The employment and output impact

of the 2012 Acts 20, 22, and 273

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EXECUTIVE SUMMARY

Thanks in part to the creation of a low-tax jurisdiction for multinational manufacturing firms, Puerto Rico was able to modernize its economy during the last century (Tobin et al. 1975; Chari et al. 2017). The negative side of this manufacturing low-tax jurisdiction was that this economy became heavily dependent on federal tax schemes provided to Puerto Rico and, after Congress decided to remove such incentives in 1996, the economy fell into an economic recession by 2006 (Caraballo-Cueto and Lara 2018).

The local government approved Act 22 of January 2012, which gives total tax exemption for capital gains to individuals who move their residence from any country to Puerto Rico (Department of Treasury of Puerto Rico 2019). This act is especially attractive to US investors, who are exempt from paying federal income taxes for Puerto Rico-sourced incomes. Those tax exemptions were complemented with local policies, such as Act 20 of 2012, which reduced the income tax rate to 4% for services exported.

Five years later, there were 1,332 individuals with decrees under Act 22. However, the effect of these acts on economic growth has not yet been scrutinized with a causal inference method. There are two studies that evaluated the economic effect of those 2012 acts based on self-reported data from the participants (Estudios Tecnicos 2015, 2019). While such an approach

provided a picture of the potential economic impact of those acts, the participants may have under- or overstated their contribution to the local economy, and the studies did not identify counterfactual levels for such acts.[1] This is important because Bartik (2018) found that almost three-quarters of the incentivized economic actors would have made the same business decision in the absence of the incentive.

We innovate by applying a Bayesian structural time series model (BSM) approach that constructs a counterfactual series based on covariates that are orthogonal to the intervention without needing to apply first differences to the original series. The outcomes from the BSM were compared with the conventional synthetic control method (SCM). We found that at the end of the period evaluated, the total employment and total output were 3% and 2% higher, respectively, than the counterfactual levels.

To fully exploit its potential, we propose amendments to the 2012 policy intervention. Specifically, we suggest that participation in Act 22 should be conditioned to certain level of investment and to a tax rate of 5%. In the case of participants of Act 20 and 273, the minimum conditions should be the creation of 10 new (not previously existent) jobs and a flat tax rate of 10%.

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[1] In economics, a counterfactual indicates what could have happened in the absence of the intervention.

Introduction

The economic literature has found that low-tax jurisdictions in general spur economic growth within their territories (Dharmapala 2008, Hines 2005), even though it may come at the expense of other countries (Slemrod and Wilson (2009). It is worth quoting Hines (2010) at large:

> Tax havens are successful players in the world economy. They draw large amounts of foreign investment; their per capita incomes and rates of economic mounts of foreign investment; their per capita incomes and rates of economic growth exceed world averages; and they have well-functioning democratic governments. Despite low tax rates, the public sectors of tax havens appear to be well-funded, accounting for roughly 25 percent of GDP, a fraction that exceeds the world average, albeit lying somewhat below those of the most affluent countries (Hines, 2005).(p. 123).

Puerto Rico's economy is nowadays not a very successful player in the world economy. Even though Puerto Rico is not considered as a low-tax jurisdiction in every classification, Grubert and Slemrod (1998) found that the investment and profit-shifting decisions of U.S. multinationals in Puerto Rico were mostly due to its special tax scheme, which could have created a low-tax jurisdiction especially for firms with relatively large intangible assets. In a recent list of low-tax jurisdictions, PricewaterhouseCoopers (one of the largest accounting firms in the world) includes Puerto Rico (PWC, 2020). Garrett and Suárez Serrato (2019) and Grubert and Slemrod (1998) also referred to the case of Puerto Rico within the topic of low-tax jurisdictions.

One of the key points in the related literature, there is no explicit distinction between low-tax jurisdictions for manufacturing corporations that invest and hire in high volumes and may allow productivity spillovers to local sectors (Smarzynska Javorcik 2004) and low-tax jurisdictions that are mainly for high-income individuals in the service sector who invest and hire at much lower levels than multinational firms. As shown in the next section, Ireland is a low-tax jurisdiction with a relatively strong enclave of high-value-added multinational manufacturing (Barrios et al. 2004) while Barbados is another low-tax jurisdiction with a relatively small manufacturing sector. Does the low-tax jurisdiction of Puerto Rico that is mostly for services and individuals cause economic growth?

Tax incentives for manufacturing corporations did help Puerto Rico in the past to industrialize and modernize (Tobin et al., 1975). However, the negative side of this low-tax jurisdiction is that the economy became heavily dependent on federal tax schemes provided to Puerto Rico and, when Congress decided to remove such incentives, the economy fell into an economic depression in 2006 that triggered a debt crisis (Caraballo-Cueto & Lara, 2018). For instance, in Figure 1 we observe the recent evolution of the gross national product (GNP) of Puerto Rico, adjusted by inflation. GNP is generally used in Puerto Rico in preference to the GDP, because much of the GDP is distorted by income transferred from other jurisdictions through the transfer pricing mechanisms of

multinational companies (see Grubert and Slemrod, 1998; Federal Reserve

Bank of New York, 2012).

Figure 1. Real GNP of Puerto Rico, 1997-2018
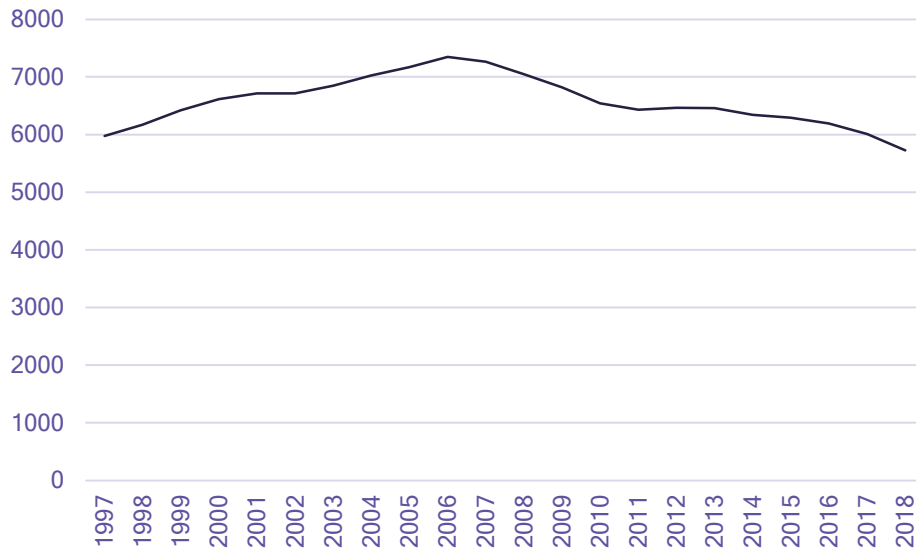
Notes: Figures were adjusted by inflation using the GNP deflator. Its base year is 1954.
Source: Author's calculations based on Puerto Rico Planning Board (2019)

The deep economic downturn after 2006 is clear: the size of the economy

(i.e. GNP) in 2018 was lower than in 1997, after adjusting by inflation. In the

case of total employment, during 2018 (the first year of post-Hurricane Maria

reconstruction) was lower than in 1997, as shown in Figure 2. In fact, total

employment in 2018 was close to the level of 1994. Thus, low-tax jurisdictions

have the risk of becoming highly vulnerable and became just the opposite of

what Hines (2010) described.

Figure 2. Total employment in Puerto Rico, 1997-2018
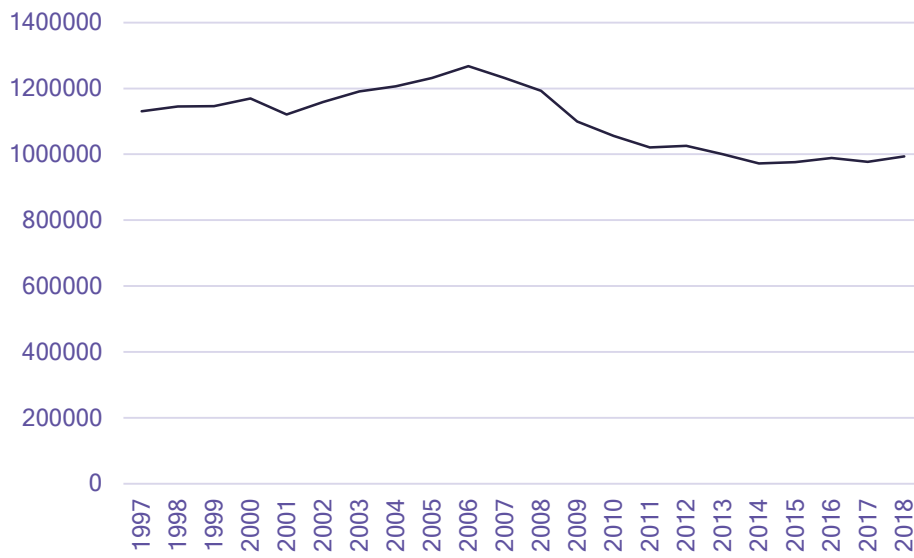
Note: Total employment includes agriculture employment.
Source: Author's calculations based on Puerto Rico Planning Board (2019)

Attempting to change that dire economic reality, local government approved Act 22 of January 2012 that, "Seeks to attract new residents to Puerto Rico by providing a total exemption from Puerto Rico income taxes on all capital incomes realized or accrued after such individuals become bona fide residents of Puerto Rico." (Department of Treasury, 2019, p. 167). This act is especially attractive to U.S. high-income individuals who are also exempt from paying federal income taxes if they live in Puerto Rico.

Furthermore, those tax exemptions were complemented with local policies such as Act 20 of 2012, which reduced to 4% the income tax rate to individuals or firms that export services. According to the Department of Treasury (2019), "In addition, the law promotes investments on research and development and initiatives from the academic and private sectors by granting credits and

exemptions for these activities. Furthermore, it helps to decrease operational and energy spending for companies moving to the island to help their operations remain profitable and efficient." (p. 159). In fact, 78% of investors participating in Act 22 are also participating in Act 20 (Estudios Tecnicos, 2019).

But there was another tax incentive enacted in 2012: Act 273 of 2012 reduces tax rates on the net income of an international financial entity that operates as a banking unit to 4% (Department of Treasury, 2019).

1.1 Puerto Rico vs. Other Low-tax Jurisdictions

In the Caribbean are located 38.5% of the low-tax jurisdictions listed by Hines (2010). In a larger list by the European Union, 20 out of 83 low-tax jurisdictions are in the Caribbean (Remeur 2018). Thus, Puerto Rico shares the trend of the Caribbean region and many islands around the world of attracting foreign corporations or individuals by subsidizing its tax load.

Are Caribbean low-tax jurisdictions mainly for manufacturing or for services? One way to distinguish between the two is to evaluate the ratio of value-added manufacturing to GDP in each low-tax jurisdiction. Low-tax jurisdictions with a high ratio can be considered as manufacturing low-tax jurisdictions; otherwise, the ratio would indicate low-tax jurisdictions for services. All the low-tax jurisdictions in the Caribbean basin, for which value-added manufacturing to GDP data are available from the World Bank, are: Antigua & Barbuda (2%), Aruba (3%), Bahamas (3%), Barbados (7%), Belize (6%), Bermuda (1%),

Cayman Islands (1%), Costa Rica (11%), Dominica (2%), Grenada (3%),

Panama (6%), St. Kitts and Nevis (6%), St. Lucia (3%), St. Vincent &

Grenadines (4%), and Turks & Caicos Islands (1%). In Figure 3, all these

economies are clustered in the bottom-left corner: all of them have a relatively

small manufacturing sector, below the world average, in which value-added

manufacturing represents 17% of the GDP. Thus, one can conclude that most

of these low-tax jurisdictions in the Caribbean are focused on the service sector,

some of which are particularly concentrated on the FIRE (finance, insurance

and real estate) subsector.

Figure 3. Value Added Manufacturing to GDP and HDI for Caribbean and Other

Low-tax jurisdictions, 2019
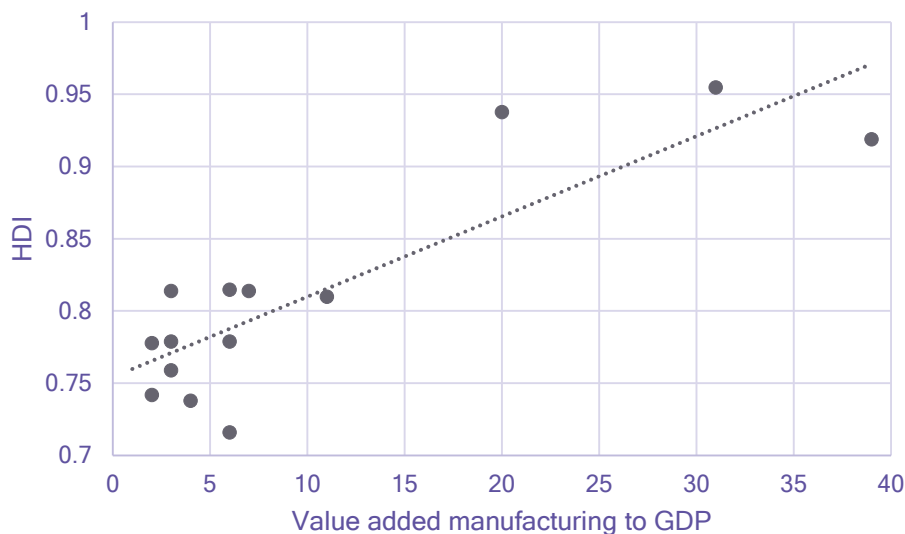
Notes: HDI indicates Human Development Index. For some Caribbean countries such as Aruba there was no 2019 data and we used the latest available.
Source: World Bank (2020), UNDP (2020)

By the same token, Caribbean low-tax jurisdictions have a relatively low

Human Development Index (HDI), an indicator published by the United Nations

Development Programme that combines information on income, health, and education to approximate overall well-being. Among these Caribbean low-tax jurisdictions, the Bahamas and Barbados had the highest HDI score in 2019 but were still in the fifty eighth position. This is in sharp contrast to low-tax jurisdictions where the percentage of value-added manufacturing in the GDP is higher, such as Ireland (31%), Liechtenstein (39%) and Singapore (20%), where the HDI is also higher. These three economies appear in the upper-right corner of Figure 3.

Puerto Rico shares the mid development levels and the preferential tax scheme to foreign investment of these economies in the Caribbean. However, contrary to other Caribbean economies, the low-tax jurisdiction in Puerto Rico is enhanced by the US Treasury's treatment of investments in Puerto Rico, which differs from elsewhere. Under Section 933 of the US Internal Revenue Code or IRC, personal income and profits earned in Puerto Rico by US citizens living in this territory are not subject to federal taxation (Lowry 2016). However, if those US citizens move to, say, the Cayman Islands and generate incomes from there, they will have to pay federal taxes for annual incomes exceeding a certain threshold (e.g. equivalent to $80,000 in 2005) under Section 911 of the IRC (Legal Information Institute 2020).

The Puerto Rican policymakers, in January 2012, took advantage of such a disposition to attract US high-income individuals by enacting Act 22, which gives complete tax exemptions on interest, capital gains and dividends earned in

Puerto Rico to certain immigrants who live for at least half of the year in Puerto Rico, do not have a tax home outside of Puerto Rico and have a closer connection to Puerto Rico than to the continental US or a foreign country (i.e. bona fide residents under Section 937 of the IRC). The benefits were extended to those who have become residents of Puerto Rico since 2006. Salaries earned by these new residents is still taxable at the local level, and they have to pay federal taxes for the income generated outside of Puerto Rico. However, if an individual accrued capital gains before becoming a bona fide resident, he or she will be subject to federal income taxes after 10 years. After these 10 years, accrued capital gains are taxed at 5%. To participate in this low-tax jurisdiction, investors must apply to the Office of Industrial Tax Exemption, and, once the decree is obtained, it is valid until December 31, 2035 (DEC 2017).

These policymakers made their target explicit: "The Act (22) is designed to primarily attract to Puerto Rico high net worth individuals, empty nesters, retirees who currently relocate to other States and investors from US and other countries" (DEC 2017, p. 2). Even though Act 22 is available to any qualified foreigner, 93% of the participants in Act 22—who answered the government questionnaires—come from the continental US (Estudios Tecnicos 2019).

In the case of Act 20, the policymakers stated that they aim, "To establish the 'Act to Promote the Export of Services,' in order to provide the adequate environment and opportunities to develop Puerto Rico as an international service center, encourage local professionals to stay and return, and attract

foreign capital" (Lex Juris 2012, p. 1). In doing so, they reduced the maximum corporate tax rate to 4% and gave total exemptions on the distribution of profits to residents and 60% exemptions on municipal gross receipts tax for 20 years to certified participants. This act also seeks to seize the potential advantages of IRC Section 933.

The original act required that new participants create at least five jobs, and existing businesses that already operate in Puerto Rico could apply such a reduction in the tax rate only to the increases in net income generated after the grant, but the job requirement was removed in 2017 (Reeves 2017).

Section 2. Data

According to the Department of Economic Development (DEC), by 2017 there were 1,332 individuals with decrees under Act 22 and 781 under Act 20. However, the number of applications has grown exponentially during the last years, as shown in Figure 4 and 5. In fact, in 2020, the DEC reported to have 579 cases approved in Act 20 and 710 in Act 22.

Figure 4. Monthly applications of decrees for 2012 Act 22
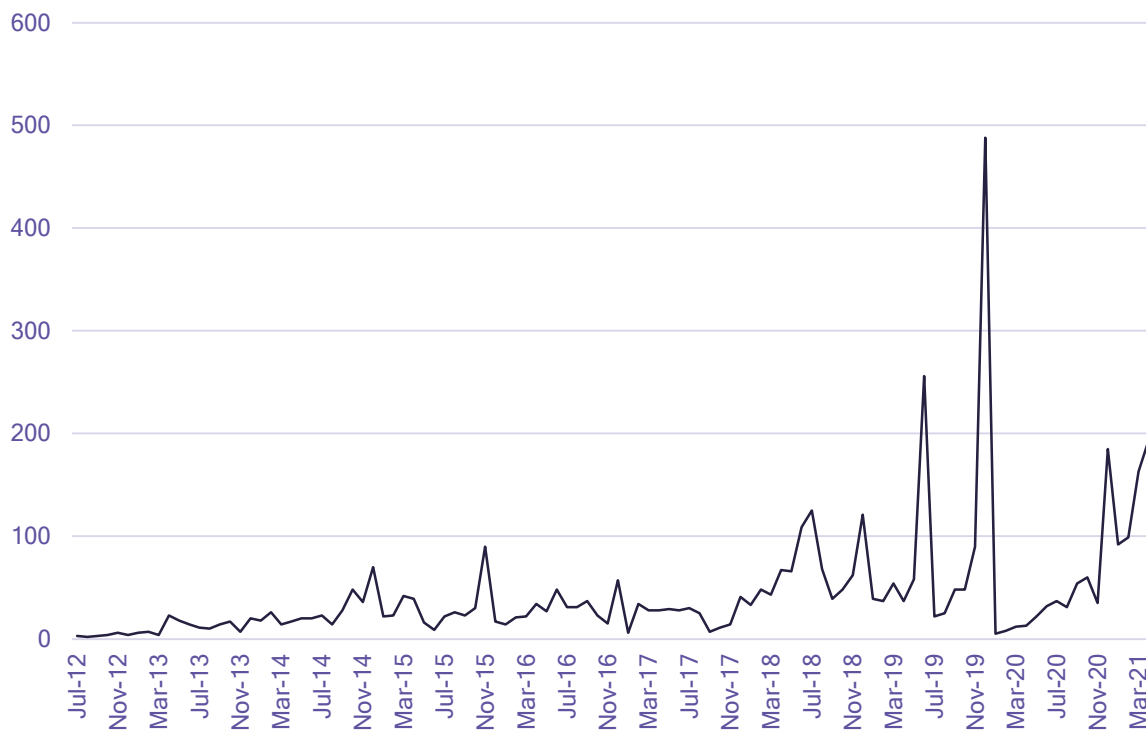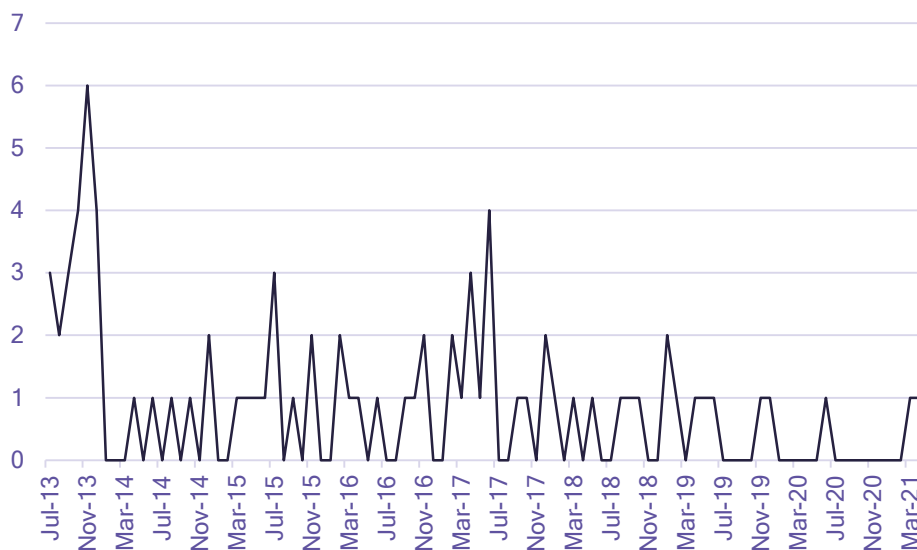

Source: DEC (2021)

Figure 5. Monthly applications of decrees for 2012 Act 20
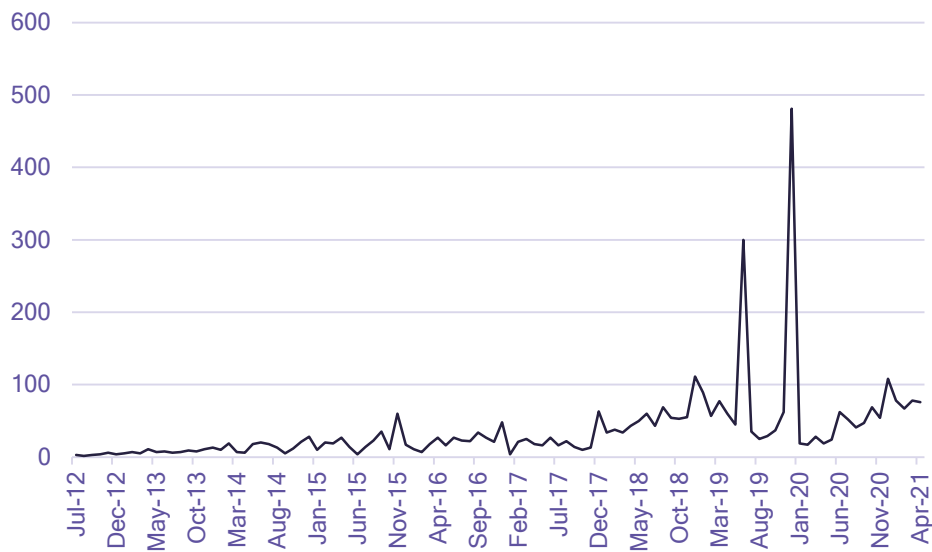
Source: DEC (2021)

In the case of the 2012 Act 273, the number of applications is much lower and has declined in the recent period, as shown in Figure 6. By 2017, 32 corporations had decrees under Act 273.

Figure 6. Monthly applications of decrees for 2012 Act 273

Source: DEC (2021)

In terms of macroeconomic variables, because the GNP is published annually, we used the index of economic activity (EAI) as an instrument for the GNP. This coincident index has a correlation of 0.97 with the GNP and is published monthly by the Economic Development Bank of Puerto Rico (2020). The EAI in Puerto Rico is composed of four non-monetary variables: gallons of gasoline sold, kilowatts generated, nonfarm employment and cement bags sold. The additional advantage of using this instrument was that we did not need price deflators, which could influence the results.

In Table 1 we show descriptive statistics of the variables to be estimated that cover the period from August 2008 to August 2017, representing a reasonable sample size of 109 observations per territory. We limited the sample size to the period before Hurricane Maria (September 2017) to avoid having confounding events. In the bottom panel of Table 1 we display the variables corresponding to the SCM analysis, which were obtained from the economic data of the Federal Reserve Bank of Saint Louis (FRED). In the case of the states, their EAIs is composed of nonfarm payroll employment, the unemployment rate, average hours worked in manufacturing and wages and salaries. We also ran a balancing test to evaluate the presence of large mean differences during the pre-intervention period, but such differences were not statistically significant.

Table 1 Summary Statistics, August 2008 to August 2017

Variables	Mean	Standard Deviation	Minimum	Maximum	n
P.R. & USVI DATA (for BSM analysis)					
Logarithm of Employment	8.87	1.95	6.85	10.9	218
Logarithm Passenger Arrivals	11.91	0.976	10.09	13.21	218
Logarithm manufacturing employment	2.27	2.28	-0.58	4.82	218
P.R. & States Data (for SCM analysis)					
Logarithm EAI	3.88	1.2	0.69	5.2	5,559
Logarithm Passenger Arrivals	7.57	1.31	0.69	8.68	5,559
Logarithm manufacturing employment	5.67	0.84	0.69	6.8	5,559

Source: Author's calculations based on USVI Bureau of Economic Research (2020); Puerto Rico Economic Development Bank (2020); FRED (2021)

In the upper panel there are the variables corresponding to the BSM analysis. Passenger arrival data in Puerto Rico were retrieved from the Bureau of Transportation Statistics (BTS) and, in the case of the USVI, from the Bureau of Economic Research (BER). The total employment and manufacturing employment for Puerto Rico were obtained from the Bureau of Labor Statistics (BLS). The total employment and manufacturing employment for the US Virgin Islands were provided by the USVI Department of Labor (USVIDL). In the case of the last specification, in which the dependent variable is the sum of

employment in services and FIRE, data were gathered from the Puerto Rico Labor Department and excluded employment in transportation, communication, trade and construction.

Why do we selected the USVI to construct the counterfactual for the BSM? USVI are three islands (St. Croix, St. Thomas and St. John) located approximately 110 miles from Puerto Rico. Their economic conditions are very similar to those of Puerto Rico. Both are territories acquired by the US from European countries: Puerto Rico in 1898 from Spain and the USVI in 1917 from Denmark. Both were agrarian economies during the first half of the twentieth century and then underwent a structural transformation toward industrialization based on tax incentives (Oldman and Taylor 1970). Furthermore, both economies were largely deindustrialized in the new century when the service sector became the largest industry in both territories. Both are considered low-tax jurisdictions under some classifications (PWC 2020).

Puerto Rico is more populated than the USVI (Bram and Hastings 2013), but the macroeconomic trends are similar. It is worth quoting Austin at length:

> While efforts of mainland and local policymakers eventually created a robust manufacturing sector after World War II, manufacturing in the Virgin Islands has struggled in the 21st century … The territorial government, facing persistent economic challenges, covered some budget deficits with borrowed funds, which has raised concerns over levels of public debt and unfunded pension liabilities. Local policymakers have proposed tax increases and austerity measures to bolster public finances, which currently operate with restricted liquidity. (Austin 2020, p. ii)

Thus, we did not find major reasons to expect that, in the post-intervention time, exogenous forces affected the treated and control groups asymmetrically. Both territories had a large increase in their debt to GDP ratio, reaching 66% in 2014 in the case of Puerto Rico and 72% in 2015 in the case of the USVI (GAO 2017). In 2016, both territories lost their access to capital markets.

These variables are used in the models that are discussed next.

Section 3. Methodology

In modern economics it is common to evaluate the effect of policies using causal inference (Varian, 2016). A popular causal inference method is the difference-in-difference approach, which has been widely used to show the causal effect of policies or events on particular indicators (Conley and Taber, 2011). For instance, Li et al. (2011) used the difference in difference framework to evaluate the effect of the one-child policy on the sex ratio in China.

We apply both the causality statistical method called Bayesian Structural Time Series Model (BSM), developed by Brodersen et al. (2015), and the traditional SCM, developed by Abadie et al. (2010), to test the effectiveness of the 2012 acts on the economic activity of Puerto Rico. Following these methods, we can observe a counterfactual series that is not affected by the policy intervention, which enables us to answer the following question: what would have occurred in the labor market or in economic activity had the intervention not taken place?

The BSM incorporates past observations from the same series, from predictor variables that were not affected by these acts of 2012 and from the prior knowledge of the model (i.e. Bayesian modeling) to project the counterfactual. Thus, the net impact of those acts in the post-policy period is a semiparametric Bayesian posterior distribution, which is modeled within a 95% credible interval. Additional improvements over traditional causal models (e.g. the Difference-in-Difference model) are that the underlying regression model in

the BSM is not static, the series are able to evolve over the whole intervention period and the selection of control variables does not depend on nonconvex combinations but on the prior distributions.

As a first step, the BSM method estimates a state–space model, such as

$$y_t = \beta^T x_t \propto_t + e_t \tag{1}$$

$$\propto_{t+1} = T_t \propto_t + R_t \Omega_t \tag{2}$$

where y is the economic activity index (EAI), **x** represents the vector of contemporaneous covariates (in our case the total employment in the US Virgin Islands, passenger arrivals and employment in the manufacturing sector in Puerto Rico), $\propto_t$ is a latent state vector, **T** is a transition matrix, **R** is a control matrix, Ω_t is a system error and $e_t \sim N(0, \sigma_t^2)$. According to Brodersen et al. (2015), to avoid overfitting, this model does not have a fixed set of contemporaneous covariates in x_t but chooses the potential covariates that enter the predictions by using a "spike-and-slab" prior over the coefficients.[2]

A key identifying assumption is that the control series are exogenous to the policy intervention. One can state that these control series were largely unaffected by these acts. On one hand, these acts barely have any effect on the number of passengers arriving in Puerto Rico, which is related to tourism, or on

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[2] Specifically, they factorize the spike-and-slab prior as follows:

$$p(\epsilon, \beta, 1/\sigma_e^2) = p(\epsilon)p(\sigma_e^2|\epsilon)p(\beta_\epsilon|\epsilon, \sigma_e^2) \tag{3}$$

where $\epsilon_j = 1$ if $\beta_j \neq 0$ and $\epsilon_j = 0$ otherwise; β_ϵ denotes the nonzero elements of the vector β. The spike is the first term $p(\epsilon)$ and the slab is the remaining portion. The spike-and-slab prior "combines point mass at zero (the 'spike'), for an unknown subset of zero coefficients, with a weakly informative distribution on the complementary set of nonzero coefficients (the 'slab')" (Brodersen et al. 2015, p. 256). This way of identifying the prior allows the usage of many predictor variables and averages the information that they contain.

the number of workers in the manufacturing sector in Puerto Rico, which is more related to industrial policies (Schwartz et al. 2008). On the other hand, Acts 20 and 22 do not apply to the US Virgin Islands (USVI, another US territory sharing many similarities with Puerto Rico, as shown in the next section) and, thus, have no explanatory power to clarify their total employment. Even though these acts are largely orthogonal to these covariates, as a robustness check, we removed manufacturing employment in Puerto Rico from all the specifications but observed the marginal changes, as shown below in the fifth section.

BSM focuses particularly on estimating a posterior probability, which in our case takes the form of

$$p(\tilde{y}_{m+1:T}|y_{1:m},\ x_{1:T}) \tag{4}$$

where m is July 2012, $\tilde{y}_{m+1:T}$ represents the counterfactual response of y and T is the end of the period (August 2017). We used six months as the waiting period to observe the effects stemming from this low-tax jurisdiction (18 individuals received a tax decree in 2012). However, our results were still optimistic: if we moved the cutoff date forward, the economic effect of this low-tax jurisdiction was smaller and, sometimes, not different from zero. We drew 5,000 Markov chain Monte Carlo samples to raise the inference accuracy.

We are interested in measuring the impact of the 2012 acts not only on output but also on employment. Hence, we would like to quantify the posterior probability of

$$p(\tilde{L}_{m+1:T}|L_{1:m}, \; x_{1:T}) \tag{5}$$

where L is the total employment of Puerto Rico and $\tilde{L}_{m+1:T}$ represents the counterfactual response of L. We also repeated this exercise just for the employment in both the service sector and the finance, insurance and real estate (FIRE) sector, which are among the specific sectors targeted by these policymakers.

On the other hand, we complemented our output analysis by applying the conventional SCM as a robustness check. Specifically, the effect of the intervention in the treated unit is given by:

$$\hat{\tau}_{PRt} = Y_{PRt} - \sum_{j=2}^{50} w_j^* Y_{jt} \tag{6}$$

where PR indicates Puerto Rico (j=1); Y is the logarithmic transformation of EAI; j is the control group composed of the 50 states in the United States (we do not include the USVI here as they do not have an EAI); w is the weight assigned to each state by following the method of Abadie et al. (2010). The set of predictors are the same as before; passenger arrivals, M is employment in manufacturing in each state, and dummies of the dependent variable for the periods January 2010, November 2010, September 2011, and February 2012 (intervention period is July 2012 as before). Estimates of the predictors were averaged during the first 27 months and were collected in a vector **X**. We applied the nested optimization provided by STATA, to pursue the best fitting units within the

control group. We corroborated the sensitivity to specification by removing

manufacturing employment, but similar results were obtained.

Section 4. Results and Discussion

What was the economic impact of the 2012 intervention? In Figure 7, we observe that the downward trends in total employment and output did not cease after 2012. This is in contrast to the evolution that the GNP and employment have experienced since the 1950s, when this economy created a low-tax jurisdiction for manufacturing corporations (Dietz 1986), which industrialized the island and modernized its economy (Tobin et al. 1975). Specifically, we can observe that the employment and output increased after the enactment of Section 936 in 1976 under the US Tax Code, which provided federal tax incentives for manufacturing corporations located in US territories such as Puerto Rico. According to Ruiz and Wolff (1996), manufacturing directly generated 17% of the total employment in 1995 (the indirect employment creation was more than twice the direct employment creation).

Figure 7. Total Employment and GNP, 1950-2018
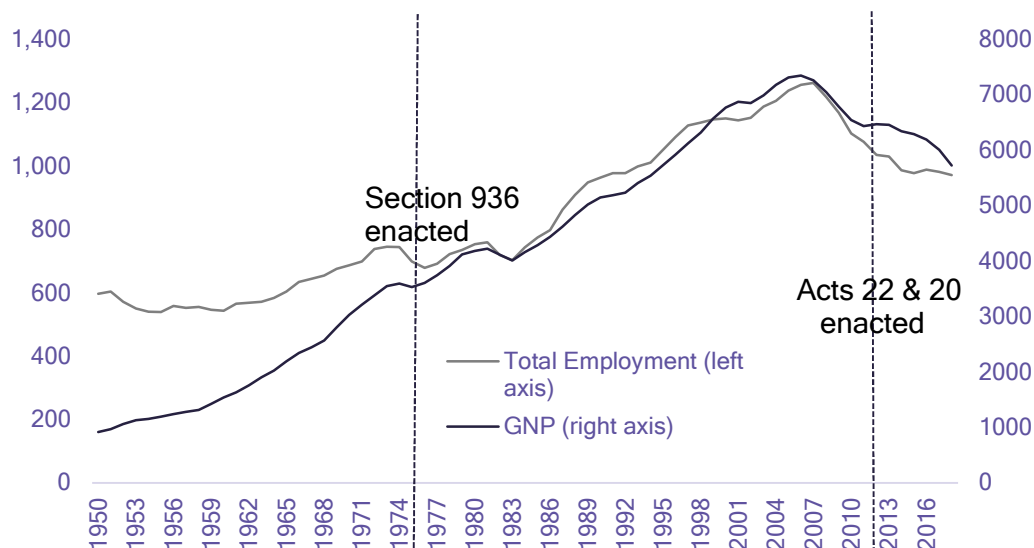
Notes: Figures were adjusted by inflation using the GNP deflator. Its base year is 1954.
Source: Author's calculations based on Puerto Rico Planning Board (2019)

However, one can argue that, without this low-tax jurisdiction for individuals and services, created in 2012, the decline in the total number of jobs and in the total output levels in Puerto Rico would have been even larger. Thus, the following question emerges: what does a causal framework reveal about the effect of the 2012 policy intervention on these macroeconomic figures? We first evaluated the effect on the EAI by applying the BSM method discussed above in section 3.

To observe the contribution to output stemming from these 2012 acts, we illustrate the current EAI against the counterfactual EAI in Figure 8. To compute this counterfactual, we used the USVI total employment, passenger arrivals and manufacturing employment during the period 1975–2018. The figure shows the

Figure 8 Current vs. Counterfactual EAI, 2008-2017
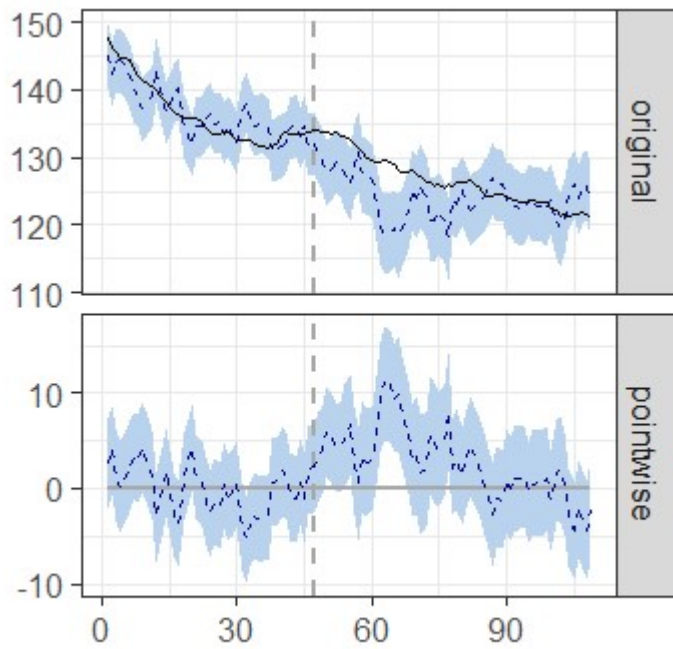
|	Dependent Variable: EAI of Puerto Rico	
2012 Intervention	3.14	2.64
	p-value = 0.043	p-value = 0.043
USVI total employment	Yes	Yes
Passenger Arrival	Yes	Yes
Manufacturing Employment	No	Yes
N	214	214

Notes: The three covariates were used in the illustration. Dotted vertical line indicates the intervention period. Dotted series represent counterfactual levels and the black lines indicate current employment level. Blue shaded area represents the 95% credible interval.

Source: Author's calculation based on BLS (2020), USVI Department of Labor (2020), PR Economic Development Bank (2020), Puerto Rico Institute of Statistics (2020)

counterfactual level of employment that would have occurred in the absence of these 2012 acts (dotted lines) vis-à-vis the current employment levels (black lines). The three covariates shown in the table below Figure 8 were used in this estimation. Blue shaded area represents the 95% credible interval. We found that these 2012 acts caused an accumulated increase in the 2017 EAI of 2% with respect to the counterfactual EAI level. This 2% is not an annual growth rate but the percentage difference between the current output and the counterfactual levels at the end of the period under evaluation. With high statistical significance, one can state that, in the absence of these acts, the 2017 EAI would have been 2.64 points lower than the 2017 current level.

As a robustness check, we estimate the SCM shown in Figure 9, in which we used the 50 states of the United States as control group and the predictors are passengers arriving, manufacturing employment, and certain periods of the dependent variable, as described above in section 3. The SCM applied here autonomously assigns weights to every unit in the control group and 70.6% of the counterfactual was weighed by Hawaii, Maryland, Maine, and Texas, as shown in the table below Figure 9. Note that the most influential unit in the control group is Hawaii, which curiously shares the condition of being an island with Puerto Rico. This model found that, thanks to these acts, at the end the EAI was 1.4% higher than the counterfactual level. Similar results were obtained without the predictor manufacturing employment and this outcome was not obtained when using other states as a placebo test (graph is in the appendix).

Figure 9. SCM Estimations of 2012 Acts Enactment and Total Employment, 2008-2017
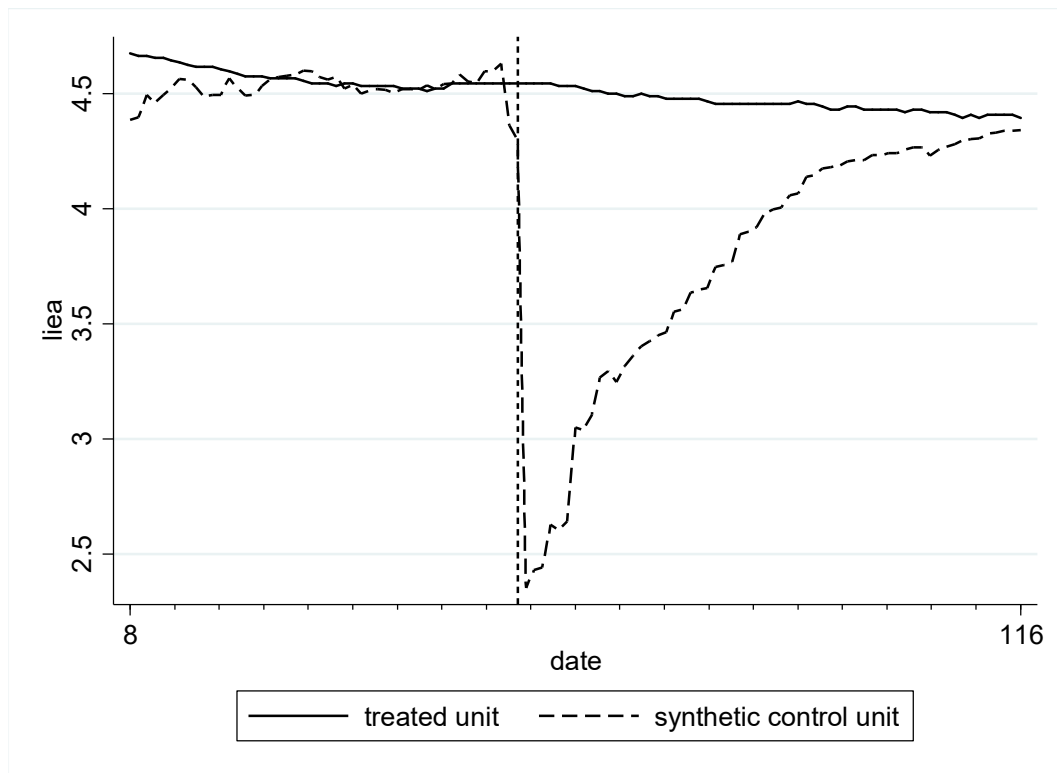
Main states in the control group	Unit weights	
Hawaii	0.478	
Maryland	0.102	
Maine	0.078	
Texas	0.048	

Predictor Balance	Treated	Synthetic
Logarithm of passenger arrivals	8.200	8.201
Logarithm of manufacturing employment	5.285	5.284

Notes: The root mean squared percentage error was 0.092
Source: Author's calculation based on BLS (2020), USVIDL (2020), BTS (2020), BER (2020)

These increases are lower than the one estimated in self-reported studies (Estudios Tecnicos 2019). Participants under Act 22, according to Estudios Tecnicos (2019), contributed $703 million in consumption and $1.3 billion in

purchases of properties in the period 2015–2019. The overall contribution to the GNP was not measured, but the 2019 study stated: "If the $1.2 billion investment were to take place in 1 year, it would represent more than 12% of the Island's gross domestic investment in fiscal 2018" (Estudios Tecnicos 2019, p. 60). One reason for these discrepancies is that, when someone buys a used property in Puerto Rico for a similar price to that paid by the previous owner, it does not represent new economic activity for the GNP but rather a title change (the factor payments and inputs used in the construction were already accounted for when the property was sold the first time).

So far, we have shown the effect on output, but what about the effect on employment? To this end, we ran several estimates and controlled for relevant factors, as explained next. The first estimation shown in Figure 10 used the USVI total employment, passenger arrivals in Puerto Rico and manufacturing employment in Puerto Rico as covariates. With this specification, the number of jobs created by these 2012 policies amounts to 33,740. The statistical significance is relatively solid.

In the table under Figure 10, we show that, if we removed manufacturing employment from the list of covariates, the employment creation potentially attributed to the 2012 acts would be 39,210. One can consider this as the upper-limit estimation. Thus, we used the estimation of 33,740 jobs. This outcome would imply that these acts, directly and indirectly, created 3.3% of the

Figure 10. Current vs. Counterfactual Total Employment, 2008-2017
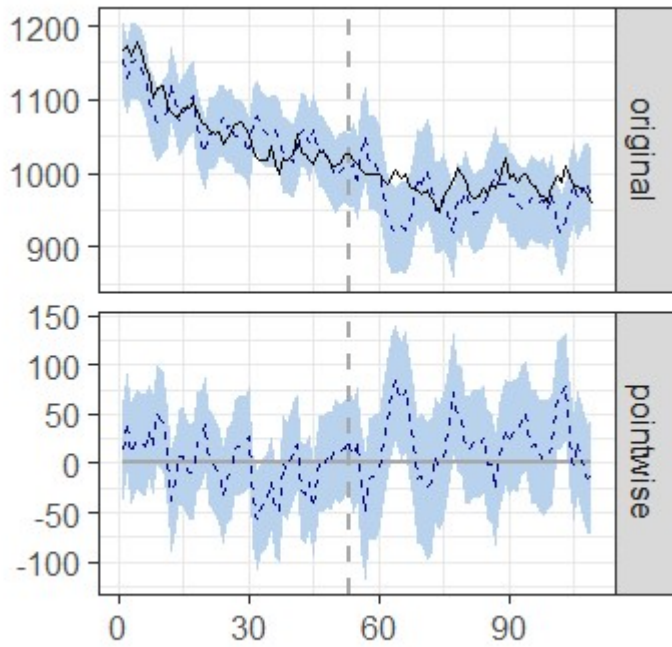
	Dependent Variable:	
	Total Employment in Puerto Rico	
2012 Intervention	39,210	33,740
	p-value = 0.024	p-value = 0.032
USVI total employment	Yes	Yes
Passenger Arrival	Yes	Yes
Manufacturing Employment	No	Yes
N	214	214

Notes: The three covariates were used in the illustration. Dotted vertical line indicates the intervention period. Dotted series represent counterfactual levels and the black lines indicate current employment level. Blue shaded area represents the 95% credible interval.

Source: Author's calculation based on BLS (2020), USVIDL (2020), BTS (2020)

total employment in Puerto Rico compared with the base month of July 2012.

Much of this employment creation is attached to Act 20, because Act 22 was

found to account for 18% of these jobs (Estudios Tecnicos 2019).

In Figure 11, we evaluate the employment created in two sectors targeted

by policymakers: services and FIRE. According to these estimations,

approximately 13 thousand jobs were added to these two sectors with this new

low-tax jurisdiction. It would appear that the employment generated, either

directly by the consumption of Act 22 grantees or indirectly, in other sectors

such as trade and communications, exceeded the employment gained in

services and FIRE.

Figure 11. Current vs. Counterfactual Employment in Services and FIRE, 2008-2017
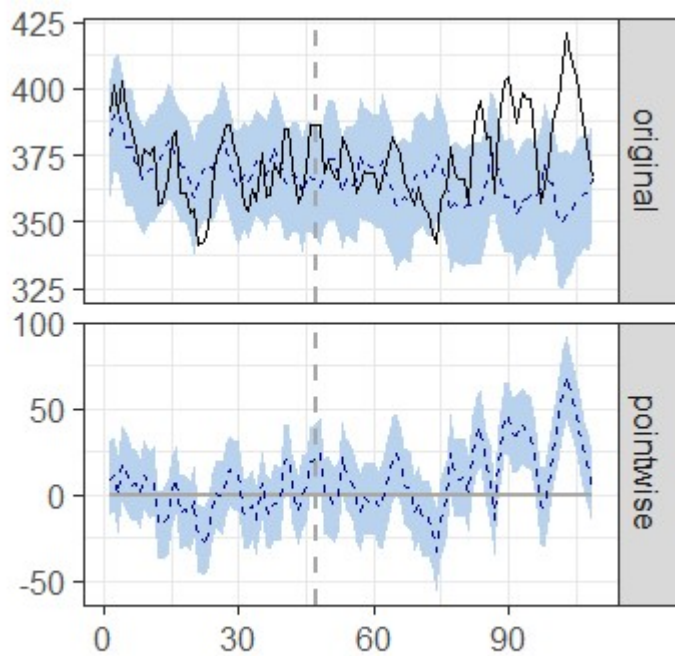
	Dependent Variable:	
	Total Employment in Services and FIRE in Puerto Rico	
2012 Intervention	13,490	13,320
	p-value = 0.024	p-value = 0.004
USVI total employment	Yes	Yes
Passenger Arrival	Yes	Yes
Manufacturing Employment	No	Yes
n	214	214

Notes: The three covariates were used in the illustration. Dotted vertical line indicates the intervention period. Dotted series represent counterfactual levels and the black lines indicate current employment level. Blue shaded area represents the 95% credible interval.
Source: Author's calculation based on BLS (2020), USVIDL (2020), BTS (2020)

Section 5. Conclusions and Policy Recommendations

Act 22 of 2012 gave complete tax exemption to capital gains to individuals who move their residence from any country to Puerto Rico. Act 20 of 2012 reduces the tax rate to exporting services to 4%, and Act 273 of 2012 also decreases tax bracket to 4% to international financial organizations. However, seven years after the enactment of these acts, we still observe modest results.

These results are more modest than those estimated by self-reported data. These discrepancies may reveal that some participants in these acts would have generated new economic activity in the absence of these 2012 policies. Instead of increasing the conditions to participate in these acts, in 2017 the local government removed the original minimum employment requirement (five jobs) to participate under Act 20.[3]

However, we do not recommend the removal of Acts 20, 22, and 273. Rather, we recommend reforming these policies to maximize their potential. Specifically, we propose that policymakers:

1. Condition the participation under Act 273 and Act 20 to the creation of at least 10 new (not previously existent) jobs.

2. Establish a minimum capital gain tax rate for Act 22 of 12% and raises property taxes for luxury properties to avoid the free rider problem.[4]

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[3] https://www.bdopr.com/en-gb/insights/tax/tax-alert/act-43-45-amendments-to-incentive-acts-20-22

[4] In economics, the free rider problem is when an economic agent enjoys public goods but does not pay for it.

However, the capital gain tax rate can be reduced to 5% if the investor hires a minimum of five employees and invest $2 million or more in renovations in existent properties or in local assets. In doing so, policymakers can make sure that grantees really have an incentive to invest. One can argue that there are no capital gain taxes at the state level in Florida, but property taxes are far higher in Florida than in Puerto Rico and individuals pay a top federal capital gain tax rate of 20%. In other states the combined federal and state tax rates for high-income individuals can go up to 24.6%.[5] The Biden administration is seeking to increase the top marginal capital gain tax bracket at 39.6%, which would raise the comparative advantage of capital gain taxes in Puerto Rico. According to the page 88 of the report made by Estudios Tecnicos (2019), in 2020 the aggregate value of real estate of these participants would be $2.997 billion. Thus, a property tax rate of 5% would generate at least $149.8 million in fiscal revenues every year. The tax form for these investors should include the alternate basic tax.

3. Deny the Act 22 incentive for individuals that do not want to do businesses in Puerto Rico, have a net worth lower than $10 million, or will transfer less than 25% of their capital to the Island. These requirements will make sure that participants can and will create economic activity.

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[5] https://www.forbes.com/advisor/investing/biden-capital-gains-tax-plan/

4. Investments in real estate in primary residence should not be considered as part of the investment requirement. Similarly, second homes located in fastest-growing areas such as the Old San Juan, Isla Verde, and subdivisions in Dorado, Vieques, and Gurabo, among others, should not count for the investment requirements. Many of these areas still qualify for the Opportunity Zones Incentives. By discouraging investments in fastest-growing areas, the government controls price bubbles that can hurt investors themselves.

5. Establish a minimum tax for corporations under Act 20 and 273 of 10%. This rate is lower to what corporations pay in Ireland[6] and far lower than the statutory corporate tax rate in Puerto Rico.

6. Require that every participant submit to the DDEC their 1040PR or their 940PR, which are federal income tax forms required in Puerto Rico. These forms should be submitted every year, before and after the incentive. In doing so, one can measure the before and after employment of each of these acts more properly, without relying on self-reported data. Similarly, investment requirements should be verified with cleared checks.

7. Change the application forms to gather more information and evaluate the economic impact of these policies. Specifically, we suggest that:

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[6] https://taxsummaries.pwc.com/ID/Ireland-Corporate-Taxes-on-corporate-income

a. the Act 273 application includes all the questions contained in the application of Act 20 and asks whether the applicant already businesses in Puerto Rico have, whether the applicant spouse had a decree from DDEC, and a racial question, as is customary in federal applications.

b. the Act 22 application asks for evidence of primary residence (for example, evidence of school registration of their children), if the person has bank accounts outside the U.S., if the applicant already has businesses in Puerto Rico, whether the applicant spouse had a decree from DDEC, and a racial question as is customary in federal applications.

c. the Act 20 application asks for the current level of exports of the applicant (incentive should apply to new exports only), whether the applicant spouse had a decree from DDEC, and a racial question as is customary in federal applications.

8. All the information obtained from the applications should be transformed in a data frame such as Excel or Comma Separated Values. It is very unfortunate when information is gathered in PDFs or other hard-to-handle formats, which limit the evaluation analysis of these incentives.

9. Require that participants under Act 22 live at least 9 months in Puerto Rico. This would maximize the consumption impact of these investors.

10.   Check if act 22 participants have a criminal background.

These and other conditions would seize the potential of these acts and maximize their economic and employment effect. The new tax revenues that can be captured with these conditions can be used for economic growth strategies such as providing seed funding for research projects in the University of Puerto Rico or to the Puerto Rico Science Trust. Alternatively, these new tax revenues can be used to provide grants for local businesses or to substitute the inventory tax that harms economic activity in Puerto Rico (Garofalo, 2019). In doing so, the link between foreign investment and the local sector would be self-evident.

If the government continues offering unconditional tax incentives, it will be difficult to observe large economic effects. In addition, it is going to decrease its optimal tax revenues or increase the tax burden to economic actors that do not participate in the low-tax scheme.

A low-tax jurisdiction could work only if it is managed wisely.

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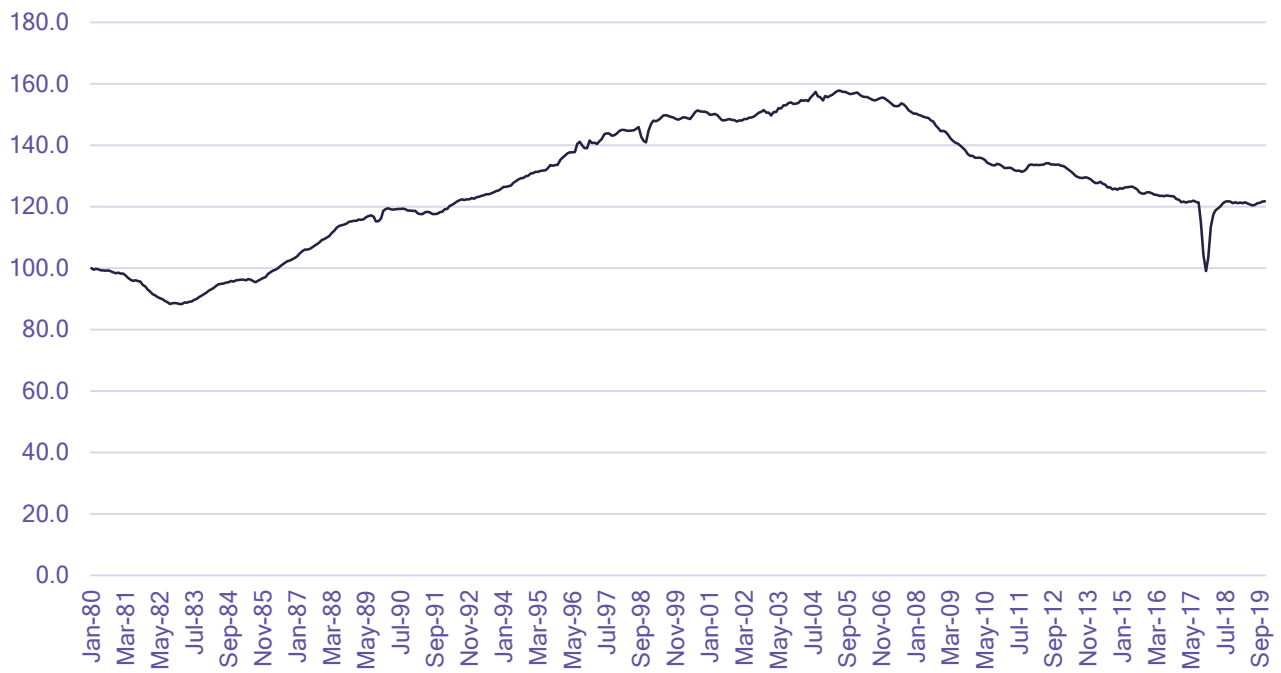
Appendix 1.

Figure A1. Index of Economic Activity, 1980-2019

Table A1. Placebo test: estimating same SCM for Alaska