THE EFFECT OF THE NUTRITIONAL ASSISTANCE PROGRAM ON EMPLOYMENT: A SPATIAL REGRESSION ANALYSIS OF THE MUNICIPALITIES OF PUERTO RICO

by

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ABSTRACT

The latest available statistics indicate that approximately 46 percent of Puerto Rico's total population receives benefits from the island's Nutrition Assistance Program (NAP). From 2005-2015, the percentage of the Puerto Rican households that received NAP benefits increased 33 percent. This study considers the effect of the amount of money received by the Puerto Rico Nutrition Assistance Program (NAP) beneficiaries on the island's employment rate. In the estimated spatial regression models, NAP family benefits have a significantly negative effect on the employment rate. The empirical results suggest that the NAP benefits that families receive disincentivize them from seeking a job.

RESUMEN

Entre 2005 y 2014, el porcentaje de hogares puertorriqueños que recibe beneficios del Programa de Asistencia Nutricional (PAN) de la isla aumentó un 33 por ciento. Las últimas estadísticas disponibles indican que aproximadamente el 46 por ciento de la población total de Puerto Rico recibe beneficios de PAN. Este estudio considera el efecto de la cantidad de dinero recibida por los beneficiarios del Programa de Asistencia Nutricional de Puerto Rico (NAP) en la tasa de empleo de la isla. En todos los modelos de regresiones espaciales estimados, los beneficios del NAP tienen un efecto de reducir la tasa de empleo. Los resultados empíricos sugieren que los beneficios del PAN que las familias reciben desincentivan buscar un trabajo.

Learning is not linear.

To my parents, Clara Valderrama and Didier Valdés.

Thank you for your courage and resilience.

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GLOSSARY OF TERMS

ADSEF	Administration for the Socioeconomic Development of the Family (*Administración para el Desarrollo Socioeconómico de la Familia*)
AFDC	Aid to Families with Dependent Children
BLS	Bureau of Labor Statistics
CPI	Consumer Price Index
DF	Puerto Rico Department of the Family
DOL	United States Department of Labor
DLHR	Puerto Rico Department of Labor and Human Resources
DRNA	Puerto Rico Department of Natural Resources (*Departamento de Recursos Naturales*)
DS	Puerto Rico Health Department (*Departamento de Salud de Puerto Rico*)
DTOP	Puerto Rico Department of Transportation and Public Works (*Departamento de Transportación y Obras Públicas*)
EAI	Economic Activity Index
EBT	Electronic Benefit Transfer
EITC	Earned Income Tax Credit
FANP	Food and Nutrition Programs
FE	Fixed Effects
FEMA	Federal Emergency Management Agency
FNS	Food and Nutrition Service
FSP	Food Stamp Program
GA	General Assistance programs
GDB	Government Development Bank of Puerto Rico
GNP	Gross National Product
IBA	Gross Agricultural Income (*Ingreso Bruto Agrícola*)
IV/GMM	Instrumental Variables or Generalized Method of Moments
MPN	My Nutritious NAP program (*Mi PAN Nutritivo*)
MCMC	Markov Chain Monte Carlo
MF	Family Market (*Mercado Familiar*)
MIMIC	Multiple Indicators Multiple Causes
ML	Maximum Likelihood
MRS	Marginal Rate of Substitution
NAP	Nutrition Assistance Program of Puerto Rico
NY Fed	Federal Reserve Bank of New York
OCIN	Office for the Control of Business Inspections (*Oficina para el Control de Inspección de Negocios*)
POS	Point of Sale
PRAA	Puerto Rico Reconstruction Administration
PRERA	Puerto Rico Emergency Relief Administration
PRDA	Puerto Rico Department of Agriculture
QCEW	Quarterly Census of Employment and Wages
QML	Quasi Maximum Likelihood
RE	Random Effects

SAC	Spatial Model with Autoregressive Disturbances
SAIC	System of Case Administration and Information
SAR	Spatial Autoregressive Model
SEM	Spatial Error Model
SNAP	Supplemental Nutrition Assistance Program
SSDI	Social Security Disability Insurance
SSI	Supplementary Security Income
SWIP	Special Wage Incentive Program
TANF	Temporary Assistance for Needy Families
TFP	Thrifty Food Plan
U.S.	United States of America
USDA	United States Department of Agriculture
USPS	United States Postal Service

1 CHAPTER –INTRODUCTION

From 2005-2015, the percentage of Puerto Rican households that received

Nutrition Assistance Program (NAP) benefits increased 33 percent (Puerto Rico

Community Survey, 2016). NAP is one of the biggest welfare programs in Puerto Rico

and has been expanding for the past decade. Furthermore, the program accounts for a

large part of the money invested in welfare by the Federal government. In 2015, NAP

represented about $1.8 billion or 10 percent of total Federal transfers to Puerto Rico

(Puerto Rico Planning Board, 2017). Despite recognition for the results it has achieved in

reducing food insecurity in Puerto Rico, NAP has also been historically criticized for

alleged disincentive effects on employment. This is in tune with the ongoing debate

amongst researchers of the existence and extent of employment disincentive effects of

food assistance programs in the United States and worldwide. This investigation focuses

on the employment disincentive effects of NAP, which has played a very significant role

in poverty alleviation in Puerto Rico since its inception (Andic and Choudhury, 1977;

Faulkner et. al., 2015; Segarra, 1999).

Although Puerto Rico is routinely compared to the U.S. in these types of analyses

or included within its statistics, it is important to note that the poverty rate on the island is

higher than that of the U.S. The annual median income of a Puerto Rican household is

$29,624 (Puerto Rico Community Survey, 2015) compared to that of U.S. households,

which is $53,046 (American Community Survey, 2015). Even when compared to the

lowest annual median income of any of the states, including Washington, D.C., there is

still a stark difference--Mississippi's annual median income is $39,031 (American Community Survey, 2015). As well as having a higher poverty rate than the U.S., Puerto Rico also has higher living costs. For example, food prices in 2012 were about 23 percent higher in Puerto Rico than in the U.S. (IE, 2014). This is partly due to U.S. cabotage law, which is laid out in the Merchant Marine Act of 1920, also known as the Jones Act. This law states that all goods (including paying passengers) transported by water between U.S. ports must be carried on ships constructed in the U.S., owned by U.S. citizens, crewed by U.S. citizens and permanent residents, and flying the U.S. flag. These shipping restrictions place an added cost on merchandise, generating floor prices above equilibrium, and restricting access to basic goods.

Meanwhile, although its famous nickname is the "Island of Enchantment", there is no doubt that Puerto Rico is currently in serious trouble. Between 2005 to 2015, Puerto Rico saw its Gross National Product (GNP) and employment fall by 10 percent (Puerto Rico Planning Board, 2015). A sustained drop since 2005 in these and other key economic markers such as labor force participation rates indicate that Puerto Rico's recession has long since become a depression. The loss of competitive advantage due to the phasing out of Section 936 of the U.S. Tax Code from 1996 to 2006 coupled with the global financial crisis of 2007 have led to a severe economic contraction with no end in sight. Added to political and fiscal irresponsibility, the whole situation has led to a severe debt crisis. The results of consequent austerity policies that both the Federal and local government have put in place to deal with the massive liabilities have contributed to a dire economic situation with high levels of poverty. Approximately 45.5 percent of Puerto Ricans lived in poverty by 2015 estimates (Puerto Rico Community Survey,

2015). Unfortunately, the state of crisis propitiated by the passage of hurricanes Irma and Maria in September 2017 has only further complicated the lives of those living in poverty.

As is the case in much of the world, welfare programs represent an important part of the strategy to mitigate poverty in Puerto Rico. Because of Puerto Rico's relationship to the U.S. as an unincorporated territory with limited sovereignty, the package of welfare programs has been mostly designed by the U.S., based on Federal programs. While Puerto Ricans have access to some of the programs that are available in the U.S., most of the programs on the island are modified versions of those on the mainland, with further restrictions on the number of users and the types of benefits available. Some of those programs include NAP, State-sponsored health insurance, Section 8 for housing, and Social Security disability benefits through the Social Security Disability Insurance (SSDI), and Supplemental Security Income (SSI) programs.

One of the main concerns about welfare programs both in the U.S. and Puerto Rico is whether the programs have a disincentive effect on labor participation and if so, how large the effect is. The literature is widely varied on this topic. Studies on the topic have found evidence to support little to no disincentive effects and others have found the opposite. Much of the recent work (Banerjee, Hanna, Kreindler & Olken 2017; Ervin, Elisenda, Silvio, Benjamin, Paul, Stanfeld, Sudhanshu, David & Nelson, 2017) done on programs in developing countries point to there being no disincentive work effects of cash transfer programs on labor in the policy context of developing and emerging economies.

As for the Supplementary Nutrition Assistance Program (SNAP), the U.S. program that is analogous to Puerto Rico's NAP, there are mixed results. Lentz and Barret (2013) found little evidence that supports any disincentive effect on employment. Meanwhile, Davis and You (2011) suggest that time is more constraining than money in reaching the Thrifty Food Plan (TFP) target. The TFP is one of the four plans designed by the United States Department of Agriculture (USDA) that specify the quantities and types of foods that people should eat to have adequate nutrition. It is the cheapest of the four plans, calculated monthly with data from the Consumer Price Index (CPI), and is used as the base for deciding SNAP benefit amounts. The researchers therefore offer an alternate explanation to SNAP disincentive effects, as they find that time makes potential job searching or working longer hours difficult.

Conversely, other researchers have found evidence of work disincentive effects in SNAP, previously known as the Food Stamp Program (FSP). Hagstrom (1996) evaluated the effect of the FSP on the labor supply of married couples using a multinomial logit model and found that small labor supply effects to changes in food stamp benefits. Fraker and Moffitt (2002) used a structural equation to study the labor supply of female heads of households and found that FSP participation reduced working hours. More recently, Hoynes and Schanzenbach (2010) found that the introduction of the FSP led to lower rates of employment and hours. The disparity between the findings in the literature belies a need to contextualize the analysis of food assistance programs to their particular location.

When analyzing the disincentive effects of welfare policies, it is also important to examine the issues related to labor demand as well as labor supply. Only looking at the

labor supply, as often occurs, paints an incomplete picture of Puerto Rico's labor crisis. While there is low labor force participation, there is also high unemployment, which points to two important considerations: a strong informal labor market and insufficient work for people, especially for those who have less academic training. Puerto Rico's unemployment rate dropped considerably by August 2017 estimates, but local economists Quiñones and Alameda argue that the drop is not cause for celebration. They argue that it does not indicate a rise in employment, but rather a decrease in the amount of people seeking to join the formal labor market and an increase in the amount of people participating in the informal labor market (Burgos, 2017). High unemployment is an important factor to consider when designing any changes to the NAP's structure, since Segarra (1999) observed that in its presence, tightening eligibility restrictions on food assistance programs would not increase labor supply and may even cause a net reduction in work effort in Puerto Rico.

The magnitude of Puerto Rico's informal labor market is well documented (Pol & Silvestrini, 2002). A report prepared by Estudios Técnicos, Inc. (2010) for the territory's Government Development Bank (GDB) compiles the results of studies that have estimated the extent of the informal labor market in Puerto Rico from 1984 to 2006 and uses three different methodologies to estimate the market's size. For the period of 2000 to 2009, the physical inputs method and the Multiple Indicators Multiple Causes (MIMIC) methods estimate the size of the informal labor market to be an average of 27.2 percent of Puerto Rico's gross national product (GNP). By the method of discrepancy in the labor statistics, the estimated average was 24.2 percent. The value of the informal market's production was estimated to be about $12,654 to $14,200 million during that

period. The estimated size and value of the informal labor market make it clear that it is an option that many people choose over the formal labor market. Therefore, we must be careful when making assumptions about the employment and unemployment rates in Puerto Rico, as well as issuing any judgments about the population's work ethic or desire to work. People may be working even though they are not represented in Puerto Rico's employment statistics.

Another important factor to consider is the relationship between the income from a job that pays a minimum wage salary and Puerto Rico's median household income. A job paying the minimum wage represents an income of approximately $15,080 annually (before deductions), while Puerto Rico's median household income in 2016 dollars for 2012 to 2016 is approximately $19,606 (United States Census Bureau, 2018). Therefore, a full-time job at minimum wage currently represents an income that is approximately 77 percent of the median household income. The surplus that this situation generates in the labor market represents a large inefficiency. The rule of thumb is that this ratio should not exceed 50 percent so as not to negatively affect the labor market (Dube, 2014). Right now, Puerto Rico finds itself in a position where too many of its workers make a minimum wage salary.

Situating the NAP within the rest of Puerto Rico's welfare policy is also necessary. Burtless and Sotomayor (2006) present that the population sector that qualifies for most of the income transfer benefit programs could receive an amount of benefits whose monetary value is equivalent to or higher than the remuneration for a full-time job at the minimum wage. However, the program's current structure restricts earning potential for participants far too much to qualify. As soon as people begin to

earn a wage, even a minimum one, there are tough consequences for them. They must either begin to pay more for the same social assistance, such as for an affordable housing unit, or their benefits are rescinded, such as in the case of the NAP. The transition period is too short, specifically for the NAP, where people need more time to stabilize their income before having their food assistance taken away.

There are four main alternatives in Puerto Rico for the low-skilled working-age population: jobs at the minimum wage, jobs in the informal sector, dependency on the package of available welfare programs, or migration. It creates a perfect storm for economic distress and poor quality of life, especially in a territory with a depressed economy. The Federally mandated minimum wage limits low-skill labor demand and the equally mandated welfare package limits low-skilled labor supply. Meanwhile, the Jones-Shafroth Act (1917) increases the prices of general merchandise by generating floor prices above equilibrium. This combination has resulted in a high general price level, very high migration rates, and a reduction of the total population.

This investigation seeks to take a closer look at the relationship between NAP, the main welfare program, and the formal employment level in Puerto Rico. First, this study looks to determine the existence of a work disincentive effect of the NAP benefits that families receive and estimate the size of the effect relative to other explicative variables. In the debate of the existence of disincentive effects in food assistance programs, Puerto Rico provides a unique set of circumstances for analysis given its issues with political jurisdiction and sovereignty as well as its economic circumstances of high unemployment, economic contraction, and vulnerability to large-scale climate disasters. Second, it wishes to examine the spatial characteristics of employment in Puerto Rico.

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Recognizing the geographical distribution of employment will allow for a level of analysis that has not previously been reached in studies of this topic in Puerto Rico. It will also lead to more precise conclusions, which will help make better policy recommendations.

Given the objectives, Spatial Panel Dynamic Models were chosen as the empirical method. The data used was obtained from the Quarterly Census of Employment and Wages (QCEW) prepared by the Bureau of Labor Statistics (BLS) and other socio-economic variables from several government sources. The employment data showed evidence of having spatial effects, according to the spatial indices that were calculated. Employment in the municipalities in Puerto Rico was mostly explained by the dynamic component. Both the Spatial Autoregressive Model (SAR) and the Spatial Autoregressive Model with Autoregressive Disturbances (SAC), which were the models that best fit the data, showed evidence of a disincentive effect of NAP benefits on employment. The NAP—employment relationship appears to be concave, peaking at a maximum point and then diminishing, suggesting the possibility of calculating an optimum amount of benefits before the disincentive effect comes into play. After certain level, an increase in the NAP benefits received by Puerto Rican families leads to a reduction in employment. Another important determinant factor for employment is the cars-to-population ratio, highlighting how essential the availability of a private vehicle is for having a job in Puerto Rico.

The results of this study have important public policy implications. The social welfare public policy established by the Federal government in Puerto Rico is incomplete because of the absence of programs to incentivize labor participation. Puerto Rico needs access to programs such as the Earned Income Tax Credit (EITC), until a full review of

welfare policy and programs can be carried out and a package that better meets the island's needs can be designed. There are serious flaws in the current NAP regulations that make the program a poverty trap. This investigation's findings are a starting point for the necessary assessments to create better incentive mechanisms in the program that will allow it to meet its mission of alleviating poverty while helping to propel people out of it.

The next chapter discusses the NAP further in depth, including its history and the evolution of its structure as well as benefit eligibility, administrative structure, and participation dynamics. Chapter 3 will further explore the existing literature on the topics relevant to this investigation, particularly the debate over the existence and extent of work disincentive effect of food assistance programs. Chapter 4 describes the data used in the study including where it comes from and how the variables for the empirical methods were constructed. It also gives a broad idea of the theoretical framework of utility maximization used in the study and details the empirical strategy more closely. Chapter 5 presents the results of the SAR and SAC models, while Chapter 6 exposes the discussion of the results, expands on the study's limitations while suggesting directions for further research, and offers policy recommendations for decision makers.

2 CHAPTER- PUERTO RICO NUTRITION ASSISTANCE PROGRAM

With the primary goal of assuring adequate nutrition intakes in populations considered at risk of undernutrition, the United States government carries out several food and nutrition programs (FANPs) at both the Federal and State levels. Another purpose of these programs is to improve the nutritional choices of recipients through nutrition education, which is important because of the evolving characteristics of at-risk populations. Though underweight was the main concern when FANPs originated, obesity is now a significant issue as well, indicating the need to shift from merely facilitating caloric consumption to have equal concern about the quality of the calories provided. The FANPs operated at the Federal level also serve the important purpose of maintaining a minimum, uniform threshold nationwide that assistance cannot fall from. They provide needy families with a safety net that can help them meet a basic need in times of severe strain (Currie, 2003).

The Supplemental Nutrition Assistance Program (SNAP), previously known as the Food Stamp Program (FSP), is the most important FANP of the U.S. safety net. Most of the rules for SNAP are determined at the Federal level because the program is meant to create balance amongst the variation in welfare benefits offered among states (Currie, 2003). However, in the case of Puerto Rico, nutrition assistance works differently than for the rest of the U.S. since it is a non-incorporated territory rather than a State. Puerto Ricans receive food aid through a program called the Nutrition Assistance Program

(NAP), in which approximately 1 in 3 Puerto Ricans participate according to the latest available statistics from the Puerto Rico Department of the Family (DF) (2018). This important program offers families of scarce economic resources assistance to meet their nutrition intake needs by providing means to buy eligible food items (Administration for Socioeconomic Development of the Family, 2018).

SNAP and NAP share an important characteristic: they are available to the needy population regardless of family structure. It makes them particularly important amongst the other programs in the social safety net, many of which are targeted to specific populations. However, while SNAP is an entitlement program that pays benefits to all eligible households, NAP is a block grant with an annual cap. The fixed annual budget has meant that while Puerto Rico has had more authority to administer the program, it has had to restrict program eligibility tighter and offer less benefits than SNAP. A study mandated by the Food and Nutrition Act of 2008 (P.L. 110-246) determined that including Puerto Rico in SNAP as a state would raise the number of households that receive nutrition assistance by 15.3 percent, increasing nutrition assistance coverage from 30 percent to approximately 43 percent of the population (Peterson et al., 2010).

This chapter will cover the history of nutrition assistance in Puerto Rico, the evolution of program rules, administrative structure, eligibility, and caseload composition.

2.1 History of Nutrition Assistance in Puerto Rico

Puerto Rico, like the 50 states, has gone through different stages of welfare programs and subsequent reform, responding to changes and decisions made at the Federal level. Welfare aid was initially extended to Puerto Rico as part of the New Deal policies of the Roosevelt era that sought to mitigate the effects of the Great Depression of 1929 (Colón, 2011). Two Federal programs were implemented: the Puerto Rico Emergency Relief Administration (PRERA) in 1933, and the Puerto Rico Reconstruction Administration (PRRA) in 1935. PRERA was directed towards disease control and prevention, highway construction, and food distribution. PRAA had several objectives: transform the economy into an urbanized industrial enclave; carry out an agricultural reform with the redistribution of approximately 500 acres; improve health, housing, education, and income indicators; massively incorporate women into the workforce; reduce the poverty rate; and develop infrastructure. The programs integrated two plans of the Puerto Rican government, the Chardón Plan and Operation Bootstrap (*Manos a la Obra*) (Hernandez & Valdés, 2018).

The first economic assistance program created in Puerto Rico using state funds to address welfare concerns was called Public Economic Assistance and launched in 1943. It was administered by the Division of Public Welfare (*Bienestar Público*) of the Puerto Rico Department of Health (DS) (Ramirez, 2001). The fiscal base of the public welfare program was amplified when the U.S. extended some sections of the U.S. Social Security Law (Titles I, IV, X, and XVI) to Puerto Rico in 1952 (Ramirez, 2001; Colón, 2011).

Federal funds have since then formed part of the financing structure of economic aid programs targeted at the poor population (Ramirez, 2001).

In November 1975, Puerto Rico began receiving Federal nutrition assistance through the FSP once the program was extended nationwide. However, Puerto Rico was not granted full coverage under the FSP until after the Food Stamp Act of 1977 (P.L. 95-113), although the program was operational on November 1, 1975 (Peterson et al., 2010). The program had previously been launched as a pilot in 1961 serving low income households whose gross income was less than 130 percent of the Federal poverty line. The benefits for the pilot program were calculated as the Thrifty Food Plan (TFP) amount minus 30 percent of countable income. Once the FSP was extended to all states and territories, it served about 20.8 million persons per month. Eligibility was determined by assessing countable income, which netted out allowable expenses. The asset limit was $2,000 for households or $3,000 for those with elderly people. Temporary Assistance for Needy Families (TANF), SSI, and General Assistance (GA) program recipients were deemed immediately eligible. Household members may have been required to meet state welfare work and training requirements. Strikers, noncitizens, postsecondary students, and the institutionalized were deemed as not eligible (Currie, 2003). In Puerto Rico, income levels were so low relative to the Federal poverty line that by 1978 that 58 percent of the population qualified to participate in the FSP. The benefits were issued as monthly coupons.

The U.S. Congress replaced the FSP in Puerto Rico through the Omnibus Reconciliation Act (Public Law 97-35 of August 13, 1981), an amendment to the Food Stamp Act (Public Law 92-113) (Trippe et al., 2015). Instead, the government of Puerto

Rico was assigned an annual block grant to provide nutritional assistance to families of scarce resources, called the Nutrition Assistance Program (NAP), or *Programa de Asistencia Nutricional*. It began formally on July 1, 1982. The main justification for the change was to control FSP costs in Puerto Rico. The government of Puerto Rico was placed in charge of creating the program structure and administration. It decided to replace the food coupons of the FSP with paper checks, changing the program from an in-kind transfer program to a 100 percent cash benefit one. The grant also limited eligibility, reduced benefit levels, and placed an annual cap on NAP benefits (Trippe et al., 2015).

2.2 Evolution of Program Rules

2.2.1 Special Wage Incentive Program

Since October 1988, the annual plan of operation prepared by the Puerto Rican government set aside a portion of the funds allocated for NAP to create program components that would help move beneficiaries into the workforce. Initially, this was done through the Special Wage Incentive Program (SWIP), known as *PAN y Trabajo* in Spanish (OMB Circular Number A-133, Compliance Supplement, OMB Circular Number A-133 2009).

After reforms came about in October 1999, the program began to require every NAP recipient who was an able-bodied adult between 18 and 59 years of age and did not have children younger than 6 years old, to register for a job with SWIP. The NAP beneficiaries in question were also required to offer evidence of at least three job-search

efforts at their case revisions, which occurred from every 6 months to a year. If the person did not accept an employment or show evidence of job-seeking, they could lose their NAP eligibility. From the registry that was created, 16 employment agencies contracted by the PR government marketed the potential employees to private companies. The company was required to provide an employment of 28 to 40 hours weekly (Colón, 2011). SWIP offered companies a subsidy of 50 percent of the beneficiary's salary for a maximum of 2 years in the manufacturing industry or 18 months in the service, tourism, and construction industries (http://www.lexjuris.com/LEXLEX/lexotras/lexvaleempleo.htm). SWIP began to be phased out in May 2005. Some existing contracts, however, remained in effect through 2008 (OMB Circular Number A-133, Compliance Supplement, OMB Circular Number A-133 2009).

2.2.2 Transition to EBT with Total Cash Redemption

In 1999, the Puerto Rican government conducted a feasibility study on replacing the paper checks they were using to distribute NAP benefits with an electronic benefit transfer (EBT) system. They cited concerns about the cost and efficiency of mailing paper checks. Based on the study, a pilot program was carried out and in October 2000, Puerto Rico fully transitioned to an EBT card system. During the initial phase, participants were able to withdraw up to 100 percent of their NAP benefits in cash. ADSEF was placed in charge of administrating the EBT funding and they committed to implementing EBT through a combination of cash and non-cash redemption (Trippe et al., 2015).

2.2.3 Transition to Non-Cash Benefits with Electronic Benefit Transfer

Redemption of NAP benefits was further restricted by the Puerto Rican government in late 2001. The system changed to allow only up to 25 percent of the total benefits to be withdrawn in cash, while 75 percent had to be redeemed electronically using the EBT card. The electronic redemption could only be carried out with the point of sale (POS) devices at certified retailers. The cash portion was maintained so that participants could redeem those benefits for eligible food items at any food retailer, even if it was uncertified. ADSEF nevertheless made it clear that, as established in Federal law and regulations, all of the money was intended for the acquisition of food (Trippe et al., 2015).

ADSEF officials stated two main reasons for allowing a portion of the benefits to be redeemable for cash. First, they wanted to ensure that all NAP beneficiaries could access food at their most convenient and geographically closest retailers. This was especially important for those who lived in the most remote areas of Puerto Rico where there were few to none EBT certified retailers. Likewise, they also wanted to give uncertified retailers in remote regions the chance to serve NAP beneficiaries even if they did not have the technological infrastructure necessary to operate EBT (Trippe et al., 2015).

However, there was still a measure of unease from both the Federal and Puerto Rican governments about the use being given to NAP benefit money. An unfortunately common occurrence is that businesses informally exchange food stamps for money. Likewise, concern arose that cash benefits were not being used for purchasing food items

only, which was confirmed in a 2015 study (Trippe et al., 2015) that identified that people were buying cleaning supplies and toiletry items alongside food.

2.2.4 Benefit Expansion for Agricultural Laborers

Several amendments were made to the NAP in June 2014 with the intention of moving people from welfare to the agricultural labor force and improving food security in Puerto Rico. First, the amount of income exempt from consideration for NAP eligibility was increased from $461 to $760 monthly for agricultural laborers. Likewise, the list of products that qualified laborers for total exemption of the income made during harvest time from consideration for NAP eligibility was expanded. Plantains, ripe and green bananas, yucca, oranges, melons, mangos, and pineapples joined coffee, tomato, and sugarcane on the list. These incentives came about as part of an ongoing collaboration between ADSEF and the Puerto Rico Department of Agriculture (PRDA) (Office of the Governor of Puerto Rico, 2014).

2.2.5 Extension of Eligibility to University Students

Before 2015, students enrolled in universities did not qualify for the NAP as independent households, even if they lived away from home. Since June of that year, however, students are allowed to participate in the program with a monthly benefit of at least $112. The requirements for eligibility include being older than 18 and enrolled as a full-time student with a regular curriculum at an accredited institution of higher education. Furthermore, the parents of the students must fall under at least one of the following categories: older than 60, NAP beneficiaries, or disabled with an income of

less than $1,200 monthly. Income from scholarships, the Pell Grant, and the Federal Work Study program are not included in eligibility calculations. Students are required to present their NAP application at the offices of the town that they are originally from, rather than where they go to school, regardless of whether they live on their own or with their parents. However, for evaluation purposes, students are considered as a separate household from their parents (El Nuevo Día, 2015).

2.2.6 Family Market Program

The Family Market program (MF, by its name in Spanish) was established in an agreement between the PRDA and ADSEF, with the approval of USDA. It began as a pilot project in August 2013 in 23 municipios, located in the regions of Caguas and Guayama, with 62 farmers from 27 municipios. The program had two objectives. The primary one was the provision of fresh and nutritionally-rich food for NAP beneficiaries. Secondly, it sought to strengthen agricultural production in Puerto Rico, especially that of small farms (Cortés & Gayol, 2017).

The MF program provided an additional 4 percent of each participating household's benefit amount per month destined specifically for use at the Family Markets. The markets opened for two days on alternating weeks for a total of four days a month. Farmers participated in a system that assigned them turns to participate. The schedule and locations for these markets were announced in official communications from the agencies', in traditional media outlets and the agencies' social media pages. Although the markets were created to serve NAP beneficiaries, the general public was not excluded from attending. Cortés and Gayol (2017) indicated that the project had multiple

positive outcomes, including the creation of 307 jobs, the provision of a much-needed marketplace for small farmers to sell their goods directly to consumers, and an important source of fresh food for NAP beneficiaries. They recommended that the pilot program be expanded due to its positive impacts.

2.2.7 Phasing Out Cash Benefits

While the Agricultural Act of 2014 (P.L. 113-79, most commonly known as the 2014 Farm Bill) reauthorized the NAP block grant for food assistance to Puerto Rico, it also included a provision to phase out the cash portion of the NAP benefit and adding that same amount in EBT benefits. To assess the potential negative effects of this change for both program participants and retailers, the 2014 Farm Bill mandated a study that was carried out in 2015 through the Food and Nutrition Service (FNS) of the USDA. The study concluded that NAP participants and retailers do not face significant barriers to redeem the non-cash portion of NAP benefits, consistent across data sources and subgroups, urban and rural participants, and participants with relatively high and low geographic access to certified EBT retailers (Trippe et al., 2015). Furthermore, Trippe et al. (2015) also found that NAP participants withdrew most of the cash portion of their benefits to use primarily for non-food items, and they considered that income as essential. Participants reportedly did not understand that the cash portion of the NAP was only supposed to be used for food purchases. They reported that the discontinuation of the cash portion of the NAP benefits would be devastating and that they have limited access to other sources of income or cash assistance from Federal programs. Overall, Trippe et al. (2015) concluded that although discontinuing the cash portion of NAP benefits would

likely have little impact on access to food for participants, it would have adverse effects on their ability to meet their basic hygiene and cleanliness needs.

Table 2-1. Phases of the removal of the portion of NAP benefits assigned as cash and transfer of that amount to food only. [ADSEF, 2018]

Time Period	Portion of NAP benefits assigned for food only	Portion of NAP benefits assigned as cash
February 1, 2018 – September 30, 2018	85%	15%
October 1, 2018 – September 30, 2019	90%	10%
October 1, 2019 – September 30, 2020	95%	5%
From October 2020 onwards	100%	0%

Ultimately, the Puerto Rican government decided to phase out the cash portion of NAP benefits, following a request from former Secretary of Agriculture Tom Vilsack after a visit to Puerto Rico in 2016. Though the implementation of the policy change was supposed to have begun in October 2017, it was interrupted by the passing of hurricanes Irma and Maria in September of that year. Now, the cash portion of NAP benefits will be reduced over the next two years, from February 2018 to October 2020. The revised schedule for the phases is shown in Table 2-1. The policy change does not affect the total amount of benefits received by each family, only the proportion (ADSEF, 2018).

2.2.8 Disaster Relief Assistance After Hurricane Maria (2017)

After the passing of Hurricane Maria on September 20, 2017, USDA approved an assignment of $1.27 billion for the NAP as disaster relief assistance. The amount represents more than 50 percent of what is usually granted for the program. As well as

providing much needed access to food, Puerto Rican government officials also praised the initiative as a deterrent for thousands of Puerto Ricans who were planning to leave the island and as a slight boost to the economy (Ruiz, 2018). The aid is temporary and will be available while the funds last (ADSEF, 2018).

Active NAP beneficiaries are already eligible for the additional funds with no paperwork or additional office visits necessary. The additional funding will automatically be reflected in their monthly balance as of March 2018. Citizens that previously did not qualify for NAP benefits due to high income are invited to go through the pre-qualification process for NAP eligibility to determine whether they are now eligible (ADSEF, 2018). The flexibility of the new standards is substantial. NAP benefits will now be available to people over 65 who receive Social Security, people who receive unemployment assistance, and a greater number of households. For example, the maximum net monthly income for a single person to qualify for NAP benefits has increased from $233 to $616 per month. Likewise, a family of four with a net monthly income of $2,033 now qualifies for NAP benefits, whereas the regular limit is $713 (Ruiz, 2018).

2.3 Structure

ADSEF, a division of the DF, is in charge of the NAP. It is tasked with running several social welfare programs, including NAP, TANF, Food Distribution, and energy subsidies for needy families. According to Marta Elsa Fernandez Pabellón (2016), the current ADSEF Administrator, the mission of this agency is to facilitate access to opportunities for development to people with social and economic disadvantages so that

Puerto Rican families may be self-sufficient and integrate themselves into the social system in a productive way, as well as positive family and community coexistence. Their administration has a vision to renew a sense of hope in a future with a better quality of life for the inhabitants of Puerto Rico and turn the desire for social justice into a reality.

The functions of ADSEF in terms of the NAP include program supervision, evaluation, benefit emission, and providing beneficiaries with nutrition education. According to Fernandez (2016), ADSEF defines four objectives of the NAP. The first is to provide economic assistance to supplement the nutritional requirements of families that meet the requirements to receive benefits of the program through the purchase of eligible food items. This objective is carried out through the use of the System of Case Administration and Information (SAIC, by its name in Spanish). It permits the determination of applicant eligibility to NAP and TANF benefits in a quick, fair, and accessible manner, within a framework of respect (Fernandez, 2016).

The next objective is to strengthen nutrition education strategies with the purpose of improving the eating habits and health of NAP participants. ADSEF accomplishes this through the program My Nutritious NAP, or *Mi PAN Nutritivo* (MPN) in Spanish. As well as offering nutrition education, MPN promotes the adequate use of NAP funds through orientations for selecting and preparing healthy and nutritious foods. Similarly, another of the objectives of the NAP is to develop the MF to improve nutrition in NAP beneficiaries as well as promoting the sustainability of food consumption and developing job opportunities in the agricultural sector.

The last objective identified by ADSEF is to achieve that the families who receive NAP benefits use 100 percent of their assigned funding to buy only eligible foods that

meet their nutritional needs and high health standards. This is carried out through the implementation and enforcement of the EBT system, both for participants retailers. The agency keeps in touch with participants through required case evaluations at least once a year as well as through mail and phone communication whenever the case worker deems it necessary. The ADSEF Office for the Control of Business Inspections (OCIN, for its name in Spanish) is responsible for authorizing, denying, monitoring, and canceling the certifications given to retailers authorized for EBT transactions (Fernández, 2016).

2.4 Eligibility

The PR Department of the Family is required to identify the population eligible for NAP benefits in its annual plan (OMB Circular Number A-133, Compliance Supplement, OMB Circular Number A-133 2009). The program is currently operating with the set of bylaws spelled out in Rulebook 8684 approved on December 28, 2015 in combination with the concessions to the rules that were determined to deal with Hurricane Maria and its consequent disaster. The following procedures and guidelines are detailed in Rulebook 8684.

A person who wishes to apply for NAP benefits must begin by filling out a pre-qualification form online, by the 3-1-1 or 787-792-553 government phone service line, or by attending the ADSEF service that corresponds to their official physical address. For the predetermination, an applicant needs to have the following information: personal identification information (name, SS number, birth date, etc); physical and mailing addresses; disability evidence if it applies; level of schooling; net income; available assets; amount of money spent on childcare and caring for any adult(s) with physical or

mental limitations or special needs; amount of money spent on rent. Predetermination of eligibility is based on program requirements and the information given about the people who live in the household. If the person is deemed eligible, they are given an appointment at their local office, corresponding with their physical address. Applicants must present a set of documents at their appointment that provides evidence of the veracity of everything they reported in their predetermination as well as additional information to determine the benefit amount they are eligible for. At the appointment, applicants are assigned a case manager who will certify their eligibility according to the documentation required and determine the appropriate benefit amount, if any (Proceso de Orientación y Predeterminación de Elegibilidad PAN Puerto Rico Se Levanta en Familia, 2018).

Applicants must offer complete and correct information about: family size and composition; identity; residence; citizenship or immigration status; Social Security numbers of household members or evidence of having applied for it; assets possessed by everyone in the household; income of all household members. They must also cooperate if a visit to the home or to interview neighbors is deemed necessary. Once the documents are handed in, the person must sign an authorization for ADSEF to be able to verify any information on every person in the household given during the application process. Before technical personnel issue the initial certification of the case, the information offered by the applicant must be verified in one of the following ways: interview with the applicant at the office or in the home designated as the residence of the core service unit; official documents presented in person, by mail, or electronically (except in the case of survivors of gender-based violence); home visits; contact with neighbors. Applicants are

responsible for keeping their contact information up to date and informing their case manager of any changes to any of the information they present to the agency within 10 days of the change or risk losing their benefits.

A household may be composed of: a single person living alone; people without a home who roam from one place to another; a person who pays for room and board at a commercial lodging establishment, the proprietary of a commercial lodging establishment, an independent minor, residents at institutions and a group of people that live in the same home. However, the group may not be composed of a religious congregation, civic group, or people who are incarcerated, hospitalized, or in health institutions. Households are considered core service units. Further restrictions for the consideration of what constitutes a core service unit are detailed in the Rulebook.

As for the economic requirements, the maximum annual resources permitted for participation in the NAP are given below. For a core service unit composed solely of people above 60 years old or people that are completely disabled, the amount is $5,000. For core service units where there are no completely disabled persons or anyone 60 years or older, the maximum annual income allowed is $3,000. The resources of people deemed completely and permanently disabled by any government agency, state or federal, are deemed totally exempt from consideration for NAP.

Some liquid and non-liquid assets are considered for determining NAP eligibility as well. The following liquid assets are considered if a household member is the titular holder and benefits from the resource: cash; checking, savings, and individual retirement accounts as well as their interests; savings and deposit certificates; bonds and stocks; and non-recurring englobed payments such as money received from the sale of properties.

The following non-liquid assets are also entered into consideration: real estate properties and personal property that is registered at the Department of Transportation and Public Works (DTOP, by its acronym in Spanish) or with the Department of Natural Resources (DRNA, by its acronym in Spanish). The resources of the following ineligible people that form part of the core service unit are also considered: people disqualified because of a willful violation; people disqualified for not presenting their Social Security number or evidence of its application; ineligible foreign people; people disqualified for not meeting the requirement of enrolling minors between the ages of 5 and 17 years old in school.

There are also resources that are exempted from consideration. Some are discussed below. The personal residence and land it is built upon that is not separated by the intervention of property belonging to others is not considered. Neither is property that is located on a piece of real estate locked from being occupied or sold due to a legal or family inheritance conflict. A piece of property or house under construction in cases where the core service unit does not have a personal residence and is in the process of constructing it, is also not considered. Personal effects such as clothing and jewelry as well as items used in the home such as furniture and appliances are not considered. The vehicle registered to transport a disabled person and the total value of any additional vehicles registered in the name of anyone in the core service unit up to $6,000 are not considered either. Reimbursements for medical expenses that are properly evidenced can be eliminated from consideration. Total or partial income from scholarships, donations, subsidies, loans with deferred payment, veteran benefits, and money deposited in a savings account that is destined to cover costs associated with education are not considered either. The rest of the exempt resources can be found in Rulebook 8684.

Once the application is completed, it must be evaluated within 30 days of its presentation. If the application is accepted, the applicant receives an EBT card in the mail. The core service unit begins receiving its benefits from the moment they are approved, using a system of apportionment for the time and total they are eligible for. If a NAP beneficiary gets a job or begins to earn more money somehow, they are responsible for informing ADSEF of their changed circumstances within 10 days. After a case reevaluation, eligibility is determined once again. Increased income from getting a job is exempt from consideration for NAP eligibility for the first 4 months. After that, the exemption is phased out of consideration for eligibility at 66 percent between months 5 and 8, then 33 percent from months 9-12. From month 13 onward, the income will be considered to determine eligibility for NAP benefits.

2.5 Participation

Since its implementation in 1982, a large part of the population has participated in the NAP. Almost half of the households of Puerto Rico, 49.8 percent, participated in NAP that first year. Peterson et al. (2010) observed that the percentage of households participating in NAP leveled off in the mid 2000s, going from 36.8 percent in 2005, 33.7 percent in 2006, and 34.4 percent in 2007, to 35.4 percent in 2008. In fact, a gradual decline in the total number of participating households from 1984 to 2004 can be observed in Figure 2-1. After 2005, in accordance with the critical economic situation of Puerto Rico, the number began to rise.
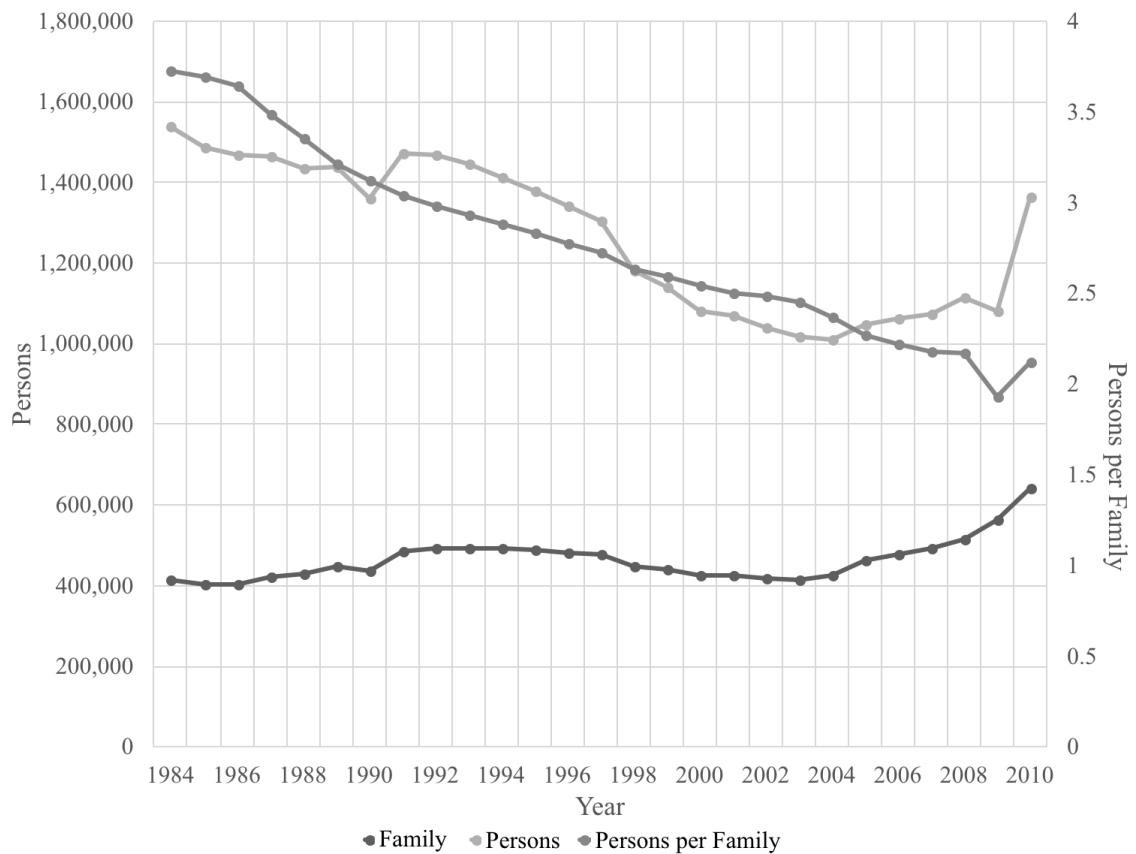
Figure 2-1. NAP Program Participants:1984-2010 [Puerto Rico Planning Board, 2018]

Family composition has also changed since NAP was implemented, from 3.72 in 1984 to 2.12 in 2010 with a negative trend throughout (see Figure 2-1). The change in family size has had an effect on the real benefit amounts received by NAP participant families. As can be observed in Figure 2-2, real NAP benefits have had a negative tendency for the whole period except for a brief increase between 1997 and 2003.
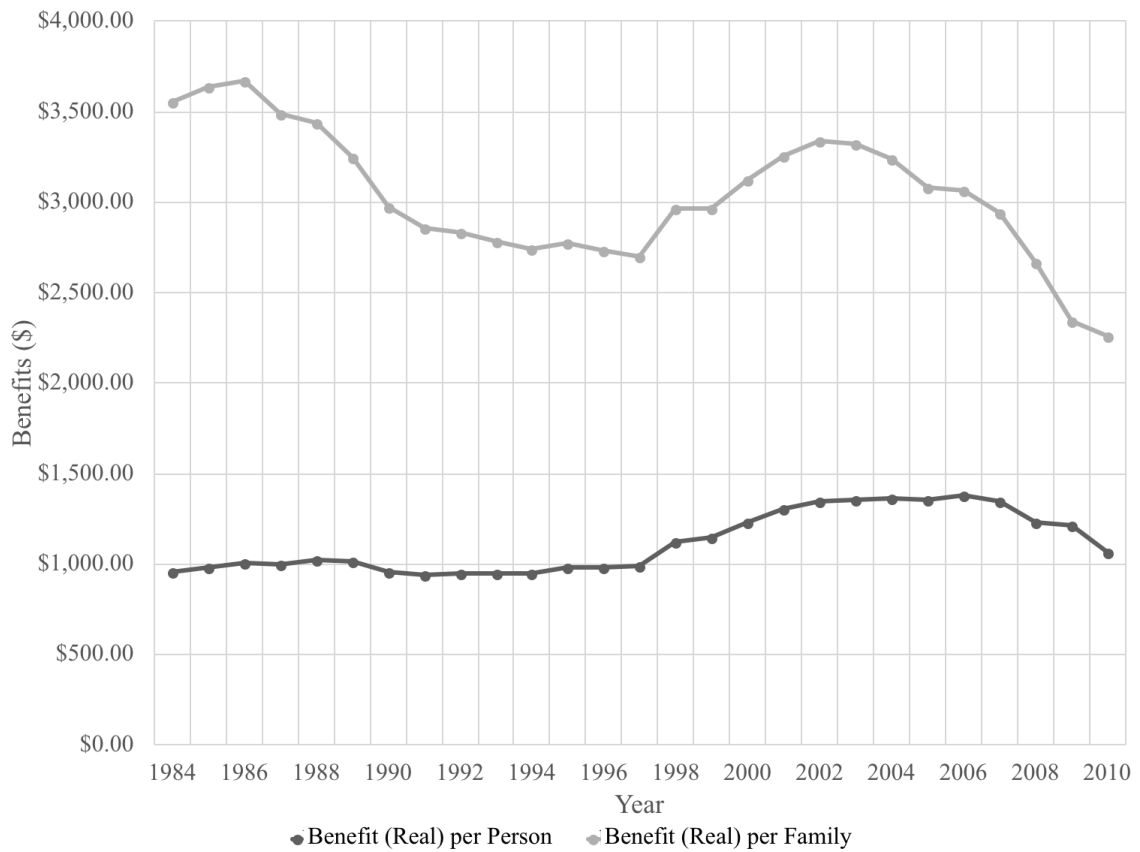
Figure 2-2. NAP Benefits (Real) per Participating Families and Individuals: 1984-2010 [Puerto Rico Planning Board, 2018]

That increase appears to respond to a reduction in family size rather than a reduction in overall benefits for two main reasons. First, the benefits per person have remained far more constant. Also,

Figure 2-3 shows that total benefits had a tendency to increase until 2004.
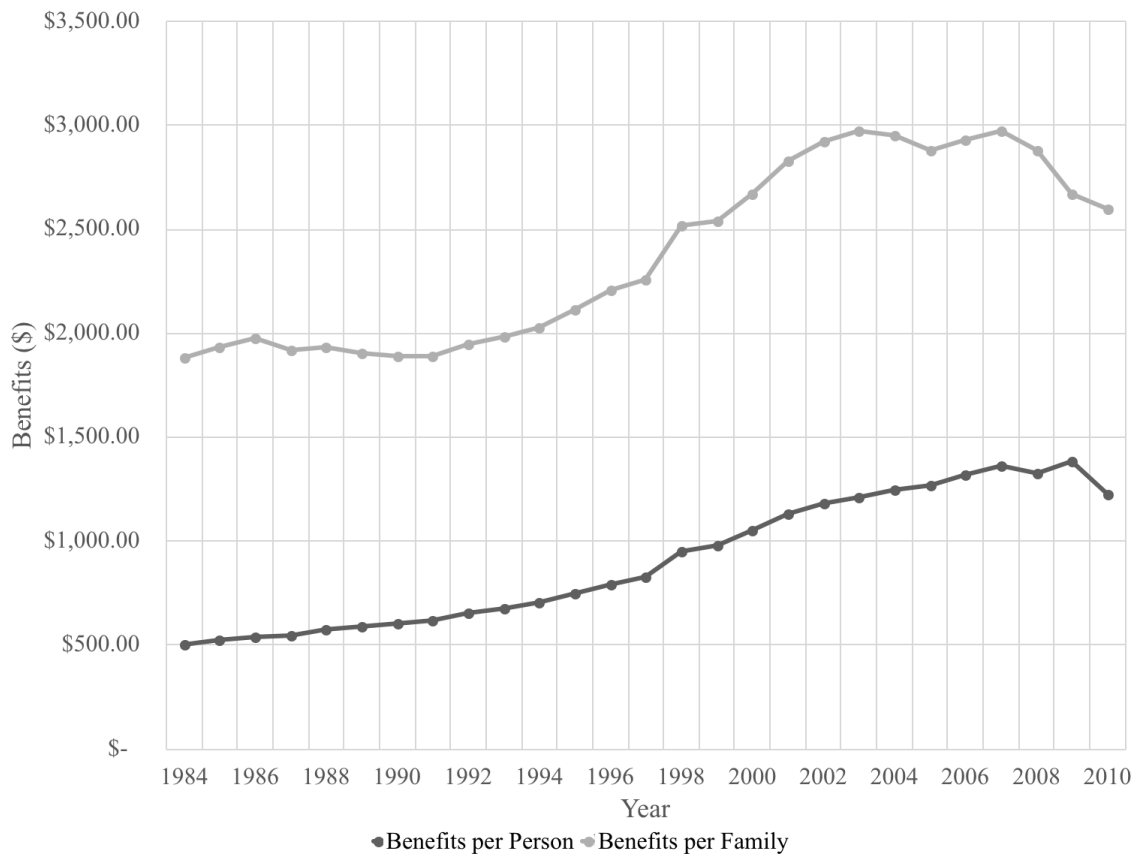
Figure 2-3. NAP Benefits (Nominal) per participating families and individuals: 1984-2010 [Puerto Rico Planning Board, 2018]

The increments in nominal benefits and the steadiness of the real benefits received by participant families also speaks to how purchasing power has remained relatively steady. ADSEF internal tabulations (quoted in Peterson et al., 2010, p. 11) indicate that the monthly average benefit amount also increased over time (see Figure 2-4). However, it appears to have leveled off after 2002.
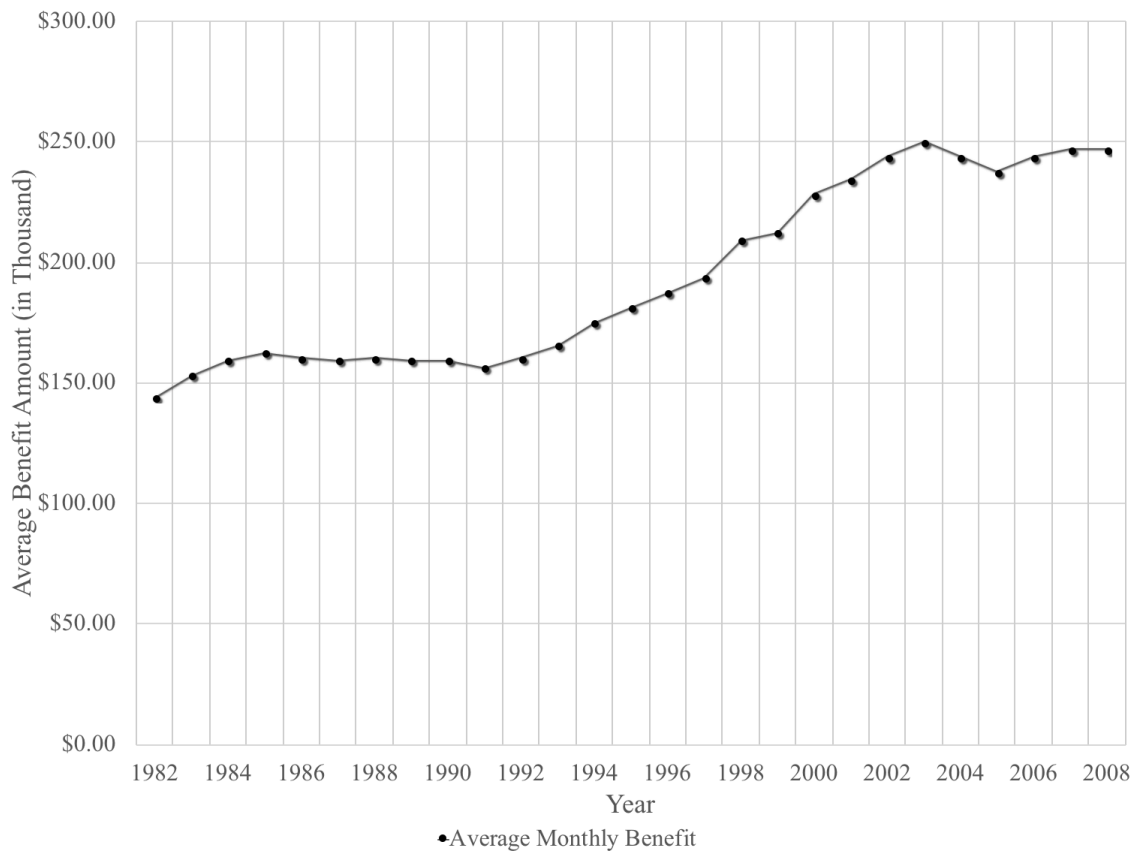
Figure 2-4. Average Monthly NAP Benefit Amount per Household: 1982-2008 [Peterson et al., 2010]

2.6   Vulnerable Subgroups of the Population

Trippe et al. (2015) identified particularly vulnerable subgroups within the NAP population in a study that examined cash nutrition assistance program benefits in Puerto Rico. They found that as of June 2014, more than 60 percent of NAP core service units had zero gross cash income from either earned or unearned sources (see Figure 2-5). Therefore, those households rely on NAP for the entirety of their income. On the contrary, only 21.5 percent of core service units in SNAP have zero income.

Figure 2-5. Percentage of NAP and SNAP Units by Income Characteristics in June 2014
[Trippe et al., 2015]

As shown in Figure 2-6, once the population with zero income is divided by characteristics, it becomes clear that the majority of the units have elderly members (89.4 percent) or nonelderly members with disabilities (80.6 percent). As for NAP families with children, 33.3 percent of them have no other source of cash income, as well as 30.4 percent of families headed by a single mother. There is only a slight difference between NAP families living in rural areas (62.7 percent) and those living in urban areas (65.5 percent) in terms of zero income.
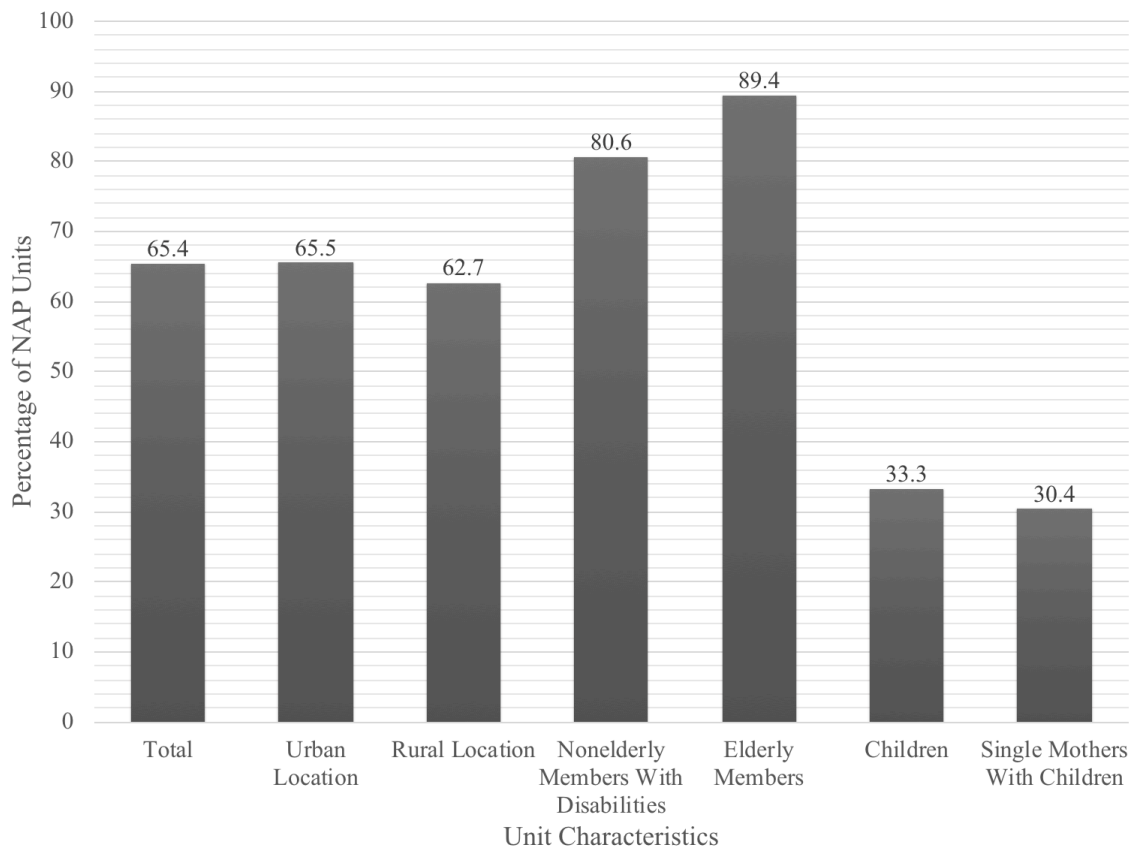
Figure 2-6. Percentage of NAP Units with Zero Income by Subgroup in June 2014
[Trippe et al., 2015]

Based on the above characteristics of the NAP population and discussions with NAP administrators, Trippe et al. (2015) identified the key subgroups that are most vulnerable amongst NAP participants. These include NAP core service units with zero income, nonelderly members with disabilities, elderly members, children, and single mothers with children. Because of the limited income opportunities found in rural areas and the possibly reduced access to food retailers, units in rural areas were identified as potentially vulnerable as well.

3   CHAPTER- LITERATURE REVIEW

One of the biggest concerns in the literature about government transfer programs is the work disincentive effect they can have. Interestingly, there have been mixed results, which have given way to even more research on the topic. Work disincentive effects have been found to be small, if there are any at all, in the policy context of developed countries. On the contrary, in the context of developing and emerging countries, there is little evidence of any disincentive effects to work. The rest of this chapter will review the empirical evidence on this topic as well as on the constructs used to select the variables for this study.

3.1   Labor Market

Studies of government transfer programs, particularly FANPs such as SNAP (previously Food Stamp Program) in the U.S. and NAP in Puerto Rico, yield different empirical results on the topic of work disincentive effects when situated in the policy contexts of developed and developing or emerging countries. Puerto Rico, a special case because of its relationship to the U.S. as an unincorporated territory, behaves differently from either group.

3.1.1 Work Disincentive Effects of SNAP

Surveys of the studies on the FSP and SNAP (Currie, 2003; Hoynes & Schanzenbach, 2016; Chan & Moffitt, 2018) have identified very small, though

statistically significant, negative effects on work (Fraker and Moffitt, 1988; Moffit (1992, 1999); Hagstrom, 1996; Keane and Moffitt, 1998) with some exceptions (Hoynes & Schanzenbach, 2012; East, 2015). Currie (2003) ties the empirical results to theory, observing that social programs with fixed income cutoffs create a notch in the budget constraints that households face. Households are likely to be discouraged from increasing their working hours when they are located near the notch points, as the marginal tax rates on additional earnings may be very high. Furthermore, if the households were initially located just above the notch, they may prefer to decrease hours of work to the notch point so that they may qualify for the social programs. However, she remarks that removing the notch by eliminating an FNP would not necessarily increase work effort.

Some of the studies that conclude there is relatively little effect on work effort consider the combined effect of multiple welfare programs (Fraker & Moffitt,1988; Keane & Moffitt, 1998), since households are often eligible for more than one program. Fraker and Moffitt (1988) model the effect of participation in food stamps and welfare programs on labor supply using structural models and kinked budget constraints to estimate the impact of food stamps on labor supply for a sample of female heads of household (families headed by a single woman), the largest recipient group in the program at the time. They model the choice of hours of work (zero, part time, full time) and participation in the Aid to Families with Dependent Children (AFDC) and food stamp programs, specifying a utility function. Fraker and Moffitt find a 9 percent reduction in the hours of work among food stamp recipients, since participants reduce

their working hours by 1 h per week due to the FSP and mean weekly hours worked for food stamp participants is about 9.5.

Keane and Moffitt (1998) estimate a structural model of participation in multiple welfare programs. They took an approximate approach to the problem of lack of data sets with sufficient consumption and labor supply data together by putting a parameter to be estimated in front of the subsidy amount of in-kind goods in the budget constraint. This allowed the effect of the in-kind good to be different from the effect of cash transfers. Since the coefficients on several in-kind transfers were far below one according to their estimates, it implies a much smaller disincentive effect on labor supply than for cash benefits. They also conclude that high welfare tax rates have relatively little effect on work effort.

Hagstrom (1996) found that the labor supply effects of the FSP on married couples are even smaller than those found in studies focusing on single persons. He used data from the Survey of Income and Program Participation to estimate a nested multinomial logit model. The smaller labor supply effects to changes in the food stamp benefit are consistent with the literature on cash welfare programs, which also finds smaller labor supply effects (Moffit 1992, 1999). Hagstrom remarks that the policy changes simulated by his model suggest that few couples make changes to their labor supply in order to become eligible for FSP benefits. He identifies differences in nonlabor income and deductions across households with identical labor incomes as the sources for the variation in FSP benefits in his model.

Other studies have found, though modest, more significant effects of SNAP on labor supply (Hoynes & Schanzenbach, 2012; East, 2015). The study by Hoynes and

Schanzenbach (2012) was the first paper to use a quasi-experimental research design to study the employment effects of the FSP. They used county variation in the implementation of the FSP in the 1960s and 1970s to estimate the impact of the program on the extensive and intensive margins of labor supply, earnings, and family cash income. They found that although there were no significant impacts on the overall sample, when they only included single-parent households with a female head they found a significant intent-to-treat estimate of a reduction of 183 annual hours (treatment-on-the-treated reduction of 505 annual hours). Their triple-difference estimates implied a 24 to 27 percentage point reduction (treatment-on-the-treated) in the employment rate.

On the other hand, East (2015) studied the effect of SNAP on the labor supply of foreign-born single women and married couples using the variation across states and over time in immigrants' eligibility. Her findings state that individuals reduce their labor supply when they are eligible. She identified the largest effects among married and single women, who reduce employment. The effects for married men are instead concentrated along the intensive margin, hours of work, and are smaller.

Another study that also questioned the structure of public policy analyses used the policy question of whether AFDC and Food Stamp payments have an impact on the number of female-headed households and female labor force participation to illustrate the importance of considering spatial dependence in econometric models (Lacombe, 2004). He found strong spatial dependence for county level observations both within-state and between-state, which implies that least-squares estimates are inconsistent and biased. In the example he used, the least-squares estimates produced results that were inconsistent with most of the previous literature on the policy effects of cash transfer programs. He

obtained more consistent results with previous empirical research using a second "matched" border county approach set forth by Holcombe and Lacombe (2003) that relies on least squares estimation. However, formal tests for spatial autocorrelation in the least-squares residuals from the two methodologies indicated the presence of significant spatial dependence in the residuals. His results were consistent with finding strong spatial dependence in the dependent variable when using the spatial autoregressive model on all four specifications. Lacombe encourages the use of the spatial autoregressive model to effectively model the influence of unobserved latent variables that vary systematically over space.

3.1.2 Work Disincentive Effects of Cash Transfer Programs in Developing Countries

The literature points to cash transfers having no work disincentive effects in developing countries. Banerjee, Hanna, Kreindler & Olken (2017) re-analyzed the results of seven randomized controlled trials of non-contributory cash transfer programs run by governments from six countries worldwide to examine their impacts on labor supply. To meet their criteria, programs had to be an evaluation of a (conditional or unconditional) government-run cash transfer program in a low-income country that compared the program to a pure control group. Furthermore, they had to be able to obtain micro data for both adult males and females from the evaluation. Also, the randomization had to have at least 40 clusters. They ended up analyzing data for transfer programs from six countries: Honduras, Indonesia, Morocco, Mexico (two different programs), Nicaragua, and the Philippines. Banerjee et al. found no systematic evidence of cash transfer

programs on the overall number of hours worked nor the propensity to work. This was true for both men and women.

Ervin et al. (2017) studied the impact of cash transfer programs on labor supply in Zambia and found similar results to Banerjee et al. Focusing on the response of household labor supply in terms of off-farm paid labor and own-farm labor, they used data from the second wave of the impact evaluation of the Zambia Child Grant model of the Social Cash Transfer program. They found that cash transfer programs cause a shift from agricultural wage labor to labor on an own-farm, so overall there were no work disincentives on farm households.

Another point to note about work disincentive effects in developing or emerging countries is that work incentives do not necessarily operate within the framework of the law. This is particularly important for economies with large informal labor sources. Bergolo and Cruces (2014) studied the impact of a reform in Uruguay's social insurance system that extended the coverage of a health insurance benefit from registered employees to their dependent children, which introduced a new incentive for parents to join the formal labor force. Results indicate an increase in benefit-eligible employment that was driven by both reductions in the number of those not working and (for single parents) by shifts from unregistered to registered employment. A complex pattern of tax-evasion responses in the labor market following the policy change rises from these results. In terms of tax evasion, the labor market decision is not simply between off-the-book versus registered employment, but between full non-compliance, full compliance, and on-the-book salaried employment with under-the-table payments.

3.1.3 Work Disincentive Effects of NAP

The literature studying the work disincentive effect of NAP in Puerto Rico generally agrees that it is negative. Situn (1992) studied the effect of NAP on employment, Gross Agricultural Income (IBA, by its acronym in Spanish), and food consumption. He used Ordinary Least Squares to estimate multiple regression equations that indicated a negative relationship between agricultural employment and increases in NAP benefits.

An analysis done by Segarra (1999) indicated that, in the presence of high unemployment, the tightening of eligibility restrictions would not increase labor supply and may even cause a net reduction in work effort. However, Segarra found that little is known about how the interaction of program incentives and labor demand conditions affect the labor supply decisions of NAP recipients. Since the late 1990s, no further research has been done using municipal data to study the effects of NAP benefits on labor supply.

Meanwhile, Burtless and Sotomayor (2006) argue that the low labor force participation rates in Puerto Rico, relative to the United States, from 1970 to 2004 are principally explained by government transfers to Puerto Ricans. Their evidence includes the immediate drop in the labor force participation and employment rates in Puerto Rico relative to the U.S. after the mid-1970s expansion of government transfer programs. Additionally, they claim that participation and employment rates continued to be depressed after the Puerto Rican economy recovered from the severe recessions it experienced in the 1970s and 1980s. Furthermore, they state that the groups that have the

greatest opportunity to obtain higher benefit amounts—the young, the old, and women—

have the biggest shortfalls in participation rates.

An evaluation by Hernández, González and Valdés (2018) of the response in

employment to changes in the minimum wage in different industrial sectors in Puerto

Rico from 1991 to 2010 included NAP benefits. The study used dynamic panel

regressions using an ABBB GMM and a S.U.R.E. model to determine that NAP benefits

appear to have a negative effect on employment in the industries of transportation, retail

sales, whole sales, services, and public administration. The estimations suggest that

increases in NAP benefits incentivizes people to not participate in the labor force of those

industries, thereby reducing employment.

3.2   Demographic

3.2.1 Migration

Migration needs to be considered when observing spatial effects of the labor

market, especially in Puerto Rico where there is such a high migration rate. Beginning

with internal migration, Cao (1984) observed that it is due to income distribution, rather

than manufacturing employment and the differences in its interregional location. Instead,

he found that inequality in income distribution within each region promotes general

migration, mostly in a selective way that increases the imbalance in interregional

distribution of human resources. Furthermore, migration dynamics affect skill level and

wages. Borjas (2007) found that Puerto Rico attracts high-skill immigrants and exports

low-skilled workers. While immigrants lower the wage of competing workers on the island, out-migrants increase the wage.

Various analyses of the determinants of the Puerto Rican migration to the U.S. mainland (Hernandez, 2002; Enchautegui & Freeman, 2005; Caraballo, 2015) agree that it is mostly due to employment-related reasons. Hernandez (2002) identified migration and return migration cycles due to job retirement of PR migrants on the mainland. He finds that the most important determinants are wages, unemployment (most), and social networks. He also remarks upon the historical incentivization of migration to the mainland by the Puerto Rican government.

Enchautegui and Freeman (2005) present the connection between relatively poor Puerto Rico and the relatively wealthier U.S. mainland as the stage that has set the economic conditions for mass migration between the island and mainland. They comment that the relationship between GDP and employment has been distorted in Puerto Rico, since GNP and GDP have diverged. Moreover, they identify that U.S. government transfers to Puerto Rican families make up a large percentage of personal income. The open borders to the U.S., they argue, give men easy access to move when they desire to find work potentially creating a lower bound to wages on the island. They also remark upon the Puerto Rican wage structure in which low paid jobs have relatively higher earnings and employment in the informal sector. Puerto Rico is not the only case to see a dynamic like this one; Enchautegui and Freeman show that regional economies with open borders to relatively richer areas have similar migration problems.

Caraballo (2015) found that in the short-run, only labor market factors explain migration. Meanwhile, in the long-run, the migration dynamics can be explained by

increases in the minimum wage with respect to the average gross income, increases in economic growth, and increases in education. He noted that homicides do not appear to affect migration dynamics though criminality has long been cited as a reason driving the mass exodus from Puerto Rico.

3.2.2 Population Density

Population density is another factor that affects spatial employment dynamics. The literature states that people tend to move away from where they work to find homes (McMillen & Lester, 2003). Furthermore, Picard and Zenou (2018) have found evidence of the importance of social networks for finding jobs, leading areas that encourage social interactions to have lower unemployment. Moreover, land use planning and transportation investments can and do influence commute patterns, also affecting employment (Guerra, Caudillo, Monkkonen & Montejano, 2018). In fact, that is an important area of improvement for Puerto Rico, which has a high population density and long history of ineffective land use planning (Martinuzzi, Gould, & González, 2007).

3.3 Transportation

Transportation infrastructure expenditures can lead to greater productivity and increases in economic output (Duran-Fernandez & Santos, 2014; Agbelie, 2014; Enflo, Alvarez-Palau & Marti-Henneberg, 2018). In fact, spatial spillovers should be considered when analyzing the effect of transportation infrastructure on economic growth (Cohen, 2009; Arbues, 2015). Furthermore, transit has a role in social equity by

providing accessibility to the labor market, especially to low-wage jobs (Fan, Guthrie &
Levinson, 2012).

3.4   Theoretical Framework

Labor market decisions are made by three main actors: individuals, private
companies, and the government. Individuals decide such things as how much training
and education to incur in before seeking a job, what type of occupation or field to go into,
and whether to unionize, as well as choose between the opportunities that their lives
present them with. Private companies must choose how many people to hire, what
benefits to offer their labor force, and whether to outsource work, among other things.
The interactions between individuals and firms are regulated and overseen by the
government, which also acts as an employer. Policymakers must balance worker
protections and rights with considerations for firms' competitiveness. These actors all
interact in their different capacities across alternative market structures, ultimately
determining wages, employment, unemployment, and labor shortages or surpluses
(Benjamin, Gunderson, Lemieux, & Riddell, 2007).

Analyzing labor demand means looking at the forces that shape the changes in
labor, including wage rate changes and other associated costs such as fringe benefits and
those required by legislation. This side of the equation is highly sensitive to issues such
as global competition, industrial restructuring, technological change, and free trade,
which are all external and constantly changing. Therefore, it is important to consider
what is happening in the global economic environment when analyzing labor demand
(Benjamin et al., 2007).

On the other side of the equation is labor supply, which focuses on how individuals earn a living by selling labor services through the labor market. Incentives to work lie at the heart of the study of labor supply. Modern labor economists focus on individual decisions of how much to work, treating populations as fixed at a point in time. Changes in population growth, labor force participation, and hours of work are all quantity dimensions of the study of labor supply. There are also quality dimensions that include looking at education, training, health, and mobility, often analyzed as human capital investment decisions. Work effort and intensity are yet another quantity dimension, analyzed in the context of efficiency wage theory and optimal compensation systems. Determining the work incentive effects of income-maintenance and tax-transfer schemes is also part of labor supply analysis. This area ties labor market economics to the areas of poverty and income distribution as well as tax and social welfare policy (Benjamin et al., 2007). This is the area of labor supply that the present investigation will be concentrated on.

The income- or labor-leisure choice framework provides the theoretical underpinnings of the labor supply function in the neoclassical model. It simplifies the dynamics of people's decision-making of how to spend their time. Time spent on work is considered labor or income, as it has a monetary value. Time spent on everything else is classified as leisure, though it could encompass activities that are not purely leisure such as education, caretaking, and housework. It is an extension of standard microeconomic consumer theory, looking at an individual's decision-making problem, representing her choice of hours worked given her market opportunities and the value she places on her non-market time (Benjamin et al., 2007).

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The decisions considered with this framework are whether or not to participate in the labor force (participation) and if so, the amount of time to spend on labor (hours). Participation is a discrete variable, as opposed to hours, which is continuous. Participation is a much more individual choice than hours, since there is more regulation and less scope for individual variation in terms of working hours. Flexible working hours are not as common as the standard typical arrangement of 8-hour days, 5-day weeks, and 40-hour work weeks. Though a lot of the policymaking attention focuses on the participation decision of individuals, the hours one also has great importance. It affects the quality as well as the quantity of work and therefore, an economy's total output and productivity (Benjamin et al., 2007). Flexible working hours and other arrangements that allow people to have greater control over use of their time are also tools that are being used to both diversify the workforce and provide work opportunities to groups of people that have been traditionally underrepresented in the workforce.

The income- or labor-leisure model can be applied to both dimensions of the labor decision. With it, one can observe the effects of changes in wage rates and other economic variables on individuals' labor preferences. It is also possible to derive an individual's supply curve of labor. The effect of wage rate changes is one of the main questions that economists have studied using the model, but there is no definitive answer for that conundrum: "labor supply *can either increase or decrease* with the wage rate", according to standard labor economics theory (Benjamin et al., 2007, p. 32). Labor supply behavior in the real world is complicated and understanding the complexity of the labor supply model is a first step towards appreciating the complexity of the labor supply decision.

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The framework models the theory of individual rationality in the face of economic constraints. Consumer choice theory underlies the model. Therefore, its building blocks are preferences and constraints. Preferences are what individuals wish to achieve, organized in utility bundles and represented graphically as indifference curves. It is tricky to try to generalize preferences, because individuals use very diverse standards to place value on their time and have different restrictions. In this model, the two goods that individuals are given to choose between are labor and leisure. Hours spent on labor represent consumption of goods and services, while leisure encompasses all non-labor market activities, including undertakings that are not purely rest or enjoyment.

On the other hand, constraints are what is feasible for individuals to achieve. The potential income constraints are the varying amounts of income that can be obtained by giving up leisure and working. It is derived using wage rates, which can be constant or not, depending on the type of work done. Potential income constraints are generally represented as straight lines, but other working arrangements, such as self-employment, can have different implications and therefore a different graphical representation. The slope of those income constraints is important, because higher wages yield a steeper budget constraint and higher potential income. However, not all income is obtained from work. Nonlabor income (Y_N in Figure 3-1), such as government transfer payments to qualifying families and parental contributions to college students, is accounted for in the model as well.

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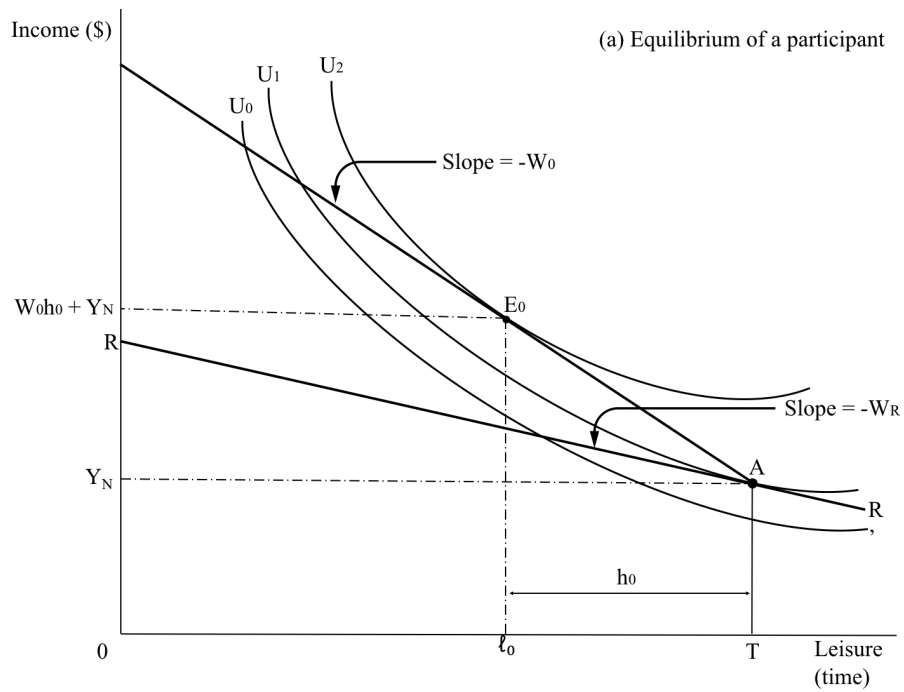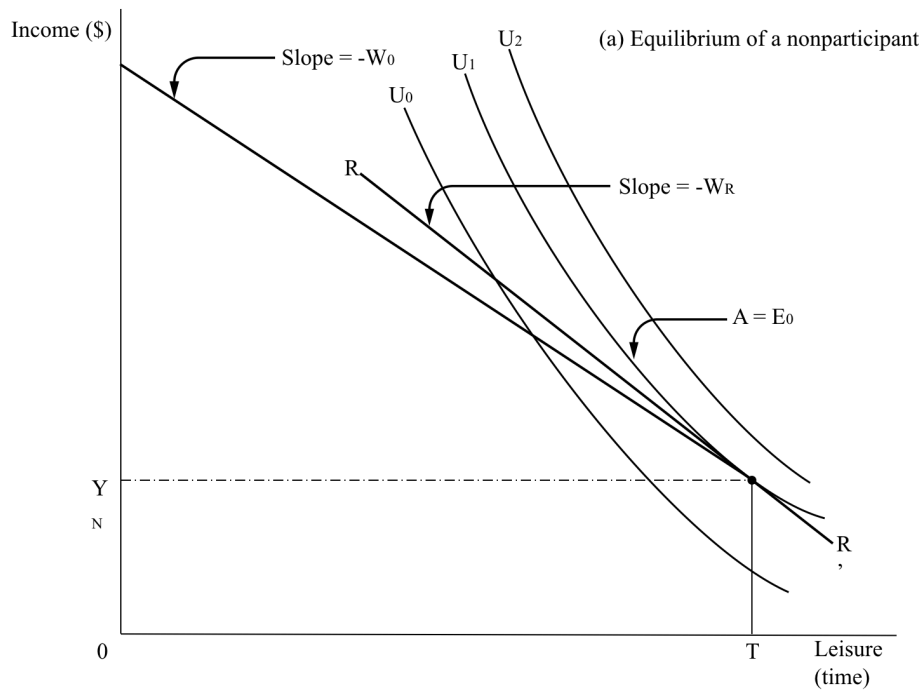
Figure 3-1. The Consumer's Labor Supply Decision: Equilibrium of a nonparticipant vs equilibrium of a participant in the labor force [Benjamin et al., 2007]

The optimal amount of work or labor supply for the consumer is found by putting together the individual's potential income constraint and indifference curves together. A key assumption of the model is that individuals choose the outcome, out of all that are feasible, the one that yields the highest level of satisfaction or well-being, according to their preferences. There are two types of outcomes to the choice dilemma, either a corner or an interior solution. At the corner solution, the individual's equilibrium occurs at one of the 2 extreme points on the potential income constraint. In the case that the individual obtains the highest possible utility at the point corresponding to maximum leisure on the budget constraint, the individual will not participate in the labor market. On the other hand, when the optimum is obtained between the 2 extreme points on the potential income constraint, an interior solution occurs. The equilibrium will be at the tangency between the budget constraint and the highest possible indifference curve. With interior solutions, individuals do choose to participate in the labor market.

Another way to visualize and understand the consumer's optimum is by examining the relationship between an individual's marginal rate of substitution (MRS) and the market wage rate. The MRS measures the individual's willingness or preference to exchange leisure for income, while the market wage rate measures the individual's ability to perform that exchange (Benjamin et al., 2007). When the MRS at 0 hours of work is greater than the wage rate, then the individual's implicit value of leisure time is high relative to the explicit market value of that time and therefore, the individual chooses to not participate in the labor force. However, if the MRS at 0 hours of work is less than the wage rate, then the individual's implicit value of leisure time is less than the explicit market value of that time and the individual will prefer to participate in the labor

market. In this case then, the individual will increase her working hours until the MRS between income and leisure is equal to the wage rate, at which point she will have exhausted any gains she may obtain from trading leisure for labor hours. The considerable variation there is in people's attachment to the labor market is indicative of the relative value that people assign to their time.

Another way to understand individuals' choice to participate or not in the labor market is using the concept of a reservation wage. This term denotes the wage rate at which an individual would be indifferent between participating in the labor force or not. In other words, it is the rate of pay for labor that makes someone feel indifferent between working in the labor market or spending their time in nonmarket activities such as retirement, household work, or leisure. The wage rate can be observed graphically as the slope of the individual's indifference curve at zero hours of work. If the market wage is less than the reservation wage, then the individual will choose to not participate in the labor market. On the other hand, if the market wage is greater than the reservation wage, then the individual will participate in the labor market.

3.5   Theoretical Analysis of the Puerto Rico Labor Market

A basic assumption of the supply and demand model is the rationality of consumers. Given Puerto Rico's high living costs and the vulnerability that results from losing access to government benefit programs upon starting a job at the minimum wage, not participating in the labor market is a rational choice for many consumers, consistent with neoclassical consumer choice theory. By this logic, Puerto Ricans are being rational

consumers, trying to reach the highest indifference curve possible, constrained by the economic opportunities they are afforded in the local labor market.

Participating in the labor market, even at a job receiving the minimum wage, means losing access to means-tested transfer benefits, effectively reducing Y_N. People become immediately poorer, sooner than they can handle the transition. Considering the uses they have for their time, which translate into the value they place on it, a minimum wage job could be a less valuable than what they could accomplish by not participating in the labor market. The demands made of people's time include important societal functions such as responsibilities associated to parenting and caretaking for the elderly, including food provision and preparation, medical appointments, and constant supervision. Having a fixed work schedule requires other arrangements for meeting these responsibilities, which almost always require money to take care of.

A job is also a riskier source of income than government benefits. There is no assurance that the job will be available throughout the work life of a person, as those decisions are affected by many external forces. Mass layoffs have been unfortunately common in Puerto Rico since the phasing out of Section 936 of the U.S. Tax Code began. Entire towns have been affected with the closing of many manufacturing plants once the economic benefits afforded by that section expired.

Not participating in the labor market can be a better alternative for people of little education or experience and who are candidates only for minimum-wage jobs. The time not spent in the labor market can include working in the formal sector, which could mean access to potentially higher wages. There is also more flexibility in working hours, which permits people to fulfill their caretaking responsibilities without incurring in

spending that they cannot handle. Furthermore, it allows for the inclusion of welfare income in Y_N, affording people greater security that they would not otherwise be able to count on.

Migration is the other alternative that Puerto Rican people are turning to in large numbers. While it is true that hurricanes Irma and María in 2017 accelerated the exodus of Puerto Ricans to the United States mainland, migration had been increasing precipitously since the island's population peaked at 3.8 million in 2004 (Abel & Deitz, 2014). According to Abel and Deitz of the Federal Reserve Bank of New York (2014), Puerto Rico's population has shrunk by more than 5 percent over the course of a decade, ranking seventh in the world for population loss. Montalvo and Laughlin (2017) of the U.S. Census Bureau estimate that about 89,000 people moved to the U.S. mainland in 2015 while only 24,000 moved back, which is further aggravated by declining fertility rates.

Furthermore, although there are varying estimates of the amount of people who have fled the dire situation the island was left in after the 2017 hurricane season, there is no doubt that the number is very high. Sutter and Hernandez (2018) observed that there were at least 10,600 applications for disaster assistance to the Federal Emergency Management Agency (FEMA) from zip codes all over the U.S. mainland. Applications are done by household, and according to the U.S. Census Bureau, the average Puerto Rican household is composed of three people. Additionally, the United States Postal Service (USPS) reported 6,600 address changes from Puerto Rico and the U.S. Virgin Islands to locations in the U.S. mainland (Sutter & Hernandez, 2018), indicating an intention to remain on the mainland rather than return after the disaster has been handled.

4   CHAPTER – METHODOLOGY

This section will discuss the databases and statistical models used to evaluate the effect of NAP program benefits on employment in each of the 78 municipios of Puerto Rico. The period of investigation covered the years 2000 to 2010, given the availability of NAP data. The Quarterly Census of Employment and Wages (QCEW) and program data from ADSEF were the main data sources. Employment data exhibits spatial characteristics upon initial inspection, so tests were done to confirm the existence of spatial autocorrelation Puerto Rico with respect to employment. Once its existence was confirmed, spatial panel data models were fit to the data in order to take the spatial characteristics into account when observing how NAP benefits affect employment. The following sections will detail the data sources, a description of the variables, the spatial characteristics of employment, and the empirical design of the present study.

4.1   Data Sources

Table 4-1 summarizes the sources of all of the variables, as well as the way they were defined for this investigation. This section will describe the sources for the data.

Table 4-1. A summary of the source and definition of the variables.

Dependent Variable	Source	Definition
Employment rate	Quarterly Census of Employment and Wages (Puerto Rico Department of Labor and Human Resources)	Employed population divided by the total population in each municipality

Independent Variables	Source	Definition
NAP family benefits	Administration for the Socioeconomic Development of Families	Amount of NAP benefit given to recipient families (in real terms)
Minimum wage	United States Department of Labor	Historical minimum wage established by the Federal government
Average salary	Quarterly Census of Employment and Wages (Puerto Rico Department of Labor and Human Resources)	Average salaries in the work establishments of each municipality (in real terms)
Migration rate	Puerto Rico Health Department, United States Census Bureau	Net migration rate per municipality
Percentage of automobiles	Puerto Rico Department of Transportation and Public Works	Number of cars registered at the DTOP in each municipality divided by the population
EAI	Government Development Bank	Economic Activity Index
Fed Funds Rate	Federal Reserve Bank of New York	Federal banking interest rate

The data for the dependent variable, the employment rate, was derived from the QCEW, which is prepared by the Puerto Rico Department of Labor and Human Resources (DLHR) in collaboration with the United States Bureau of Labor Statistics (BLS). The QCEW report produced by the Puerto Rico DLHR is obtained from an administrative archive that originates in the Office of Contributions of the same department, where payments made by employers for Unemployment Insurance are processed. The archive is produced on a quarterly basis and is edited by DLHR staff according to the BLS operative manual. It is the most comprehensive report on employers in Puerto Rico, offering information about the number of establishments, employment (on a monthly and quarterly basis) by industrial sector, and the geographical

area of the employers (Department of Labor and Human Resources of Puerto Rico, 2018).

The main explanatory variable, the amount of NAP benefits received by families in each municipio, comes from program data collected by ADSEF. Although the data set is quarterly, it was obtained compounded by fiscal year. The agency reports the amount of families and individuals receiving NAP benefits as well as the amount allotted to each municipio by identifying the active cases in their registry. This investigation is limited to the years 2000 to 2010 because the latest publicly available reliable data is that of 2010, as published by the Puerto Rico Planning Board on its website (Puerto Rico Planning Board, 2018).

The rest of the variables were derived from various databases prepared by both local and Federal government institutions. The minimum wage was derived from the historical minimum wage series established by the Federal government and published by the U.S. Department of Labor (DOL). The average salary was derived from the QCEW. The migration rate was calculated using the birth and death rates reported by the Demographic Registry, ascribed to the PR Health Department (DS), and the population estimates for each municipality calculated by the U.S. Census Bureau. The data to calculate the percentage of automobiles per municipality was taken from DTOP. The Economic Activity Index (EAI) used was calculated by the GDB, and the Federal Funds Rate was obtained from the Federal Reserve Bank of New York (NY Fed) (Federal Reserve Bank of New York, 2018). The next section gives more details about how the variables were constructed.

4.2 Description of the Variables

Table 4-2. Descriptive statistics.

Variables	Mean	Std. Dev.	Min	Max
Employment to Population[a]	0.29	0.055	0.02	0.48
Real Avg NAP Family Benefits	3114.08	351.62	2114.45	7282.02
Real Avg Wage	199.63	87.91	90.29	2309.37
K Index[a]	0.62	0.15	0.06	1.24
Cars to Population[a]	0.57	0.09	0.04	0.87
Net Migration[b]	-5.94	7.50	-39.32	25.78
Population Density[c]	1279.99	1363.34	151.50	9087.32
Inflation[b]	2.80	1.95	0.19	5.61
Real Avg Personal Tax	708.01	68.01	599.97	809.56
Fed Fund[b]	2.70	1.99	0.16	6.24

Note. Dollar amounts were adjusted for inflation by using the 2008-dollar value. [a] These variables are expressed as ratios. [b] These variables are rates. [c] Population Density is calculated as each municipality's population divided by its area in square miles.

The employment rate is the dependent variable. It was calculated by dividing the amount of people employed in each municipio by its total population. Total population was used to calculate the employment rate rather than the labor force, since the labor participation rate is too low relative to the population, given the size of the informal labor market. The employment rate was used rather than unemployment, since the latter is not sensitive to changes in the economy. This happens due to the high attrition that results from migration to the U.S. mainland, given the ease of travel between the two places. Rather than remain unemployed in Puerto Rico, people prefer to search for a job in the more robust U.S. labor market. This makes the unemployment statistic in Puerto Rico remain relatively steady throughout time. For example, after Hurricane Maria devastated the island in September 2017, the unemployment rate dropped. That was because of the amount of people who left PR rather than because people found jobs here.

The main independent variable included in this study is the amount of NAP

benefits assigned to families. The variable used was constructed by dividing the amount

allotted to each municipio by the amount of families reported there as receiving NAP

benefits. That way, an average of what families receive in each municipio was obtained.

The variable is in real terms, adjusted for inflation using 2008 as the base year.

The minimum wage is another important explanatory variable for employment

dynamics, especially considering the population that receives NAP benefits. This paper

uses the K index to measure changes in minimum wage. The K index comes from the

division of the average wage by the minimum wage. This index not only measures

changes in the minimum wage but the reaction of wages on the labor market as well.

The net migration at the municipality level was included as an independent variable

as well. This variable is calculated based on the population equation (Equation 1). The

population equation states that the current population (Pt) is the sum of the population in

a later period (Pt-1), births (Nt) and immigration (It), minus deaths (Mt) and emigration

(Et) in the current period.

$$P_t = P_{t-1} + N_t + I_t) - (M_t + E_t) \qquad (4\text{-}1)$$

By eliminating the population equation by the flow of immigration and the flow of

emigration, the net migration is obtained (Equation 2). Net migration is the difference

between the flow of immigration and the flow of emigration.

$$NM_t = I_t - E_t \qquad\qquad (4\text{-}2)$$

The gross net migration rate is the net migration divided by the population divided by 1,000. Based on our sample, the average gross net migration rate for the municipalities was -2.90 people per thousand inhabitants in the period from 1991 to 2010.

Other economic variables such as gross product growth, inflation and tax rate were also included. It is generally expected that as the economy grows, employment should increase. Increases in gross national product growth in Puerto Rico imply better economic opportunities. On the other hand, increases in inflation and the tax rate are expected to reduce employment. Income taxes reduce both purchasing power and disposable personal income.

Transportation is another important factor that affects employment in Puerto Rico. Jobs tend to be concentrated in regional hubs, and people often do not live in the same municipio where they work. The Metropolitan Area of San Juan is the largest of those hubs, with a large part of the population concentrated in that urban area. It includes the municipios of San Juan, Cataño, Bayamón, Guaynabo, Caguas, Trujillo Alto, and Carolina. Ponce is the hub in the south, Mayagüez the hub for the west, and Arecibo in the north. Aguadilla is developing into another hub, in the northwest. Indicators of distance from each municipality to the urban centers were therefore included in the models.

There is very little public transportation infrastructure on the island, which introduces another job-related complication. The Urban Train (TU, for its Spanish acronym) and the Metropolitan Bus Authority (AMA, for its Spanish acronym) have

limited routes, connecting a small part of San Juan. The rest of the island has very

localized public transportation trolley routes that are not reliable enough for people to

depend on for work purposes. Therefore, private vehicles are key for people to find and

keep jobs, so the number of cars per capita is included in the models.

Dichotomous variables were also included to control for the presence of highways

in the municipalities. Better transport systems (greater number of cars per capita and the

presence of freeways) are expected to reduce emigration movements. This is due to the

fluidity and access these roads provide to other centers of economic and social activity.

The highways included were PR- 2, PR-30 and PR-52.

4.3   Design

4.3.1 Spatial Econometrics

When observations are collected from points or regions that are located in space,

they are often not fully independent from each other (LeSage, 2008). The distance

between objects can have a great effect on how they behave or what they have in

common. As Tobler's first law of geography states, although everything is related to

everything else, near things have a greater effect on each other than those that are far

(Pisati, 2012). The interaction effects lead to spatial dependence among observations.

There are various theoretical reasons for the dependence, including physical and human

capital externalities as well as technological interdependence between regions (Ertur &

Koch, 2007). Likewise, variations observed in the dependent variable could be due to

influences that are unobserved or latent. Such influences could be due to culture,

infrastructure, recreational amenities and many other factors that cannot be accounted for with observable sample data (LeSage, 2008).

The first law of geography is translated into economics by the statistical concept of spatial autocorrelation, which states that objects that are spatially close tend to be more similar to each other with respect to a given attribute y than objects that are spatially distant (Pisati, 2012). Spatial econometrics deal with interaction effects among geographical units (Elhorst, 2011) by integrating spatial effects in econometric methods (Anselin, Le Gallo & Javet, 2008). Spatial regression extends the analysis of linear regression by taking into account the spatial dependence among observations when estimating the relationship between an outcome variable of interest, Y, and one or more predictors X (Pisati, 2012). Spatial regression models consider three different types of interaction effects between geographical units.

4.3.2 Types of Interaction Effects Among Geographical Units

Extending the linear regression model to include spatial effects allows outcomes in one unit to be affected by (1) outcomes in nearby areas, (2) covariates from nearby areas, and (3) errors from nearby areas. Using the vocabulary in spatial literature, spatial regression models may include (1) spatial lags of the outcome variable, (2) spatial lags of covariates, and (3) spatially autoregressive errors (StataCorp, 2013). The interaction effects, as explained by Elhorst (2011), are summarized in Table 4.

Table 4-3. Types of interaction effects among geographical units.

Interaction Type	Description

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Endogenous	Dependent variable y of location A ↔ Dependent variable y of unit B	
Exogenous	Dependent variable y of unit A ↔ Independent variable x of unit B	
Error terms	Error term u of unit A ↔ Error term u of unit B	

The first are endogenous interaction effects, which occur when the behavioral decisions of one geographical unit, A, are dependent on the behavioral decisions made by the decision-making agents in other units, such as B, for example. For the equilibrium outcome of a spatial or social interaction process in which the value of the dependent variable for one geographical unit or agent is determined jointly with that of its neighboring agents, endogenous interaction effects are generally considered the formal specification.

On the other hand, exogenous interaction effects are those where a decision of one agent to behave in one way or another depends somehow on independent variables of other units, such as B. One way to visualize this is by considering the savings rate. Although saving and investment rates are always equal, according to standard economic theory, it is not always true for individual economies because of capital flows across borders. The amount saved in one individual economy is not necessarily the same as the amount it invests, so per capita income in each economy also depends on the savings rates of neighboring economies. Notably, there may be more than one exogenous interaction effect in play at once, given that all independent explanatory variables taken into account for one region may have an effect on the behavioral decisions of the other ones. Therefore, if there is K number of explanatory variables in a linear regression, there may be K exogenous interaction effects (Elhorst, 2011).

Third, there may be interaction effects among the error terms, which do not require a theoretical model for a spatial or social interaction process. Rather, they exist when there is spatial autocorrelation in any determinants of the dependent variable that are omitted from the model, and when unobserved shocks follow a spatial pattern.

4.3.3 Spatial Weights Matrix

A spatial weights matrix is used to incorporate the interaction effects. The values of the matrix represent the relationships between the geographical units. To illustrate the composition of the matrix, consider that each element (i,j) of W expresses the degree of spatial proximity between the pair of objects i and j. Elements $W_{i1,i2}$ specify how much potential spillover there is between unit 1 and unit 2. Therefore, the greater the potential spillover is, the larger $W_{i1,i2}$ is. Likewise, if unit 1 has no potential effect on unit 2, then $W_{i1,i2}$ is zero. W is essentially a constraint placed on the individual spillovers, formulated as part of the model specification (StataCorp, 2017).

The spatial weighting matrix must be created before spatial regression models can be fit. The matrix is non-negative, of NxN size, with zeros along the diagonal because no unit is a neighbor onto itself. Spatial literature identifies two main ways to measure potential spillover, and therefore quantify the elements in the matrix: using binary terms to represent contiguity or using the inverse distance between the geographical units (StataCorp, 2017). The matrices used to produce lags of the dependent variable or autoregressive errors are usually scaled, as the software used to fit spatial regression models tends to produce more accurate results when inputs are scaled so that their largest eigenvalue is 1.

4.3.4 Types of Spatial Regressions

Usually, in empirical work, the approach is to begin with a non-spatial linear

dependence model and then test to determine whether it is necessary to apply spatial

effects. In vector form, that model looks as follows:

$$Y = \alpha \iota_N + X\beta + \varepsilon \tag{4-3}$$

where Y is an Nx1 vector that consists of one observation on the dependent variable for

every unit in the sample (i=1,...,N), ι_N is an Nx1 vector of ones associated with the

constant term parameter α, X is an NxK matrix of exogenous explanatory variables, with

the associated parameters β contained in a Kx1 vector, and $\varepsilon=(\varepsilon_1,...,\varepsilon_N)^T$ is a vector of

disturbance terms where ε_i are independently and identically distributed error terms for

all i with zero mean and σ^2 variance (Elhorst, 2011).

Once all the spatial interaction effects are included, the model takes the following

form:

$$Y = \rho WY + \alpha \iota_N + X\beta + WX\theta + u \tag{4-4}$$

$$u = \lambda Wu + \varepsilon \tag{4-5}$$

where WY denotes the endogenous interaction effects among the dependent variables of

all the geographical units, WX the exogenous interaction effects among the independent

variables, and Wu the interaction effects among the disturbance terms of the units. The

spatial autoregressive coefficient is denoted by ρ, the spatial autocorrelation coefficient is

denoted by λ, and θ represents a Kx1 vector of fixed but unknown parameters, as β does.

As Baltagi (2005) remarks, spatial panel data models are progressively becoming more

attractive in empirical economic research given the increasing availability of both micro

and macro level panel data where a great number of spatial units are followed over time.

There are various benefits to using panel over cross-sectional data. One is that panel data

contain more variation, less collinearity among the variables, and are generally more

informative. Using panel data also increases efficiency in the estimation because of the

availability of greater degrees of freedom that it provides (Elhorst, 2011). Baltagi (2005)

further discusses the more complicated behavioral hypotheses that may be addressed

using panel data and are unavailable with pure cross-sectional data. The spatial

econometric model applied to panel data looks as follows:

$$Y_t = \rho WY_t + \alpha\iota_N + X_t\beta + WX_t\theta + u_t \qquad (4\text{-}6)$$

$$u_t = \lambda Wu_t + \varepsilon_t \qquad (4\text{-}7)$$

It is an extension of the spatial econometric model detailed in equation 2 from applying

to a cross section of N observation into a space-time model that fits a panel of N

observations over T time periods. This can be achieved by adding a subscript t, running

from 1 to T, to the variables and error terms of equation 2. If the notations can be

adjusted from one cross-section to T cross-sections of N observations, then this model

can be estimated in much the same manner as the cross-sectional one (Elhorst, 2011).

Since this model does not account for spatial and temporal heterogeneity, however,

there are objections to its use. It is important to consider that spatial units may vary

greatly amongst themselves due to background variables that are difficult to measure or

obtain and are usually space-specific and time-invariant. Some examples include the

cultural differences amongst the populations in each spatial unit, whether the units are

landlocked or have access to greater bodies of water, and urban versus rural

characteristics. To account for these variables and avoid estimation bias, one solution is

to introduce a variable intercept u_i that represents the omitted variables contributing to

uniqueness amongst units. Spatial effects then control for the time-invariant variables

that could bias the estimates in a typical cross-sectional study, adding time-period

specific effects controls for all the spatial-invariant variables that could produce a bias in

a typical time-series study (Baltagi, 2005). An example of these types of variables is the

changes caused by economic booms and recessions. Including spatial-specific and time-

period specific effects in the spatial panel data model results in:

$$Y_t = \rho W Y_t + \alpha \iota_N + X_t \beta + W X_t \theta + \mu + \xi_t \iota_N + u_t \qquad (4\text{-}8)$$

$$u_t = \lambda W u_t + \varepsilon_t \qquad (4\text{-}9)$$

where $\mu = (\mu_1, \dots, \mu_N)^T$. The spatial-specific and time-period specific events may be

treated as fixed effects or random effects, depending on the method of estimation chosen.

A dummy variable is introduced for each spatial unit and for each time period in the fixed effects model. Meanwhile, μ_i and ξ_t are treated as random variables in the random effects model, with a mean of zero and a variance of σ_μ^2 and σ_ξ^2, respectively, as well as independently and identically distributed. The random variables μ_i, ξ_t, and ε_{it} are assumed to be independent of each other (Elhorst, 2011). Time lags of the variables Y_t and WY_t can also be added to the spatial panel data model (equation 4) to make it dynamic.

Finally, expanding notation to column-vector for precision, a general specification for Spatial Panel models with all of the possible parts and variables included looks as such:

$$Y_{it} = \alpha + \tau Y_{it-1} + \rho \sum_{j=1}^{n} W_{ij} Y_{jt} + \sum_{k=1}^{K} X_{itk} \beta_k + \sum_{k=1}^{K} \sum_{j=1}^{n} W_{ij} X_{jtk} \theta_k + \mu_i \qquad (4\text{-}10)$$

$$+ \gamma_t + v_{it}$$

$$v_{it} = \lambda \sum_{j=1}^{n} m_{ij} v_{it} + \epsilon_{it} \qquad i = 1 \dots n; \quad t = 1, \dots, T \qquad (4\text{-}11)$$

As τ is the dynamic component, it is defined only when the model is dynamic. If the model is static, then $\tau = 0$. From this general specification, particular models can be defined. A Spatial Autoregressive Model (SAR) occurs when $\lambda = 0$ and $\theta = 0$. If only $\theta = 0$, one has a Spatial Autoregressive Model with Autoregressive Disturbances (SAC).

Spatial Error Models (SEM) are defined when $\rho = 0$ and $\theta = 0$ (Belotti, Hughes & Mortari, 2013).

4.3.5 Estimation Methods

To estimate models that include interaction effects, three methods have been developed. One of them is based on maximum likelihood (ML) or quasi maximum likelihood (QML), another on instrumental variables or generalized method of moments (IV/GMM), and another on the Bayesian Markov Chain Monte Carlo (MCMC) approach. While ML and QML rely on the assumption of normality of the disturbances, the IV/GMM and MCMC approaches do not (Elhorst, 2011). Full descriptions of the methods are detailed by Anselin (1988), Kelejian and Prucha (1998), Lee (2004), and LeSage and Pace (2009).

4.3.6 Empirical Strategy

Since employment appeared to be clustered, it suggested that there could be spillover effects between municipios that merited a spatial analysis. A specific-to-general approach was designed, as is the standard when working with spatial panel data (Elhorst, 2011). Testing whether ordinary regression was adequate, pooled OLS models were first estimated, with fixed effects, random effects, and none. A Hausman test was performed, which indicated that fixed effects fit the data best.

Next, two global indices of autocorrelation, Moran's I and Geary's C, were performed to measure the overall degree of similarity between spatially close regions in the study area with respect to employment. Both indices are intended to detect the presence of a general tendency to cluster within the study area rather than to identify specific spatial clusters, since they summarize the phenomenon of interest in a single value (Pisati, 2012). Since both indices indicated a statistically significant presence of autocorrelation, it was determined that ordinary regression was not enough. Spatial regression models were then considered.

A spatial weights matrix was created using the inverse of the distance between municipios, which was calculated with the latitude and longitude coordinates of their central plazas. The xsmle command in STATA was used to calculate SAR, SAC, SEM, and GSPRE models via ML estimation. The specifications for these models is detailed in the previous section.

5 CHAPTER - RESULTS

From the early 2000s to the present, the economy of Puerto Rico has suffered a considerable reduction in economic activity. From 2006 to 2014, both the GNP and employment in Puerto Rico dropped approximately 13 percent (Puerto Rico Planning Board, 2014). Hernandez et al. (2014) identified some of the events that seemingly led to the reduction in aggregate economic activity, including in large part the flight of financial capital and displacement of manufacturing plants from Puerto Rico related to the gradual elimination of the tax deductions for U.S. companies granted by Section 936 of the U.S. Tax Code. Likewise, they recognize the reduced rate of investment in productive capital at the local level, the reduction in population generated by a reduction in births and an increase in migration, as well as inefficiencies in the labor market generated by Federal public policies. The policies that they point to causing labor market inefficiencies are the structure of the NAP program, Social Security disability benefits, and the minimum wage.

Although the program is important for poverty alleviation in Puerto Rico, there has been concern about the historically high levels of participation in the program, especially since it is often cited as one of the main reasons for the low formal labor force participation rate in Puerto Rico. Nonetheless, Segarra (1999) indicated that, in the presence of high unemployment, the tightening of eligibility restrictions on the FSP would not increase labor supply and may even cause a net reduction in work effort. Reviews of studies on the work disincentive effects of SNAP (Currie, 2003; Hoynes & Schanzenbach, 2016), the program analogous to NAP in the U.S., show that the work

disincentive effect is very small (Fraker and Moffitt, 1988; Hagstrom, 1996) or nonexistent. The exception mentioned is the study by Hoynes and Schanzenbach (2012), that found modest negative effects on the work effort of single mothers after the rollout of the FSP in the 1970s. Meanwhile, Burtless and Sotomayor (2006) argue that government transfers to Puerto Ricans are the main reason for the low labor force participation rates in Puerto Rico, relative to the United States, from 1970 to 2004.

Previous work on the relationship between NAP and labor force participation has not taken into account the spatial spillover effects that occur between municipios. The present study does, applying spatial panel regression models to evaluate the effect of NAP on the employment rate in the municipios of Puerto Rico between 2000 and 2010.

5.1 Spatial Effects

Since there is a concentration of jobs in some municipios of Puerto Rico by region, employment was tested for clustering using the global indices of autocorrelation Moran's I and Geary's C. Spatial autocorrelation implies spatial clustering, though neither test distinguishes between hot spots where high values cluster together and cold spots where low values cluster together (Anselin, 1992). Both indices detected the presence of a general tendency to clustering within the study area with respect to employment. The value of Moran's I was 0.047, which is higher than its expected value of -0.001. The overall distribution of employment can therefore be characterized by positive spatial autocorrelation. This means that the values taken on by employment as Y at each location i tends to be similar to the values that Y takes on at spatially contiguous locations (StataCorp, 2001). Geary's C at 0.959 also indicated positive spatial

autocorrelation, as it was between 0 and 1. Both indices are statistically significant, as inferred from their z-values.

Table 5-1 presents the results of the estimations, starting with the standard Ordinary Least Squares (OLS) regression model and the panel regression model with fixed effects (FE). The fixed effects were chosen over random effects (RE) because of the results of a Hausman test. However, since our observations are spatial units, the two models may be mis-specified because of the presence of spatial dependence among the units (Newton, 2001). Therefore, the four spatial panel models were estimated: a spatial lag model, two spatial error models, and one with a mixed spatial autoregressive process.

Spatial lag models consider the spatial autoregressive process in the outcome variable. These models treat spatial dependence as substance (Pisati, 2012), if the value taken by the employment rate in each municipio is affected by the values taken by the employment rate in neighboring municipios. It contrasts with the spatial error model, which considers the spatial autoregressive process in the error term and treats spatial dependence as a nuisance (Pisati, 2012).

Table 5-1. Estimations Using Various Methods: Pooled OLS Regression, Panel Fixed Effects (FE), Spatial Autocorrelation with Auto Regressive Disturbances (SAC), Spatial Autoregressive Model (SAR), Spatial Error Model with Fixed Effects (SEM-FE), and Spatial Error Model with Spatial Autoregressive Random Effects (SEM-RE).

Variables	Pooled	Panel FE	SAC	SAR	SEM-FE	SEM-RE
Real Avg NAP Family Benefits	0.0000462	0.0000353	0.0000407	0.0000402	0.0000255	0.0000234
	(3.82)***	(2.34)**	(2.84)***	(2.66)***	(1.48)	(1.31)
Real Avg NAP Family Benefits (sq)	-4.43E-09	-3.22E-09	-3.94E-09	-3.88E-09	-2.39E-09	-2.15E-09
	(-3.45)***	(-2.02)**	(-2.58)**	(-2.43)**	(-1.36)	(-1.15)
Real Avg Wage	7.29E-06	6.61E-06	8.12E-06	7.66E-06	7.49E-06	9.08E-06
	(0.91)	(1.72)*	(3.24)***	(2.88)***	(2.30)*	(2.35)
K Index[a]	0.0014	-0.0073	-0.0002	-0.0003	0.0025	-0.0010
	(0.23)	(-1.04)	(-0.03)	(-0.05)	(0.38)	(-0.09)
Cars to Population[a]	0.0245	0.0567	0.0411	0.0437	0.0590	0.0670
	(1.6)	(2.53)**	(2.11)**	(2.34)**	(2.33)**	(1.87)
Net Migration[b]	0.0001	-0.0004	-0.0002	-0.0002	-0.0002	0.0001
	(0.56)	(-1.11)	(-0.48)	(-0.51)	(-0.63)	(0.40)
Employment to Population[a] (lag 1)	0.6241	0.2967	0.2688	0.2686	0.2656	0.3792
	(3.27)***	(2.53)**	(2.63)***	(2.61)***	(2.56)**	(3.41)
Employment to Population[a] (lag 2)	0.2750	0.1013	0.0969	0.0970	0.0999	0.1749
	(1.55)	(4.26)***	(4.54)***	(4.54)***	(4.48)***	(3.69)
Population Density[c]	9.06E-07	-8.68E-06	-1.09E-05	-1.10E-05	-0.0000115	5.70E-06
	(0.95)	(-0.59)	(-0.79)	(-0.79)	(-0.77)	(0.55)
Inflation[b]	0.0010	0.0016	0.0008	0.0008	0.0013	0.0007
	(1.08)	(4.68)***	(2.55)**	(2.60)***	(1.60)	(0.81)
Real Avg Personal Tax	0.0000482	0.0000492	0.00000107	0.00000432	0.0000619	0.0000586
	(2.51)**	(2.98)***	(0.07)	(0.22)	(1.89)*	(1.73)
Fed Fund[b]	0.0014	0.0013	0.0003	0.0004	0.0013	0.0015
	(2.38)**	(2.40)**	(0.54)	(0.6)	(1.12)	(1.89)
R^2 Overall	0.8224	0.5548	0.3767	0.3781	0.3967	0.7900
ρ			0.6295***	0.5873***		
λ			-0.1232		0.6159***	0.5935***
φ						1.4736***

Note. Dollar amounts were adjusted for inflation by using the 2008-dollar value. [a] These variables are expressed as ratios. [b] These variables are rates. [c] Population Density is calculated as each municipality's population divided by its area in square miles. $*p < .05$. $**p < .01$. $***p < 0.001$

The first model, the Spatial Autoregressive Model with Auto Regressive Disturbances (SAC), which takes the form:

$$Y_{it} = \alpha + \tau Y_{it-1} + \rho \sum_{j=1}^{n} W_{ij} Y_{jt} + \sum_{k=1}^{K} X_{itk} \beta_k + \mu_i + \gamma_t + v_{it} \qquad (5\text{-}1)$$

$$v_{it} = \lambda \sum_{j=1}^{n} m_{ij} v_{it} + \epsilon_{it} \qquad i = 1 \ldots n; \quad t = 1, \ldots, T \qquad (5\text{-}2)$$

includes a spatial autoregressive process both in the outcome variable and in the error term. The spatial effect in the outcome variable, ρ, is 0.6295 and highly significant. Meanwhile, the effect in the error term, λ, is -0.1232 but is not significant.

The next model is the Spatial Autoregressive Model (SAR). It is a spatial lag model that looks as follows:

$$Y_{it} = \alpha + \tau Y_{it-1} + \rho \sum_{j=1}^{n} W_{ij} Y_{jt} + \sum_{k=1}^{K} X_{itk} \beta_k + \mu_i + \gamma_t + \epsilon_{it} \qquad (5\text{-}3)$$

where i = 1,…,n   t = 1,…,T .

This model only considers the spatial autoregressive process in the outcome variable, ρ, which is calculated at 0.5873 and is highly significant.

The following two models are spatial error models. The first controlled for fixed effects while the second did so for random effects. They look like this:

$$Y_{it} = \alpha + \tau Y_{it-1} + \sum_{k=1}^{K} X_{itk}\beta_k + \mu_i + \gamma_t + v_{it} \tag{5-4}$$

$$v_{it} = \lambda \sum_{j=1}^{n} m_{ij}v_{it} + \epsilon_{it} \qquad i = 1 \dots n; \quad t = 1, \dots, T \tag{5-5}$$

Controlling for fixed effects resulted in the effect in the error term, λ, as 0.6159 and for

the model controlling for random effects, λ was 0.5935. Both are highly significant.

Controlling for random effects also calculates ϕ, which is 1.4736 in this model and highly

significant.

5.2 Temporal Effects

Temporal effects are included in the estimations with the two lags of the

employment variable (see Table 5-1). The first lag is significant for all models except the

SEM-RE, which likely has less to do with the explicative power of the variable and more

to do with how the random effects are not the best fit for the phenomenon. The second

lag is nearly the same, except that it does not appear significant in the pooled regression

model either. The results of the estimations suggest that the temporal effect occurs as a

spatial autoregressive process in the dependent variable. This means that the value of

employment in each municipio is likely affected by the employment of neighboring

municipios in both of the previous two periods before the one being studied.

5.3 Variable Interactions

NAP benefits have a significant though small effect on employment in the pooled, Panel FE, SAC, and SAR models (see Table 5-1). Without transformations of the variable the effect is positive, and when NAP benefits are in quadratic form, the effect is negative. The NAP-employment relationship appears to be concave. This suggests that there is a peak, a maximum number of NAP benefits after which they begin to affect employment negatively. Employment and NAP benefits rise together until the peak of $2,828.67 at which point NAP benefits begin to affect employment negatively (see Figure 5-1).

Figure 5-1. Estimated Concave Relationship Between NAP and Employment
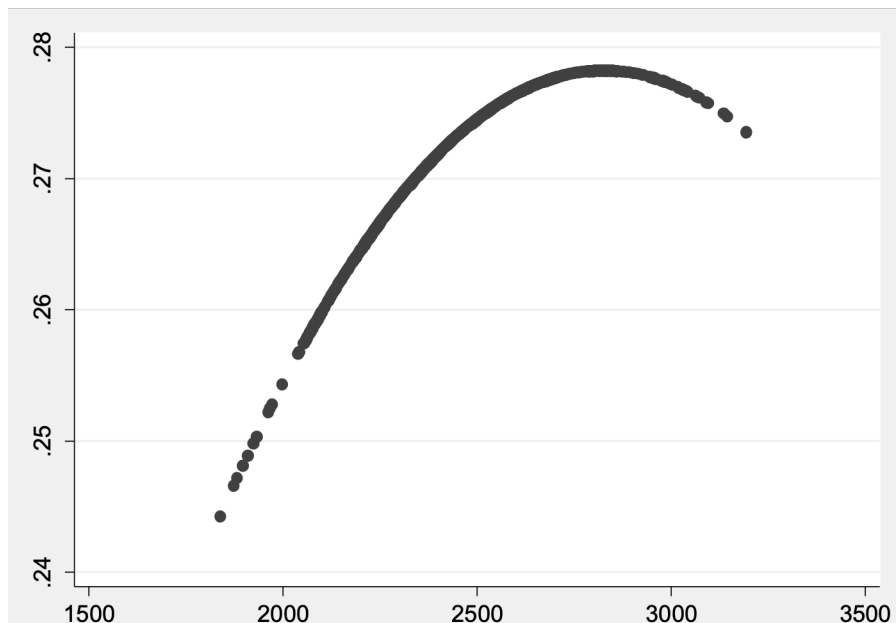
Another important variable outcome is that of the cars-to-population ratio. It is significant in all of the models that control for fixed effects. The strong positive relationship suggests that employment and owning a car go hand in hand in Puerto Rico.

Although the presence of transportation infrastructure, and especially a strong road network, has been associated with greater productivity and increases in economic output (Duran & Santos, 2014; Agbelie, 2014; Enflo et al., 2018) which are closely associated to job creation and retention, roads alone cannot transport people interested in employment. Since there is only public transportation available for a very small area of a few municipios, transportation for work purposes requires having a car. The importance of cars for jobs is reflected by the data, as the cars-to-population ratio is a determinant factor for employment.

6 CHAPTER - CONCLUSION

The results suggest that NAP benefits influence the employment rate at the municipio level, though the magnitude of the effect is small. From the results of all the estimations, it appears as though the spatial autoregressive process occurs in the dependent variable rather than the error term. Likewise, controlling for fixed effects appears to give a better estimation than controlling for random effects. This suggests that the unobservable factors that affect employment in the municipios affects them all in a constant way over time, rather than in a variable one. The results for the temporal effects suggest that the value of employment in each municipio is likely affected by the employment in neighboring municipios during both of the previous two periods before the one being studied. This suggests positive spillovers among the regions. The importance of cars for jobs is also reflected in all the models, as the cars-to-population ratio appears to be a determinant factor for employment.

The Puerto Rican labor market has been experiencing labor market woes for about forty years, far before the current economic and debt crises. They began with the implementation of Federal transfer programs and the imposition of the Federal minimum wage on the labor market in Puerto Rico (Catalá, 1998). Following the implementation of these public policies, the growth tendency of the GNP of Puerto Rico has exhibited a negative slope and has eroded at -0.1 percent annually (Hernandez et al., 2013). NAP policies restrict too tightly the income that people may have while still receiving benefits, disincentivizing vulnerable populations from working rather than motivating them to make the transition to work. Furthermore, government development initiatives have not

resulted in significant job creation of the type that provide enough of a salary to

incentivize the low-skilled population to join the formal labor market. The minimum

wage, on the other hand, reduces labor demand in many industrial sectors.

Puerto Rico needs systemic reform that will encourage the 66 percent of the labor

force that is not currently working or actively seeking employment to insert itself in the

formal labor market (Hernández, González & Valdés, 2018). The first is to extend SNAP

to Puerto Rico, the feasibility of which has recently been studied by the Food and

Nutrition Service of the USDA (Peterson et al., 2010). Using FY 2009 data, the study

estimated that Puerto Rico would have received about $420 million more in benefits in

FY 2009 under SNAP than it did under NAP, a substantial difference. Approximately

85,000 households more, which would total about 220,000 people, would be eligible for

SNAP benefits. There would also be an increase of 9.6 percent in average monthly

benefits (about $23) for all food assistance recipients. SNAP would provide better access

to food resources for a currently neglected part of the population that lives below the

Federal poverty line yet does not qualify for NAP benefits. Additionally, it would allow

people to continue receiving food assistance while spending their time working for a

salary that would not be enough of an incentive to join the formal labor market on its

own.

Another important reform that should not be overlooked is the reinstallation of a

local Minimum Wage Board, like the one that existed from 1956 to 1998 (Government of

Puerto Rico, 2018). It is necessary to have a local entity with the authority to evaluate

and implement changes to the minimum wage in Puerto Rico by industrial sector

(Hernández, González & Valdés, 2018). Merely imposing the Federal minimum wage is

dangerous for Puerto Rico, as its economy is not at the same productive level as that of the continental U.S. It would be better to analyze minimum wage policy locally, taking into account both the particular productivity aspects of each industry and sub-industry as well as the effect each industry has on employment.

This investigation has its limitations, leaving plenty of space to develop future work in this area. It focuses on the effects of the NAP only on formal employment, leaving the informal sector out of the analysis of employment dynamics. Given the size of the informal sector in Puerto Rico, its inclusion would give a clearer picture of the dynamic between work and government assistance in Puerto Rico. The biggest restriction to including the informal sector is its quantification. By definition, there is no clear record of its size or production, making it difficult to include in a regression.

Furthermore, the design of the study also presents certain limitations. Since it is quantitative, the results of the estimations permit us to draw conclusions only about the observed data. However, the motivations and reasons behind people's labor decisions are also very important and useful information. They can be crucial for the success of policy interventions to deal with the current inefficiencies of the labor market and welfare programs in Puerto Rico. Further research using qualitative methods to explore motives, values, and reasoning behind the decision-making of NAP participants and minimum wage earners would be a next step.

Because of the gender dynamics that exist in Puerto Rico, another potential next step that would be useful for gaining better understanding of the labor dynamics of NAP participants is to incorporate gender into the analysis. Women overwhelmingly find themselves in caretaker roles where they continuously engage in unpaid work that is not

considered labor but is crucial for the survival of their family unit. Often, such work could interfere with their ability to work outside the home, placing them in a difficult economic situation, especially for those who are heads of households. A large number ofMany NAP participants are female and most of them are heads of households, making gender dynamics a worthwhile direction in which to take further research. Since the data that this current study uses is aggregate, this work cannot evaluate the effect of gender. Therefore, a microlevel study using participant data is needed to assess many issues at the household level. It is important to note that NAP data by gender is not currently available, violating Act Num. 190 of December 13, 2007.

Puerto Rico also has a challenge to face in terms of its labor dynamics and its need for a strong safety net. Global climate change will surely be significant for Puerto Rico's future, especially since the island is vulnerable to potentially catastrophic climate events such as hurricanes and tsunamis because of its geographical location. Although the effects of 2017 hurricanes Irma and María are not included in this study, the changes in the island's situation, including the mass emigration to the U.S. mainland, will surely be significant. This should be considered when creating strategies for dealing with the shortcomings of current welfare policies.

This study is an important first step for improving social welfare policy in Puerto Rico. It presents evidence of unintended negative consequences of the NAP that are due to structural flaws. Puerto Rico needs programs that incentivize labor participation as part of the design of its welfare programs as well as robust creation of jobs with salaries that are high enough for people to live on well. The NAP needs adjustments to the

structural flaws in its design to turn it into a trampoline out of poverty rather than the

poverty trap it currently is.

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