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Second District Highlights



The Causes and Consequences of Puerto Rico's Declining Population

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Puerto Rico's population has been falling for nearly a decade, and the pace of decline has accelerated in recent years.

Although a slowdown in the island's birthrate has contributed to this decline, a surge in the out-migration of its citizens has been a more important factor. The exodus—which includes a large share of younger people—has hastened population aging, but it has not necessarily led to a "brain drain." To counter its population loss, Puerto Rico must not only adopt measures to shore up its economy and expand job opportunities, but also enact fiscal reforms and improve the island's amenities.

Alongside the many economic challenges currently facing Puerto Rico is a significant demographic challenge: the island's population has shrunk by more than 5 percent over the course of a decade. Population loss of this magnitude is not uncommon for regions of the U.S. mainland—indeed, New York, West Virginia, and Wyoming have all seen declines that rival Puerto Rico's recent experience. But the gravity of the problem becomes more apparent when Puerto Rico, a commonwealth, is compared with countries around the globe: According to estimates for 2014,¹ Puerto Rico ranks a surprising seventh in population loss.

This troubling decline presents a host of difficulties for the island. A smaller population translates into a shrinking tax base, which in turn strains government finances. In addition, Puerto Rico is losing a disproportionate share of its younger citizens, a trend that has accelerated the aging of its population. This demographic shift adds to the burden of supporting the island's elderly population, who tend to be poorer and more intensive users of the health care system, and puts stress on already fragile pension systems. Together, these pressures can create a cycle of economic decay and further population losses that can be difficult to break.

In this issue of *Second District Highlights*, we examine the causes and consequences of Puerto Rico's recent population decline. We show that the driving forces behind the decline are falling birthrates and a large

¹ See CIA Factbook (2014).

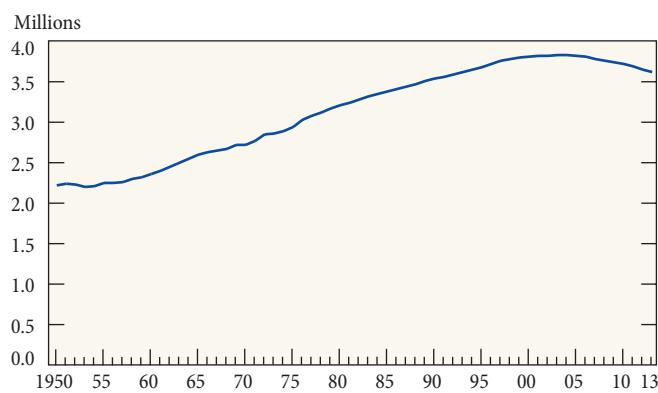
net out-migration of the island's citizens. Further, we demonstrate that although population outflows have accelerated the pace of population aging, out-migration has not necessarily led to a "brain drain." In fact, the share of residents with a college degree has increased slightly in recent years—in part because people without college degrees have been leaving in higher numbers. Finally, we consider how Puerto Rico might best address its population loss. While measures to shore up the island's economy are a necessary step to curtail the decline, Puerto Rico must also pursue fiscal reforms and improve the island's amenities. Together, these efforts could create economic opportunities for workers and make the island more attractive to residents and businesses, thereby helping to counter the island's population decline.

Magnitude of Population Loss

Puerto Rico's population grew at a steady clip following World War II, rising from 2.2 million in the early 1950s to a peak of about 3.8 million in 2004 (Chart 1). Since then, however, the population has been falling. While the decline dates from 2005, breaks in the island's trend population growth actually began much earlier (Chart 2). Puerto Rico's annual population growth rate averaged about 1.7 percent during the 1970s, and then began to slow in the early 1980s. Between 1982 and 1992, that rate dropped by half, from 1.2 percent to 0.6 percent. Population growth picked up briefly between 1992 and 1996, only to give way to a sharper and more sustained downward trend. The population growth rate turned negative in 2005, and by 2013, the annual pace of decline totaled a full percentage point—a very significant loss in demographic terms. Overall, Puerto Rico's population fell to about 3.6 million in 2013, a loss of 212,000 residents, or 5.5 percent, over nine years.

Chart 1

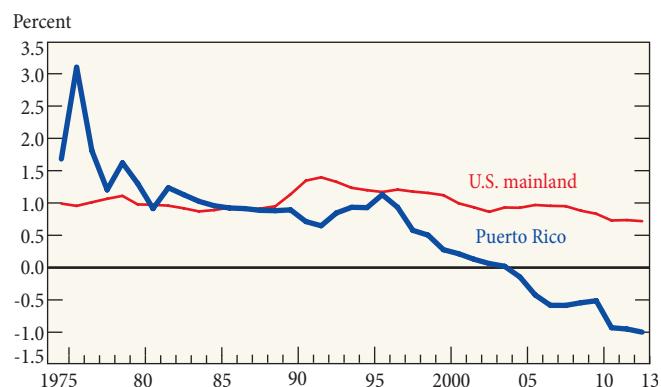
Population of Puerto Rico



Sources: U.S. Census Bureau; Moody's Analytics.

Chart 2

Annual Population Growth Rates: Puerto Rico and the U.S. Mainland



Sources: U.S. Census Bureau; Moody's Analytics; authors' calculations.

Why Has Puerto Rico's Population Declined?

To uncover what has caused Puerto Rico's population to drop, we break down population change into its constituent parts: first, the natural increase² from the net effects of residents' births and deaths and, second, net migration, which reflects the movement of people in and out of Puerto Rico. We find that each component has played an important role in influencing Puerto Rico's population trends over the past several decades.

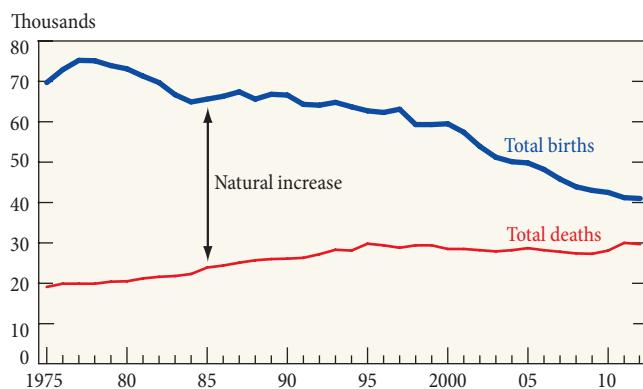
Puerto Rico's natural increase in population has been shrinking over time (Chart 3). Though births held fairly steady from the early 1980s into the mid-1990s, they have generally been falling since the 1970s, and were cut by almost half over the last four decades, with a particularly sharp decline beginning in the late 1990s. The general downward trend in the island's births over the past several decades can be attributed to factors that explain falling birthrates in many other developed countries, including greater access to effective birth control, an increase in women's participation in the labor force, rising incomes, and higher educational attainment. The more recent sharp decline over the past decade and a half may also be tied to Puerto Rico's poor economy, which has made child-rearing more difficult to afford for some. Puerto Rico's deaths climbed from the mid-1970s to the mid-1990s, rising nearly 50 percent, and have held steady at a higher level since then. This rise in deaths stems in part from an aging population.

Taken together, falling births and rising deaths have resulted in a continuous shrinking of the island's natural population increase over the past four decades. This trend, due here

² The demographic term *natural increase* is defined as the difference between the number of live births and the number of deaths in a particular period. The natural increase becomes negative if the number of deaths exceeds the number of births.

Chart 3

Natural Population Increase in Puerto Rico



Sources: U.S. Census Bureau; Moody's Analytics.

primarily to falling birthrates, is not unusual in developed countries. In fact, Italy, Germany, and Japan have seen their natural population increase turn into a decrease in recent years.

The second source of Puerto Rico's population change is migration. The Jones Act of 1917 granted U.S. citizenship to the people of Puerto Rico, allowing them freedom to move between the island and the U.S. mainland. Migration to the U.S. mainland became much more common beginning in the 1950s when low-cost air travel between Puerto Rico and the United States was introduced, and its influence on the island's population has remained significant since then.

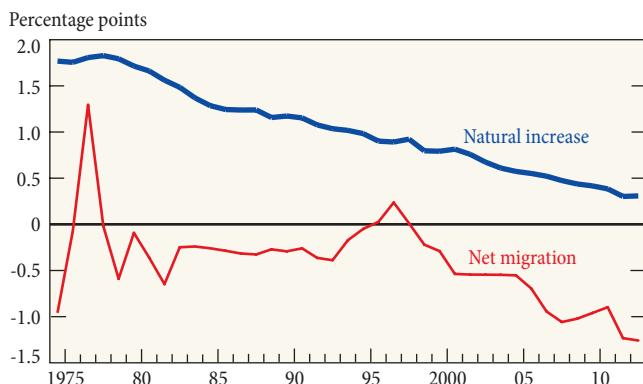
Our next step is to consider the relative impact of natural population increase and net migration on Puerto Rico's annual population growth rate. We calculate net migration by subtracting the island's natural population increase from its total population change, interpreting the difference between these two as the change in population from the movement of people in and out of Puerto Rico.

The contribution of natural population increase to population growth has steadily declined over time, adding 1.8 percentage points to annual population growth in the 1970s but just 0.3 percentage point by 2013 (Chart 4). For the most part, the contribution of net migration to population growth has been negative in Puerto Rico, meaning that out-migrants have tended to outnumber in-migrants. This negative contribution grew from about -0.3 percentage point in the 1980s and 1990s to about -1.3 percentage points by 2013.

If we look at the degree to which the natural population increase and net migration have affected population growth rates over the past four decades, some telling findings emerge. First, the downward trend in the island's population growth from 1982 to 1992 was driven by a slowdown in its natural population increase that reflected both a declining birthrate

Chart 4

Contribution of Natural Increase and Net Migration to Puerto Rico's Annual Population Growth Rate



Sources: U.S. Census Bureau; Moody's Analytics; authors' calculations.

and an increasing death rate. Second, the pickup in population growth in the 1990s resulted from a reduction in net outflows starting in 1993, and a small net inflow between 1995 and 1997—most likely tied to Puerto Rico's relatively strong economic growth during this time. Third, the population growth slowdown that began in the late 1990s and turned into a population decline by 2005 resulted from both a sharp downturn in the island's birthrate and, more significantly, a large out-migration of its citizens. An event that may have contributed to this large out-migration was the repeal of Section 936 of the Internal Revenue Service Code—a provision that had boosted manufacturing activity and employment in Puerto Rico by exempting multinational corporations from paying U.S. corporate income taxes on profits from their operations there. More generally, Puerto Rico's high unemployment and weak economic conditions during this time likely prompted a number of workers to seek better job opportunities elsewhere.

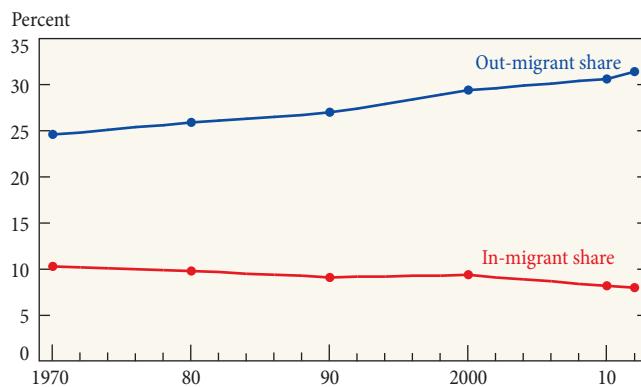
A Closer Look at Puerto Rico's Migration Patterns

Because migration has played such an important role in Puerto Rico's recent population decline, we focus our analysis next on how it has shaped the island's population demographics—in particular, its age profile and human capital stock. To begin, we examine the components of net migration: in-migration and out-migration. We then look at differences in the characteristics of in-migrants and out-migrants relative to the population as a whole to see how migration has changed the characteristics of the island's people.

To identify in-migrants and out-migrants, we rely on micro-level data from the decennial censuses of both the United States and Puerto Rico for the years 1970, 1980, 1990, and 2000, and the American Community Survey and Puerto Rico Community Survey for the years

Chart 5

Puerto Rico's Out- and In-Migrant Shares



Sources: U.S. Census Bureau; Decennial Census; American Community Survey; Puerto Rico Community Survey; authors' calculations.

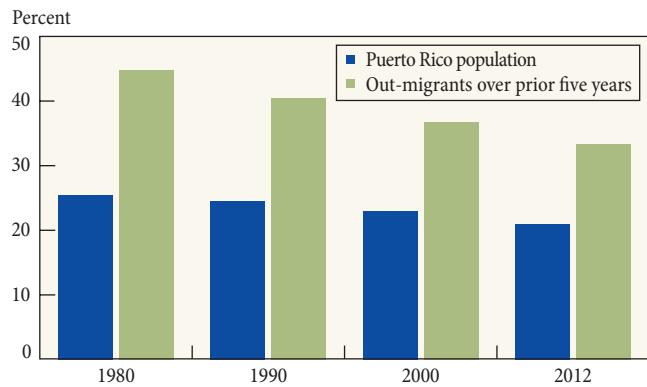
Notes: The out-migrant share is defined as the number of people born in Puerto Rico who are living on the U.S. mainland divided by native-born Puerto Rico residents plus these out-migrants. The in-migrant share is the number of people living in Puerto Rico who were not born on the island divided by the number of native-born Puerto Rico residents plus these in-migrants.

2005 through 2012. We identify a person as an in-migrant if he or she lives on the island but was born outside of Puerto Rico, and an out-migrant if he or she lives on the U.S. mainland but was born in Puerto Rico. Unfortunately, these data have limitations. While we are able to identify the *stock* of migrants at a point in time, the data do not allow us to identify migrant *flows* on a historical basis. Thus, we are unable to count the number of people migrating in and the number of people migrating out each year prior to 2005. In addition, since we rely on data sets from the United States and Puerto Rico, we only capture information about those out-migrants who move to the U.S. mainland and not those who move to other countries.

We see in Chart 5 how the number of people moving to and from Puerto Rico has changed over time by plotting out-migrant and in-migrant shares. The *out-migrant share* is defined as the number of people born in Puerto Rico who are living on the U.S. mainland at a particular point in time divided by the "potential" Puerto Rico population—native-born Puerto Rico residents plus these out-migrants. A rising out-migrant share between two points in time indicates that people have left Puerto Rico for the mainland. This share was about 25 percent in 1970, meaning that roughly a quarter of all those born in Puerto Rico lived on the U.S. mainland at that time. The out-migrant share rose at a fairly steady pace between 1970 and 1990, and then the rate of growth picked up over the 1990s. By 2012, the share had reached almost 32 percent, so that about a third of the Puerto Rican-born population lived on the U.S. mainland.

Chart 6

Share of Puerto Rico Population and Out-Migrants Aged Sixteen to Thirty



Sources: U.S. Census Bureau; Decennial Census; American Community Survey; Puerto Rico Community Survey; authors' calculations.

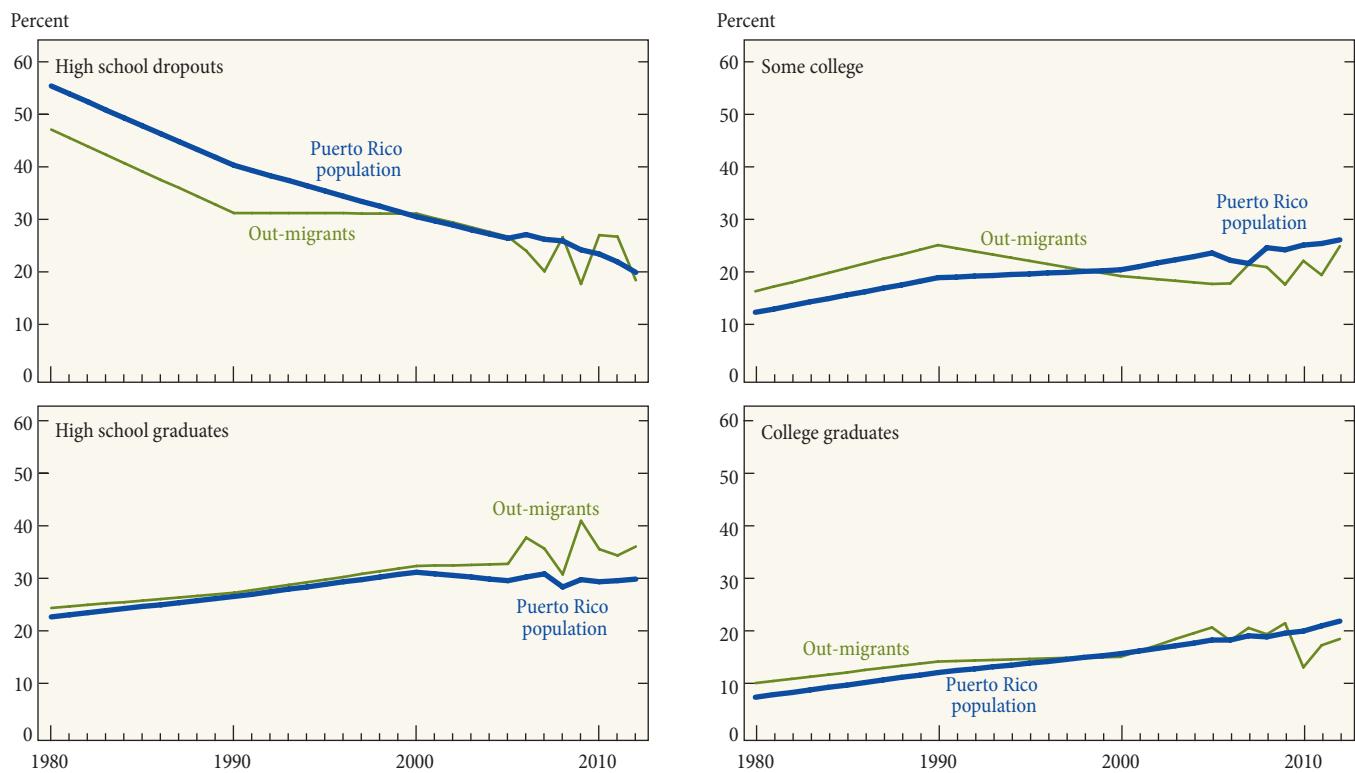
Similarly, we define the *in-migrant share* as the number of people living in Puerto Rico who were born elsewhere (whether the U.S. mainland or another country) divided by the number of native-born Puerto Rico residents plus these in-migrants. A rising in-migrant share between two points in time means that the island is seeing an in-migration of people during this time; a falling share indicates that in-migrants have left the island during the period. Not surprisingly, the in-migrant share largely mirrors the pattern of the out-migrant share. Although the in-migrant share was about 10 percent in 1970, it fell slowly between 1970 and 2000, meaning that, on net, the in-migrant population declined as fewer people came to the island and some in-migrants departed. This drop became more pronounced during the 2000s, and the in-migrant share stood at about 8 percent in 2012.

Has Migration Changed the Island's Demographics?

The significant amount of migration that has occurred in Puerto Rico raises the question whether the demographic makeup of the population has been altered by the movements of its people. Such a change will have occurred if those who now reside on the island differ in systematic ways from those who have come and gone. To explore this issue, we look at the demographics of in-migrant and out-migrant populations relative to those of island residents over time. We rely on the same sources we cited above but use slightly different information to identify and characterize migrants in this analysis. The decennial censuses for the U.S. mainland and for Puerto Rico identify whether a person lived in a different location five years prior to the census and, further, where the person lived at that time. The American Community Survey and Puerto Rico Community Survey for the years 2005–12

Chart 7

Share of Puerto Rico Population and Out-Migrants by Education



Sources: U.S. Census Bureau; Decennial Census; American Community Survey; Puerto Rico Community Survey; authors' calculations.

give similar information, but indicate whether a person lived in a different location one year ago, as opposed to five years ago. Thus, the decennial censuses allow us to classify five-year migrants, while the Community Surveys only allow us to classify one-year migrants. Since people who move within time frames of less than five years will be missed by the decennial censuses, we may be tracking trends across slightly different groups.³ Nonetheless, we make adjustments where necessary to obtain figures comparable across data sets.

Our analysis shows that Puerto Rico's out-migrants tend to be from younger and, in recent years, less-educated segments of the population. While the share of young people both living in and leaving Puerto Rico has declined over time because of natural population aging, the sixteen-to-thirty-

year-old age group makes up a greater percentage of the out-migrants than of the Puerto Rico population as a whole (Chart 6). In 2012, for example, the share of out-migrants aged sixteen to thirty was about a third, compared with a little more than one-fifth for the population as a whole. This pattern suggests that out-migration has accelerated the pace of the island population's aging.

On the human capital side, we compare the education levels of out-migrants and the population as a whole by identifying the share of working-age adults⁴ in the two groups that fall into each of four education categories: high school dropouts (those with less than a high school diploma), high school graduates with no college, those with some college, and those with a bachelor's degree or higher (Chart 7). Starting in the mid-2000s, we find that high school graduates with no higher education make up a greater percentage of out-migrants than of the population as a whole. In 2012, for example, about 37 percent of out-migrants had only a high school diploma, compared with about 30 percent for the Puerto Rico population.

³ For example, migration rates before 2005 might be somewhat lower than those after 2005 simply because of this measurement issue. It is also possible that migrants captured in post-2005 data differ by age or education levels from those of earlier years; for example, persons who move multiple times within a five-year period, missed by the decennial census but captured in the community surveys, might tend to be younger. However, our focus is on comparing the demographics of migrants and non-migrants in a given period, so such differences are likely to have little effect on our conclusions.

⁴ Working-age adults are defined as those aged sixteen to sixty-four.

Given particularly pervasive unemployment among younger and less-educated workers in Puerto Rico over the past several years, one would expect out-migration to be high in this segment as people seek out better economic opportunities on the U.S. mainland. Still, it is somewhat surprising that out-migration is not steepest for the least skilled—those with less than a high school diploma—since recently, unemployment has been highest for this group. However, these workers likely face economic constraints that might make the cost of moving prohibitive. Those with at least a high school diploma tend to have greater access to the resources needed to move.

Is Migration Causing a “Brain Drain”?

Pursuing a related question, we next consider whether Puerto Rico has experienced brain drain—that is, a loss of its most educated, or highest-human-capital, citizens. To determine whether such a loss has in fact occurred, we quantify the annual net migration for each education group (Table 1). The net change is calculated as the number of in-migrants minus the number of out-migrants.⁵ We see from the table that Puerto Rico has experienced a net loss of its citizens across all education groups in recent decades, including its college-educated citizens.

However, a closer look at the composition of out-migrants by education level reveals that citizens with a college degree are not over-represented among those leaving. Indeed, the share of out-migrants with a college degree has generally been quite close to—and, in recent years, below—the corresponding share for the population as a whole (Chart 7). If anything, Puerto Rico’s out-migrants tend to be somewhat lower-skilled than the population overall. As the lower left panel of the chart suggests, high school graduates have made up a greater percentage of the out-migrant pool than of the population as a whole since the mid-2000s, when Puerto Rico’s population started to decline. Among in-migrants (not shown in the chart), the share of high school dropouts is somewhat higher than in the population throughout the entire period, and the share of those with some college or with college degrees is slightly lower, suggesting that in-migrants tend to be tilted toward lower-skilled groups. Nevertheless, on net, the patterns of in- and out-migration have actually contributed to a small *increase* in the share of the population with a college degree among those remaining on the island.

So, has there been a brain drain in Puerto Rico? Recent migration flows have indeed reduced the number of citizens with a college degree in Puerto Rico. However, on balance, since the rate of out-migration for lesser-educated Puerto Ricans

⁵ Figures were converted to an annual basis for decennial census years where only five-year totals were available.

Table 1
Net Migration over Prior Year by Education

Year	Less Than High School	High School Graduate	Some College	College Graduate	Total
1980	-3,208	-2,800	-2,648	-1,896	-10,552
1990	-432	-3,112	-4,360	-2,357	-10,260
2000	-4,238	-5,533	-3,602	-2,950	-16,323
2005	-342	-1,389	-116	1,982	135
2006	-3,626	-9,639	-2,146	-4,002	-19,413
2007	-1,939	-8,393	-4,317	-2,876	-17,525
2008	-2,699	-4,359	-3,601	-3,504	-14,163
2009	-903	-10,434	-1,333	-6,688	-19,358
2010	-4,833	-5,001	-5,260	-925	-16,019
2011	-10,607	-14,247	-6,853	-6,120	-37,827
2012	-4,656	-12,396	-8,441	-4,929	-30,422

Sources: U.S. Census Bureau; Decennial Census; American Community Survey; Puerto Rico Community Survey; authors’ calculations.

exceeds that for Puerto Ricans with higher levels of human capital, migration patterns have actually tilted the composition of those remaining in Puerto Rico toward the college educated. This finding does not mean that brain drain has not occurred or is not a concern, but rather that people with higher human capital are not particularly vulnerable to the forces leading to migration when compared with other education groups.

Is Puerto Rico’s Population Decline Reversible?

Can Puerto Rico curb or even reverse its population loss? While the answer to such a question is speculative, the experience of other U.S. regions can help clarify whether such an outcome is achievable. As we noted at the outset, a population decline of this magnitude and duration is not unusual among the states (Table 2). Seventeen different states have experienced a post-World War II population loss lasting at least five years, with some states having more than one episode. Arkansas and Wyoming, for example, have each had population losses double the magnitude of Puerto Rico’s, and New York, Iowa, and West Virginia have experienced episodes lasting nine or more years.

For regions in the United States that have seen their populations fall, these episodes are usually closely tied to an economic decline and a loss of jobs. In many cases, this dynamic can be traced to the decline of a key local industry that offered the region an economic advantage. For some states, the advantage arose from the presence of natural resources—for example, coal and oil in North Dakota, West Virginia, and Pennsylvania. For other places, location favored the growth of certain industries that became less competitive over time or diminished in importance—for example, the steel industry in Pennsylvania and upstate New York, or the automotive industry

Table 2
State Population Declines Lasting Multiple Years

State	Period	Duration in Years	Percentage Decline
Puerto Rico	2004-13	9	-5.5
Wyoming	1983-90	7	-11.1
Arkansas	1950-56	6	-10.7
West Virginia	1950-57	7	-8.1
North Dakota	1984-91	7	-6.6
South Dakota	1963-70	7	-5.8
West Virginia	1959-70	11	-5.8
Mississippi	1950-55	5	-5.3
Iowa	1978-87	9	-5.2
North Dakota	1965-70	5	-4.6
New York	1971-80	9	-4.3
Oklahoma	1983-90	7	-4.3
Louisiana	1985-90	5	-4.2
Montana	1985-89	4	-2.8
Michigan	1979-83	4	-2.4
Rhode Island	2004-12	8	-2.3
North Dakota	1996-2002	6	-1.9
Michigan	2004-11	7	-1.8
Kansas	1962-67	5	-1.5
West Virginia	1995-2001	6	-1.2
Pennsylvania	1979-85	6	-1.0
Indiana	1979-83	4	-0.9
Massachusetts	1973-78	5	-0.8
Ohio	1980-86	6	-0.7
Kentucky	1984-89	5	-0.5

Sources: U.S. Census Bureau; Moody's Analytics; authors' calculations.

in Michigan. These examples provide a useful comparison with Puerto Rico, since the island's manufacturing industry—particularly pharmaceuticals—has been in steep decline in recent years as the Section 936 tax advantages that benefited many manufacturing companies were phased out.

U.S. states and regions have had varying degrees of success in coping with the consequences of population decline and implementing strategies to curb the exodus of residents. Many places that lost a key productivity advantage, such as Michigan and upstate New York, have seen population outflows continue for decades. Their experiences suggest that the loss of Puerto Rico's tax advantage may continue to spur out-migration for years to come.

New York City, however, provides a useful example of the potential for a region with problems akin to those of Puerto Rico to reverse its population loss. New York actually lost more than 10 percent of its population during the 1970s, a decline from about 7.9 million residents to 7.1 million residents. Although the city experienced a weakening of its

manufacturing base during this period, its economic troubles also reflected poor fiscal management and deteriorating quality of life. New York City's large debt burden, outsized spending obligations, and shrinking tax base nearly forced a declaration of bankruptcy in 1975. The city was also viewed by many as unsafe and undesirable. Similarly, Puerto Rico now faces significant fiscal distress and a serious crime problem. The island's fiscal problems follow years of public-sector deficits; borrowing costs have surged and the island nearly lost access to debt financing in capital markets in early 2014. As for crime, the island saw a murder rate of 26.7 murders per 100,000 residents in 2012, an alarming figure when compared with the U.S. mainland rate of 4.7 murders per 100,000 residents.

Despite its challenges, New York City was able to set the stage for a recovery in part through successful policy. New York State established an Emergency Financial Control Board to help the city balance its budget and restore its credibility to investors. Although the road to solvency was difficult and took time, the city was able to correct its financial problems by the mid-1980s.⁶ Moreover, New York City took aggressive action to reduce crime and improve its overall attractiveness. By 2000, New York City's population had increased to over 8 million people, more than fully reversing the decline that occurred during the 1970s. The city's recovery was not completely driven by the policy response; New York was fortunate to have unique finance-related industries, which boomed in this period. Yet without the right policy, its ability to recover would have been more doubtful. Today, New York City is a safe and desirable location that continues to attract new businesses and people. Like New York City in the 1970s, Puerto Rico must address its fiscal problems to be on the road to recovery.⁷ It must also reduce crime so that residents can enjoy the island's many amenities without fear for their safety.

Conclusion

Puerto Rico's population has been falling for nearly a decade, and the pace of decline has accelerated in recent years. Although a slowdown in the island's natural population increase has contributed to this decline, a more important factor recently has been a sharp surge in the out-migration of its citizens. Indeed, nearly one-third of those born in Puerto Rico now live on the U.S. mainland. Puerto Rico's out-migrants have tended to be concentrated among the younger and less-educated segments of the population. As a result, out-migration has accelerated the aging of the remaining population but has not necessarily led to a brain drain.

⁶ See Dunstan (1995).

⁷ See Federal Reserve Bank of New York (2014).

Although the magnitude of Puerto Rico's population loss is not unprecedented, it poses a significant challenge. Puerto Rico's declining birthrate—like that of many developed countries—represents a significant structural trend that is unlikely to be reversed. For Puerto Rico to slow or halt its population loss, it must address the out-migration of its citizens.

How can Puerto Rico accomplish this goal? The clearest pathway seems to lie in strengthening the island's economy.⁸ Without significant economic growth and the job creation that would follow, out-migration and population loss are likely to continue. Current migration patterns suggest that it is particularly important for Puerto Rico to focus on improving job opportunities for younger, lower-skilled workers. A stronger economy would help Puerto Rico return to a state of fiscal health. Enhancing the island's attractiveness as a place to live and work, and especially reducing crime, may also serve to slow the exodus of its people.

⁸ See Federal Reserve Bank of New York (2012, 2014).

Yet as the experience of some U.S. regions indicates, reversing population loss when it is tied to the decline of a key industry is quite difficult. Fortunately, Puerto Rico has a tremendous set of assets to leverage to improve its economy. There is prodigious value in its climate, and its Caribbean location makes it ideal for tourism. Its economy has many strengths, including a high level of human capital and close ties with the U.S. mainland. Still, the island has big problems to fix, and implementing solutions will take time, resources, and patience.

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