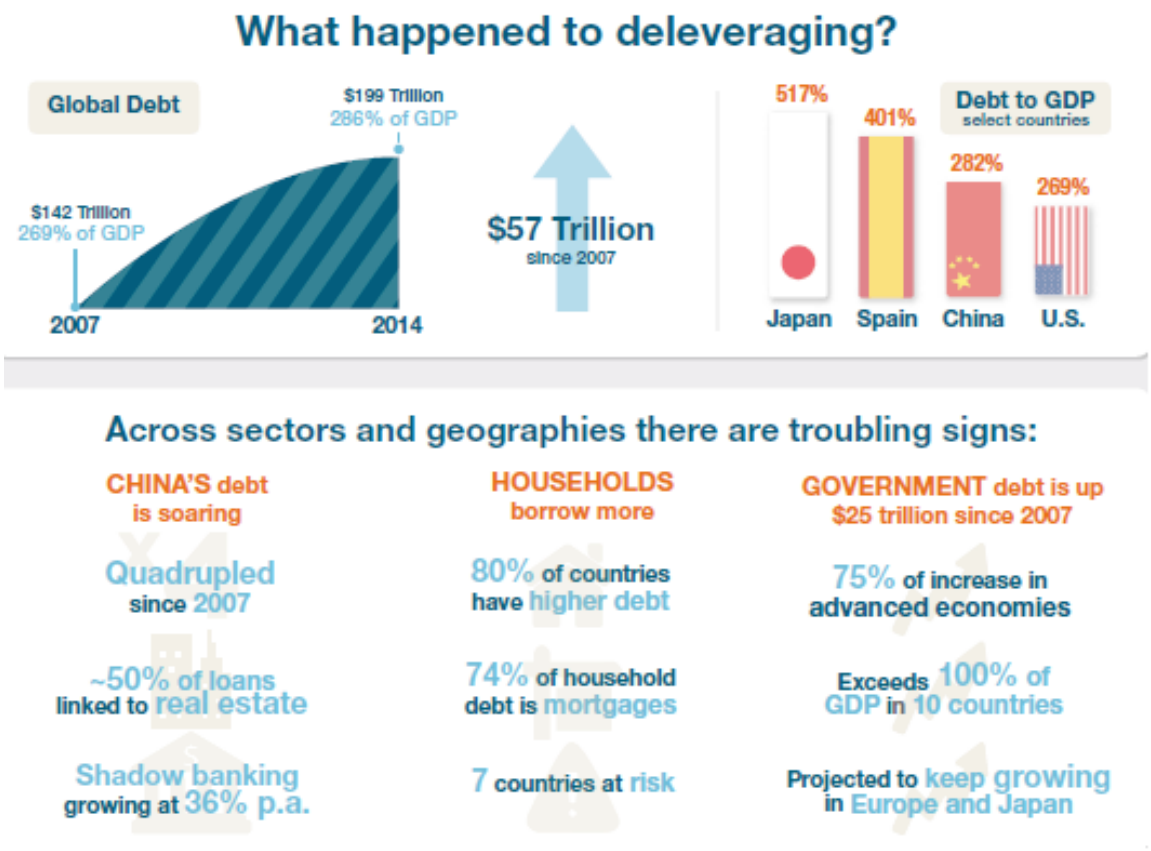
48 "The Rise of Innovation Districts: A New Geography of Innovation in America," Brookings Institute, 2014, http://aa61a0da3a709a1480b1-9c0895f07c3474f6636f95b6bf3db172.r70.cf1.rackcdn.com/content/metro-innovation-districts/index.html.

49 Ibid.

50 Ibid, pp. 46-47.

51 Richard Dobbs et.al. (2015), "Debt and (not much) delivering," McKinsey & Co (February). Available at: http://www.mckinsey.com/global-themes/employment-and-growth/debt-and-not-much-deleveraging.

FIGURE 49



Source: Richard Dobbs et.al. (2015). *Debt and not much deleveraging* (February 10), p. vi.

A recent report by S&P supports this claim by calculating the ratio of total debt of nonbank entities or sectors, such as households, business, and public debt, as a ratio to nominal GDP by country.[52] The ratio is used as an indicator of debt-servicing ability and leverage. The report examines the level and change of the ratio, but not the factors that affect debt serviceability, such as the quality of debt and sustainability of GDP for 20 countries (Developed and emerging economies). A high ratio is a sign that a sector may have built too high of a risk. This can be leveraged, though, in terms of how big net worth is. The principal finding is: the increase in debt has outstripped income growth, more in some countries than in others, specifically in the case of Asia (China, Japan), and Latin America (Brazil, Mexico, Venezuela). In the case of the US, the rise seen in

[52] FTSE Global Markets (2016), *S&P's debt report says global debt has outstripped income growth* (January 14). Available at: http://www.ftseglobalmarkets.com/news/sps-debt-report-says-global-debt-has-outstripped-income-growth.html.

2015 reflects the increase in consumer and business debt as economic conditions improved.

TABLE 9

Public and Private Levels of Indebtedness Oustanding: Puerto Rico and the U.S. - 2006 - 2015 (a)

	Total Gross Federal Gov debt/GDP*	States and Local Total Debt/GSP	Total US Public Debt/GDP****	US Consumer Debt/GDP	Business/GDP	US Economy Total Indebtedness /GDP	PR (Total public debt/GNP)****	PR Consumer Debt/GNP**	PR Total Indebtedness /GNP
2006	107.7%	15.9%	123.6%	95.5%	64.9%	219.1%	74.6%	65.1%	139.7%
2007	112.8%	16.6%	129.4%	97.8%	69.8%	227.2%	76.2%	64.1%	140.3%
2008	123.2%	17.4%	140.6%	95.2%	72.6%	235.8%	85.2%	64.7%	149.9%
2009	138.4%	18.8%	157.2%	95.4%	70.3%	252.7%	91.8%	63.9%	155.8%
2010	141.0%	19.0%	160.0%	90.3%	66.6%	250.3%	96.8%	61.4%	158.1%
2011	143.8%	18.8%	162.6%	85.7%	66.1%	248.3%	97.8%	57.3%	155.1%
2012	145.9%	18.2%	164.1%	82.7%	66.7%	246.8%	102.7%	60.2%	163.0%
2013	146.0%	17.7%	163.7%	81.0%	67.8%	244.8%	101.9%	57.0%	158.8%
2014	147.6%	17.0%	164.6%	80.0%	69.2%	244.6%	103.2%	56.8%	160.1%
2015e	148.5%	16.7%	165.1%	86.0%***	76.3%***	327.4%	103.0%	---	---

Sources: Trading Economics; U.S. BEA; Federal Reserve Board; Usgovernmentspending.com; *Economic Report of the President 2015*; Government Development Bank; P.R. Planning Board, *Statistical Appendix 2014; Office of the Commissioner for Financial Institutions.*

(a) Does not include financial institutions.

* Include the "agency debt" or "Government-sponsored enterprises", such as FHLB, GNMA, Fanny Mae and Fanny Mac, which is not included in the debt issued by the US Treasury.

** Does not include debt incurred with financial and credit institutions in the U.S. Includes mortgage debt, and as in the US student loans.

*** Average for the first three quarters of the year. **** Does not include interest.

Note: Data for Puerto Rico on a fiscal year basis. e = Estimates for US. In the case of public debt.

Table 9 shows how the United States, including Puerto Rico, has had a steadily increasing total indebtedness to GDP ratio for the last decade. In reality, the growth of this ratio can be traced back to a few years before the Reagan administration. It is estimated that by 2035, US debt will reach 213% of GDP.[53] The world, on the other hand, is predicted to have net public debt of 98% of global GDP in 2035.[54]

An analysis conducted by the IMF in 2010 shows that, if public debt increases by 40%, global interest rates could rise by 2%, thus lowering potential economic growth.[55] This has important implications for the global economy in 2030, since higher interest rates and slower growth will make it harder for governments to lower their debt to GDP ratio. Another possible consequence of increasing public debt is higher tax rates, which will burden the consumer and/or producer, depending on which tax system is altered or established.

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53 Joseph Gagon with Marc Hinterschweiger. June 2011. "The Global Outlook for Government Debt over the Next 25 Years: Implications for the Economy and Public Policy." Peterson Institute for International Economics, Policy Analyses in International Economics 94. https://piie.com/publications/chapters_preview/6215/iie6215.pdf

54 Ibid.

55 Carlo Cottarelli and Andrea Schaechter, *Long Term Trends in Public Finances in the G-7 Economies*, (n.p.: International Monetary Fund, 2010).

Trend #6: Climate Change

Climate change is driven by the accumulation of greenhouse gases (GHG), which are primarily created by the use of fossil fuels. The next decade and a half will see a closer linkage between the problems arising from climate change and those from scarcity of resources since overall production is projected to double.[56]

Climate change is expected to worsen the outlook of the availability of food, water, and energy since their demand increases as population and consumption patterns grow, particularly the less developed countries. Demand for food and water are expected to rise by 35% and 40% respectively by 2030. Nearly half of the world's population will live in areas experiencing severe water scarcity. Although fragile states in Africa and the Middle East are the most at risk of experiencing these shortages, China and India also face the threat.[57]

Moreover, emerging markets' demand for infrastructure, housing, consumer goods, and equipment will raise global investment to higher levels. The increase in demand will exert pressure on available natural resources and rely on the use of energy, which, in turn, rely on fossil fuels. Yet, consumption patterns in developed nations seem to be turning towards more sustainable "green" consumption every day. The "Greendex" score of the national geographic, a scored consumption index of environmentally friendly products and service, shows that most of green consumption is concentrated in the BRIC countries, followed by the Western world.[58] India leads the ranks, while the United States falls 18th, behind most of Europe. Regardless of the fact that fossil fuel usage is diminishing, they are still, and will continue to be, in high demand. The World Bank estimates that by 2025 climate change will be responsible for lack of food and water that will affect 1.4 billion people.[59]

By 2030 the rise in energy consumption will come from non-OECD countries, in particular from China. Natural gas will play a bigger role in generating electricity, particularly in

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56 Gros and Alcidi (2013), p. 74.

57 National Intelligence Council (2012). p. v.

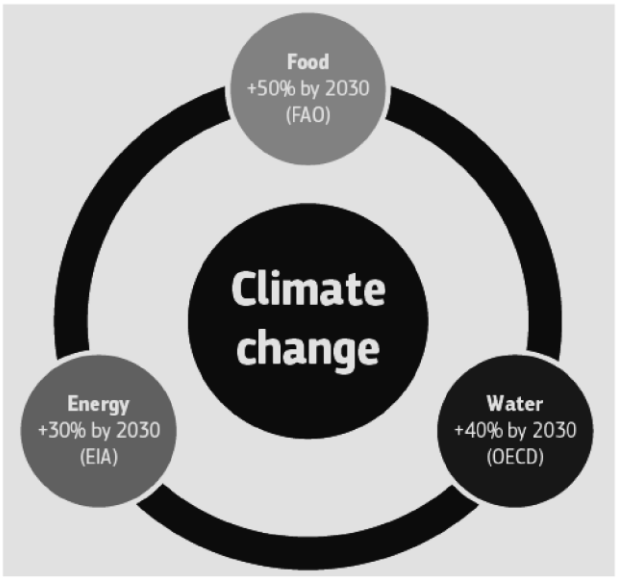
58 "Greendex: Survey of Sustainable Consumption," 2014, http://environment.nationalgeographic.com/environment/greendex/.

59 ESPAS (2015), p. 37.

Europe, even though coal consumption is expected to continue strong until 2030. The natural gas market is expected to grow by 50.0% by 2035 while nuclear energy and renewable are expected to account for 24.0% of electricity produced and 40.0% of the growth in energy demand by 2035.[60] Furthermore, a trend for sustainable infrastructure has emerged in developed and developing nations. For example, Australia has made sustainable development key in its economic and infrastructure policy decisions, taking into consideration Britain's Standard's Principles and Framework for Procuring Sustainability (BS 8903), a guide for both the public and private sector.[61]

FIGURE 50

The Natural Resources Perfect Storm by 2030?



Source: ESPAS (2015), p. 38.

The abovementioned trends provide a fresh example on how social and technological change is shaping local, national and international scenarios. These changes have profound implications, particularly for a small-open economy like Puerto Rico. Institutionalizing the external intelligence will be key to any future development initiatives. Policy decisions will require a closer relationship with international actors.

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60 ESPAS (2015), p. 40.

61 "Current Trends in Sustainable Infrastructure," Edge News, November 17, 2015, http://edgeenvironment.com.au/current-trends-in-sustainable-infrastructure/.

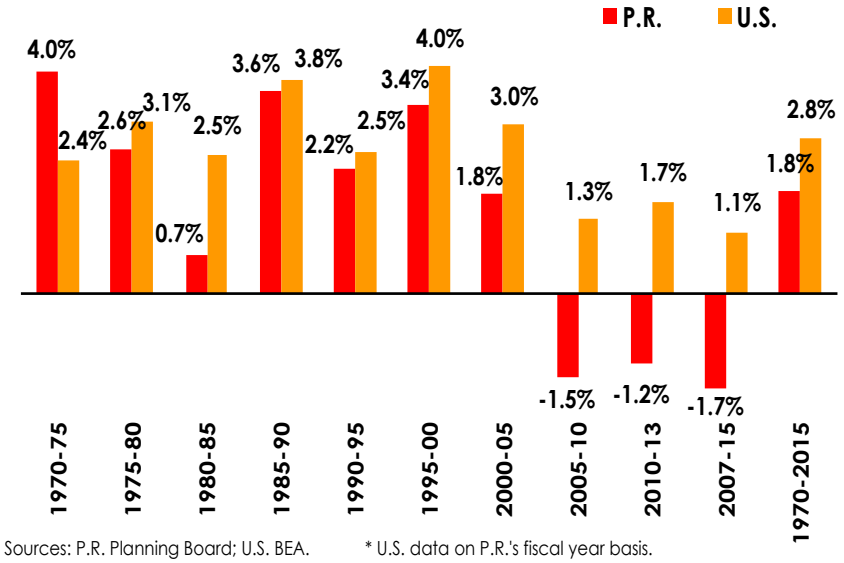
Puerto Rico as a Regional Economy

After the Great Recession of 2007–2009, the US economy entered a slow period of recovery. Even with the 2008-2009 policy effort that successfully prevented financial collapse, by 2011 the US was halfway to a lost economic decade. In the period of 2006-2011, the economy's growth rate averaged less than 1% per year. At the same time, the share of working population declined from 63.1% to 58.4%, reducing the number of employed by more than 10 million. It was not until 2014, when the pace of the economy started to accelerate, that real GDP growth increased, from 0.2% in 2010 to 2.1% in 2014 and later to 2.7% in 2015.[62]

Even though the state of the US economy directly affects the Puerto Rican economy, its influence over the territory's economic performance has diminished (See Figure 55). The growth gap between both economies has been widening since 2000. For instance, during the second half of the 80s, PR's real GNP growth averaged 3.6%, compared to 3.8% in the US. Since 2000, until fiscal year 2014, the Puerto Rican economy declined at an average rate of -0.2%, while the US economy expanded at an average annual rate of 2.1%.

FIGURE 51

Average Annual Growth of Real GNP: Puerto Rico and U.S., 1970 to 2015*



Sources: P.R. Planning Board; U.S. BEA. * U.S. data on P.R.'s fiscal year basis.

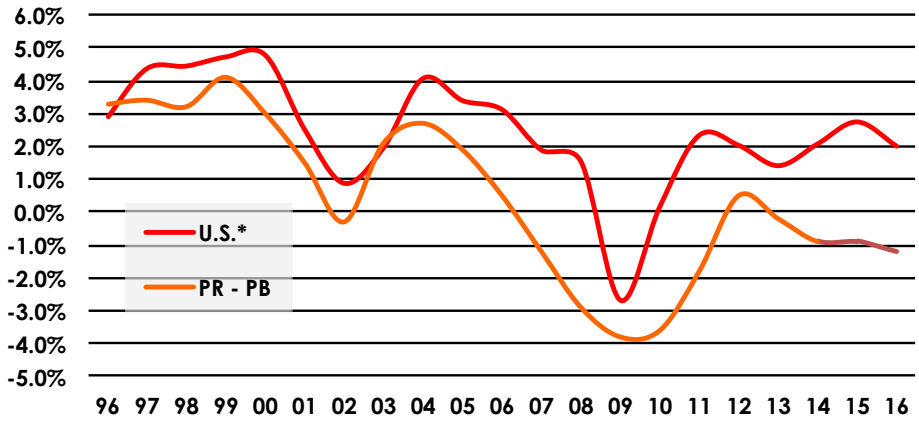
62 US growth data on P.R.'s fiscal year basis.

The developments presented above reflect serious structural problems: the "bursting of the bubble" in the housing and construction sectors, lack of high and sustainable levels of direct external investment, and other economic imbalances that are yet to be resolved. Addressing these issues in light of the worsened economic and social landscape remains a challenge.

In fiscal year 2015, the local economy declined again by 0.6%. According to the PR Planning Board, GNP growth is forecasted to decline by 1.2% in fiscal 2016 and by 2.0% for fiscal year 2017.[63] We believe these estimates to be somewhat optimistic, given the current and expected future economic conditions. On the other hand, the US economy grew by 2.7% in fiscal year 2015 and is expected to grow by 2.0% in 2016.[64]

FIGURE 52

Real Economic Growth: Puerto Rico and U.S.*



Sources: Puerto Rico Planning Board (2015); U.S. BEA; Aspen Publisher, *Blue Chip Economic Indicators* (April 10, 2016). * U.S. data on P.R.'s fiscal year basis. GDP for U.S. (Chained 2009$).

Federal Policy: A Key Variable

The US government, through its three branches and the Federal Reserve, exerts considerable influence on the Nation's economy and jurisdictions, with two basic policy instruments: Monetary and fiscal policy. Monetary policy is implemented by the Federal Reserve Board, which is the US central bank, with three main objectives: maximizing

63 P.R. Planning Board (May 2016).

64 Wolters Kluwer (2016), *Blue Chip Economic Indicators* (April 10), p. 5.

employment, stabilizing prices, and moderating long-term interest rates.[65] It also supervises and regulates banks, and provides financial services to depository institutions as well as the US government. The second, fiscal policy, establishes expenditures, taxation, regulations, and non-defense investment, as determined by Congress and the Administration.[66] Over the years, this area of economic policy has become very important to Puerto Rico.

Federal policies have a direct impact on P.R.'s economy mostly through changes in federal programs and in corporate taxation statutes. Changes in federal expenditures can significantly alter Puerto Rico's economy, as the flow of federal funds has increased dramatically. From 2009 to 2014, they represented 23.0% of the consolidated budget, and 17.0% of disposable personal income. In that period, federal funds represented about 25.4% of the Island's GNP.

Inflows of Funds Received by Puerto Rico

Between 2009 and 2014, the economy of Puerto Rico had an accumulated inflow of federal funds and other sources of about $109.9 billion. This amount exceeded that of (non-financial) external direct investment in the island. The accumulated inflow of funds represented 27.5% of the accumulated GNP for that period (See Table 10).

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[65] Board of Governors of the Federal Reserve System. Monetary Policy. Available at: http://www.federalreserve.gov/monetarypolicy/default.htm

[66] It should be added that several federal government agencies have quite an important role through their regulatory functions. For instance, the Labor Department, the Health and Human Services Department, Education, and the Social Security Administration. Their decisions also impact Puerto Rico.

TABLE 10

Inflows of Funds Received by the Economy of Puerto Rico During 2009 - 2014

Funds	Amount ($Mm)	Dist. %	As a % of GNP During Period
ARRA Funds - Total	$7,100.0	6.5%	1.8%
Received by ELA and Municipalities	$4,093.1	3.7%	1.0%
Destined to Individuals	$1,430.0	1.3%	0.4%
Channelled through Federal Agencies	$1,405.8	1.3%	0.4%
Private Organizations and Non-Profit Institutions	$160.9	0.1%	0.0%
Local Stimulus Fund (2009 - 2010)	$500.0	0.5%	0.1%
Reduction of individual and corporate taxes (Tax Reform 2011)	$706.0	0.6%	0.2%
Subtotal, ARRA and Local Funds (Stimulus and Reforms)	**$8,306.0**	**7.6%**	**2.1%**
Federal Funds (Receipts):*			
Individuals*	$82,412.2	75.0%	20.6%
Central government, agencies, public corporations and municipalities**	$15,775.0	14.4%	3.9%
For infrastructure (PREPA and PRASA)	$1,360.9	1.2%	0.3%
Municipalities (Communal Development)	$694.3	0.6%	0.2%
Subsidies to industries (Public corporations) and WIA	$1,352.0	1.2%	0.3%
Subtotal, Federal Funds (Receipts)*	**$101,594.4**	**92.4%**	**25.4%**
Total	**$109,900.4**	**100.0%**	**27.5%**

Puerto Rico's Fiscal and Economic Crisis (Marzo 1,2016), p. 2.

* Does not include receipts from ARRA, which are included above. and from state governments, and civil service pensions.

** Includes U.P.R.

Flows of Federal Funds

As can be seen in Table 10, the inflow of funds to the economy came from multiple sources, but can be grouped into four categories:

1) American Reconstruction and Recovery Act (ARRA) funds;
2) Local Stimulus Funds, using bond proceeds from the Puerto Rico Sales Tax Financing Corporation (COFINA);
3) Freed funding from the reduction in tax rates for individuals and corporations through the Tax reform of 2011; and
4) Federal funds to individuals, the Commonwealth, and municipalities.

The majority of the total inflows of funds to the economy (92.4%) were Federal funds, which amounted to $101.6 billion, or 25.4% of the accumulated GNP for the fiscal 2009 –

fiscal 2014 period. Most of these (75.0%) corresponded to Social Security and Medicare payments, which are paid-for benefits to individuals, followed by food stamps and scholarships. Given that personal consumption expenditures averaged 88.0% of Puerto Rico's GNP during the period, it is safe to assume that most of these inflows went to consumption.

The second-largest inflow consisted of funds received by the state & local government – meaning the Commonwealth, corporations, and municipalities. These inflows amounted to $15.8 billion, representing 14.4% of the total. Funds received by the government go into various purposes and entities, but the majority is received by the Education and Health departments; these two agencies accounted for 68.0% of the total funds received by the government. In the area of infrastructure, a key part of economic growth, inflows of federal funds (Mostly to the public corporations PREPA and PRASA) were $1.4 billion, representing a small share of the total inflow of funds (1.2%).

In the case of municipalities, the bulk of the funds received were for Community Development ($694.3 million), for which we assume that at least some goes to construction of local infrastructure.

Inflows of Funds at the State Level

Federal fund inflows are significant revenue sources for the states as well. According to a report from the Pew Charitable Trusts (2015), federal dollars made up a bigger proportion of state revenue from fiscal year 2009 to 2012 than at any other time in the past 50 years. After peaking at 35.5% in fiscal year 2010, the revenue share of federal funding fell to 30.0% in fiscal year 2013, back within its historical ranges, with Mississippi and Louisiana having the biggest share at over 40.0%.[67]

Trends in US Fiscal Policies

New fiscal policies can have significant impacts on the flows of federal spending and investment, for instance, through changes in government expenditures.[68] During the period 1957-2006, prior to the Great Recession, real government expenditures increased

[67] The Pew Charitable Trusts (2016). *Fiscal 50: State Trends and Analysis* – Federal Share of State Revenue (April 16). Available at: http://www.pewtrusts.org/en/multimedia/data-visualizations/2014/fiscal-50#ind1.

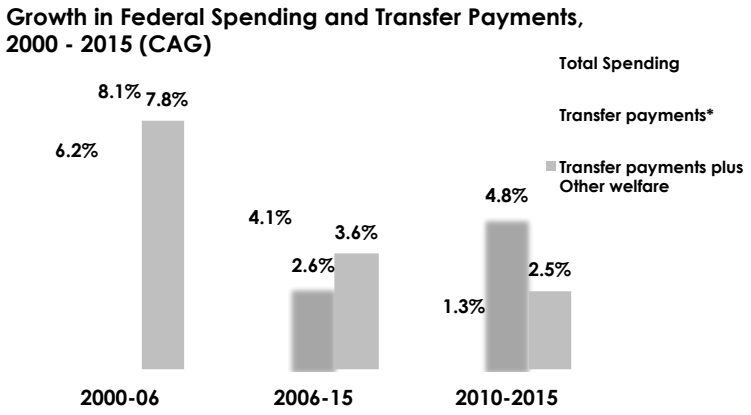
[68] Government spending consists of consumption expenditures (goods and services), transfer payments (social security, unemployment insurance, veteran's benefits, and other transfer payments), and gross fixed investment.

by an average of 3.8% annually; in fact, real spending grew every fiscal year.[69] Spending also increased between 2007 and 2014, a period which includes the Great Recession, but at a slower pace, averaging a 1.9% annual growth. As GDP fell during the recession, federal expenditures' share of GDP increased to 41.0%, its highest level since 1940-45.[70]

Significant structural shifts have also occurred in terms of the composition of federal expenditures. The spending share of transfer payments and other welfare payments increased from 14.4% of total spending in 1957 to 51.4% in 2000 and to 61.0% in fiscal year 2015.[71] While the upsurge in spending mostly reflects increases in Social Security and Medicare spending, it was also affected by the contraction in GDP during the Great Recession.

For the 2000-2006 period, total federal spending increased at a compound annual rate of 6.2%, owing mainly to an even higher growth of transfer payments (See Figure 4). In the following period (2006-2015), which incidentally includes the Great Recession (2007-2009), growth of expenditures slowed to 4.1%, with that of transfer payments falling below growth in total spending.

FIGURE 53



Source: www.usgovernmentspending.com. * Social Security, Medicare and Medicaid.

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69 Mark Bognanni and Sara Millington (2015), *US Fiscal Policy: Recent Trends in Historical Context*, Federal Reserve Bank of Cleveland (July 14). Available at: https://www.clevelandfed.org/newsroom-and-events/publications/economic-trends/2015-economic-trends/et-20150714-us-fiscal-policy-recent-trends-in-historical-context.aspx.

70 Bognanni and Millington (2015), pp. 1-2.

71 Data from www.usgovernmentspending.com. Refers to transfer payments (Social Security, Medicare, and Medicaid), plus other welfare payments. Available at: http://www.usgovernmentspending.com/year_spending_2000USbn_06bs6n_30#usgs302.

In the last six years (2010 – 2015), the annual growth of total spending declined to 1.3%, a growth below the one experienced at the beginning of the past decade. In contrast, spending on transfer payments increased at a compound rate of 4.8%. As previously mentioned, the increase in transfer payments reflects increases in Social Security and Medicare payments.[72]

According to a recent report from the Congressional Budget Office (CBO), the federal budget deficit will increase in 2016 at a compound annual rate of growth of 5.1%, slightly higher than the rate in the 2010-2015 period. The deficit is expected to continue increasing over the next 10 years, and by 2026 it should be considerably larger than its average over the past 50 years.[73] This situation is likely to force adjustments in federal spending. In the most recent Federal Fiscal Outlook, the General Accounting Office (GAO) points out that "the federal government's debt as a share of GDP is growing unsustainably because revenue and spending are fundamentally imbalanced over the long term, according to GAO's."[74]

US Policies and Puerto Rico

On June 29th Congressional leaders approved the PROMESA bill[75], which instituted a Board with powers to conduct supervisory and fiscal control measures to meet Puerto Rico's fiscal challenges. The measures to be implemented by this Board will impact the performance of the local economy. On July 1st the Commonwealth defaulted on its General Obligations (GOs), marking the first time a territory or state of the US defaulted on GOs since 1933. As a response to the Commonwealth's inability to gain access to credit markets or meet its current financial obligations, the US Congress enacted PROMESA. The Oversight board (Board) is tasked with reviewing the island's budgets and monitor fiscal policies. The Board will also be in charge of approving negotiations

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[72] The spending numbers underestimate the amount of transfers' payments when comparing to Puerto Rico, as in the Federal Budget veterans pensions are included in Defense expenditures, and those corresponding to education in All Other Spending.

[73] Congressional Budget Office (2016). *CBO's Recent Budget and Economic Projections*. Presentation to the American University Department of Economics by Keith Hall, Director (April 28). Available at: https://www.cbo.gov/publication/51510?utm_source=feedblitz&utm_medium=FeedBlitzEmail&utm_content=812526&utm_campaign=Express_2016-04-28_15%3a30.

[74] General Accounting Office (2016). *Fiscal Outlook: Federal Fiscal Outlook*. Available at: http://www.gao.gov/fiscal_outlook/federal_fiscal_outlook/overview#t=0.

[75] The Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA; HR 5278, S 2328). (July 1st, 2016).

with creditors carried out by the Government of Puerto Rico.. It is worth noting that although Puerto Rico defaulted on its GOs, the Island is currently protected from creditor's lawsuits due to the moratorium on litigations stipulated by PROMESA. This moratorium covers litigation filed between December of last year and the later of February 15, 2017, or six months after the Board is organized[76].

The enactment of a fiscal Oversight Board is expected to lead to significant structural changes and exert additional downward pressure upon economic activity. The Board has budget balancing as a primary objective. Therefore, additional spending cuts should be expected. The Board has the power to consolidate departments and agencies, sell public assets, reduce the number of public employees, and/or raise taxes. Any of these measures would have a negative impact on the economy.

Debt restructuring is still a strong possibility. The restructuring process is complex and will take many years. It will likely require significant operational funds for the handling of the process until completion. The Congressional Budget Office estimated that the Oversight Board will require an estimated $350 million during the five years.

The Board must meet certain objectives before it can conclude its work, among these are 1) assuring Puerto Rico has access to credit markets at reasonable rates; 2) and achieving four straight years of balanced budgets. Due to the magnitude of Puerto Rico's economic deterioration and fiscal imbalances, *it is highly probable that the Board will be in place for more than five years*.

Revenues for fiscal 2016 were below revised estimates, forcing the Commonwealth to further reduce its budget to offset the resulting deficit. Revenues for fiscal 2016 were $101.1 million below revised estimates, even after the increase in the Sales and Use Tax implemented in July of 2015. According to the Act, the Governor of Puerto Rico must submit quarterly reports of the island's finances, and if conditions call for adjustments, spending cuts must be promptly implemented to produce a balanced budget. The recently constituted Board (September, 2016) has implemented even more stringent requirements in terms of reporting. Continuous reductions in public spending should be expected in the coming years.

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[76] http://www.bondbuyer.com/news/washington-budget-finance/obama-signs-promesa-starting-long-process-for-puerto-rico-1107451-1.html

As part of the PROMESA law, a stay on all debt principal payments until February 2017 is in place. The duration of the stay could be extended if the Board deems it appropriate. This is a welcome relief for the Commonwealth, which was unable to meet its debt obligations in July, as said provision allows the Island to continue providing essential services. Although interest payments were to be made, some were not. Given the reductions in public spending that will likely be implemented, services could be reduced in fiscal year 2018. This is even more likely when the longstanding problems regarding healthcare and retirement funds are taken into account.

Puerto Rico and the Caribbean Region

Puerto Rico's insertion in the Caribbean region has not been a constant. At times, as in the 1970's and early eighties, the twin plant concept provided the basis for a more intense interaction, but was not continued. Puerto Rico's participation in regional entities has also been weak, except for a more active participation in the Caribbean/Latin American Action, headed for a time by a well-known former Puerto Rican Government official. In recent years there has been an increase in interactions with the Dominican Republic and Panama, with commercial missions to some other countries in the region and Central America, as well as Colombia and Peru.

According to a recent report from the Caribbean Development Bank (CDB) (2016), the Caribbean economy experienced a difficult year in 2015. The main reason was the slowdown in China, which along with other events kept commodity prices low, impacting exporters of those products.

Being small open economies, the commodity producing countries saw sharp falls in growth. On the other hand, for those economies reliant on tourism, it was a relatively good year, as in the case of Barbados and Jamaica. Falling commodity prices dominated the fortunes of several of the major commodity exporters (Trinidad & Tobago, St. Lucia, Dominica).

Unemployment remains a concern across much of the Caribbean economies in the region. Youth unemployment, according to CDB research completed in 2015, is among the highest in the world. In St. Lucia, despite recent economic growth, unemployment

fell only slightly to 25.0%, while in Jamaica it fell, but still remained above 12.0%, and in Barbados 12.0%.

Inflation has remained under control, with several of the islands actually experiencing deflation. High levels of indebtedness remain a problem in many of the economies in the region. The two biggest debtors are Barbados and Jamaica, with the ratio of public debt to GDP being 131.0% in 2015 for Barbados, and 125.0% for Jamaica. For the smaller islands the ratio averaged 75.0%.

The region's outlook remains uncertain, as reflected in the following table. The slow-down in China, persistently low commodity prices and their implications for producers and consumers, as well as tighter monetary policy in the United States and the opening of Cuba all generate risks for the other countries, particularly those that depend on tourism. The Caribbean Tourism Organization (CTO) expects stay-over arrivals to increase by between 4.5% and 5.5% in 2016, on the back of a 7% increase in 2015. Projecting for 2017 and 2018 will depend on how quickly Cuban tourism becomes more fully available to U.S. tourists.

Slower growth is predicted for 2016, with modest increases in real GDP growth expected for 2017 through 2018 below historic growth. The average for the region is estimated at 2.2%, and for the OECS an average of 3.0%, declining in 2017 to 2.4% and 2.6% in 2018.

Outlook

GDP Annual Growth, (Constant 2010 USD In %)

			Forecasts		
Country	2014	2015p	2016	2017	2018
Latin America & Caribbean	1.5	-0.7	0.1	2.3	2.5
Anguilla	6.2	1.8	2.2	NA	NA
Antigua and Barbuda*	3.2	1.8	2.4	2.7	2.7
Barbados	0.2	0.5	1.4	2.0	2.0
British Virgin Islands	0.5	2.0	2.5	NA	NA
Caribbean small states	1.3	1.3	NA	NA	NA
Dominica*	3.9	2.8	4.0	2.0	2.0
Dominican Republic	7.3	5.6	4.6	3.8	3.9
Grenada*	5.7	3.4	2.8	NA	NA
Jamaica	0.7	0.9	1.5	2.2	2.6
Monserrat	2.4	-1.1	3.5	NA	NA
St. Kitts and Nevis*	6.9	4.6	4.5	NA	NA
St. Lucia*	-0.7	1.6	1.5	1.9	2.0
St. Vincent and the Grenadines*	-0.2	1.8	2.4	3.1	3.1
Trinidad and Tobago	0.8	-2.0	-2.0	1.2	1.5
OECS - Average of member countries	3.1	2.8	3.0	2.4	2.5
Average all Caribbean	2.6	1.6	2.2	2.4	2.5

Sources: World Bank Data Base (2016); Caribbean Development Bank (2015). NA = Not available p = Preliminary

* Members of the OECS.

The Cuban economy is experiencing difficulties due to its dependence on Venezuelan oil and this country's very serious situation has led to a reduction in oil based trade. This could have an impact on negotiations with the United States, forcing a speeding up of these negotiations. The opening of Cuba so far has had relatively little impact on Puerto Rican businesses seeking opportunities in the country. This is not expected to change significantly in the near future.

The Dominican Republic is, by far, Puerto Rico's main trade partner in the region. It is also the most dynamic economy in the Caribbean, although its growth rate is projected to slow down in the next two years. What is important from the perspective of Puerto Rico is the fact that the Dominican Government has recently made it known that it seeks a greater regional role. The implication is that it will assume an economic role in the region that is new and that could, because of its economic performance, become significant in terms of having the resources to put in place trading and other types of agreements with the rest of the Caribbean.

Summing up, the regional environment is changing rapidly due to Cuba's new orientation and a more aggressive Dominican Republic. Puerto Rico has not had a clearly expressed regional policy and the uncertainty that prevails makes it absolutely necessary. Cuba and Puerto Rico's participation in its economy should be part of the policy.

PART 2: THE ECONOMY OF PUERTO RICO IN 2030

Chapter 1: Scenario Analysis

This chapter develops an outlook for Puerto Rico for the period 2016-2030 using a *planning approach*. It consists of a series of scenarios that represent possible growth paths for the economy of Puerto Rico.

Introduction

One of the main objectives of this report is to provide a closer look at the Island's socioeconomic horizon to 2030. The report incorporates a scenario planning methodology that provides potential outcomes based on a particular set of assumptions. The interpretation of such scenarios provides a unifying agenda and a planning tool during the next 15 years.

The last decade experienced an accelerated pace of change, along with deeper transformations in production, technology and societal arrangements. Puerto Rico has reacted to these changes with a limited view of what lies ahead in the next two decades, for reasons mentioned earlier. Moreover, external shocks, along with lackluster economic growth, have accentuated the effects of change in the Island. Deep demographic and economic changes are limiting the Island's ability to secure sustained economic development; hence, this study seeks to provide a closer look at what lies ahead, beyond traditional long-term trend analyses.

In the case of the Puerto Rican economy, scenario planning will give policy makers the best tool to understand future possibilities and options. As it stands right now, there is no way to definitively predict where Puerto Rico will be in the mid and long term future, particularly since current demographic trends and lack of access to capital markets create limits to the Island's capacity to recover in the short term. The best way to improve on the current economic trends is to generate scenarios that could come into play in the short, medium and long term and react to them with carefully devised policy initiatives.

With this in mind, the report takes into account the main socioeconomic variables of the Puerto Rican economy since 1970's, main tendencies at a global level and some relevant international experiences that provide policy lessons for Puerto Rico. The last

part of the report provides specific policy recommendations in view of the foreseeable scenarios for 2030.

Forecasts vs. Scenarios: Key Terms and Definitions

The analysis performed throughout this chapter assumes a *scenario-based* approach, that has substantial differences with respect to the typical *forecasting-based* analysis. This section defines and distinguishes forecasts from scenarios, and explains the reasons for adopting the scenario-based approach.

What is a Forecast?

According to the Cambridge Dictionary, a *forecast* is defined as "a statement of what is judged likely to happen in the future, especially in connection with a particular situation,…". This involves choosing a narrow set of characteristics and assigning differing probability values to each outcome in response to a *model* of the situation. In the forecasting paradigm, the researcher a) formulates a theoretical model of the situation, b) determines a statistical representation of this model, accounting for the various sources of uncertainty and data limitations, and c) using a variety of methodologies, obtains parameter estimates given the available data.

What is a Scenario?

A *scenario*, on the other hand, is the representation of an expected reality. The Cambridge Dictionary defines it as "a description of possible actions or events in the future". Unlike a forecast, a scenario does not seek the trajectory that best explains the available data, but rather aims to develop a coherent, detailed internal narrative which can best explain the given forecast. Scenarios are used to describe, visualize and plan according to an expected set of conditions in a detailed manner. They are a particularly useful tool when confronted with a highly uncertain context.

Why Scenario Modeling?

Forecasts solve the problem of gaining future intuition from current knowledge, by returning: a) *confidence or credibility intervals*[77] with desirable predictive properties, conditional upon the available information; and b) an *expected value* which represents the global maximum of the conditional likelihood. This allows performing simulations, experiments and hypothesis tests to gain a better understanding of future conditions. In the short term, forecasts are a powerful instrument, as the assumptions underlying the forecasting model are likely to hold, and the ratio of available information to the unknowns is sufficient to warrant a significant level of precision to the estimates produced by the model.

On longer time spans, the assumption of permanence in the conditions underlying the model estimates quickly breaks down, particularly because of exogenous events. The forecasting model is likely to change through time, as external impulses continually reshape the system and agents react to these changes. Additionally, the ratio of available information to unknowns shrinks at a surprisingly fast rate, which negatively affects the precision of parameter estimates. Therefore, the added effort of a long forecast from a specific structural model quickly diffuses under data limitations and overly restrictive theoretical formulations.

Scenarios are useful for long-term planning, because unlike forecasts, they are invariant to the choice of model used to represent the internal structure. By construction, scenarios are driven by a coherent narrative, which is not prone to the inconsistencies that naturally arise in a stochastic forecasting model. Additionally, answers are often directly available in terms of the basic assumptions, whereas hypothesis testing procedures are necessary to estimate conclusions in the forecasting approach.

Limitations of Scenario Planning

Unlike forecasting methods, scenarios are highly subject to selection bias. The reduced sample of evaluated outcomes has the risk of not accounting for important occurrences that are plausible in the economy and could generate other scenarios not

[77] A credibility interval is an interval which is expected to contain the "true" population value with probability p. In contrast, a confidence interval is an instance of a set of intervals of which p percent are expected to contain the "true" value.

considered. As with any model, scenarios are sensitive to the assumptions and the underlying narrative, and do not provide direct inferential procedures to verify these assumptions. Finally, scenarios do not include an assessment of the level of *risk* involved in a particular variable, as the variance of their components is not accounted for. Without statistical methods, measuring the level of uncertainty in the indicators is not possible.

Chapter 2: Methodology for Scenario Development

As discussed in the previous section, both forecasts and scenarios have strengths and limitations. The ETI model follows a combined approach:

1) A statistical analysis the base trends and impacts was performed, and initial estimates of the variables were generated;
2) These initial estimates underwent a rigorous consistency check according to various empirical and theoretical criteria; and
3) Final estimates were generated by recalibrating the initial estimates under a scenario narrative, using the feedback from the consistency check.

Stage 1: The Statistical Model

In order to derive a scenario-based estimate of the effects, as opposed to historical "trend" forecasts, a hybrid estimation approach was chosen. The statistical model consisted of two (2) parts: 1) estimating impulse responses from historical trends, and 2) generating an impulse cluster with non-sample information regarding the expected economic shocks throughout the 2016-2030 periods. The impulse cluster consisted of a series of expected economic and fiscal shocks; these were propagated through an econometric model and incorporated into the pure (historically-based) trends from the system. This methodology allows us to isolate the historical impacts from expected shocks, and also to gain insight with respect to the interrelationships between the selected economic indicators.

The basic underlying principle for the model was:

$$Base\ Trend + Impact\ Estimates = Scenario$$

In other words, each scenario began with trends derived from statistical methods and past data, to which a series of external shocks were incorporated via a scoring mechanism (discussed later in detail) and propagated according to the historic responses of the system to a shock in each of the variables estimated.

Variables in the Model

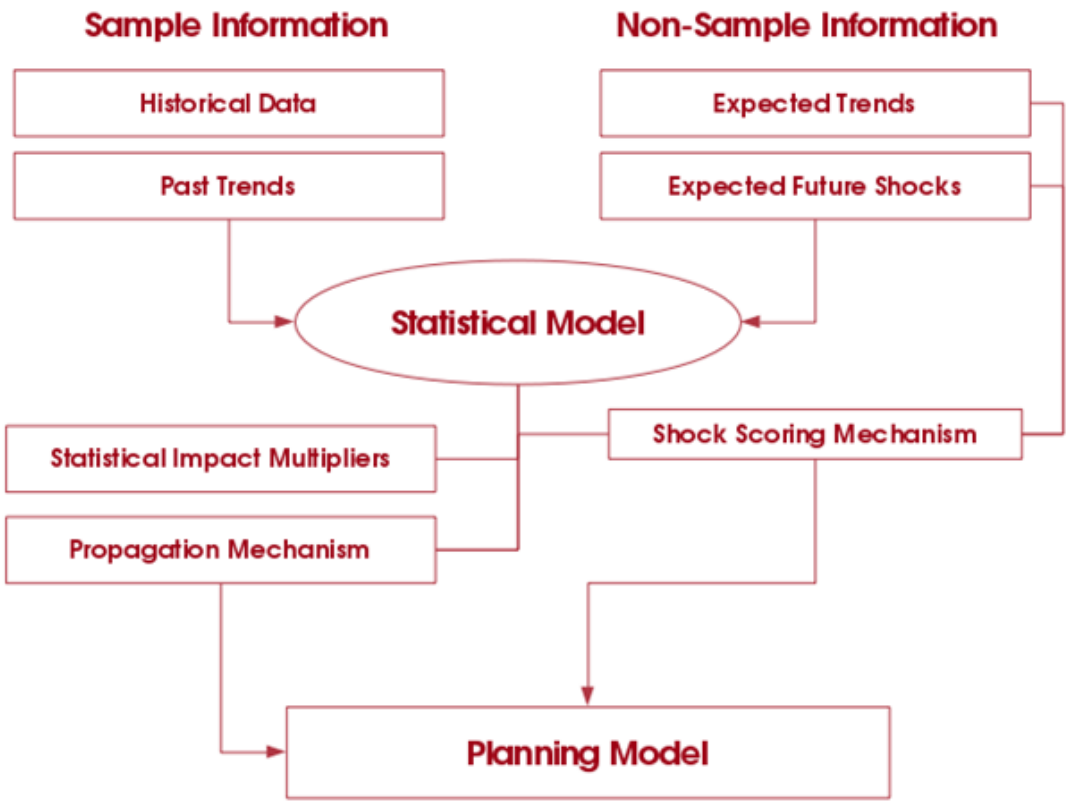
The aforementioned process was performed for a total of 11 variables, which are listed below:

1) Population
2) Government Expenditures
3) Public Construction Investment
4) Private Construction Investment
5) Machinery & Equipment Investment
6) Consumption Expenditures
7) Labor Participation Rate
8) Unemployment Rate
9) Employment
10) Real Wages
11) Gross National Product (GNP)

The variables were standardized by using percentage growth rates in order to perform the necessary analyses. The observational measurement unit for the model was the fiscal year. The 11 variables were selected based on a) availability of long-term historical data and b) the variable's overall contribution to the scenario.

The following diagram details the components and intermediate inputs used to construct the model:

FIGURE 54



Dynamic Multipliers

Dynamic multipliers for each of the series were calculated using the impulse response functions obtained from a VAR (1) system. Dynamic multipliers are time-varying versions of static multipliers, which interrelate the impacts upon the system of a marginal shock in a particular indicator. Dynamic multipliers are imbued with the additional property of mean-reversion; that is, after a number of years, the expected value of the multipliers tends toward 0. A shock traversing through the VAR system would affect all variables

via impact multipliers at different points in time, and depending upon its dynamic, a shock could be permanent, transitory, strong or weak. This is a much more complex typology of propagation than a simple estimate at one point in time (static multiplier).

The model inputs chosen were the accelerations of the selected variables (differences in growths) from one period to the next. The reasoning behind this specification was two-fold. First, impulse estimates would have clear interpretations as trend deviations in percentage points of each particular variable. Secondly, the estimated model was deemed more stable and possessing better statistical properties than other specifications.

External Shocks

A comprehensive cluster of shocks was sequentially inserted to the system, accounting for various exogenous and endogenous factors ranging from the new fiscal control board in the short term, to structural deteriorations in the birth rate throughout the 2016-2030 period. Each shock was propagated throughout the period according to the historically obtained multipliers, and then incorporated to the model. Incorporated shocks were assumed to be additive; that is, the shocks were percentage point contributions to an expected growth rate, or the non-sample forecast of the variables.

Due to the large number of external shocks involved (11 variables * 3 scenarios * 15 years + additional exogenous shocks), these were treated as average growth rates for three (3) five-year periods: 2016-2020, 2021-2025 and 2026-2030. A generational propagation mechanism was employed within the periods: shocks within the same five-year period were assumed to follow the same historical pattern, but beginning at different points in time.

Scoring Mechanism

The scoring mechanism consisted of two elements: a) a prior expectation on the growth rate of a particular component, and b) a measure of the relative importance of a shock for that component. These were dealt with separately from the statistical model, accounting for the various types of non-sampling and non-statistical information currently available to researchers (e.g. knowledge of newly enacted policies, recent changes in the international environment, and so forth). Using the relative importance

of each shock, the total deviation from the prior trend for each variable was converted to percentage points.

Stage 2: The Consistency Check

After the statistical results were obtained, the scenarios underwent a rigorous consistency check, which examined three (3) main elements:

1) Cross-sectional consistency: declines in related variables must follow the theoretical *directionality*, e.g. increases in GNP should produce increases in employment, for example.
2) Historical consistency: the behavior of the forecasts was compared to the historical behavior in the time series, to ensure that a) values remained within reasonable bounds for a particular period, and b) values which break away from the historical trend are justifiable by some known economic mechanism, a known structural or international change or an expected local shock.
3) Expectations consistency: the behavior of the forecasts was compared to the expected or prior values, to investigate a) which values did not change significantly and/or b) the extent to which the discrepancy between the results and the prior shocks be justified.

The results from these consistency checks were later incorporated into the growth rate expectations for particular years. In some instances (e.g. government consumption expenditures), the current and expected events break away from the historical trends due to fiscal constraints, and were manually adjusted.

Stage 3: Developing a Coherent Narrative

In order to examine the temporal dynamics, a unifying *period narrative* was developed for each period; this narrative contained an analysis of the main factors expected to impact the economy during each five-year time span. Period narratives shape the growth path expected for the different scenarios, as impacts upon the trend growth are isolated to the analyzed factors in the narrative.

Within each period narrative, three different scenarios – optimistic, base and pessimistic – were developed by applying different perspectives to the Key Indicators. These

perspectives describe the possible growth paths, in light of the elements described in the narrative and the historical trends, which served as a consistency check. Each scenario changed the relative importance of events in the period narrative and the trend growths.

The following typology (Figure 58) summarizes the developed scenarios. A descriptive title was assigned to each particular scenario, which best describes its internal narrative and perspectives for the Key Indicators.

FIGURE 55

Description of Scenarios by Time Period and Perspectives on Key Indicators
2016-2030

	2016-2020	2021-2025	2026-2030
Optimistic	Readjustment Period	On the Path to Recovery	Modest Growth
Base	Contraction Period	Critical Stabilization Period	On the Path to Recovery
Pessimistic	Lost Period	Readjustment Period	Stabilization Period

Chapter 3: Scenario Results

The following table presents the average growth rates for the constructed scenarios:

TABLE 11

Scenario Results
Fiscal Years -- 2016 - 2030
(Average Growth Rates for the Period)

Indicator	2016-2020			2021-2025			2026-2030		
	Optimistic	**Base**	Pessimistic	Optimistic	**Base**	Pessimistic	Optimistic	**Base**	Pessimistic
Population	-1.2%	**-1.3%**	-1.8%	-0.3%	**-0.8%**	-1.6%	0.2%	**-0.1%**	-0.2%
Gross National Product	-1.4%	**-1.8%**	-2.2%	2.2%	**1.1%**	-1.1%	3.4%	**1.9%**	1.0%
Personal Consumption Expenditures	-1.0%	**-1.5%**	-1.7%	1.3%	**1.0%**	-0.9%	1.8%	**1.3%**	0.9%
Investment	-2.4%	**-3.8%**	-4.8%	1.3%	**0.5%**	-1.9%	2.9%	**2.4%**	1.3%
Government Expenditures	-1.0%	**-2.9%**	-4.0%	1.0%	**0.3%**	-1.1%	1.7%	**1.6%**	1.2%

Source: Estimates by Estudios Técnicos, Inc. (2016).

Following the process by which the scenarios were developed, a *continued perspective* will be used for the scenario analysis. This perspective involves a summary of the previous period's conditions, and a description of the changes expected afterwards, in a continuum from the past scenario to the future one. The scenarios are described in terms of each period narrative and the key factors analyzed.

A detailed analysis of the growth path of each variable and the most relevant factors for each period/scenario is included in Appendix I.

2016-2020: At Best, a Readjustment Period; At Worst, a Lost One

The wave of fiscal overspending, economic contraction and emigration that began in fiscal 2007 is expected to take new dimensions as its effects propagate throughout the 2016-2020 period. The financial crisis in the US in 2008, compounded by an already stagnant local economy, significantly impacted Puerto Rico's construction investment and the real estate market, driving them to a near stand-still for almost a decade. Two banks closed due to the financial crisis in the island, and more cautious lending practices strained commercial investment further. From 2007 to June 2016, the economic crisis in the island eliminated a net 82,000 private-sector jobs and 72,000 public-sector jobs; 46.5% of all private jobs lost during this period were in the manufacturing sector. On an accumulated basis, real GNP contracted by 15%.

The severe economic deterioration contributed to a spike in emigration, which produced a decade-long population decline. Nearly 300,000 people have left the

island from 2010 to 2015. The effects of this decline affected almost all economic sectors in the island, and further strained economic hardship in the Island.

In the meantime, significant factors for the 2016-2020 period are also expected to take place. The most significant one is the Oversight Board created in the PROMESA Act in late June of 2016. This Board will exert broad control over fiscal and economic policies in the Island, and will likely enact significant cuts in the public sector to help balance the government budget. It is not expected that these spending cuts will be met with additional economic development measures, and thus will result in net downward pressure on the economy. The disappearance of significant tax revenue sources and federal funds also loom as threats, including the loss of the Act 154 at the end of 2017, and the termination of $700 million in annual Affordable Care Act funding in fiscal 2018. Elimination of these funds would drastically worsen the current fiscal situation and may force massive adjustments and austerity measures.

Due to these expected factors, all scenarios point to a contraction from 2016 to 2020, differing only in the magnitude of the expected shocks.

TABLE 12

Comparison of Key Indicators for the 2016-2020 Period
Fiscal Years

Variable	2006-2015 Average	Scenario		
		Optimistic	**Baseline**	Pessimistic
Population (End of Period)	3,505,000	3,308,045	**3,283,022**	3,203,964
Gross National Product (Growth)	-1.5%	-1.4%	**-1.8%**	-2.2%
Personal Consumption Expenditures (Growth)	0.2%	-1.0%	**-1.5%**	-1.7%
Investment (Growth)	-3.6%	-2.4%	**-3.8%**	-4.8%
Government Expenditures (Growth)	-1.2%	-1.0%	**-2.9%**	-4.0%

Baseline Scenario

The baseline scenario assumes an average decline in population of approximately 50,000 individuals yearly for the 2016-2020 period, leading to a total outmigration of almost 250,000 individuals. In this period, a cumulative decline of 14.5% is expected in government consumption expenditures, and a 19% decline in investment. Decline in investment is particularly driven by reductions in public construction and privatization

initiatives. Personal consumption expenditures are expected to average a yearly reduction of 1.5%, or a cumulative 7.5% reduction during the period.

1) This scenario considers the 2016-2020 period to be a contraction phase in the economy, in which there will be both deadweight losses in some sectors and readjustments in others.
2) Some aspects of the 2016-2020 period are continuations of the deterioration that occurred in the 2006-2015 period. For example, the significant decline in investment is due to the stagnation of the housing market and the loss of access to credit markets, which severely reduce the growth expectations of construction investment. Continued population loss, followed by a weaker labor market, is also expected to accentuate the downward trend of investment during this period.
3) The large reduction in population is expected to have a palpable effect upon consumption expenditures.
4) Government expenditures are expected to have relatively large cutbacks from the Oversight Board's activities, particularly during the first two years of operation. Once balanced-budget goals are attained, spending cuts should gradually recede.
5) The Oversight board is expected to last throughout the period, until at least the end of 2020 (fiscal 2021).

Optimistic Scenario

The optimistic scenario reduces the magnitude of downside risks to some extent, and introduces the possibility of some economic reforms taking place during this period.

1) In this scenario, the expected population decline up to 2020 is expected to be only slightly lower than in the baseline scenario, with an average yearly decline of 1.2%. Demographic factors have significant inelasticity, and the negative economic outlook, that remains practically unchanged during the 2016-2020 period, continues to be the most significant factor in accelerating migration.

2) Spending cuts proposed by the Oversight Board are not expected to be as strong as originally proposed, and there will be instead a balance of austerity

and stimulus measures to balance the budgets. Government expenditures are expected to decline by 1% yearly, as better outcomes from negotiations with bondholders are expected, that also reduces the pressure to enact spending cuts.

3) Personal consumption expenditures are expected to contract moderately, in view of lower migration flows and less decay in the labor market. The cumulative decline in personal consumption expenditures by 2020 is of 4.9%.

4) Investment is expected to contract significantly, due to the stagnation of the housing market and the decline in population. The labor market is expected to remain stationary, and thus would not contribute to a more downward trend in construction investment (although it is not expected to provide any positive contribution to investment growth, either). The average yearly decline in investment is of 2.4%, or a cumulative decline of 11.4% in investment at the end of the period.

5) A general easing of fiscal pressure is expected at the end of the period, and the possibility of some important reforms being enacted remains. In other words, the overall negative economic outlook is expected to significantly reduce towards the end of this period.

Pessimistic Scenario

The pessimistic scenario assumes that the current contraction trend will continue through the next five years, and no significant improvement in the economic or social conditions will be attained.

1) Under this scenario, the Oversight board will take longer to complete its task than the proposed 5-year period.

2) Further contractions in the public sector will continue to negatively impact the possible growth in the private sector.

3) Population is expected to decline by about 65,000 people yearly, that is equivalent to the current cumulative migration from 2010 to 2015, plus an allowance for a negative expected natural increase.

4) Government expenditures and public investment are expected to undergo severe cuts, with an average decline of 4.8% during the period, or a cumulative decline of 22%.

5) Personal consumption expenditures will contract by 1.7% yearly on average, resulting in a cumulative decline of 8.2%.

6) The economy is expected to undergo significant contractions, with an average decline of 2.2% throughout the period.

2021-2025: Stabilization and Reforms

After five years of contraction as a starting point, the outlook diverges significantly with respect to each scenario. The key factors evaluated were: a) the enactment of economic reforms, b) the cumulative decline/growth in the economic indicators, c) the attainment of the Oversight Board's objectives, and d) the possibilities of new investment.

TABLE 13

Comparison of Key Indicators for the 2021-2025 Period
Fiscal Years

Variable	2016-2020 Baseline	Scenario		
		Optimistic	**Baseline**	Pessimistic
Population (End of Period)	3,283,022	3,266,901	**3,161,742**	2,961,732
Gross National Product (Growth)	-1.8%	2.2%	**1.1%**	-1.1%
Personal Consumption Expenditures (Growth)	-1.5%	1.3%	**1.0%**	-0.9%
Investment (Growth)	-3.8%	1.3%	**0.5%**	-1.9%
Government Expenditures (Growth)	-2.9%	1.0%	**0.3%**	-1.1%

Baseline Scenario

The baseline scenario for 2021-2025 contemplates the following factors:

1) Population loss is expected to decline significantly, by approximately 25,000 per year. This is a result of a restructuring of economic conditions, in which the contraction period reaches a trough, and begins to stabilize into a structurally smaller economy.

2) Some key weaknesses, such as population decline, will remain throughout the period.

3) Growth rates within components such as consumption and investment are expected to grow very modestly, as they are predicated upon a smaller economic base.

4) Economic reforms should begin to take effect in the medium-to-long term.

Optimistic Scenario

The optimistic scenario considers the readjustment period as a starting point, during which a less severe contraction should be experimented, and at least some economic reforms should have been enacted.

1) This scenario assumes a certain level of institutional improvement, leading to a foundation for future growth in spite of the negative short-term economic implications.

2) The 2021-2025 period serves as a recovery period, with the economy gradually moving towards sustained growth and stabilization in the key declining trends.

3) The expected population decline for the period shrinks to less than 10,000 people yearly in this scenario. This is driven by a combination of factors, including a more favorable economic outlook, a modest growth in the labor market and new investment. Net migration is expected to become very small, while the natural increase is assumed to be slightly negative.

4) Access to capital markets is attained towards the end of the Oversight Board's period, and a modest growth path for additional debt issuance is expected. The

average yearly growth in investment is anticipated to be 1.3%, as the housing market is expected to remain weak.

5) Personal consumption expenditures and investment are expected to grow cautiously (only 1.3% on average), in response to a slow labor market recovery and modest expected increases in government expenditures.

6) The economy picks up the pace in growth, with an average growth rate of 2.2%. Growth from new sources of trade & investment is particularly important to maintain this trend.

Pessimistic Scenario

As expected, during the 2016-2020 said period, the economy is expected to have undergone significant contractions, and its growth path should have delayed economic readjustment and stabilization in general. Under this scenario, the 2021-2025 period reflects similar readjustments as the 2016-2020 period under the optimistic scenario.

1) Some economic sectors are expected to readjust in light of the new economic reality, and others will stabilize to modest growth levels.

2) The weakness of the economy should maintain several indicators on the negative side, as structural problems in the 2016-2020 period are expected to linger on, notwithstanding the possibility of some economic reforms taking place during the period.

3) Migration is not expected to recede during this period, due to the strong deterioration of the economy in the previous period and the anticipated contractions in investment. A yearly population decline of around 50,000 people is still expected.

4) The Oversight Board is still expected to be in operation for at least the first year of this period, prompting the possibility of further spending cuts or tax increases. A 1.1% yearly decline in government expenditures for the 2021-2025 period is forecasted.

5) Government adjustments should take more time than anticipated, and thus public investment is expected to continue contracting. The weak housing market and low economic growth pushes expected private investment into the negative as well. The average expected decline in investment for the 2021-2025 period is projected to be 1.9%.

6) GNP is expected to contract at an average rate of 1.1%, due to declines in investment, personal consumption and government spending.

2026-2030: On the Path to Recovery

After 10 years, the economy shows varying levels of growth possibilities for the 2026-2030 period. In the baseline and optimistic scenarios, a more positive growth path is expected, due to improvements at the institutional and economic level. In the pessimistic scenario, a 5-year delay in the improvement process is expected, and thus, the economy would find itself towards stabilization instead of growth.

The key factors analyzed were: a) possibility of new investment, b) the previous growth path from 2016 to 2025, c) historical growth rates of indicators (as a consistency check), and d) the level of institutional improvement (if any).

TABLE 14

Comparison of Key Indicators for the 2026-2030 Period
Fiscal Years

Variable	2021-2025 Baseline	Scenario		
		Optimistic	**Baseline**	Pessimistic
Population (End of Period)	3,161,742	3,300,194	**3,145,964**	2,926,361
Gross National Product (Growth)	1.1%	3.4%	**1.9%**	1.0%
Personal Consumption Expenditures (Growth)	1.0%	1.8%	**1.3%**	0.9%
Investment (Growth)	0.5%	2.9%	**2.4%**	1.3%
Government Expenditures (Growth)	0.3%	1.7%	**1.6%**	1.2%

Baseline Scenario

In the baseline scenario, all trends remain positive except population. Growth rates are expected to be weaker than in previous periods, in view of a structurally smaller economy and the relative stabilization of existing sources of investment. Some new investment is expected.

1) Population is expected to decline by an additional 15,000 people during the period, in view of a negative expected natural increase and stagnant migration.

2) The labor market once again begins creating jobs, which prompts a pickup in consumption expenditures and GNP growth. GNP is expected to increase by an average 1.9% during the period.

3) Personal consumption expenditures increase by an average of 1.3% - less than usual increases, but positive given the smaller size of the labor market and population.

4) Investment is expected to increase, in view of new opportunities and a relative improvement in commercial investment conditions.

5) Government expenditures are expected to increase by 1.6%.

Optimistic Scenario

In the optimistic scenario, the economy is poised to experience higher growth levels, due to the effects of economic reforms, improved confidence and the expected development of new growth sources, particularly in the service sector.

1) Population decline is expected to stop, due to a slightly positive migration and natural increase. The population is expected to increase by an accumulated 33,000 people in the 2026-2030 period.

2) GNP growth is expected to average 3.4% for the period, a significant rate. Key factors for this positive growth are a surge in sources of new investment, improvement in labor market conditions and gains in competitiveness.

3) Consumption expenditures are increasing by an annual average of 1.8% for the period. Healthy inflation growth, coupled with a slight pickup in the housing market and better economic conditions help foster this trend.

4) Investment is expected to increase by almost 3% per year on average, or an accumulated 15% in the period. Both the public sector and private sector are expected to increase and take advantage of new investment opportunities.

Pessimistic Scenario

In the pessimistic scenario, a stabilizing period – not a growth one – is expected to ensue, with strong downside risks. The delay in implementing meaningful reforms in the previous periods, coupled with the consistent deterioration of the economic and demographic base, is expected to hinder the potential development of the economy, and a degree of uncertainty is expected to remain in some economic sectors.

1) Population is expected to decline by another 30,000 people in the period, due to negative net migration and natural increase.

2) Cautious investment growth, averaging only 1.3%, is expected to predominate throughout the period.

3) Personal consumption expenditures should remain low, due to the small population base and its continued erosion. Average consumption is expected to increase by only an accumulated 5% during the period, or 1% yearly.

4) GNP is only expected to average 1% in growth, due to the low growth of key elements in the economy and the still-present uncertainty in consumption and investment.

Chapter 4: Labor Market Scenarios

A key factor in the development of the scenarios was the labor market trends and perspectives. The development of the labor market is complex, as it responds directly to both economic and demographic trends, and affects long-term GNP growth, productivity and consumption. The following section contains our analysis of the labor market trends, and the narrative of our expectations throughout the 2016-2030 period.

Introduction

Notwithstanding periods of high employment, two permanent characteristics of Puerto Rico's labor market have been the high levels of unemployment and a low labor force participation rate (LFPR). Reflecting the trends described above, even under the best scenarios the unemployment rate is not expected to fall below historic levels of 10.7% in 1970 and 10.1% in 2000 by 2030. Another characteristic is that even with the improvements in educational levels of the labor force, the share of high-technology employment in total salaried employment has remained low and will likely remain low unless major structural changes occur.

Trend #1: Unemployment Still Above Historic Heights

In the period between the onset of the current contraction (2007) and July 2016, the economy has registered a net decline of approximately 155,000 jobs, of which 53.0% were private employment.[78] Between 1970 and July of 2016, the unemployment rate has fluctuated from a low of 10.1% in 2000 to a high of 23.4% in 1983, with the rate in July being 11.4%, almost identical to that in 2007.[79] Not even the recent improvement in the unemployment rate, more a reflection of a reduction in the labor force, has pushed it down below its historic minimum level of 10.0%; this is a basic assumption of our scenarios. The size of the labor force has declined much more sharply than that of the adult population, reflecting a falling LFPR.

By educational level, the rates vary. For those with an Associate's Degree their unemployment rate was 13.0% in 2015, from 13.4% in 2010, and higher than the total

[78] Refers to employment from the Establishment Survey (Seasonally adjusted).

[79] Department of Labor and Human Resources, Historical Data (2013), *Empleo y Desempleo en Puerto Rico* (August 2016). Seasonally adjusted.

(12.0% in 2015), while for those with a college degree and above it is lower, 7.3% in 2015. That disparity points to a structural problem concerning the disconnect between the product of the educational system and what the market is demanding, and the fact that given the overall high level of unemployment, more educated people are being hired for occupations that previously were held by those with lesser levels of education. This is known as "educational inflation".

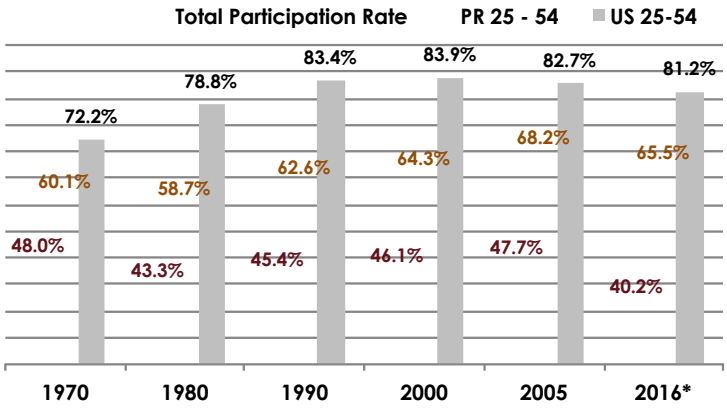
Trend #2: Decreasing Labor Force Participation Rate

- The LFPR has fallen sharply, from 48.0% in 1970, to 46.1% in 2000, and to 40.5% in July 2016. The participation rates are substantially lower in Puerto Rico than on the US across all ages. This decline cannot be attributed to any particular demographic segment. Instead, it is the result of an aging population, accelerated by a falling birth rate and outmigration of relatively young cohorts.

  A key segment of the labor force is that of the cohort in the working age of 25 to 54 years. They are the one ones who bear the brunt of sustaining the non-working dependent population. In their case, their LFPR actually increased between 1970 to 2005, from 60.1% to 68.2%, declining to 65.5% in 2016. It is still below that for the US. What has happened since 2005? In all likelihood the same factors as for the overall population: job losses and emigration. If their participation rate has declined, that for those 65+ has gone down much faster, from 15.9% in 1970, to 7.6% in 2005 and 4.3% in 2016. Since the cohort 16-24 is typically in school/university, the pressures on the working 25-54 cohorts will increase considerably. Given the outmigration and foreseen reduction in population by 2030, it is unlikely that the LFPR will rise to much higher levels.

FIGURE 56

Labor Force Participation Rates: Total and for the 25 -54 Years Cohort



Sources: US BLS, Current Population Survey (August 2016); DTRH. * Up to June.

- The size of the labor force has declined much more sharply than the size of the adult population, reflecting falling labor force participation. The decline in the adult population has been more modest, starting only in 2010, explained by declining birthrates (so, fewer individuals moving into the adult population) and outmigration picking up in the post-2010 period. More dramatic is the shrinking labor force: after increasing more than 10% from 2001 to 2006, the labor force has since plummeted 20.0% and stands at its lowest level in more than twenty-five years.
- A key source for this decline is the aging of the population, that is, people are moving into age groups where the propensity to be part of the Labor force tends to be lower. To that end, while the adult population has not declined significantly since 2000, its age composition has changed. The population 65 and older has increased substantially since 2000, while the population of young adults (15 to 24) has fallen. Moreover, the population age 5 to 14 (those coming of working age over the next decade) has fallen even more sharply.
- One factor is that the birth rate has fallen by one third over the past fifteen years. This decline, coupled with a large outmigration of younger individuals that gained momentum in recent years, has shifted the composition of the Puerto Rico population towards older cohorts.

Thus, expected demographic trends will continue to put downward pressure on the participation rate over the medium term.

Trend #3: Shifts in the Occupational Distribution of Employment and Labor Demand

Besides a decrease in total salaried employment, a worrisome trend is the reduction of middle wage occupations, which has created a polarization in the wage distribution (See Table 14). Adopting the typology recently used by the Federal Reserve Bank of New York, and using data from the Occupational Employment Survey for Puerto Rico, a distribution of employment by type of occupation (on the basis of the mean salary) was developed for the period 1999 – 2015.[80]

As can be seen, there has been a reduction in the employment in mid-level wage occupations; contrastingly, employment in higher wage occupations increased, and those in lower wage occupations had only a modest decline. Employment in higher wage occupations increased at an annual compound rate of 1.2%, but that in middle wage occupations declined at an annual rate of 1.5, and that in lower wage occupations fell by 0.4%.

Between 1999 and 2015 total salaried employment (Public and private) declined by 105,290 jobs. Of these, the reduction in employment in middle wage occupations of 116,330 jobs contributed the most, as employment in lower wage occupations fell by 16,580 jobs, reflecting considerable reductions in employment in construction and manufacturing (Production workers). The increase in higher wage occupations reflects the rise in employment in the occupations related to health (Healthcare Practitioners and Technical Occupations). That increase accounted for 56.0% of the total increase in higher wage occupations. Also, a positive development is that employment in computer and mathematics related occupations increased at an annual compounded rate of 3.0%.

[80] Federal Reserve Bank of New York, *Job Growth in the Region* – Economic Press Briefing, August 18, 2016. At: https://www.newyorkfed.org/newsevents/mediaadvisory/2016/0811-2016.; U.S. Bureau of Labor Statistics, *Occupational Employment Survey – Puerto Rico* 1999; Departamento del Trabajo y Recursos Humanos (2016), Empleo y Salario por Ocupación, 2010 y 2015. At: .

Even when employment in higher-wage occupations rose, which ought to be stimulated, it is still worrisome that the employment in mid-level wage occupations declined and at such a rapid pace, as it encompasses the majority of the salaried employment. By 2015, its share of total employment increased to 18.3% from 14.0% in 1999, while that of mid-level wage occupations declined to 50.0% from 56.4% in 1999. On the other hand, the share of lower wage occupations has remained in essence the same, 30.0%.

Trend #4: Creation of Better-Paying Jobs, Skilled Jobs, and a Knowledge-Based Economy

Unemployment and changing patterns of work bring new urgency and a much greater emphasis on lifelong learning and up-skilling. Worker skills often remain insufficient for remaining middle- and high-wage jobs in health care, advanced manufacturing or various services, that often require more technical or communication skills and perhaps certain postsecondary credentials. Rapid technological change is impacting those occupations and requires aggressive upscaling and updating of acquired skills in academic studies or in previous work experience.

Many students, especially among the academically disadvantaged, enter college with very weak academic skills, and too little information and support to succeed, and most attend lower-tier two and four-year colleges with too few resources and too little incentive to respond to the labor market. Unfortunately, with some exceptions, many employers choose the "low road" human resource models, where they seek to profit only by minimizing labor costs, rather than investing in skilled employees who would be more productive and committed to their businesses (the "higher road" to competitiveness and profitability).[81]

A high proportion of the skills that are needed now in the workforce are high-order knowledge-based skills, many of which can be acquired only in higher education institutions. The importance of high quality research to the teaching mission and to underpinning socio-economic development has grown significantly over the past decade and will continue to do so over the next decade. At the same time, high-tech

[81] Harry J. Holzer (2016), "Creating skilled workers and higher-wage jobs," Brookings OP-ED (April 10, 2016). At: https://www.brookings.edu/opinions/creating-skilled-workers-and-higher-wage-jobs/

occupations have higher salaries. Thus the dual challenge of improving learning and skills, and the number and quality of better-paying jobs, in particular of high-tech occupations. Most of these jobs are tech-related and in demand across a multitude of industries, not only by tech companies, but also employers in finance, health care, government, retail, and other sectors.[82]

Table 16 below presents the distribution of employment (Private and public) by occupations for Puerto Rico, according to the annual Occupational Employment Survey of the U.S. Bureau of Labor Statistics, in the case of those associated with high-technology-oriented and knowledge-based occupations.[83]

The first striking fact is how small is the proportion of these occupations in total employment (Salaried), 3.3%, an increase from the share of 2.8% in 2010, even when total employment declined 6.3% between 2010 and 2015.[84] That rise contributed to the increase in higher wage occupations examined before and is a small but positive trend. Out of the total employment of 29,280 in 2015, 34.0% were in computer-related occupations, slightly up from the 33.0% share in 2010, and 42.0% in engineering and related occupations.

In terms of salaries, almost all the occupations included have an annual mean salary above that for all occupations ($28,190) in 2015. As indicated before, the salaries of higher wage occupations, adjusted for inflation rose in real terms 0.2% between 1999 and 2015, while that for the other occupations declined.

The increase in the share of these occupations is a positive sign, but still they represent a very small share of total employment. Overall, one can say that there have been positive trends: for instance, the number of engineers and scientists, as a proportion of total employment, rose from 0.06% in 1997 to 0.22% in 2010.[85] The goal for 2030 should be how to increase it in order to better sustain a competitive economy.

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82 Holzer (2016).

83 Adopting as a basis the typology in Daniel E. Hecker, "High-technology employment: a NAICS-based update," in *Monthly Labor Review* (July 2005), table 3, and using the Occupational Employment Survey for Puerto Rico. The data does not distinguish between private and public employment, only by type of occupation, but the sample in the survey does include government. At: http://www.bls.gov/opub/mlr/2005/07/art6full.pdf.

84 In the US the share is higher, about 11.0%.

85 National Science Foundation (2014), Table 8-35. 2010 is the last year for which there is information.

TABLES 15 & 15 (SEE APPENDIX)

Labor Market Scenarios

The following table contains the estimated scenarios for the labor market:

TABLE 16

Scenario Results for the Labor Market
Fiscal Years -- 2016 - 2030
(Average Growth Rates for the Period)

Indicator	2016-2020			2021-2025			2026-2030		
	Optimistic	**Base**	Pessimistic	Optimistic	**Base**	Pessimistic	Optimistic	**Base**	Pessimistic
Employment Growth	-0.9%	**-1.1%**	-1.4%	0.6%	**0.1%**	-0.3%	0.9%	**0.6%**	0.2%
Unemployment Rate	12.2%	**14.3%**	15.0%	11.1%	**13.6%**	14.9%	10.8%	**11.9%**	14.3%
Labor Participation Rate	38.9%	**39.2%**	37.9%	40.5%	**39.4%**	37.0%	42.9%	**42.1%**	38.1%

Source: Estimates by Estudios Técnicos, Inc. (2016).

1) As can be seen, all three scenarios follow the same trajectory in terms of employment: stagnation for the 2016-2020 period, stabilization from 2021 to 2025, and a growth period from 2026 to 2030. The depth of the economic and demographic factors affects the magnitude of these changes.

2) The unemployment rate follows a declining trend throughout the period. However, even in the optimistic case, it is not expected to return below the historical minimum of 10%.

3) The labor participation rate is expected to fluctuate between 38.1% and 42.9% for the 2026-2030 period. The reason for these relatively low participation rates is that population is expected to undergo a major shift towards older individuals, and the younger workforce is still expected to face significant challenges in obtaining employment.

4) As the demand for high-skilled jobs increases and the demand for low-skilled jobs declines. Individuals will have greater incentives to pursue higher degrees, although this is a positive development if growth in demand for such skills does not generate sufficient jobs, further out-migration may ensue.

Chapter 5: Expected Trends to 2030

This section constitutes a discussion of the potential problems in achieving economic recovery by 2030, according to our scenarios. It also highlights some basic assumptions and downside risks that accompany the narratives for the period.

Trend #1: The Economy Will Be Smaller

In almost all of the scenarios, Puerto Rico will have a substantial downsizing in its demographic and economic base, with higher percentages of elderly population and a challenging labor market. Coupled with the starting point of a decade-long economic decay, these changes will have multifaceted repercussions upon the economy:

1) Less new infrastructure will be necessary, and upkeep of existing infrastructure will assume a more important role.

2) The housing market will be smaller and concentrated in niche segments such as housing for the elderly.

3) The previous economic engines of manufacturing, construction and real estate will give way to a service-led economy, with significant niches for social interest projects and a large amount of resources dedicated to the elderly population.

4) Manufacturing will be a leading sector but it will be a very different type of activity focused on the production of intangibles. This merging of advanced services and manufacturing activities is already occurring and will intensify.

5) The demand for quality services and educated professionals in Puerto Rico will increase, yet the economy's ability to provide these resources endogenously will be impaired.

6) Age dependency ratios will be high, and the tax burden upon the working-class population is expected to increase.

7) The deteriorated public sector will require transforming the current institutional environment into a foresight oriented, coordinated and responsive framework

capable of creating and sustaining a new economic model for the next 15 to 20 years.

Trend #2: Policy Reforms Will Be Indispensable to Achieve Economic Growth

It is clear that for the short and medium term, uncertainty is the defining factor in Puerto Rico's economy. A large number of external and internal variables are subject to change, and there remains a desperate need for policy reforms to address long-standing structural weaknesses in the economy. *All of our scenarios assume economic reforms taking place at differing starting points, and their trajectories are inherently shifted by how rapidly policymakers and private agents react to the economic landscape.* Our recovery expectations and shifts in the inter-period dynamics depend heavily on policy changes to move the economy towards a growth path, away from the self-reinforcing spiral of migration, economic contraction and job loss.

Trend #3: Fixed Capital Investment Will Have to Increase

A growing economy is associated with high levels of investment. For example, between fiscal 2000 and fiscal 2004 the GNP share of gross fixed capital investment (GFCI) averaged 27.9%; during the same period, the economy grew at an average rate of 1.8%. In contrast, the share of fixed capital investment declined to 12.6% in fiscal 2015, with a corresponding decline of 0.7% in GNP.

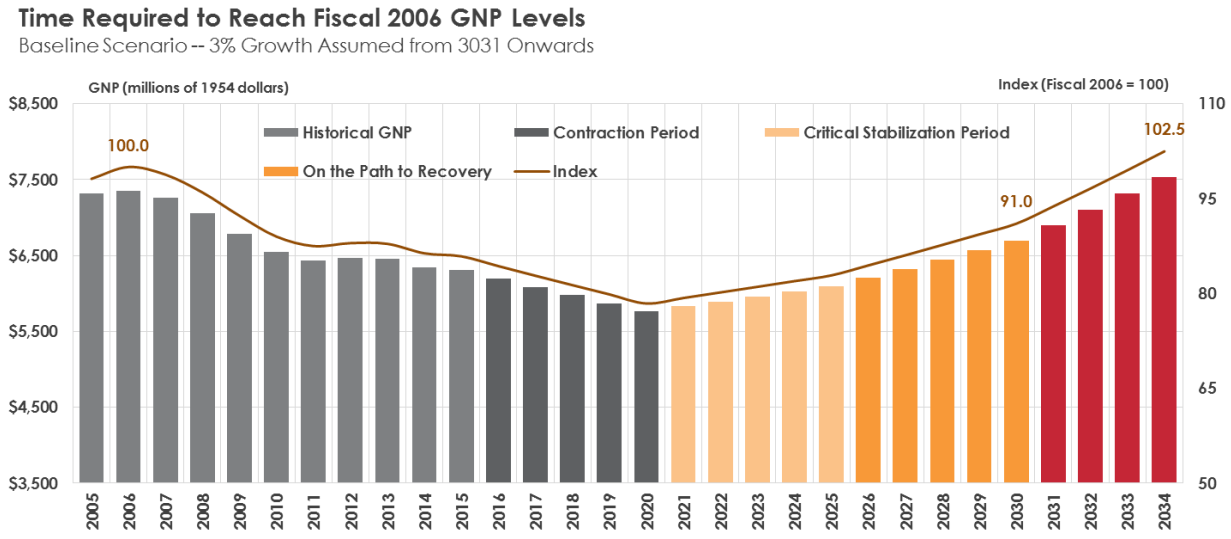
If we assume the total requirements of fixed capital investment in the island to be the average during fiscal years 2000 to 2004 (27.9%), we find that none of our scenarios point to an increase in the GFCI share anywhere near that level. In fact, the highest real share of GFCI to GNP in our scenarios was 18% by 2030.

What could change the above conclusion is an aggressive program of infrastructure rehabilitation and a successful promotion program for new economic activities. However, it is good to keep in mind that contrary to traditional manufacturing and tourism development, services do not require as large a component of "brick and mortar" investment.

Trend #4: The Recovery Path Will Likely Take Longer than 2030

Even with economic reforms in place, the path to recovery is expected to take more than 15 years. An exercise was conducted to determine the approximate time period during which a scenario would attain a non-recessionary level of economic output. Being the last pre-recessionary year, fiscal 2006 was chosen as the basis for this exercise. As seen in the charts below, *the only scenario in which the economy returns to fiscal 2006 GNP levels by 2030 is the optimistic one*. The baseline scenario has a return to fiscal 2006 GNP occurring in 2034, while the pessimistic scenario delays this by 7 years, until 2041. In other words, the impacts upon the economy contemplated by the pessimistic scenario will push economic recovery possibilities by more than a decade relative to 2030.

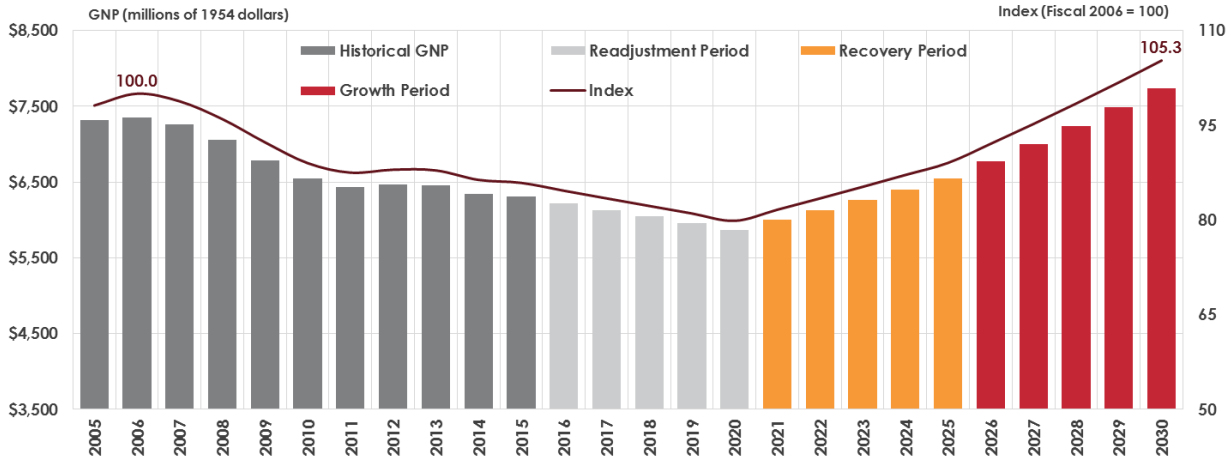
FIGURE 57



Sources: PR Planning Board (2016). *Statistical Appendix (Various Years)*. Estimates by Estudios Técnicos, Inc. (2016).

FIGURE 58

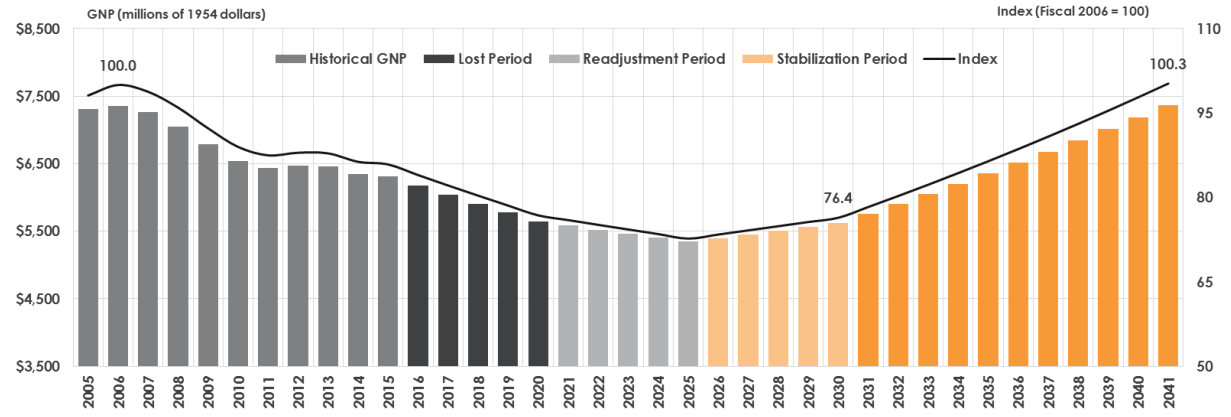
Time Required to Reach Fiscal 2006 GNP Levels
Optimistic Scenario



Sources: PR Planning Board (2016). *Statistical Appendix (Various Years)*. Estimates by Estudios Técnicos, Inc. (2016).

FIGURE 59

Time Required to Reach Fiscal 2006 GNP Levels
Pessimistic Scenario -- 2.5% Growth Assumed from 3031 Onwards



Sources: PR Planning Board (2016). *Statistical Appendix (Various Years)*. Estimates by Estudios Técnicos, Inc. (2016).

Chapter 6: Summary of Key Facts and Conclusions

The following are the key facts and conclusions from the scenario planning analysis:

1) In a general sense, the economy will undergo several transitions during the period that are dependent upon institutional, demographic, and economic variables.

2) The baseline scenario contemplates a contraction period in the years 2016 to 2020, followed by stabilization from 2021 to 2025 and finally resuming a growth path from 2026 to 2030. The economy is not expected to recover to the 2006 real GNP pre-recessionary levels until 2034.

3) The optimistic scenario contemplates readjustments from 2016 to 2020, followed by a recovery period from 2021 to 2025, and finally a growth phase in the 2026-2030 period. The economy will recover to its pre-recessionary (2006) levels in 2029.

4) The pessimistic scenario assumes a lost 5-year period from 2016 to 2020, during which basically the current deterioration trends continue and/or intensify. The following period (2021-2025) is one of structural readjustments, where the economy undergoes major shifts before entering into a stabilization period from 2026 to 2030. The pessimistic scenario delays economic recovery by 7 years with respect to the baseline scenario.

5) GNP growth will fluctuate from an average decline of between 1.4% and 2.2% for the 2016-2020 period to growth between 1.0% and 3.4% for the 2026-2030 period. In all cases save the optimistic scenario, the economy by 2030 is expected to be smaller than the economy in the last pre-recessionary year (2006).

6) The population is expected to fall in all scenarios. In the optimistic one, it is expected to be around 3.3 million. In the baseline scenario, population is expected to reach 3.14 million inhabitants. The pessimistic scenario assumes a population of 2.9 million by 2030, a decline of more than 600,000 inhabitants from 2015.

7) The unemployment rate is not expected to lie below the historical minimum of 10.0% by 2030. Even with the current demographic trends and the significant transformation of the economy and labor market, the current unemployment rate still remains above the 10.0% mark. Unemployment is expected to increase from 2016 to 2020 as the public sector continues decreasing and significant outmigration of the working-age population remains.

8) The labor force participation rate will remain stationary until at least 2025, when the current demographic trend is expected to recede. The aging population and the composition of the labor force will continue to impose significant downward pressures upon the potential labor participation. By 2030, labor force participation is expected to fluctuate between 38.1% and 42.9%.

9) Employment in mid-level wage occupations has declined, whereas employment in higher-wage occupations has been increasing. Particularly, jobs in computer and mathematics related occupations that increased at a 3% compound rate between 1999 and 2015.

10) The expected challenges in the labor market and changing occupation structures in labor demand place much greater emphasis upon lifelong learning and increasing individual skills.

11) Policy reforms are assumed to be enacted at differing times in the scenarios, as these remain necessary to shift the economy away from the spiral of economic contraction, emigration and job loss.

12) Assuming the total requirements of fixed capital investment in the island to be the average during fiscal years 2000 to 2004 (27.9%), none of our scenarios point to an increase in the Growth Fixed Capital Investment (GFCI) share anywhere near that level. The highest share of GFCI to GNP was 18% by 2030. The potential growth of our economy will continue to be led by consumption and government expenditures even by 2030, as infrastructure requirements will not be fully met.

13) Even with economic reforms in place, the growth path for Puerto Rico's economy is likely to take longer than 2030 to achieve full recovery. Only in the

optimistic scenario does the economy return to the GNP level in fiscal 2006, the last pre-recessionary year. In the pessimistic scenario, economic growth to fiscal 2006 levels is not expected until 2041, shifting the growth period by more than a decade with respect to 2030. For the baseline scenario, parity with the 2006 GNP level is achieved in 2034.

Chapter 7: Economic Reconstruction – A Benchmarking Exercise

This chapter highlights the main characteristics of several jurisdictions that have experienced socioeconomic circumstances similar to those experienced by Puerto Rico. Even though these jurisdictions do not coincide in all aspects with our economy, the case studies provide an example of policy tools that are available under the current and future economic scenarios[86].

Case studies for the benchmark exercise were selected according to several factors. These were mainly based on comparability of the jurisdiction and Puerto Rico, relevance of socioeconomic circumstances vis-à-vis Puerto Rico's internal factors, and availability of empirical data. These factors were aggregated in order to complete the selection process. These examples do not translate directly into specific policy recommendations, but rather, their implementation within a different context is contingent on the political, economic and institutional environment of Puerto Rico.

The following cases focus on countries that have suffered economic stagnation or population loss. The causes for such circumstances vary greatly; however, governments have adopted several policy measures to manage shrinking societies by boosting population to previous levels or have adapted their new demographic characteristics to their internal scenario, i.e. retirement cities, right-sizing, smart shrinkage, among others. These examples provide key lessons that could be partially replicated the local scenario.

[86] The experiences of other jurisdictions provide great insight into the specific policy mix, but are also constrained by the particular context of each nation-state and/or region. Thus, the benchmark exercise is inevitably context specific but provide an adequate example of growth strategies.

Case Study #1: Finland

Finland is generally regarded as a small peripheral country to the European common market with a total population of slightly over 5.2 million. The presence of certain favorable conditions typical to Scandinavian countries could limit its relevance to other socioeconomic settings; nonetheless, the radical transformation that the country endured during the late 20th century provides valuable policy lessons.

Finland is considered a world leader in the knowledge-driven economy, with a strong information and communications technology industry. In 2010, information and communications technology industries amounted to 5.2% of Finnish GDP, a percentage point above the EU27's 4.1% average[87]. According to the UN Conference on Trade and Development,[88] Finland had the world's largest portion of domestic economic activities related to information and communication technology. As of 2012, nearly a tenth of the country's non-agricultural business workforce is employed in the ICT sector.

Innovation is at the core of Finland's economic approach. The World Economic Forum's 2014-2015 Global Competitiveness report ranked Finland as the most innovative country in the world[89]. The government actively markets this fact in order to spur foreign investment and promote new business ventures in knowledge-based sectors[90].

Yet, creating this innovative economy took time; it required a deliberate public policy approach from the Finnish government. Finland's economic development, particularly from the 1990s onwards, provides invaluable lessons for Puerto Rico moving forward. This insight is not only relevant in the search for solutions to Puerto Rico's current economic predicament, but also in the search for policies for the promotion of long-term economic growth.

The most impressive achievement and biggest takeaway from the Finnish experience is the swiftness with which the state transformed a traditional industrial economy into a modern and robust technology-driven society. More importantly, Finland's experience

87 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tin00074&plugin=1 accessed 6/29/2016

88 http://www.un.org/apps/news/story.asp?NewsID=41247#.V3QeXPnhDcs accessed 6/29/2016

89 http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf accessed 6/29/2016

90 http://www.investinfinland.fi/why-finland/competent-professionals/152 accessed 6/29/2016

highlights a particular set of policy measures that were taken to bootstrap an economy that suffered a severe economic depression during the 1990's. Between 1990 and 1993, Finnish GDP decreased more than 14% from its peak and unemployment went from a historic low of 3% to nearly 20%. Finnish economists Seppo Honkapohja and Erkki Koskela describe the Finnish crisis as "a tale of bad luck and bad policy."[91] Finland was not only affected by external shocks – for example, the breakup of the Soviet Union and an economic downturn among OECD countries – but was also afflicted by a reduction in available funds as a consequence of poor financial regulations and international indebtedness of the government. This combination caused aggregate demand to plummet as both consumption and investment faltered.

Since its accession into the European Union in 1995 (hereafter, EU), Finland was obliged to diversify its export base, from forest-related industries to highly innovative technologies. Before forming part of the European Union, Finland tended to devaluate its currency in response to changes in the international markets, benefiting from monetary policy tools. However, after adopting the Euro the Finnish government could no longer use currency devaluations and began to rely on fiscal stimulus and export-led development to increase its international competitiveness[92]. Due to its market openness – 24th most open economy in the world as of 2016[93] –Finland benefited from an inflow of foreign capital. Private funds accounted for over 70% of total investment in R&D (World Bank Institute, 2006). Some authors argue that, given the economic recession which affected Finland during the 90's, the state had to push for *prioritization* as a development strategy; in the Finnish case this meant emphasizing research and development (R&D) over other potential areas of improvement in the economy. This prioritization policy was the end product of Finnish policies that date as far back as the 1980s, emphasizing science and technology as central tenets for economic policy[94]. Another important lesson from the Finnish experience is the development of a proper innovation ecosystem that ranged from basic research to business development and

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91 The Economic Crisis of the 1990s in Finland by Seppo Honkapohja, Erkki Koskela, Stefan Gerlach and Lucrezia Reichlin, http://www.jstor.org.ezproxy.cul.columbia.edu/stable/pdf/1344693.pdf?_=1467296200243 , accessed 6/30/2016

92 It is important to note that Puerto Rico holds this same condition in terms of its inability to devaluate its currency. (World Bank Institute, Overview Finland as a Knowledge Economy, Elements of success and lessons learned. 2006)

93 http://www.heritage.org/index/country/finland accessed 6/30/2016

94 http://ec.europa.eu/economy_finance/publications/publication1417_en.pdf accessed 6/29/2016

commercialization (i.e. business Angels, VCs, universities, among others). Within this realm, the availability of seed capital or startup funding was of paramount importance. Finland also developed a business-friendly environment by maintaining its commitment to high R&D funding and implementing corporate taxation reform in order to forestall business relocation to low-tax jurisdictions. Moreover, the economic crisis of the 1990s prompted the efficient reabsorption of Finland's unemployed pool of high-skill human resources towards the new, growing businesses within the economy[95].

As mentioned earlier, one of the main characteristics of the Finnish experience was the capacity of the state to channel massive resources to R&D investment. Finland's Research and Development sector currently accounts for almost 3.5%[96] of Finland's Gross Domestic Product (GDP), which is well above the 2% EU[97] average. The role of the state was not limited to financing mechanisms; as most of the industrial policy was driven by strong and innovative private technological firms such as high mobile technology firm Nokia. The key role of government was to provide responsive and long-term policies to improve the overall conditions for firms and industries.[98] For instance, the state recognized the importance of institutional innovation (even within the political realm) by developing what is known as the *Committee for the Future*, which represents one of sixteen standing committees in Finland's Parliament. This committee provides greater synchronization between the legislative body and other government branches on issues related to international trends and trends related to main drivers in social and technological innovation. The Committee essentially provides foresight capacity to the legislative body, by a long term planning orientation and articulating policy guidelines for the future. The Committee's institutionalization within the legislative body provides it with strong political leverage.

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95 During the past years Puerto Rico has lost capital intensive industries, which left a vast group of skilled workers. The state has not yet designed any tools to capture this labor force.

96 http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS accessed 6/30/2016

97 http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Gross_domestic_expenditure_on_R%26D_in_the_Triad_and_China,_2003%E2%80%9313_(%25_of_GDP)_YB15.png accessed 6/30/2016

98 Id.

Foresight ability provides one of Finland's most valuable experiences applicable to Puerto Rico: to anticipate the future, prepare for it accordingly, and develop the institutional mechanisms that channel innovative growth. This has made a major difference in Finland's success in the recent past. The Government's Future Report exemplifies how embedded these institutions have become in Finnish governance. Even today, policymaking is greatly influenced by this publication, developed for the first time in 1993 by the *Committee for the Future,* and used as an integral guiding tool for the whole of Finnish Society. The following list shows the subjects that have been selected by the Prime Minister for previous reports:

1) 1993 "Report on the Long-Term Future"
2) 1996 "Part I "Finland and the Future of Europe"
3) 1997 "Part II "Honest and Courageous – a Finland of Responsibility and Confidence"
4) 2001 "A Finland of Balanced Development 2015" (a 15 year planning tool)
5) 2004 "A Good Society for People of All Ages", a report on demographic development, demographic policy and preparation for a changing age structure.
6) 2009 "Towards a Finland of Low Emissions", a report on climate and energy policy
7) 2013 "Sustainable Growth for Welfare"

The Finnish case highlights the importance of directing resources to R&D and strengthening the educational system. In the case of Puerto Rico, such efforts require an influx of capital, which are usually derived from FDI. Given the current fiscal scenario, Puerto Rico should capture potential investment in R&D from competitive federal grants and maximize the potential linkages brought upon by the current industrial class. Concomitantly it will require a great degree of local industrial innovation via smaller ventures such as new trends in manufacturing like "makers' labs" and digital manufacturing facilities. Moreover, imported enabling technologies allow for industrial development in the form of local innovations that provide a particular combination of hardware and software.

The lessons from Finland's transformation go beyond replicating the same efforts in our local context, but rather, adapting their institutional experiment to current circumstances. Puerto Rico currently suffers from a similar combination of external and domestic shocks in the same way Finland did during the 1990s. Although the cases are not fully comparable, the policy takeaways certainly are. Today's context provides greater opportunity for social and business innovations due to much smaller and flexible scales of innovation. This critical juncture provides greater space for maneuvering between the state and private actors to develop forward-looking policy alternatives that take into account Puerto Rico's comparative advantages within an ever-shifting global economy.

Case Study #2: Mauritius

Mauritius is a small island economy in the Indian Ocean with an estimated population of almost 1.3 million inhabitants. The island is a former British colony, with a high regard for its political and cultural institutions. Within the economic literature Mauritius has been a common case study for policies related to industrial or productive capacity. A remarkable transition – from a low-income (per capita $200 in 1968) to a stable middle-income economy (per capita of $8000 in 2012) – was achieved through a combination of policymaking, commitment to orthodox reform, and adaptive institutions in the face of new economic trends. Mauritius' economy also followed a steady path towards diversification along the way. Despite being a predominately agrarian economy for most of its history, with nearly 90% of total exports coming from the sugarcane industry, it expanded its manufacturing and tourism sectors during the 1980s and then moved to develop its service sector during the 1990s. Today, Mauritius only devotes 3.7% of its economy to agriculture and now focuses on manufacturing (18%), trade (12%), and financial services (10%) and is looking towards developing innovative sectors like renewable energy and the knowledge economy.[99]

One of the most interesting aspects of the Mauritian experience has been its capacity to attract foreign investment (FDI). Mauritius opened its economy following an increase in its imports and exports since the middle of the 80s. Its openness ratio (trade in goods

[99] http://ecdpm.org/great-insights/value-chains-industrialisation/economic-transformation-mauritius-heterodox-journey/ accessed 7/12/2016

to GDP) increased from 70 percent to 100 percent over this period,[100] as a consequence of concerted efforts to eliminate barriers to trade. Some also argue that Mauritius's success is partially attributed to controlling imports and boosting exports through the undervaluation of its currency. Monetary policy and the promotion of preferential trade agreements with the EU and the US[101] has worked particularly well in promoting a relatively open and export-driven economy. This concerted policy effort by Mauritius stands in stark contrast to Puerto Rican trade policy that tends to provide contradicting dual incentives. Since no holistic strategy has been adopted by the Government of Puerto Rico, gains from exports by local firms have been relatively small. Most exports are by multi-national firms that have used the Island as an export platform. Law 20 has begun to make a difference by stimulating local advanced services firms to export.

Harvard University Professor Dani Rodrik has argued that Mauritius's trade liberalization during the 90s generated strong incentives on exports and decreased resources destined to the inefficient import sector[102]. This new orientation towards exports freed-up resources to be devoted towards furthering the development of the service sector, adding more value to the economy as a whole. Complimentary policy measures also involved the development of a set of particular labor market regulations for the export processing zones, which provided an indirect subsidy to the export sector. Some of the changes to labor legislation included the elimination of severance allowances, flexible overtime compensation, and changes to minimum wages. Another important fact is that contrary to Puerto Rico's experience, Mauritius export-led development harvested a strong domestic entrepreneurial class by successfully incorporating private sector institutions into the policymaking process. An effective mix of economic incentives and

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100 A. Subramanian, D. Roy, IMF Working Paper, Who can explain the Mauritian miracle: Meade, Romer, Sachs, or Rodrik? (2001)

101 http://ecdpm.org/great-insights/value-chains-industrialisation/economic-transformation-mauritius-heterodox-journey/ accessed 7/12/2016

102 Id.

collaborative policymaking catalyzed the export strategy from the *Export Processing Zones* (EPZ)[103].

The case of Mauritius shows that holding the appropriate incentives and export regimes is crucial for export-led growth. The Mauritian experience also highlights how having efficient and properly functioning domestic institutions is a necessary condition for economic prosperity. Moreover, well-functioning institutions proved to be an essential precondition to foreign investment, entrepreneurship, growth and innovation. To become a successful open export-led economy, Puerto Rico needs to create the adequate institutional arrangements through policy reforms such as incentives to allocate local capital into productive ventures, effective labor market reforms, and proven consultation mechanisms that open a dialogue between entrepreneurs and policymakers.

Mauritius is a great example of institutional innovation that builds upon its local factor endowments to create an export-led economic growth strategy. The Mauritian success story owes a lot to its adoption of export-processing zones and its capitalization of access to European markets as an impulse for its garment industry.

Other notable aspects include a strong protection to their local industrial class and the adaptation of existing technologies to their local production factors. These two measures are worth considering in Puerto Rico. Given the diminished role of the domestic private sector in the Puerto Rican export sector, specific industrial policy could be developed, on a conditional basis for upcoming businesses in strategic sectors. It's worth noting that this does not resemble import substitution industrialization, instead it focuses on creating a business climate that is amenable for nascent industries to grow and become internationally competitive. Additionally, Puerto Rico's surplus of human capital in fields like engineering and biological sciences may allow the island to take a leading role in adapting new technologies to the export supply chain if economic incentives are properly aligned to do so. These endeavors can be complimented

[103] "While it may have been true that the initial wave of investments that triggered the growth in EPZ output was largely foreign, the Mauritian EPZ sector, unlike that in many countries has a substantial local presence… 50 percent of the total equity of firms in the EPZ was owned by Mauritian nationals." (Id. p.24)

through amendments to Law 20 of 2012 that focus on promoting the export of advanced services.

Case Study #3: Ireland

Puerto Rico's economic literature has made strong reference to the FDI strategy that was developed by Ireland during the 1990's and early 2000's. Ireland's incentive strategy has placed strong emphasis on the pharmaceutical industry and more recently on advanced export services. The Irish experience shows the importance of building upon a previous development strategy to bootstrap the economy amidst a declining world market.

The centerpieces of Ireland's recent economic history have been its ability to maintain continuity in its incentive structures as well as a premeditated shift to a post-industrial service sector. Having a predictable set of investment policies in place gives investors the broad time horizon and the institutional continuity needed to confidently engage in large financial commitments in the economy that require an extended gestation period. Interestingly, continuity does not necessarily mean maintaining the same set of incentives on a perpetual basis but rather developing flexible frameworks that communicate possible changes in a timely manner to multinationals and other sources of investment. For instance, the Republic of Ireland developed a sophisticated pharmaceutical industry that was captured via state incentives, but recognized the trends in the international economy and the low cost labor dependency of the industry. This awareness of economic trends allowed them to transition to advanced export services, which has higher value-added production, making it a sector with better long-term prospects for continued growth. This policy shift built on human capital availability and previous tax incentives that were already central to Irish economic policy – merely adapting it to the new economic circumstances.

Ireland has been successful in its foresight capacity, particularly by recognizing socioeconomic trends and translating those trends into new policies. For instance, before the commencement of the deindustrialization process, Ireland refocused its incentive strategy to knowledge-intensive sectors within the service industry. Ireland's adaptive policymaking can be seen in its development of Social Partnership

Agreements that have been a staple of Irish economic policy since 1980. These agreements on wages and taxes at the national level between private enterprises, labor sectors, and the government is renewed every three years and contributes to moderate wage demands and the reduction of inflation[104]. The existence of Social Partnership agreements not only contributes to macroeconomic stability, but also dictates the focus of future economic development strategies. As a matter of fact, Ireland's Ten-Year Framework Social Partnership Agreement (2006-2015) [105] explicitly outlines specific policies – like increased education in STEM, incentives for R&D, and international cooperation for knowledge based fields – aimed at bolstering the knowledge economy.

Moreover, while maintaining a strong foreign direct investment orientation, the island-economy provided strong support for indigenous economic activity. This successful cohabitation between multinational corporations and domestic activity has been achieved through purposeful considerations by Irish policymakers. FDI has been stimulated in economic sectors that have a low domestic presence, hence precluding any possible employment loss as a result of competition. More importantly, Irish policy has focused on incentivizing industrial clustering[106] and integrated supply chains. This allows for domestic entrepreneurs to make the best of existing linkages and function as suppliers for the multinational corporations that have established themselves in Ireland.

The Irish government recognized Ireland's position within the European Union and its relation to the global market. With its accession to the Single European Market, Ireland solidified its role as a base for US companies to export to the growing continental economy. The literature on Ireland shows the success the state had in a central industrial strategy focused on FDI, particularly in the framework of an open export-led island economy[107]. Some institutions argue that a compression in the domestic demand allowed for increased competitiveness for Irish exports[108]. However, there is a particular

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104 Ireland: A Case Study of One of Our Key Competitors by Estudios Técnicos, Inc. (2006)

105 Towards 2016, Ten-year Framework Social Partnership Agreement 2005 – 2016

106 https://www.tcd.ie/iiis/documents/discussion/pdfs/iiisdp113.pdf accessed 7/14/2016

107 Ireland's Industrial Development Agency had the responsibility for attracting new industry and had the policy autonomy to operate independently from political parties.

108 Aidan Regan. Why Austerity And Structural Reforms Have Had Little To Do With Ireland's Economic Recovery

view of Ireland that highlights the results of the island's export driven strategy, mainly in ICT services. Today these services account for about 50% of Irish service exports. These outcomes are the result of the state's deliberate industrial policy, which promoted FDI in the high-tech sector and benefited the country from the creation of high-paying jobs. Some suggest that the success is related to state-led policy[109] and the "cluster effect of having a large pool of workers with general experience of working in the technology sector and experience of the corporate culture of working in large US multinational corporations"[110].

Furthermore, Ireland developed a strong planning agenda before the beginning of the 2008 economic downturn, which provided a strong social cohesion and business oriented strategy that maximized the returns from the previous industrial era. This meant the official recognition of an aging population and the spatial consequences of such trends in local communities and urban scenarios. Some examples include "Towards 2016", *Programme for Government* (2011 – 2016), and the *National Action Plan for Social Inclusion* (2007 – 2016), among others.

According to estimates almost 20-25% of the Irish population will be in the over 65 age cohort by 2041, with the greatest increase being in the age group of 80+[111]. This demographic trend, which has provoked a decrease in the share of the working age population, is widespread among developed countries including Puerto Rico. The threat that this transformation presents to the economic base of developed countries can only be remediated through an active policy[112] to reform entitlement structures and facilitate work for all generations. With this in mind, Ireland's approach sets inclusion at the heart of government, both in terms of the popular perception of older members of society and the institutional framework required to guarantee a more prosperous allocation of human resources. Specific strategies include establishing

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109 i.e. IDA Ireland (Industrial Development Agency)

110 Id.

111 The National Positive Ageing Strategy, available at: http://health.gov.ie/wp-content/uploads/2014/03/National_Positive_Ageing_Strategy_English.pdf

112 http://www.brookings.edu/blogs/up-front/posts/2016/05/02-challenges-population-aging-nikolova accessed 7/15/2016

flexible retirement agreements, developing working environments that are adapted to the needs of all generations via continuous education and training, among others.

The key lesson from the Irish state is its capacity to capitalize on its assets and historical experiences with FDI in the midst of economic contraction. Ireland's development agencies adapted to the changing conditions of international markets, particularly by transitioning from tangible manufacturing to digital or intangible industries. The state also promoted strong linkages with domestic supply chains. The main strategy was "to attract multinational corporations in internationally traded services, who do not compete on labour costs".[113]

Due to the similarities between the island-economies of Ireland and Puerto Rico – both have large amounts of FDI, have predominately trade-oriented economies, and are directly linked with a larger single market – there is much to be learned from Irish policymaking. First, Ireland has had a clear understanding of its comparative advantages in the world economy. Due to the lack of economies of scale and the limits of space that Ireland has it makes little sense to promote low-skill manufacturing buttressed on low labor costs, especially given the international emergence of other developing countries with much lower wage ceilings. Instead Ireland has focused on making the best of its highly skilled labor force by creating flexible labor conditions and stimulating linkages between domestic firms and foreign operations established in the country.

Second, Ireland has focused its incentive structure to center around high value-added manufacturing and service sectors that have much better long term prospects for sustained growth. Generating a similar environment in Puerto Rico would provide space for clustering between foreign investment ventures and up-and-coming local businesses, develop industrial activity based on economic benefits rather than economic distortions (subsidies, tax breaks, expedited permits … etc.), and ultimately generate prolonged economic growth.

Last but not least, Ireland has had active rather than reactive policymaking. Its shift from an economy focused on the export of manufactured goods to one built around

[113] Id.

the export of services and high-value added products, is the result of policies that took into account the shifting trends of global markets. Additionally, the development of Social Partnership Agreements brings in different economic actors into the policy making process and strengthening implementation by generating ample commitments to make these strategies succeed. Although Ireland was hard hit by the 2008 economic recession as a result of its banking sector's large stake in the construction bubble of the early 2000s,[114] it has managed to recover through fiscal stimulus and the institutional continuity provided by its long-term industrial policy. If handled correctly, Puerto Rico's current economic crisis can serve as a stimulus for more responsible and resolute policymaking in years to come and for effective reforms to Puerto Rican institutions be set in place. As demonstrated by the Irish experience the future of policymaking lies in the understanding of global trends and bringing this understanding to bear on local policy making.

Case Study #4: Pittsburgh

The City of Pittsburgh has been widely discussed within the academic field of urban studies, due to its profound transition from a "rust belt" economy, to an advanced and innovative city with strong academic institutions and a vibrant urban core. According to an NBER study, Pittsburgh has the second highest intergenerational economic mobility among all of the urban centers in the United States[115]. Through careful planning, the City has transitioned from heavy-industry manufacturing (mainly steel) to downtown re-development and community development during the 1950's and 1960s. The city initially devoted strong efforts towards creating vibrant neighborhoods in order to attract highly-skilled human resources. This strategy also provided a halt to the decaying urban scenario that affected the city.

What is particularly remarkable about Pittsburgh's experience has been its capacity to bounce back from the decline of its heavily steel-reliant economy and use the city's existing assets to develop an economy centered on innovation and technology. Ever since the late 19th century, Pittsburgh had been a powerhouse of steel production.

114 http://www.karlwhelan.com/Papers/Whelan-IrelandPaper-June2013.pdf accessed 7/15/2016

115 https://web.archive.org/web/20140202184957/http://obs.rc.fas.harvard.edu/chetty/mobility_geo.pdf accessed 7/21/2016

However, the United States' gradual transformation to a service-oriented economy during the second half of the 20th century, the impact on aggregate demand of back to back recessions in the 1970s and 1980s, and the steel industry's lack of technological adaptation[116] provoked the collapse of Pittsburgh and many other Rust Belt cities. By 1983, the city's unemployment rate reached 17.1%[117] and nearly 212,000 people found themselves out of work. Yet this was not an individual instance of crisis, rather it was the result of a major shift in the economic and technological context. "Between 1970 and 1996, Pittsburgh suffered the third greatest percentage loss in manufacturing jobs (56.85) among all eighty-four MSAs (Metropolitan Statistical Area) in the industrial heartlands west of the Appalachians, north of the Ohio River, and East of the Mississippi."[118] Additionally, whereas the average US job growth between 1970 and 1993 was 63.9%, Pittsburgh experienced the second slowest growth among urban areas with a meager 15.6% during that span of time[119].

Along with the dire economic circumstances, Pittsburgh was also afflicted by a dramatic loss in population. Between 1980 and 1987 the city's population declined by 8%. The city confronted an increase in the dependency ratio with rapid outmigration among all groups below the age of 55[120] deteriorating the proportion of working age population as a total of Pittsburgh's inhabitants. Moreover, the city's significantly deteriorated image also affected initial efforts to diversify since most investors still retained the idea of Pittsburgh as a rustic and steel reliant urban center.

The adverse economic outlook forced the city of Pittsburgh to rethink itself and search for new ideas. In a 1989 article[121], Aydan Kutay from Carnegie Mellon University responded to the growing comparisons between the factor endowments of Pittsburgh

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116 http://www.larouchepub.com/eiw/public/1982/eirv09n32-19820824/eirv09n32-19820824_033-the_decline_and_fall_of_us_steel.pdf accessed 8/3/2016

117 http://www.post-gazette.com/businessnews/2012/12/23/In-desperate-1983-there-was-nowhere-for-Pittsburgh-s-economy-to-go-but-up/stories/201212230258 8/2/2013

118 Pack, Janet Rothenberg, ed. James A. Johnson Metro Series: Sunbelt/Frostbelt: Public Policies and Market Forces in Metropolitan Development. New York, NY, US: Brookings Institution Press, 2005. ProQuest ebrary. Web. 2 August 2016.

119 *Ibid*

120 http://onlinelibrary.wiley.com.ezproxy.cul.columbia.edu/doi/10.1111/j.1467-9906.1989.tb00200.x/epdf accessed 8/2/2013

121 Prospects for High Technology Based Economic Development in Mature Industrial regions: Pittsburgh as a Case Study, JOURNAL OF URBAN AFFAIRS, Volume 11, Number 4, pages 361-377 by Aydan Kutay (1989). Accessed via http://onlinelibrary.wiley.com.ezproxy.cul.columbia.edu/doi/10.1111/j.1467-9906.1989.tb00200.x/epdf

and those of successful high technology urban areas like Silicon Valley and Boston. He identified three important necessary conditions for the development of a high technology economic development model: 1) a heavy concentration of highly skilled workers, 2) an organizational infrastructure that successfully links the key elements of scientific knowledge, high risk capital, and skilled labor, 3) and proximity to existing clusters that facilitate the generation of new ideas which eventually develop into new products. Although Kutay did acknowledge Pittsburgh's assets in the existent economic infrastructure and in an important Research University like Carnegie Mellon, he pointed out the shrinking labor force, the negative image of Pittsburgh, the relative weakness of Pittsburgh's existing innovative industries, and the lack of integration between academic research and high-risk capital investment as significant obstacles to a path of high technology economic development.

In the run-up towards the revitalization of Pittsburgh, it seemed as if these elements would not come together and the economy would remain in free fall. Nevertheless, a unifying vision came about through the development of a roadmap to guide economic activity. The 1994 Carnegie Mellon White Paper "Toward a Shared Economic Vision for Pittsburgh and Southwestern Pennsylvania" provided a unifying vision[122] that would combine the interests of business and the community towards making the best of the city's resources. The report identified important assets like a downtown complex with a high concentration of important firms, high levels of public and private research & development, an important concentration of human capital, and an abundance of industrial infrastructure[123]. More importantly, it led to the development of specific policy objectives that put these economic assets to work.

The 1994 White paper, made recommendations[124] addressed at not only the business community, but also academia and government. It highlighted the need to develop incentives for startups through a business-stimulating tax system and a more welcoming regulatory climate. Emphasis was given to research and development in robotics, software, and medical services with the aim of developing new industries and utilizing

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122 https://www.freeenterprise.com/pittsburgh-s-reinvention-steel-city-tech-hub/ accessed 7/21/2016

123 Toward a Shared Economic Vision for Pittsburgh and Southwestern Pennsylvania. White Paper, Carnegie Mellon.

124 *Ibid*

the already existing manufacturing infrastructure for the purpose of high technology production. Public-private partnerships, cost-efficient provision of government services, along with initiatives for culture and recreation were deemed crucial for economic development and a better quality of life for citizens. This would provide better governance and a more appealing city for young people to live in and start their businesses. Last but not least, policies were centered on a sustainable development model – striving to solve environmental problems through green production, low-impact architecture, and the reuse of old industrial sites.

Bringing new economic activity to Pittsburgh also required targeted strategies that made the best of each community within the city. For example, the counties of East Liberty and Lawrenceville were the site of what is known as asset-building[125] community redevelopment. This strategy focuses on identifying the potential assets of the community – like labor, talent, money, social groupings, and attractive structures – in order to leverage them as a means of attracting economic activity and government resources. Instead of restricting attention to what is needed, it facilitates the improvement of the community even within the context of limited resources. During the 1990s, both of the aforementioned counties made the best of their connection with the public transportation grid, their rigorous urban development codes, and the resources of their population to attract retail stores and small businesses that significantly improved the market value of property in the area.

Pittsburgh also made the best of its existing institutions to bring about new economic activity in the area. Academic institutions like Carnegie Mellon University and the University of Pittsburgh have become leaders in research within the cutting-edge fields of STEM. In the year 2014, these two academic institutions combined devoted more than $1.1 billion to Research & Development efforts[126]. These research initiatives generate patents, attract new businesses, and give confidence to existing ones to continue investing in the city.

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[125] Community Building for the 21st century: Asset-building and the Resurgence of Pittsburgh by Jason Tigano of Duquesne University (2013)

[126] 2016 State of Downtown Pittsburgh, Pittsburgh Downtown Partnership (2016)

The University of Pittsburgh Medical Center has played an important role in the development of a strong healthcare sector, which provides nearly one out of every five private sector jobs[127] in the city of Pittsburgh. The city of Pittsburgh also leveraged the successful private sector institutions that remained after the economic turmoil for the purposes of revitalizing the downtown area. The presence of five Fortune 500[128] companies in the city: United States Steel (176), PNC Financial Services Group (192), PPG Industries (198), J. Heinz (272), WESCO International (360), Dick's Sporting Goods (393), represented reliable sources of private investment that were used to gradually rebuild the city's economic credibility.

The development of a Business Improvement District (BID) in the downtown area of Pittsburgh in 1999[129] is an important example of a concrete policy used to integrate existing assets within the city in a beneficial arrangement for economic development. BIDs are public-private partnerships, between a group of businesses in tandem with the local government, which are able to levy an additional property tax within a specified area for the purpose of developing projects that will add to the business environment[130]. These projects can range from capital improvements, public space maintenance, and the improvement of public services to marketing initiatives, public transportation developments, and social services. In Pittsburgh, although the BID initially took the function of rehabilitating downtown space and preparing new spaces for retail establishments it gradually evolved to adopt new projects as economic activity returned to the area. Today, besides the more orthodox economic policies it also takes an active role in marketing the city and developing cultural initiatives that improve the attractiveness for new inhabitants.

All of these transformations have made Pittsburgh one of the most attractive cities for STEM professionals.[131] The old manufacturing sectors have been displaced by offices for

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127 http://articles.latimes.com/2012/may/13/business/la-fi-pittsburgh-revival-20120513 accessed 8/4/2016

128 http://online.pointpark.edu/business/history-of-pittsburgh-business/ accessed 8/2/2016

129 http://www.popcitymedia.com/features/45bid.aspx accessed 8/4/2016

130 http://search.proquest.com.ezproxy.cul.columbia.edu/docview/1647669978?pq-origsite=summon&accountid=10226 accessed 8/4/2016

131 2016 State of Downtown Pittsburgh, Pittsburgh Downtown Partnership (2016)

tech giants like Facebook's oculus-rift research facilities and Uber's research exploits in the field of automated cars.

Through a successful mixture of institutions that spurred economic development, Pittsburgh managed to use its economic advantages to bring about a new model of economic development. Institutions allowed the creation of a consensus that enabled strategic initiatives that provided increased competitiveness in international and domestic markets, along with higher living standards for significant segments of the population. One of the most important aspects of Pittsburgh's strategy involved understanding the current socio-economic scenario.

Key questions – such as how firms were recruited in the region? What is the region's retention rate record? Why did firms arrive in the first place, and why did some of them leave?[132] – were crucial in the development of a planned urban redevelopment strategy.

Due to Pittsburgh' historical reliance on the steel industry the city planned to answer these questions in order to bring new industries to diversify its economic base. Pittsburgh's shared economic vision required an analysis of the institutional apparatus, particularly by gauging the performance of previous socioeconomic initiatives and adapting them to new economic challenges.

In the case of Puerto Rico this will require the answer to some basic questions such as: What are the factors behind the current performance of PRIDCO, one of the Island's longest-standing development institutions? How is our export agency working within a globalized economy and the multiple changes in economic actors within the global arena? Pittsburgh's approach involved capitalizing on current assets, predominantly, new uses for abandoned industrial sites. Assets varied from cultural capital, urban quality, availability of high-quality services, and a large concentration of world-class manufacturing corporations to human resource capacity, airport infrastructure, urban amenities, and top-notch educational institutions[133]. A large portion of Pittsburgh's success is partly attributed to successful ventures of educational and medical

[132] Toward a Shared Economic Vision for Pittsburgh and Southwestern Pennsylvania. White Paper, Carnegie Mellon.

[133] Id.

institutions, such as Carnegie-Mellon University and the University of Pittsburgh. In the end the city understood the importance of creating a vibrant urban center with strong cultural, artistic, academic and entrepreneurial networks.

Other Experiences

Detroit, Michigan

Right-sizing: The city developed a program called "Detroit Work Project" which basically relocated populations which lived in neighborhoods with an occupancy rate below 15% to higher density neighborhoods. The plan emphasized demolition strategies and concentration of city resources in denser urban areas. Furthermore, big companies established in the suburbs relocated to the downtown, such as Quicken Loans and other anchor institutions that invested in the urban core (health research, universities, etc.) Some authors argue that one of the main drivers of Detroit's changing scenario was a sense of community within a city driven by private and civic networks run on a state platform[134].

Youngstown, Ohio

The city embraced the idea of smart shrinkage. The program provided a series of economic incentives packages that recognized a smaller population, but aimed for higher economic diversity. During the past years Act 20-22 have allowed the government of Puerto Rico to increase investment in high-value added services and increase the influx of new investment capacity. Yet, the state has not concentrated resources in developing a particular set of vibrant urban neighborhoods.

Newcastle, Bilbao, Torino (Recovering Ex-Industrial Cities)

Industrial cities in Europe suffered from a decline in population and a loss in productive capacity, similar to the experience of rust-belt cities in the US. An immediate response was the extension of the green belt, and construction outside the city. This promoted urban sprawl, inequalities and social problems

[134] Professor Bruce Katz has been one of the main promoters of this type of strategy.

within the urban core. European industrial cities, like Pittsburgh, also suffered from profound environmental problems from abandoned steel and industrial-intensive industries. Old industrial infrastructure such as warehouses, railways, canals, were originally abandoned but latter recuperated under a different strategy to capitalize on the assets that old industrial sites provided.

1. Cities restored their civic infrastructure and neighborhoods.
2. SMEs proved to be more resilient and capable to adapt than big companies. Traditional skills from old enterprises were transferred to SMEs.
3. Empty urban spaces were revamped with green areas.
4. Cities changed from old industrial factories to vibrant creative spaces for design, young entrepreneurs, artists, and diversified communities. This provided high-skilled, high-tech incubators, which are supported by local back-up services with lower skills.

Summary and Additional Remarks

The experiences described in this section not only provide specific policy recommendations, but also make evident the need of a widely agreed upon project for change. Essentially, demographic, social and economic preferences have changed over the years, and their tangible effects, such as population loss or the increase in aging populations provide a fertile ground for change in social, political and economic institutions, particularly in the local sphere. These megatrends have been thoroughly studied by the research work of Bruce Katz[135]. The main focus for state action will be to recognize the current fiscal constraints and develop strategies that increase overall efficiencies in society such as renewing urban cores, along with increasing productive capacity within such areas; "vibrancy, proximity and diversity" are the key concepts. These cities essentially recycled their old urban scenario as described in Professor Anne Power's book *Cities for a Small Continent: International Handbook of City Recovery*[136].

Cities, governments and other local institutions have the ability to create innovative approaches to regenerate economic activity. The discussed case studies provide examples of how to repurpose existing spaces or infrastructure and add new amenities to decaying areas. The states, along with civic, cultural, and other private economic institutions have to place the right networks to make urban cores desirable to work, live and play.

The current economic crisis in Puerto Rico limits the government's ability to develop counter measures to halt population decline or even limit the accelerating effect of the aging population, however, the state can develop several policy interventions that will adapt or transform Puerto Rico's public institutions. Low-cost interventions such as promoting healthier lifestyles, adapting industries to older age requirements, promoting continuous education and extending retirement age, placing adequate incentives for value-added services, adapting to generational preferences and revitalizing urban centers, are all plausible mechanisms that have been well documented in other

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135 B. Katz & J. Bradley. The Metropolitan Revolution: How Cities and Metros Are Fixing Our Broken Politics and Fragile Economy

136 A. Power, *Cities for a Small Continent: International Handbook of City Recovery*. The Policy Press (2016)

jurisdictions. Understanding the underlying circumstances of Puerto Rico's population decline, such as free labor mobility with an advanced economy, will support delineating potential courses of action. Such approaches and scenario analysis will be discussed in the following sections.

Chapter 8: Challenges

In economic development the size of the economy or of the population is not an obstacle. Countries with smaller populations and economies have taken the appropriate steps and have put in motion strategies that have been very successful. Examples are well known: Ireland, Singapore, Panama, Mauritius, among others. In Puerto Rico's case, as illustrated by the previous chapters, the problem arises not because of where it is now in terms of population and economic size, but rather how it arrived at the present situation in the past two decades.

In many cases of economic development success, countries were beginning from a socio-economic foundation and institutions that had not resulted from major structural transformations from a prolonged contraction, leading to a smaller economy and population. The development process could in most cases be conceptualized as starting from a blank canvas. In Puerto Rico the long term process of economic and demographic contraction generated major structural disruptions in the economic, social and institutional infrastructures. Thus, the development process entails not simply putting in place new, previously absent infrastructure or incrementally improving existing infrastructures , but also profound restructuring or reconstruction of existing ones. Rethinking infrastructure and its role in the development process, including physical infrastructure planning, becomes necessary, including although less obvious, the need for introducing changes in the prevailing economic culture that focuses on investment in new infrastructure.

Reconstruction is, to a significant extent, a more difficult proposition than new construction because it calls for abandoning approaches and cultural biases that have persisted, in Puerto Rico's case, for decades. It also means adopting new ways of looking at development from a very different perspective and constructing a new development culture as well as rethinking the institutions that provide the framework for economic development. This is evident in the need to plan, not for a growing population and economy, the approach that has prevailed in much development literature and experience, but rather for a smaller population and a non-growing or zero sum economy, at least for a significant period of time. The economy is bound to become even more open to outside influences due to loss of population and

economic contraction. One reason is that demand will be more diversified than local production capabilities, a problem shared with many small, open economies, severely limiting import substitution opportunities.

John Maynard Keynes once wrote: "The difficulty lies not so much in developing new ideas as in escaping from old ones." In the particular case of economic development thinking this need to escape from old approaches results from a changing technological, geo-political and economic context as well as from changes in the evolution of particular societies. Both these circumstances are present in the drafting of strategies for Puerto Rico's economic future, since both internal and external factors have changed substantially and new points of reference, in substitution of the old, must be part of the planning equation.

Internally the major challenges facing Puerto Rico include the following:

- Addressing the needs of a smaller but older population with scarce government resources
- Evaluating the consequences of improved longevity on labor market conditions, including increased rigidity from individuals working well past the age of 65, and the need for constant "upskilling" of an aging work force
- Dealing with the out migration of the young and professional groups that has generated scarcity of trained personnel in a number of specialties, concretely in health services
- Downsizing much of the physical infrastructure to accommodate reduced needs and demand, and placing greater emphasis on maintaining and updating existing physical infrastructure rather than increasing capacity
- Providing needed connectivity infrastructure in response to the need for inserting the economy in the global environment and new trends in technology
- Addressing the serious deterioration of the social infrastructure, mainly education and health services, and recognizing that the economic and demographic conditions require major changes in approaches in both
- Making appropriate decisions for optimizing targeted investment aimed at stimulating the economy under conditions of extreme scarcity of resources in order to maximize benefit-cost ratios and outcomes

- Transforming an obsolete institutional framework, including public sector and political institutions, mostly devised under very different conditions and assumptions concerning growth in both population and the economy
- Obviously, in the short term, dealing with fiscal matters such as the pension system and public sector financing within the framework of the PROMESA legislation

External factors that impinge on policy-making include the following:

- A volatile global environment due to geo-political instability, technological change and global business trends that can generate major economic consequences and increase risk for a fragile, small open economy
- Rapid technological change that will impact the competitive advantage of the economies and impact job creation and educational needs, but can also open up important opportunities for growth in engineering, electronics, C&IT, environmental services and others.
- A spatial redistribution of global economic activity that will continue to shift the economic center of gravity towards the Pacific and Asia for the foreseeable future
- New regional economic actors that will reconfigure the Caribbean and Central American region's economic structure and prospects, including the opening of Cuba to external investment, the enlarged Panama Canal and the Dominican Republic's new interest in assuming greater influence in the region
- A competitive environment in which market entry and exit is relatively easy and that requires access to market and industry intelligence to a much greater degree than in a more stable environment, and greater agility in responding to changing competitive situations
- A slowing of the Latin American economy's rate of growth and the serious reversals in two major economies, that of Brazil and Venezuela, but at the same time a more aggressive and expansive attitude by others such as Colombia and the Dominican Republic

- Changes in the federal government's social, economic and fiscal policies, including those related to international tax matters that could impact CFC's in Puerto Rico, as well as others that impact health and social services

The above challenges not only impact the content of development strategies and actions, but also introduce the need for changes in the process of formulating plans and strategies. These process changes include the following:

- Developing what is known as the *foresight function* as part of the planning and decision-making process, particularly important in a volatile and rapidly changing environment.
- Introducing *scenario construction* capabilities both as an aide to decision-making under conditions of uncertainty and as a means of introducing qualitative elements in the planning process.
- Inserting *risk management* as an integral part of the policy-making process in the context of a very open economy very susceptible to exogenous events and one with little margin for error due to resource scarcity and institutional constraints.
- Develop a capacity for *network creation* and participation to compensate for scale limitations in certain areas that will become even more acute due to loss of population and a smaller economy, but also to improve market access and strengthen technological readiness

Chapter 9: Strategies and Actions

The benchmarking exercise made it clear that there is no one specific route for reconstructing an economy that has suffered both economic contraction and severe loss of population. There are, however, initiatives that are common to many of these success stories. In the case of Ireland, Finland and Pittsburgh the shift to a high value added service economy based on technology and innovation is present in all three, as is the importance of mobilizing society's stakeholders in support of an agreed upon vision. In Finland's case the creation of the *Committee for the Future* as a permanent fixture in the policymaking system, and in Ireland the *Social Partnership*, both played a key role in the reconstruction of their economies.

The success stories also shared the characteristic of a strong external orientation, true of the above cases but also a characteristic of Mauritius as well as Pittsburgh. The emphasis on long range planning is also a shared characteristic as is the intention of developing strong internal linkages through clustering of activities. Other experiences were evaluated and some unique approaches were identified, including "right sizing" and "smart shrinkage" approaches that characterized urban experiences in the U.S. In these cases, as well as in Detroit, approaches also included the use of abandoned or empty properties as assets in promoting renewal.

The following recommended approaches have been developed from three sources: the best practices identified, current discussions in the development and urban reconstruction literature and from the scenarios developed in this project. The strategic guidelines below respond to the need to restructure an economy that is both smaller in population and economic activity, and incorporate approaches that characterize best practices discussed above. The recommendations focus on those actions directly related to dealing with these two conditions rather than on widely accepted prescriptions such as stimulating entrepreneurship, reforming the tax system or improving certain government procedures.

The recommended strategies and actions include:

- **Outward orientation** – Effective global insertion was found to be a key factor in reconstructing economies. This means having the capacity to manage not just export activities as traditionally defined, but also other means of global insertion, including technology and knowledge transfers, supply chain management, within boundary exports, and other channels for integrating the economy with global trends.
    - The specific recommendation is for the Puerto Rico Trade Company (Compañía de Comercio y Exportación, CCE) to be merged into the Department of Economic Development and Commerce (DEDC), its functions restructured, and act as the coordinating entity for achieving effective global insertion beyond export promotion. This will require coordination with other government agencies, private sector entities and universities. The DEDC will also assume a key role in external and internal network creation and management, a key competence for a smaller economy.

    - A smaller population will mean, in the case of a number of federal programs where funds are allocated in proportion to population, that the amount of federal funds will fall. This makes it essential to optimize the use of such funds by a centralized management structure for this purpose, in order to assure that all available funds are secured and that their use is efficiently and effectively handled. The Puerto Rico Federal Affairs Administration (PRFAA) could be transformed into the entity responsible for managing the federal funds with operations in Puerto Rico and Washington, DC.

    - Another dimension is the need to have in place a specific policy to deal with the Puerto Rican population abroad and treat this population as an asset in future development initiatives by integrating them into such initiatives. Puerto Rico has no clear policy on dealing with its diaspora as other success stories in economic development have. Both Singapore and Tai-

wan have policies in place that treat their populations abroad in this manner.

- **Strengthening Internal linkages** – To the extent that internal linkages between different economic activities are strengthened, the economy is provided with greater stability as *production systems* substitute *production lines* as the key defining characteristic of the industrial economy. To the extent that value chains in productive systems are localized, multiplier effects on employment and income are enhanced. Achieving such linkages, necessary in a small economy, require careful planning and strategizing since they are particularly difficult to achieve in an economy that has contracted deeply[137].
    - There are in place incentives to stimulate local purchases by manufacturing firms, but the recommendation is for the creation of a mechanism for not only passively stimulating local purchases, but for going beyond that and establishing a support infrastructure that will make possible a more integrated economy. Effectively implementing a cluster based promotional strategy, identifying the necessary linkages and gaps in value chains and implementing the strategy requires profound changes in PRIDCO. Planning for linkage creation as a means to a more internally integrated economy, as mentioned, should be the responsibility of the Department of Economic Development and Commerce, with PRIDCO acting as the promotional entity and, to some extent, charged with assuring compliance with the adopted strategies.

    - Given the Island economy's outward orientation, the logistics industry should be a priority concern and should be the object of a carefully drafted policy that integrates all components – air, sea, inland – of logistics activity as well as the desirability of utilizing a logistics cluster ap-

[137] MIT Industrial Performance Center, *Strengthening the Innovation Ecosystem for Advanced Manufacturing*, May, 2015, Cambridge, MA.

proach[138]. This may require not only dealing with existing federal maritime cargo legislation but also that related to air cargo, where restrictions with a much more significant negative impacts exist. The experience of Alaska, exempted from these restrictions, can serve as a model for action with respect to these air cargo restrictions.

- **Mobilizing stakeholder integration** – This has been a salient feature in some the cases examined above and is particularly important in order to focus on a new vision and a new approach to reconstruction of the economy.
    - Reaching consensus on a development vision and on the needed strategies proved to be an essential component of reconstruction efforts in Ireland, Finland, and Pittsburgh. This has been achieved through the creation of specific entities such as the *Social Partnership* in Ireland. What is being recommended is the creation of a public-private entity along those lines. Although there have been many initiatives in this direction, few have managed to have a positive impact and none has had long term continuity. In part this has been the case due to the fact that, although they incorporated non-government representation, the entities simply had an advisory role. The Irish *Social Partnership*, that brings together central and local government, unions, business organizations ad community based organizations provides an effective model for mobilizing stakeholder integration. In fact, the *Social Partnership* prepares the ten year economic development plan.

- **Long term vision** – Planning activities must be framed within a long term vision for the economy that not only focuses on internal issues but also on the expected transformations in the global and regional context.
    - An economy with the characteristics of Puerto Rico's between now and 2030 will have little margin for error and thus there will be a need for careful long term planning. What is being recommended is the creation of a body similar

[138] Sheffi, Yossi, *Logistics Clusters*, The MIT Press, Cambridge, MA, 2012.

to Finland's *Committee on the Future* to handle the task of providing the foresight function, essential for long term planning in a volatile global environment. The proposed entity would provide the external context data and qualitative information for the planning process.

- **Innovation driven development** – Puerto Rico must reconstruct its economy by building on its innovation infrastructure, including a strong C&IT component, the existing Science, Technology and Research Trust Fund and a growing medical research sector.
    - Although significant initiatives have been taken with respect to developing an innovation driven economy[139], what is recommended is the adoption of a Public Policy on Innovation that will harness all efforts in this direction and provide the necessary priority to the development of an innovation driven development process. Support for technology startups is a key component of these efforts and, although major steps have been taken in recent years to promote startups, these efforts would benefit from the adoption of a policy that recognizes such support as a priority concern in the context of developing an innovation focused economy.

    - Migrating to an innovation driven economy will require an aggressive effort to achieve economies of scale and scope in R&D, not only through insertion in external knowledge production networks but by creating collaborative partnerships among the universities in Puerto Rico. These arrangements could make it possible to offer specialized degrees and research projects more efficiently.

- **Strong emphasis on core competences** – A smaller economy will have less room to handle risks inherent in promoting economic activity, and thus promotional

[139] Estudios Técnicos, Inc., Cronología de los Esfuerzos Hechos en PR para Desarrollar la Infraestructura y la Comunidad de C+T y el I+D, 2005.

activities should focus on those areas in which the Island has core competences and existing strengths. Although advanced services should be the center of promotional activities going forward, manufacturing will continue to be a key sector, but it will be an activity with a strong service component. Given the challenges posed by the Island's economic and demographic situation, a special effort to retain the existing industrial base is essential and requires specific policy initiatives aimed at maximum retention. Attention to the retention issue has been on a case by case process.

- PRIDCO's efforts have centered on manufacturing activities as its name suggests, although some recent promotional activity has focused on certain services such as aerospace engineering and MRO activities in the former Ramey Base. It is not prepared to handle a shift to advanced services, the activities in which Puerto Rico has very strong core competences. The recommendation is for PRIDCO to be restructured into an agency with the capacity to manage the migration to a service economy in addition to its role as executor of the retention strategy mentioned and, of course, the cluster based manufacturing strategy recommended.

- The loss of population and reduced economic activity have generated excess or abandoned properties that are presently not only unproductive but actually hamper development. They present an opportunity to lower development costs, particularly in urban areas, and turn these properties into productive assets. Detroit and Pittsburgh, both have programs to deal with this situation. This requires amending the existing legislation to make the expropriation process easier in the case of privately owned and abandoned properties, as well as increasing the flexibility in the process for turning over properties classified as nuisance or simply excess, to private sector developers.

- **Effective management of the economy's openness** – Being small and destructured and a highly open economy, requires that specific attention in devel-

opment planning for reconstruction be placed on those flows that define economic openness: capital, technology, information, population, exports and imports.

- The restructuring of the CCE and its full incorporation into the DEDC, recommended previously, is to make the entity the manager of Puerto Rico's external linkages, a complex task and one that requires specific capabilities in terms of understanding global trends and their impact on the Island's economy. At present no one entity in Government handles this task. The link with the DEDC responsibilities is essential.

- More broadly, a new model of public sector management is called for, one that places emphasis on the private provision of public services such as electric energy, water and sewerage, transportation and others. It will also be a much more decentralized management model with municipalities and community based organizations assuming a more a proactive role in providing services such as school management and maintenance, public housing maintenance and others that directly affect residents .

- **Network creation as a key competence** – Lacking sufficient scale for achieving efficiency in a number of areas, developing the capacity to create and to insert itself in external networks for both physical and knowledge production is essential. This capacity is particularly important when facing severe constraints on resources as Puerto Rico will face in the coming decade.

  - Part of the effort of successful global insertion is generating the capacity to create and be part of global and regional networks. The recommendation is for designating the CCE within the Department of Economic Development and Commerce to work with other government agencies, universities and private sector organizations in identifying existing networks and creating new networks. Denmark provides an example of successful insertion into knowledge production networks.

- **Strategic competence** – In a volatile world and with few resources, the capacity to develop the correct strategies is essential in achieving success in reconstructing the economy. Achieving this requires not only having the correct institutional framework, but also developing the capacity to understand global trends, convert this intelligence into policy prescriptions and have the capacity to make the adjustments necessary to respond to changing global conditions.

    - Present day planning mechanisms are insufficient and thus what is recommended is for an overarching entity such as the *Committee on the Future* does for Finland, to assume this task. Among its responsibilities would be to assess risks, particularly those arising from the external environment, and introduce the risk management component into the economic development decision-making process[140].

Obviously, the above recommendations will have to be implemented over a number of years, but the end result will be an institutional framework much more attuned to the needs to reconstruct an economy that will have a much smaller population and economy and that faces serious external challenges from a changing global and regional context.

2016-2020

In the initial phase, 2016-2020, fiscal issues will be the driver in economic policy-making and the thrust of initiatives by the Fiscal Oversight Board will be on two aspects: returning to a balanced budget and restructuring the public sector's debt. The recommended policy initiative in this period is to place emphasis on maximizing efficiency in public sector processes, effectiveness in the use of fiscal revenues and

[140] The World Economic Forum, *The Global Risks Report: 2016*, Geneva, 2016.

mobilization of non-government resources, including both private and federal government funds. This initial phase should also provide space for planning the implementation of the above recommendations.

In this first phase some steps can also be taken to stabilize the economy and prevent further contraction in the economy. These steps include dealing with the energy problem as part of an integrated infrastructure development plan framed within the needs of an economy that is migrating to one focused on innovation and technology. Moreover, the need to stabilize the economy and halt the negative economic downward spiral the conditions calls for maintaining in place certain key fiscal measures, including Law 154. Current efforts in Congress for approval of Section 245(a) of the Internal Revenue Code should be supported for the same reason. In addition the Government's fiscal condition would be significantly improved should Medicaid parity be achieved, as has been requested from the Congressional Task Force, by various business entities, and the Government of Puerto Rico. This measure should not be underestimated since it would also signify major improvements in the provision of health services to our medically indigent population. Obtaining parity with respect to Medicaid is in line with other Federal Government-Commonwealth institutional relations.

Additionally, utilizing the PPP framework to carry out small scale investment projects that have short gestation periods and can be commenced fairly rapidly as a way of mitigating the downward spiral in the economy. Changes to the PPP legislation should be made to make this possible and for turning the PPP Authority into a promotional entity that identifies opportunities, selects potential partners and actively promotes the implementation of projects and not, as at present, a procedural and supervisory entity.

In this initial period, efforts should be directed towards laying the foundations for an innovation based economic development strategy that must include organizational arrangements and network construction initiatives, both internally and externally. Such a strategy must necessarily include a reorganization of entities in science, technology and research activities and their relationship with economic development priorities.

The DEDC should fully implement a comprehensive reorganization and re-staffing of PRIDCO and the CCE to make them more effective in the economic reconstruction process.

2021-2025

Within the 2021-2025 period the Government will have been able to return to capital markets and this will mitigate the absence of resources for investment in infrastructure and economic development initiatives. With respect to fiscal issues, implementing a "zero base budgeting and organization" process will provide the means to assure sound fiscal conditions. This, and a simple and effective tax system that stimulates investment will provide the foundations for a more stable fiscal environment. Infrastructure investment will take place corresponding to a previously drafted integrated infrastructure investment plan.

Needed transformations in the institutional framework, as identified previously, can be put in place, including changes in labor market legislation and other areas. Implementing labor reform to increase labor market flexibility while, at the same time, stimulating productivity and improving labor force quality can take place early in this second phase.

Global insertion efforts will be fully operational after the preparatory work between 2016 and 2020. Part of the recommended DEDC reorganization entails creating a foresight unit similar to Finland's *Committee for the Future* that will have as its major responsibility the foresight function, that entails obtaining external context intelligence and inserting it into the decision-making process.

Science, technology and innovation initiatives will have become even more central to development processes by this time. Adoption is recommended of an organic law that prioritizes a Science, Technology and Innovation Based Economic Development Strategy and sets out the required support from all government instrumentalities. Drafting of this legislation should be a joint effort of the Department of Economic

Development and Commerce and the Science, Technology ad Research Trust Fund, with ample participation from the universities.

2026-2030

This third phase should see the full implementation of the recommended actions for reconstructing the economy:

- Improved foresight and planning capabilities
- A restructured PRIDCO and CCE
- The foundations for an innovation driven economy
- A concerted effort to insert Puerto Rico in the global context
- A strengthened advanced services sector

Opportunities

Although much of the above discussion centers on resolving existing or projected problems associated with a smaller economy, the conditions that are evolving internally and in the external environment present opportunities for Puerto Rico and its business sector. These opportunities can be divided into those that arise from the recommended outward orientation and those that develop from internal conditions.

With respect to the former, Puerto Rico's opportunities lie in exporting advanced services in areas in which it has competitive advantages. Some of this is already occurring, but a concerted effort to support exports of services will augment the scale and impact. The areas that have been identified as part of this exercise include C & IT, technology applications in health services, financial services, concretely those related to insurance activities, business support services, and others such as those associated with specialized higher education. Laws 20 and 22 have begun to play a key role in

strengthening the service export activity. Opportunities arise from global trends and local and regional needs[141].

Internally, an aging population will generate demand for specialized services such as those related to home care, disease management, housing with specific characteristics and continuing care services. Opportunities for generating economic activity also exist in turning the unproductive assets mentioned above into productive assets. Legislating to make the expropriation process simpler and to permit the turning over of these properties to private developers, including community groups, will lower the cost of land a major component of project cost. Major opportunities exist in regional markets for advanced services in C&IT, engineering, construction management, validation services, insurance and others.

There are opportunities that overlap between the external and internal dimensions. Thus, labor market conditions as well as advances in production techniques make the agro industrial sector one in which there are significant opportunities not only to satisfy internal market needs but also for export. Activities in the sector must be high value added ones, however, to compensate for the relatively high wages in Puerto Rico compared to competing jurisdictions.

[141] United Nations Global Compact, et. al., *Global Opportunity Report: 2015*, New York. This report identifies opportunities in such areas as energy self sufficiency, environmental services, innovation in health services financing, the use of mobile technologies in prevention, and water efficient agriculture, among others.

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APPENDICES

TABLE 17

Distribution of Employment by Occupations, and Changes, 1999, 2010 and 2015

	1999		2010		2015		-/+ 2015/1999		CAGR 1999 - 2015	
	Employment	Annual Mean Salary	Employment	Annual Mean Salary	Employment	Annual Mean Salary	Employment	Annual Mean Salary	Annual Mean Salary	Mean Salary Growth Adjusted by Inflation
All Occupations	**996,050**	**NA**	**950,570**	**$26,870**	**890,760**	**$28,190**	**-105,290**	---	---	---
Management Occupations	37,970	$50,610	36,110	$67,740	38,140	$72,020	170	42.3%	2.4%	0.0%
Business and Financial Operations Occupations	**31,950**	**$27,560**	41,980	**$36,430**	39,890	$38,610	7,940	40.1%	2.3%	-0.1%
Computer and Mathematical Occupations	6,070	$33,060	9,360	$41,350	9,430	$43,110	3,360	30.4%	1.8%	-0.6%
Architecture and Engineering Occupations	12,420	$34,140	12,150	$50,440	12,700	$54,220	280	58.8%	3.1%	**0.8%**
Life, Physical, and Social Science Occupations	6,840	$30,540	7,160	$41,800	6,580	$45,280	-260	48.3%	2.7%	**0.3%**
Community and Social Services Occupations	12,770	$19,000	18,730	$28,420	15,670	$28,620	2,900	50.6%	2.8%	**0.4%**
Legal Occupations	3,750	$43,510	4,640	$58,900	4,460	$63,420	710	45.8%	2.5%	**0.2%**
Education, Training, and Library Occupations	63,690	$23,030	92,280	$31,320	65,910	$35,020	2,220	52.1%	2.8%	**0.5%**
Arts, Design, Entertainment, Sports, and Media Occupations	6,190	$27,040	6,590	$29,960	6,910	$32,660	720	20.8%	1.3%	-1.1%
Healthcare Practitioners and Technical Occupations	36,330	$21,820	45,600	$33,250	51,740	$35,850	15,410	64.3%	3.4%	**1.0%**
Healthcare Support Occupations	9,280	$14,390	13,980	$18,700	10,430	$19,730	1,150	37.1%	2.1%	-0.2%
Protective Service Occupations	64,820	$15,790	62,320	$25,350	54,470	$25,070	-10,350	58.8%	3.1%	**0.8%**
Food Preparation and Serving Related Occupations	62,390	$12,720	66,730	$17,740	71,680	$18,300	9,290	43.9%	2.5%	**0.1%**
Building and Grounds Cleaning and Maintenance Occupations	42,400	$13,230	44,760	$18,090	40,240	$19,310	-2,160	46.0%	2.6%	**0.2%**
Personal Care and Service Occupations	12,860	$14,790	11,840	$19,800	16,550	$18,780	3,690	27.0%	1.6%	-0.8%
Sales and Related Occupations	98,580	$17,840	101,910	$21,960	112,040	$21,980	13,460	23.2%	1.4%	-1.0%
Office and Administrative Support Occupations	181,720	$17,110	178,450	$23,300	167,480	$23,900	-14,240	39.7%	2.3%	-0.1%
Farming, Fishing, and Forestry Occupations	1,510	$14,430	1,340	$24,930	2,080	$21,530	570	49.2%	2.7%	**0.3%**
Construction and Extraction Occupations	72,140	$15,150	39,500	$20,740	29,560	$21,020	-42,580	38.7%	2.2%	-0.2%
Installation, Maintenance, and Repair Occupations	37,820	$20,540	31,120	$27,510	30,250	$27,320	-7,570	33.0%	1.9%	-0.5%
Production Occupations	112,390	$15,910	68,700	$22,360	61,130	$23,430	-51,260	47.3%	2.6%	**0.2%**
Transportation and Material Moving Occupations	82,160	$15,280	55,050	$20,660	43,410	$21,890	-38,750	43.3%	2.4%	**0.1%**
Job categories (Based on mean wages):							**CAGR**			
Higher wage occupations	135,330		157,000		162,940		1.2%			0.2%
As a % of total employment	13.6%		16.5%		18.3%					
Middle wage occupations	561,560		513,240		445,230		-1.5%			0.03%
As a % of total employment	56.4%		54.0%		50.0%					
Lower wage occupations	299,160		280,060		282,580		-0.4%			-0.2%
As a % of total employment	30.0%		29.5%		31.7%					

Source: U.S. BLS. Occupational Employment Surveys - Puerto Rico, 1999, 2010 and 2015. **Denotes real growth in salaries.**

TABLE 16

Distribution of Employment in High-Tech Oriented Occupations, and Salaries, 2010 and 2015

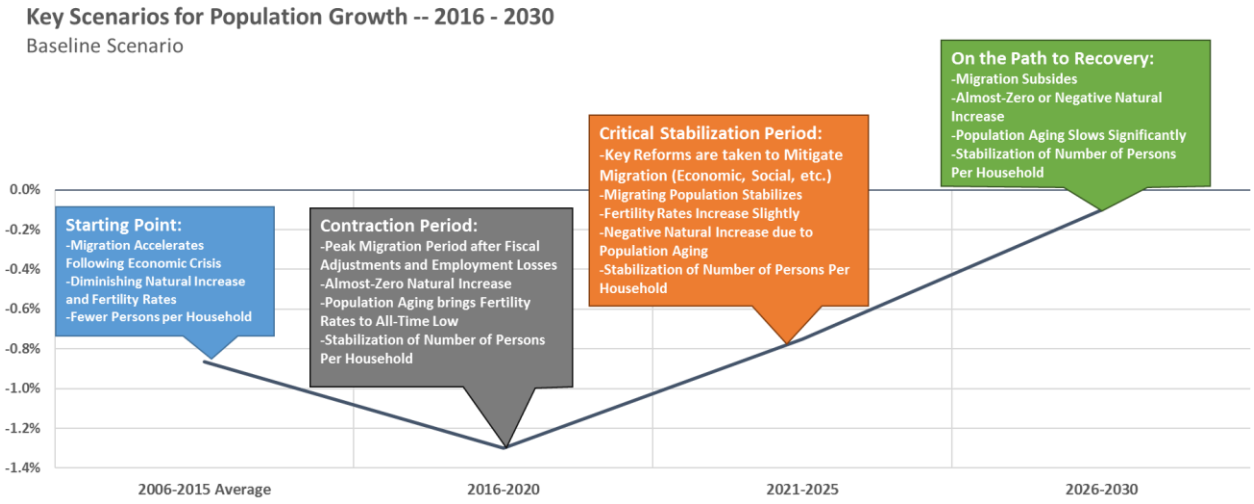
SOC	Occupations	Employment 2010	Hourly Mean 2010	Annual Mean 2010	Employment 2015	Hourly Mean 2015	Annual Mean 2015	2010/2015	Emplyment 2010/2015 (%)
000000	**All Occupations**	**950,570**	**$12.92**	**$26,870**	**890,760**	**$13.56**	**$28,190**	**-59,810**	**-6.3%**
113021	**Computer and Information Systems Managers**	840	$36.77	76,480	1,120	$37.31	77,600	280	**33.3%**
119041	**Architectural and Engineering Managers**	760	$46.57	96,870	890	$48.24	100,330	130	**17.1%**
119121	**Natural Sciences Managers**	90	$35.79	74,440	40	$46.64	97,000	-50	**-55.6%**
151121	**Computer Systems Analysts**	1,110	$23.74	49,370	990	$22.70	47,220	-120	**-10.8%**
151122	**Information Security Analysts**	NA	NA	NA	260	$21.41	44,540	NA	**---**
151131	**Computer Programmers**	1,680	$20.33	42,290	1,260	$21.38	44,460	-420	**-25.0%**
151132	**Software Developers, Applications**	550	$24.67	51,310	560	$25.91	53,890	10	**1.8%**
151133	**Software Developers, Systems Software**	360	$29.73	61,840	240	$34.79	72,370	-120	**-33.3%**
151134	**Web Developers**	NA	NA	NA	160	$17.42	36,230	NA	**---**
151141	**Database Administrators**	220	$21.90	45,550	460	$24.40	50,750	240	**109.1%**
151142	**Network and Computer Systems Administrators**	880	$21.25	44,200	670	$21.77	45,280	-210	**-23.9%**
151143	**Computer Network Architects**	NA	NA	NA	510	$22.76	47,330	NA	**---**
151150	**Computer Support Specialists**	2,630	$14.21	29,550	NA	NA	NA	NA	**---**
151151	**Computer User Support Specialists**	NA	NA	NA	3,000	$15.24	31,700	NA	**---**
151152	**Computer Network Support Specialists**	NA	NA	NA	500	$19.58	40,720	NA	**---**
152011	**Actuaries**	30	$25.70	53,460	NA	NA	NA	NA	**---**
152031	**Operations Research Analysts**	60	$26.51	55,140	120	$30.00	62,400	60	**100.0%**
152041	**Statisticians**	270	$16.07	33,440	190	$17.66	36,740	-80	**-29.6%**
172011	**Aerospace Engineers**	NA	NA	NA	490	$28.49	59,270	NA	**---**
172041	**Chemical Engineers**	110	$30.14	62,690	60	$30.31	63,040	-50	**-45.5%**
172051	**Civil Engineers**	1,860	$29.42	61,190	1,760	$27.26	56,690	-100	**-5.4%**
172061	**Computer Hardware Engineers**	240	$28.78	59,870	440	$33.34	69,350	200	**83.3%**
172071	**Electrical Engineers**	190	$30.04	62,470	650	$32.13	66,830	460	**242.1%**
172072	**Electronics Engineers, Except Computer**	250	$43.90	91,300	330	$35.44	73,720	80	**32.0%**
172081	**Environmental Engineers**	180	$26.59	55,300	250	$29.70	61,770	70	**38.9%**
172111	**Health and Safety Engineers, Except Mining Safety Engineers and Inspectors**	100	$31.93	66,410	50	$26.34	54,780	-50	**-50.0%**
172112	**Industrial Engineers**	2,140	$29.97	62,340	2,830	$33.95	70,620	690	**32.2%**
172131	**Materials Engineers**	50	$25.03	52,070	NA	NA	NA	NA	**---**
172141	**Mechanical Engineers**	490	$27.58	57,360	740	$23.89	49,690	250	**51.0%**
172199	**Engineers, All Other**	1,350	$28.82	59,940	320	$27.05	56,250	-1,030	**-76.3%**
173011	**Architectural and Civil Drafters**	480	$13.40	27,860	290	$13.86	28,830	-190	**-39.6%**
173012	**Electrical and Electronics Drafters**	NA	NA	NA	40	$21.22	44,140	NA	**---**
173013	**Mechanical Drafters**	110	$13.85	28,800	220	$14.98	31,150	110	**100.0%**
173022	**Civil Engineering Technicians**	190	$14.90	30,980	440	$12.92	26,880	250	**131.6%**
173023	**Electrical and Electronics Engineering Technicians**	1,190	$16.34	33,990	1,160	$20.45	42,540	-30	**-2.5%**
173024	**Electro-Mechanical Technicians**	NA	NA	NA	40	$22.71	47,240	NA	**---**
173025	**Environmental Engineering Technicians**	190	$11.09	23,080	200	$21.47	44,660	10	**5.3%**
173026	**Industrial Engineering Technicians**	810	$22.19	46,150	1,330	$19.79	41,160	520	**64.2%**
173027	**Mechanical Engineering Technicians**	170	$19.35	40,250	160	$14.58	30,330	-10	**-5.9%**
173029	**Engineering Technicians, Except Drafters, All Other**	890	$14.28	29,710	200	$18.70	38,890	-690	**-77.5%**
173031	**Surveying and Mapping Technicians**	170	$10.64	22,140	170	$11.18	23,260	0	**0.0%**
191012	**Food Scientists and Technologists**	30	$26.58	55,280	NA	NA	NA	NA	**---**
191013	**Soil and Plant Scientists**	480	$17.83	37,090	NA	NA	NA	NA	**---**
191021	**Biochemists and Biophysicists**	50	$18.52	38,520	50	$26.44	55,000	0	**0.0%**
191022	**Microbiologists**	280	$20.89	43,450	220	$24.12	50,170	-60	**-21.4%**
191029	**Biological Scientists, All Other**	310	$23.85	49,600	280	$27.80	57,830	-30	**-9.7%**
191031	**Conservation Scientists**	30	$29.35	61,050	NA	NA	NA	NA	**---**
191041	**Epidemiologists**	60	$17.25	35,890	60	$18.99	39,510	0	**0.0%**
191042	**Medical Scientists, Except Epidemiologists**	50	$35.19	73,200	120	$20.66	42,970	70	**140.0%**
191099	**Life Scientists, All Other**	180	$19.44	40,440	NA	$24.47	50,890	NA	**---**
192031	**Chemists**	1,520	$23.90	49,710	1,190	$27.57	57,340	-330	**-21.7%**
192041	**Environmental Scientists and Specialists, Including Health**	500	$16.42	34,160	480	$25.22	52,450	-20	**-4.0%**
192042	**Geoscientists, Except Hydrologists and Geographers**	40	$18.83	39,170	80	$36.79	76,530	40	**100.0%**
194021	**Biological Technicians**	250	$14.92	31,030	530	$17.27	35,920	280	**112.0%**
194031	**Chemical Technicians**	1,050	$17.69	36,800	1,160	$16.49	34,290	110	**10.5%**
194091	**Environmental Science and Protection Technicians, Including Health**	130	$10.72	22,300	80	$17.26	35,890	-50	**-38.5%**
194092	**Forensic Science Technicians**	NA	NA	NA	130	$14.35	29,850	NA	**---**
194093	**Forest and Conservation Technicians**	NA	NA	NA	50	$15.34	31,920	NA	**---**
251021	**Computer Science Teachers, Postsecondary**	220	NA	56,000	330	NA	45,530	110	**50.0%**
251022	**Mathematical Science Teachers, Postsecondary**	170	NA	42,650	220	NA	62,750	50	**29.4%**
251032	**Engineering Teachers, Postsecondary**	270	NA	47,310	450	NA	63,580	180	**66.7%**
251042	**Biological Science Teachers, Postsecondary**	150	NA	55,380	250	NA	62,620	100	**66.7%**
251052	**Chemistry Teachers, Postsecondary**	70	NA	55,010	250	NA	64,490	180	**257.1%**
251054	**Physics Teachers, Postsecondary**	50	NA	68,890	110	NA	74,710	60	**120.0%**
292033	**Nuclear Medicine Technologists**	110	$19.09	39,700	100	$19.78	41,130	-10	**-9.1%**
	Total	**26,640**			**29,280**				**9.9%**
	As a share of total employment	**2.8%**			**3.3%**				

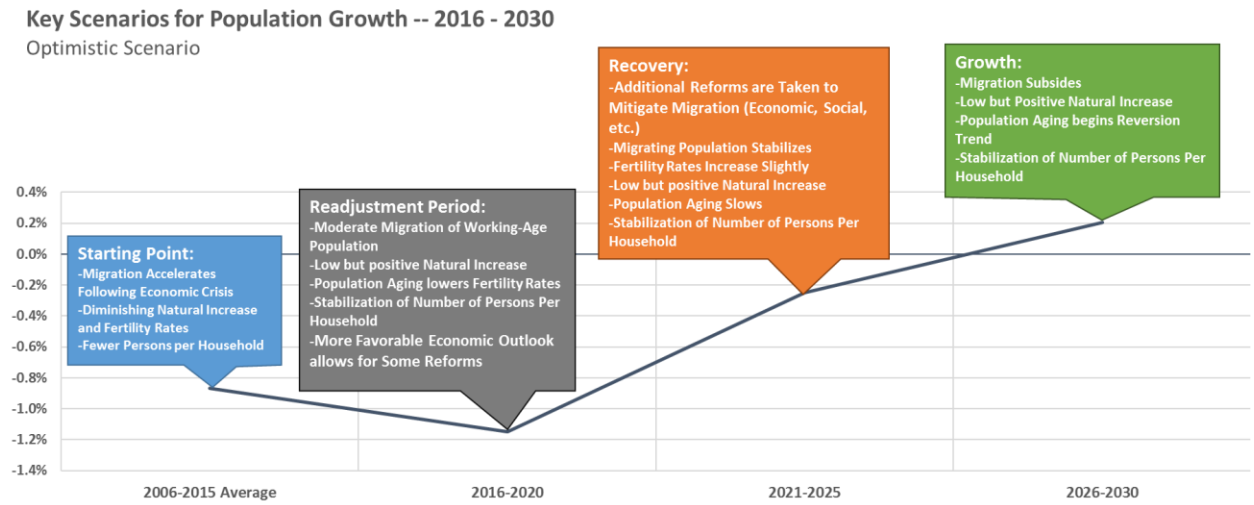
Source: U.S. BLS (2016). Occupational Employment Survey - Puerto Rico (May 2015). NA = Not available

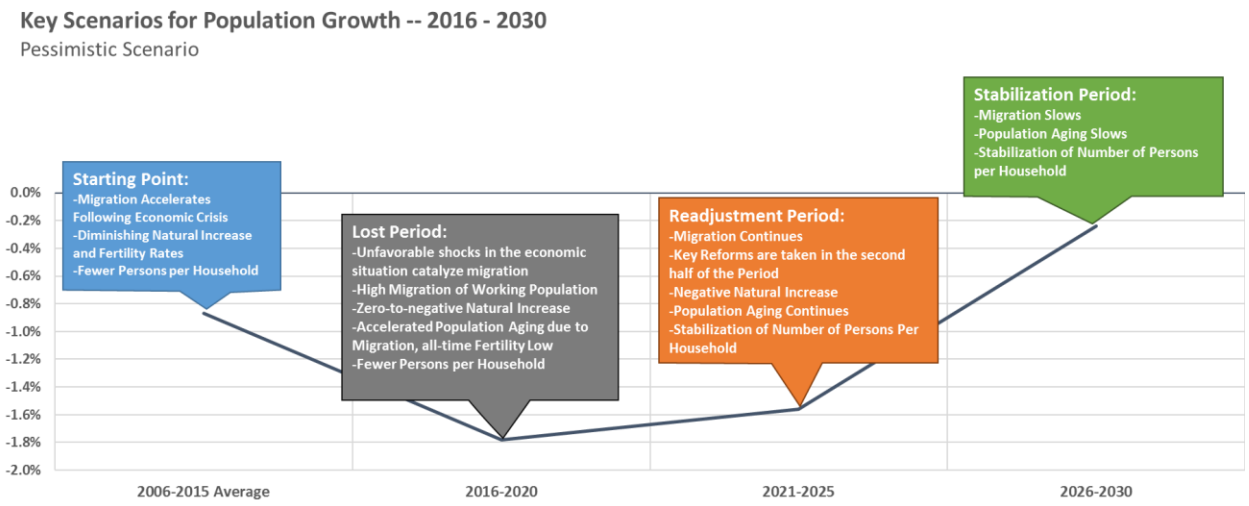
Note: It is possible that some occupations with data for 2010 but not for 2015 might have been redistributed among those for 2015.

Appendix I: Detailed Scenario Assumptions for Key Economic Indicators

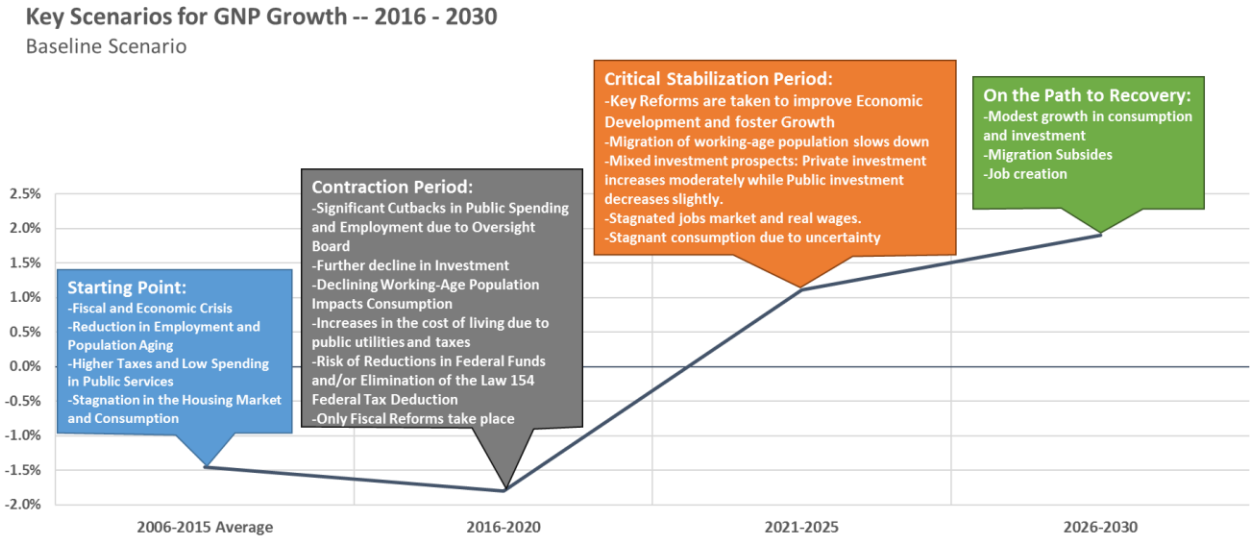
Population

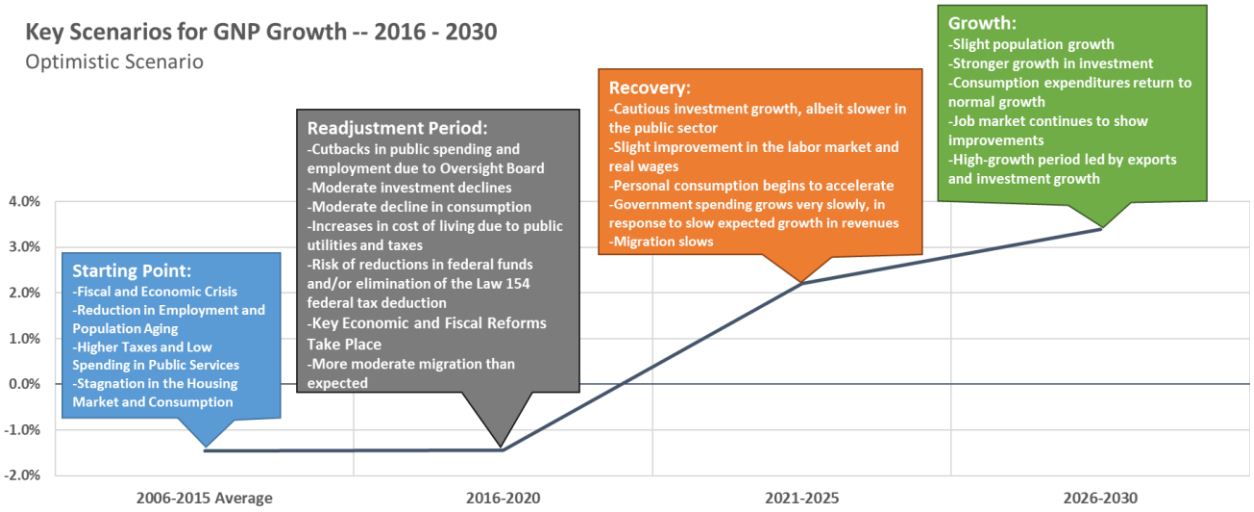


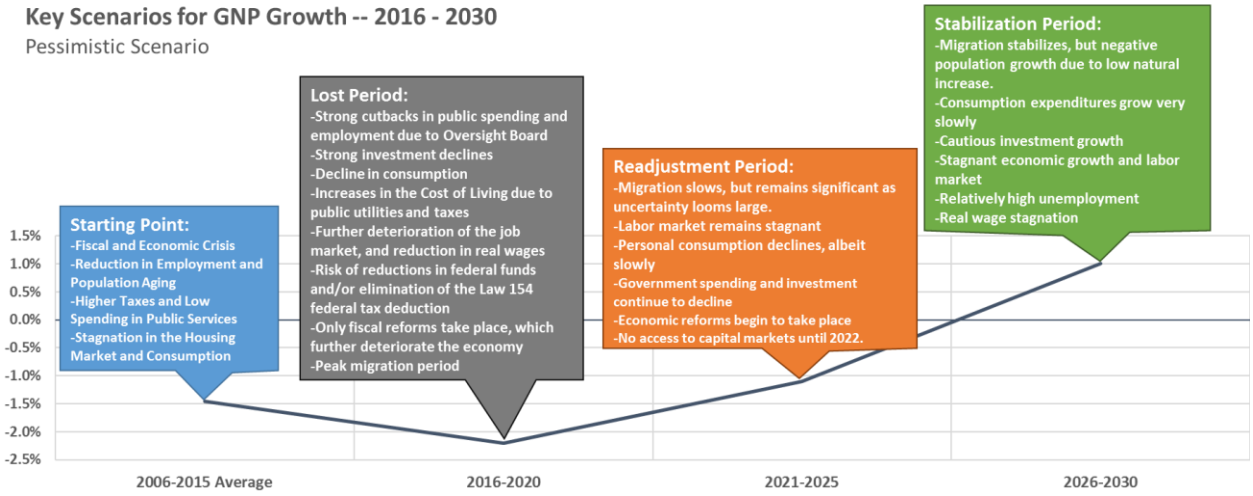



Key Scenarios for Population Growth -- 2016 - 2030
Pessimistic Scenario
Starting Point:
-Migration Accelerates Following Economic Crisis
-Diminishing Natural Increase and Fertility Rates
-Fewer Persons per Household
Lost Period:
-Unfavorable shocks in the economic situation catalyze migration
-High Migration of Working Population
-Zero-to-negative Natural Increase
-Accelerated Population Aging due to Migration, all-time Fertility Low
-Fewer Persons per Household
Readjustment Period:
-Migration Continues
-Key Reforms are taken in the second half of the Period
-Negative Natural Increase
-Population Aging Continues
-Stabilization of Number of Persons Per Household
Stabilization Period:
-Migration Slows
-Population Aging Slows
-Stabilization of Number of Persons per Household
0.0%
-0.2%
-0.4%
-0.6%
-0.8%
-1.0%
-1.2%
-1.4%
-1.6%
-1.8%
-2.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030

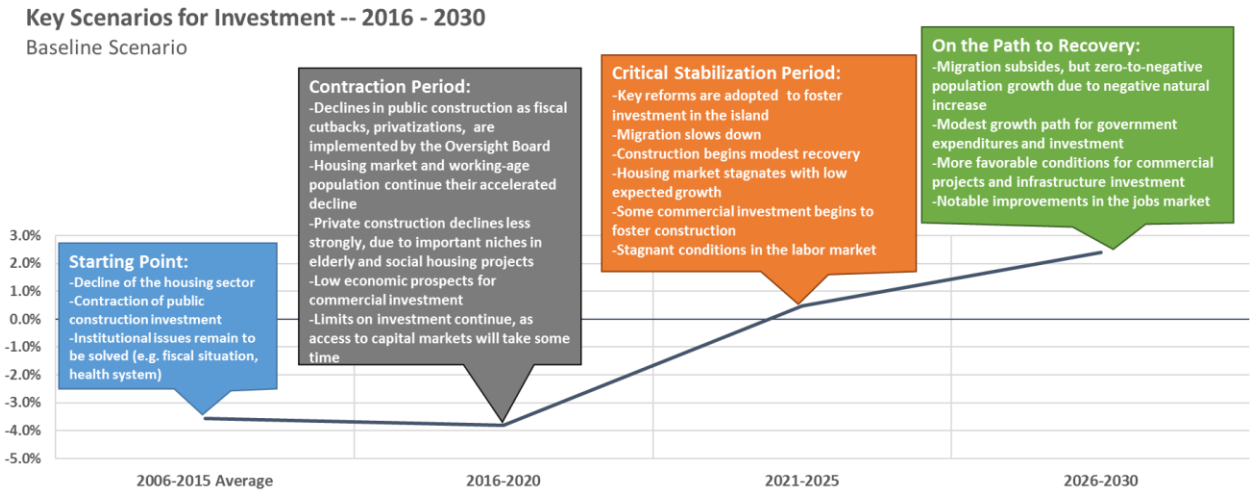
GNP Growth

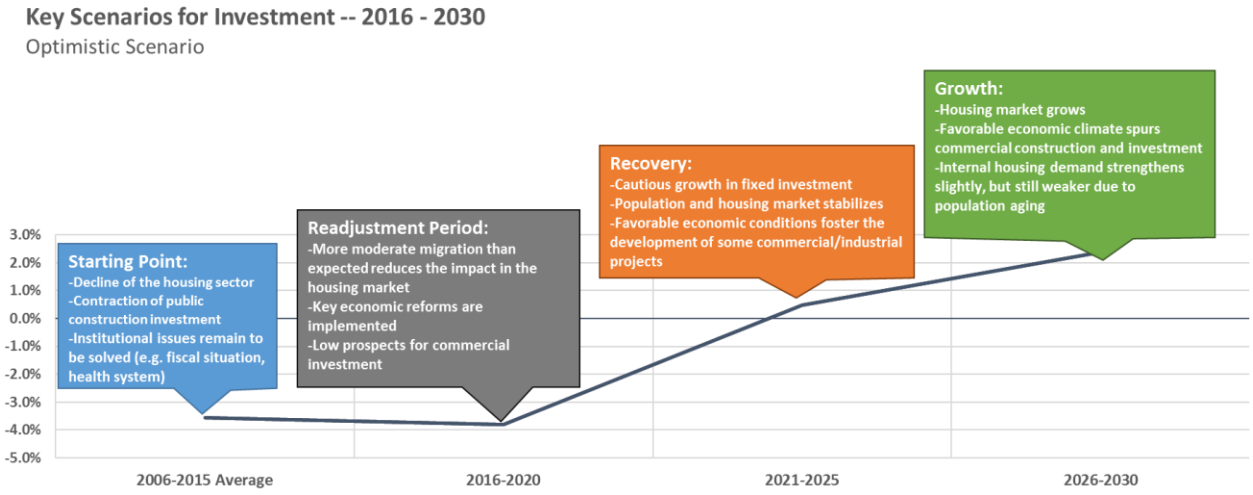

Key Scenarios for GNP Growth -- 2016 - 2030
Baseline Scenario
Starting Point:
-Fiscal and Economic Crisis
-Reduction in Employment and Population Aging
-Higher Taxes and Low Spending in Public Services
-Stagnation in the Housing Market and Consumption
Contraction Period:
-Significant Cutbacks in Public Spending and Employment due to Oversight Board
-Further decline in Investment
-Declining Working-Age Population Impacts Consumption
-Increases in the cost of living due to public utilities and taxes
-Risk of Reductions in Federal Funds and/or Elimination of the Law 154 Federal Tax Deduction
-Only Fiscal Reforms take place
Critical Stabilization Period:
-Key Reforms are taken to improve Economic Development and foster Growth
-Migration of working-age population slows down
-Mixed investment prospects: Private investment increases moderately while Public investment decreases slightly.
-Stagnated jobs market and real wages.
-Stagnant consumption due to uncertainty
On the Path to Recovery:
-Modest growth in consumption and investment
-Migration Subsides
-Job creation
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
-0.5%
-1.0%
-1.5%
-2.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030

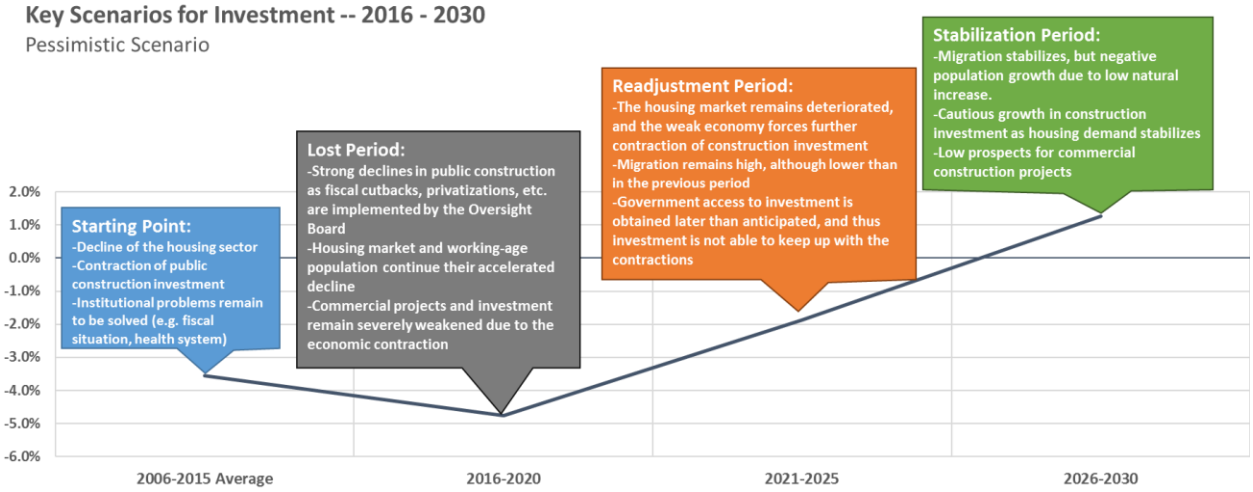

Key Scenarios for GNP Growth -- 2016 - 2030
Optimistic Scenario
Starting Point:
-Fiscal and Economic Crisis
-Reduction in Employment and Population Aging
-Higher Taxes and Low Spending in Public Services
-Stagnation in the Housing Market and Consumption
Readjustment Period:
-Cutbacks in public spending and employment due to Oversight Board
-Moderate investment declines
-Moderate decline in consumption
-Increases in cost of living due to public utilities and taxes
-Risk of reductions in federal funds and/or elimination of the Law 154 federal tax deduction
-Key Economic and Fiscal Reforms Take Place
-More moderate migration than expected
Recovery:
-Cautious investment growth, albeit slower in the public sector
-Slight improvement in the labor market and real wages
-Personal consumption begins to accelerate
-Government spending grows very slowly, in response to slow expected growth in revenues
-Migration slows
Growth:
-Slight population growth
-Stronger growth in investment
-Consumption expenditures return to normal growth
-Job market continues to show improvements
-High-growth period led by exports and investment growth
4.0%
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030


Key Scenarios for GNP Growth -- 2016 - 2030
Pessimistic Scenario
Starting Point:
-Fiscal and Economic Crisis
-Reduction in Employment and Population Aging
-Higher Taxes and Low Spending in Public Services
-Stagnation in the Housing Market and Consumption
Lost Period:
-Strong cutbacks in public spending and employment due to Oversight Board
-Strong investment declines
-Decline in consumption
-Increases in the Cost of Living due to public utilities and taxes
-Further deterioration of the job market, and reduction in real wages
-Risk of reductions in federal funds and/or elimination of the Law 154 federal tax deduction
-Only fiscal reforms take place, which further deteriorate the economy
-Peak migration period
Readjustment Period:
-Migration slows, but remains significant as uncertainty looms large.
-Labor market remains stagnant
-Personal consumption declines, albeit slowly
-Government spending and investment continue to decline
-Economic reforms begin to take place
-No access to capital markets until 2022.
Stabilization Period:
-Migration stabilizes, but negative population growth due to low natural increase.
-Consumption expenditures grow very slowly
-Cautious investment growth
-Stagnant economic growth and labor market
-Relatively high unemployment
-Real wage stagnation
1.5%
1.0%
0.5%
0.0%
-0.5%
-1.0%
-1.5%
-2.0%
-2.5%
2006-2015 Average
2016-2020
2021-2025
2026-2030

Investment

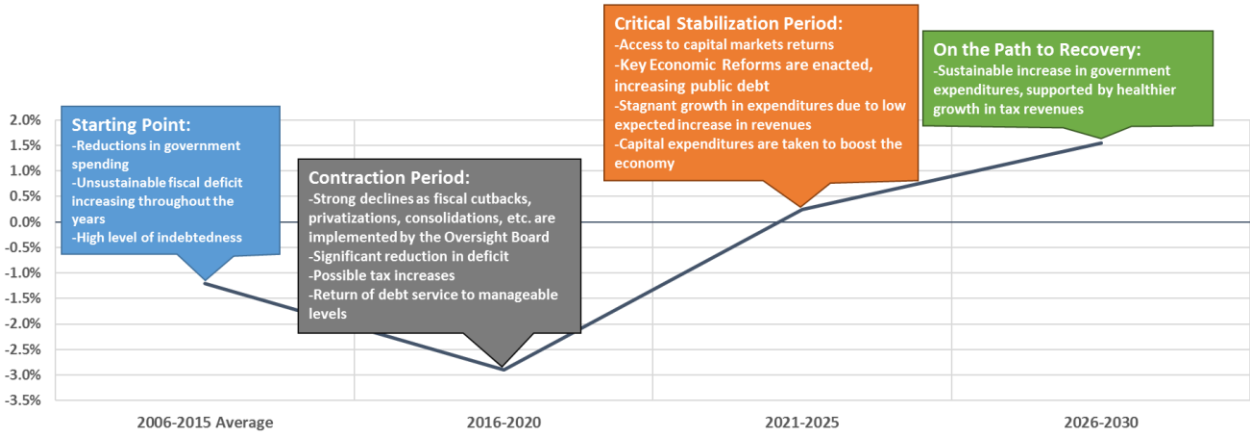

Key Scenarios for Investment -- 2016 - 2030
Baseline Scenario
Starting Point:
-Decline of the housing sector
-Contraction of public construction investment
-Institutional issues remain to be solved (e.g. fiscal situation, health system)
Contraction Period:
-Declines in public construction as fiscal cutbacks, privatizations, are implemented by the Oversight Board
-Housing market and working-age population continue their accelerated decline
-Private construction declines less strongly, due to important niches in elderly and social housing projects
-Low economic prospects for commercial investment
-Limits on investment continue, as access to capital markets will take some time
Critical Stabilization Period:
-Key reforms are adopted to foster investment in the island
-Migration slows down
-Construction begins modest recovery
-Housing market stagnates with low expected growth
-Some commercial investment begins to foster construction
-Stagnant conditions in the labor market
On the Path to Recovery:
-Migration subsides, but zero-to-negative population growth due to negative natural increase
-Modest growth path for government expenditures and investment
-More favorable conditions for commercial projects and infrastructure investment
-Notable improvements in the jobs market
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
-4.0%
-5.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030


Key Scenarios for Investment -- 2016 - 2030
Optimistic Scenario
Starting Point:
-Decline of the housing sector
-Contraction of public construction investment
-Institutional issues remain to be solved (e.g. fiscal situation, health system)
Readjustment Period:
-More moderate migration than expected reduces the impact in the housing market
-Key economic reforms are implemented
-Low prospects for commercial investment
Recovery:
-Cautious growth in fixed investment
-Population and housing market stabilizes
-Favorable economic conditions foster the development of some commercial/industrial projects
Growth:
-Housing market grows
-Favorable economic climate spurs commercial construction and investment
-Internal housing demand strengthens slightly, but still weaker due to population aging
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
-4.0%
-5.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030

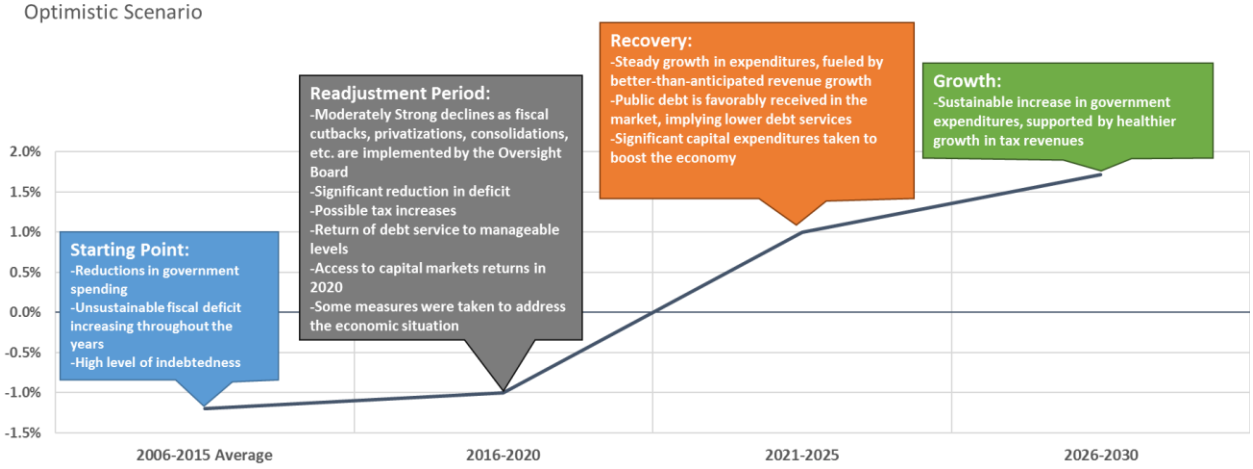

Key Scenarios for Investment -- 2016 - 2030
Pessimistic Scenario
Starting Point:
-Decline of the housing sector
-Contraction of public construction investment
-Institutional problems remain to be solved (e.g. fiscal situation, health system)
Lost Period:
-Strong declines in public construction as fiscal cutbacks, privatizations, etc. are implemented by the Oversight Board
-Housing market and working-age population continue their accelerated decline
-Commercial projects and investment remain severely weakened due to the economic contraction
Readjustment Period:
-The housing market remains deteriorated, and the weak economy forces further contraction of construction investment
-Migration remains high, although lower than in the previous period
-Government access to investment is obtained later than anticipated, and thus investment is not able to keep up with the contractions
Stabilization Period:
-Migration stabilizes, but negative population growth due to low natural increase.
-Cautious growth in construction investment as housing demand stabilizes
-Low prospects for commercial construction projects
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
-4.0%
-5.0%
-6.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030

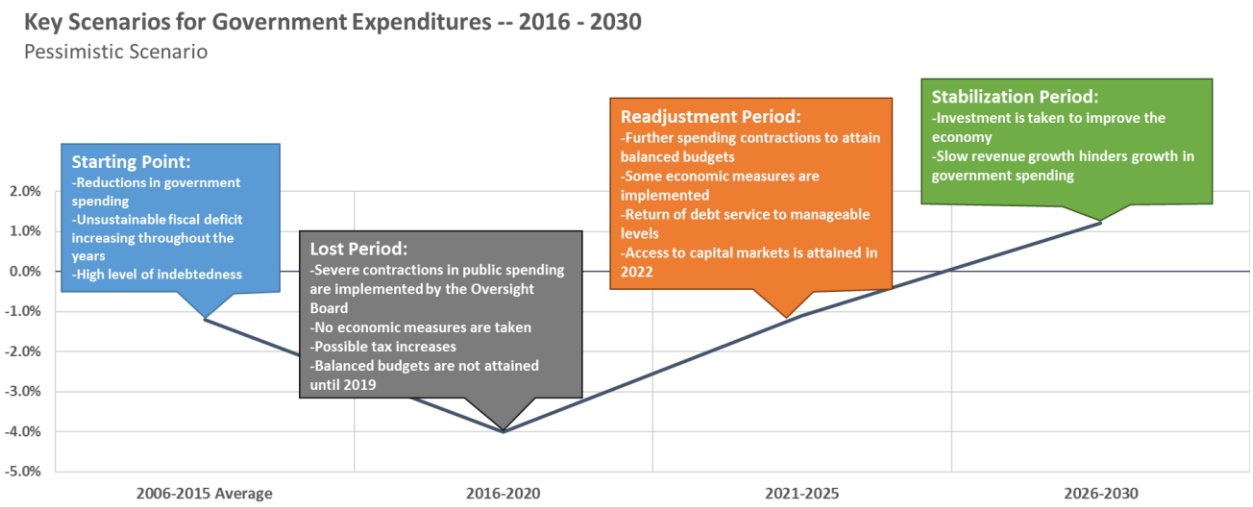
Government Expenditures

Key Scenarios for Government Expenditures -- 2016 - 2030
Baseline Scenario

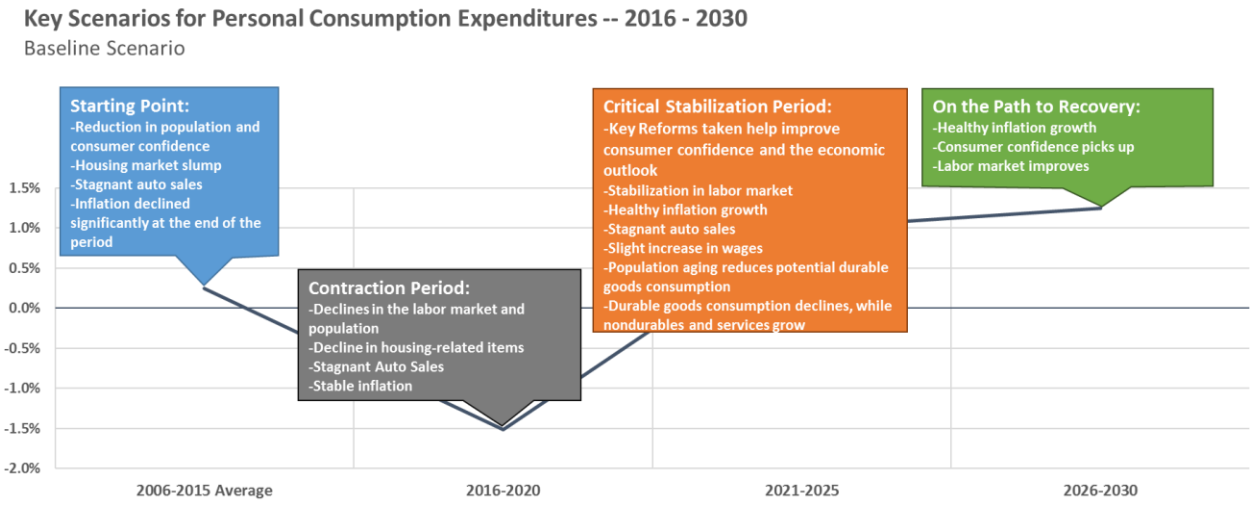


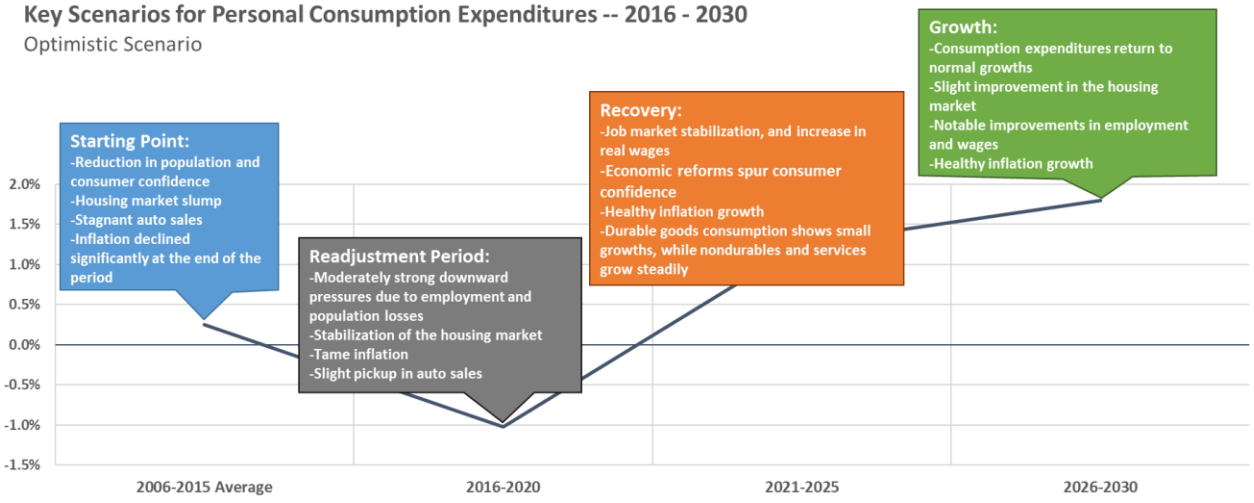
Key Scenarios for Government Expenditures -- 2016 - 2030
Optimistic Scenario

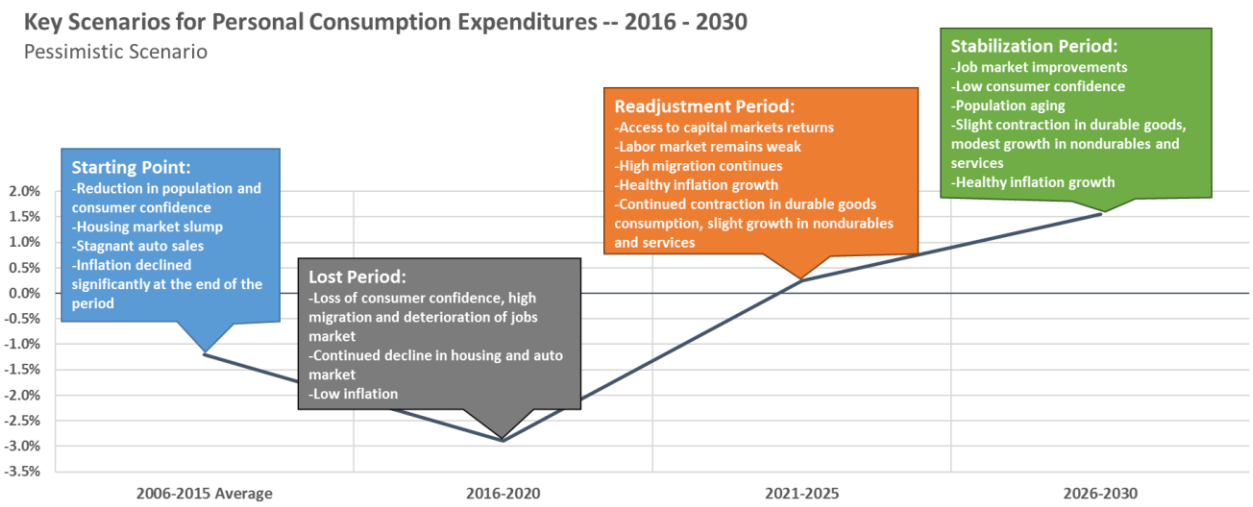



Key Scenarios for Government Expenditures -- 2016 - 2030
Pessimistic Scenario
Starting Point:
-Reductions in government spending
-Unsustainable fiscal deficit increasing throughout the years
-High level of indebtedness
Lost Period:
-Severe contractions in public spending are implemented by the Oversight Board
-No economic measures are taken
-Possible tax increases
-Balanced budgets are not attained until 2019
Readjustment Period:
-Further spending contractions to attain balanced budgets
-Some economic measures are implemented
-Return of debt service to manageable levels
-Access to capital markets is attained in 2022
Stabilization Period:
-Investment is taken to improve the economy
-Slow revenue growth hinders growth in government spending
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
-4.0%
-5.0%
2006-2015 Average
2016-2020
2021-2025
2026-2030

Personal Consumption Expenditures






Key Scenarios for Personal Consumption Expenditures -- 2016 - 2030
Pessimistic Scenario
Starting Point:
-Reduction in population and consumer confidence
-Housing market slump
-Stagnant auto sales
-Inflation declined significantly at the end of the period
Lost Period:
-Loss of consumer confidence, high migration and deterioration of jobs market
-Continued decline in housing and auto market
-Low inflation
Readjustment Period:
-Access to capital markets returns
-Labor market remains weak
-High migration continues
-Healthy inflation growth
-Continued contraction in durable goods consumption, slight growth in nondurables and services
Stabilization Period:
-Job market improvements
-Low consumer confidence
-Population aging
-Slight contraction in durable goods, modest growth in nondurables and services
-Healthy inflation growth
2.0%
1.5%
1.0%
0.5%
0.0%
-0.5%
-1.0%
-1.5%
-2.0%
-2.5%
-3.0%
-3.5%
2006-2015 Average
2016-2020
2021-2025
2026-2030

Appendix II: Detailed Scenario Tables (11 Variables)

Comparison of Key Indicators Across Time Periods -- Optimistic Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,308,045	3,266,901	3,300,194
Gross National Product (Growth)	-1.5%	-1.4%	2.2%	3.4%
Personal Consumption Expenditures (Growth)	0.2%	-1.0%	1.3%	1.8%
Investment (Growth):	-3.6%	-2.4%	1.3%	2.9%
Public Construction	-9.0%	-4.9%	3.1%	2.9%
Private Construction	-8.0%	-3.3%	1.9%	3.1%
Machinery & Equipment	-0.5%	-1.9%	1.0%	2.8%
Government Expenditures (Growth)	-1.2%	-1.0%	1.0%	1.7%
Employment (End of Period)	984.0	940.5	966.7	1,008.4
Unemployment Rate	13.3	12.2	11.1	10.8
Labor Participation Rate	39.9	38.9	40.5	42.9

Comparison of Key Indicators Across Time Periods -- Baseline Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,283,022	3,161,742	3,145,964
Gross National Product (Growth)	-1.5%	-1.8%	1.1%	1.9%
Personal Consumption Expenditures (Growth)	0.2%	-1.5%	1.0%	1.3%
Investment (Growth):	-3.6%	-3.8%	0.5%	2.4%
Public Construction	-9.0%	-6.7%	2.6%	1.8%
Private Construction	-8.0%	-4.4%	1.2%	2.5%
Machinery & Equipment	-0.5%	-3.3%	0.1%	2.4%
Government Expenditures (Growth)	-1.2%	-2.9%	0.3%	1.6%
Employment (End of Period)	984.0	930.1	932.9	962.3
Unemployment Rate	13.3	14.3	13.6	11.9
Labor Participation Rate	39.9	39.2	39.4	42.1

Comparison of Key Indicators Across Time Periods -- Pessimistic Scenario

Fiscal Years -- 2006 - 2030

Variable	Period			
	2006-2015	2016-2020	2021-2025	2026-2030
Population (End of Period)	3,505,000	3,203,964	2,961,732	2,926,361
Gross National Product (Growth)	-1.5%	-2.2%	-1.1%	1.0%
Personal Consumption Expenditures (Growth)	0.2%	-1.7%	-0.9%	0.9%
Investment (Growth):	-3.6%	-4.8%	-1.9%	1.3%
Public Construction	-9.0%	-7.2%	-2.8%	1.1%
Private Construction	-8.0%	-6.0%	-2.8%	2.1%
Machinery & Equipment	-0.5%	-4.2%	-1.6%	1.1%
Government Expenditures (Growth)	-1.2%	-4.0%	-1.1%	1.2%
Employment (End of Period)	984.0	917.0	903.3	911.1
Unemployment Rate	13.3	15.0	14.9	14.3
Labor Participation Rate	39.9	37.9	37.0	38.1