"U.S. Multinationals in Puerto Rico and the Repeal of IRS Section 936 Tax Exemption for U.S. Corporations"

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Abstract

In 2017, unable to pay $72 billion it owes to bond holders, Puerto Rico's government filed for court proceedings similar to Chapter 9 of the U.S. bankruptcy code. The origins of the crisis have been attributed in part to the 2006 elimination of Internal Revenue Service (IRS) Section 936 tax exemption for U.S. corporations. Using industry panel data, compiled from the IRS Statistics of Income for U.S. Possessions Corporations, the U.S. Economic Census for Outlying Areas, and the mainland U.S. Economic Census, we analyze the effects of the elimination of IRS Section 936 on Puerto Rico's manufacturing. Our results show the elimination of IRS Section 936 was associated with a 16.7% decrease in average manufacturing wages in Puerto Rico relative to the United States. Moreover, the number of manufacturing establishments decreased by 18.7% to 28.0% relative to a control group of states that includes Indiana, North Carolina and Oregon.

1. Puerto Rico and Section 936 of the IRS

Puerto Rico, the commonwealth island, was placed under a financial and oversight board by the U.S. Congress in 2016. Unable to pay for its 72 billion-dollar debt, the Puerto Rican government and the oversight board, filed for court proceedings similar to Chapter 9 of the U.S. Bankruptcy Code in 2017 (Andrew Scurria, and Heather Gillers, WSJ May 4, 2017).[1] The origins of the crisis in Puerto Rico have been attributed in part to the phase out and elimination of Internal Revenue Service (IRS) Section 936 tax exemption program for U.S. corporations in 2006. (Krueger, Teja and Wolfe, 2015). Despite this claim, there has been no econometric analysis of the impact of the phase out and elimination of IRS Section 936 tax exemption program on the manufacturing industry in Puerto Rico.

Using industry level panel data, compiled from Internal Revenue Service Statistics of Income for US Possessions Corporations, US Economic Census for Outlying Areas, and the mainland US Economic Census we analyze the effects of the phase out and elimination of IRS Section 936 on Puerto Rico's manufacturing industry, in particular we estimate the effects on the number of establishments, value added (sales or shipments), employment, and wages using data from 1982 to 2012. Difference in difference regression results show the elimination of the tax exemption program was associated with a 16.7% reduction in average manufacturing wages in Puerto Rico relative to the United States. Additional regressions show eliminating the tax exemption program was associated with an 18.7% to 28% decrease in the number of manufacturing establishments, when using the states of Indiana, North Carolina and Oregon as

[1] The bankruptcy was filed under Title III of the Puerto Rico Oversight Management and Economic Stability Act (PROMESA).

the control group. These results suggest the elimination of IRS Section 936 had a negative impact on the manufacturing industry in Puerto Rico.

2. Section 936 of the IRS Tax Code

Legislation granting tax benefits to firms located in U.S. territories (possessions) started in 1921. The original legislation provided a 100 percent tax exemption from income derived from sources outside the United States if the corporation had derived 80 percent or more of its gross income from U.S. possessions, and 50 percent or more of its gross income from the active conduct of trade or business in the U.S. possession (Holik, 2009).[2]

The Tax Reform Act of 1976 changed taxation rules for U.S. corporations operating in U.S. possessions, creating a new Section 936 of the Internal Revenue Code. The new legislation allowed only tax credits against taxes paid on income derived from the active conduct of trade or business in a U.S. possession, and qualified possessions source investment income. The goal of the legislation was to encourage U.S. corporations to increase employment-producing investments in U.S. possessions (Holik, 2009).

The Tax Equity and Fiscal Responsibility Act of 1982 and the Tax Reform Act of 1986 changed IRS Section 936 rules. The 1982 Act provided that possessions corporation's income from intangible assets, like patents and copyrights, be taxable to U.S. shareholders (a U.S. parent corporation) of the corporations unless the corporation demonstrated a significant business presence in the U.S. possession. A direct labor or value-added test with respect to a specific product or service was required to obtain tax exemption. The percentage of gross income that a

[2] Unlike the foreign tax credit, the possessions tax credit could reduce and, in some cases, eliminate the U.S. tax liability on qualified possessions income whether or not the possessions tax that income.

possessions corporation had to earn from trade or business in a U.S. possession was originally set to 65 percent but increased to 75 percent in 1986 (Holik, 2009).

The Small Business Job Protection Act of 1996 eliminated IRS Section 936 for tax years after December 31, 1995 (Holik, 2009). The 1996 Act phased out tax exemption given to U.S. corporation in U.S. territories between 1995 and 2005. Existing investors could continue to claim reduced credit amounts for active income using a percentage or economic activity limitation. These transition rules allowed existing possessions corporation to claim credits through taxable years beginning before January 1, 2006.

Even though tax exemption through IRS Section 936 applied to all U.S. possessions territories, U.S. possessions corporations with operations in Puerto Rico accounted for virtually all of the possessions tax credits.[3] In 2005, 98.8% of the 0.9 billion dollars in tax credits claimed were from US possessions corporations located in Puerto Rico. Moreover, of the 102 possessions corporations claiming credit, 94 were located in Puerto Rico. These corporations also accounted for nearly all of the assets, receipts, and net income of corporations claiming the credit. Most of the tax credit was given to manufacturing firms, accounting for 69% of possessions tax credit in 2005 (Holik, 2009).

3. Literature on Taxation, Firm Location and US Corporations

The literature on taxation and foreign direct investment (FDI) is extensive. Theoretical models of the impact of taxes on the location of FDI consider whether firms engage in horizontal FDI, which has the goal of establishing production abroad to serve local labor markets, or vertical FDI, which involves locating different stages of production in different countries

[3] U.S. possessions include Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands.

depending on relative factor endowments (Fuest et al, 2005, Helpman, 1984, 1985, Horstmann and Markusen, 1992). Some empirical studies use these theoretical models to estimate tax semi elasticities of FDI (Devereux and Lockwood, 2006, Devereux et al, 2015) while others use gravity models (Bellakk et al, 2009).

Feld and Heckemeyer (2011) conducted a meta study of FDI and taxation. They reviewed 704 primary estimates of the tax semi elasticities of FDI and found the precision weighted average elasticity is -2.55, and when publication selection was taken into account, the elasticity decreases to between -2.28 and -1.19. Other research supports their findings, Blonigen et al (2014) use firm level data from the US Bureau of Economic Analysis (BEA) to examine the potential benefits of bilateral tax treaties, intended to promote foreign direct investment through double taxation relief. They find US multinational firms using differentiated inputs increased foreign affiliate activity (measured by sales) once the United States had established a bilateral tax treaty with the country hosting the affiliate. An (2012) analyzed the effects of China's *Corporate Income Tax Law,* put into effective on January 1 2008, which removed preferential tax treatments offered to foreign investment enterprises. Using data from the Chinese Industrial Enterprises Database, An finds reductions in tax benefits offered to foreign firms had the effect of reducing foreign investment enterprises in China. These studies suggest firm location and activity is very sensitive to tax levels and thus the elimination of tax exemption for U.S. corporations in Puerto Rico may have had a large impact on the decision of firms to continue operating in the territory or leaving the island for other less costly locations.

In a tax study, Hexner and Jenkins (1995) found that the job creating benefits of IRS Section 936 in Puerto Rico were not large enough to justify the U.S. loss in tax revenue. Possessions corporations received full credit against U.S. taxes owed on the net income earned in

a U.S. possession, regardless of whether the income was generated by the use of tangible property and labor, or intangible property transferred to the possessions corporation. They argued IRS Section 936 did not produce enough employment because it benefited capital-intensive firms such as pharmaceuticals and did not benefit labor-intensive industries such as apparel manufacturers. IRS Section 936 was a costly tax benefit to a few corporations with limited benefits to possessions economies and their exports. Moreover, they argued the IRS Section 936 tax code could not be fixed and thus had to be abolished (Hexner and Jenkins, 1995).

Previous research by Grubert and Slemrod (1998) investigated income shifting by U.S. corporations operating under IRS Section 936. They analyzed 419 U.S. possessions corporations in 1987 and found that the operating capital and payroll of Puerto Rican affiliates would be more than two thirds lower in the absence of income shifting. They predicted that the elimination of tax exemption for U.S. possessions corporations would result in firms leaving or reducing their size of operations in Puerto Rico.

4. Data

We constructed two different data sets to study the impact of the elimination of IRS Section 936 on Puerto Rico's manufacturing industry. The first data set is based on the IRS Statistics of Income for U.S. Possessions Corporations. Using these data, we constructed a panel of 23 two-digit Standard Industrial Classification (SIC) industries of US possessions corporations for the years 1993 to 2005 (see Appendix A for description of industries). These data include the last 12 years of IRS Section 936, including the ten-year phase out period that started in 1995 and ended in 2005. The panel includes data on the number of tax returns filled by

U.S. possessions corporations, value of tax credits, total expenditures on salaries and wages, net depreciating assets, net intangible assets, and business receipts.

The second data set is based on the U.S. Economic Census for Outlying Areas, and the mainland U.S. Economic Census. With these data, we constructed a panel of industries originally at the two-digit SIC level from 1982 to 1992 and at the three-digit North American Industrial Classification System (NAICS) level from 1997 to 2012 with some consolidation resulting in 14 industries.[4] The panel includes data in five-year intervals between 1982 and 2012 (See Appendix B for Description of Industries).[5] Variables included in these data include value added (sales in the case of U.S. state data), number of manufacturing establishments, employment and payroll.

We also constructed a data set based on a report by the Junta de Planificación of Puerto Rico, "Impacto de las Firmas Manufactureras 936 sobre la Economía de Puerto Rico," which includes information on firms within industries operating under IRS Section 936 and firms within industries that did not receiving tax exemption for the year 1987. These data are used for descriptive purposes.

5. Methodology

We estimate a fixed effects model to analyze the impact of the elimination of IRS Section 936 on the manufacturing industry in Puerto Rico. Puerto Rico is a territory of the United States and has no votes in the U.S. Congress. The phase out of IRS Section 936 was a policy change

[4] We created a concordance to reconcile 2-digit SIC and 3-digit NAICS industries. The U.S. Census classified data on and prior to 1997 by SIC and after 1997 by NAICS. The concordance is available in Appendix A. Mapping of 2-digit SIC into 3-digit NAICS required reducing the number of industries to 14.

[5] These data were collected in five-year intervals because the Economic Census is conducted every five years.

imposed on Puerto Rico by the U.S. Congress, driven by the desire to increase U.S. tax collection. The Puerto Rico government opposed the elimination of IRS Section 936. A New York Times article provides an account of the government's position. "Puerto Rico's new Governor, Dr. Pedro J. Rossello, and business groups contend that eliminating the provision will virtually destroy the island's manufacturing industries, which employs about 165,000. It would also deprive the local government of a big revenue source: a tax of up to 10 percent on profits that mainland companies send home from their Puerto Rican operations," (Rohter, 1993). Thus, we consider the policy of eliminating IRS Section 936 to be exogenous to economic conditions in Puerto Rico and it is a natural experiment on the impact of removing tax exemptions on the location and operation of US multinational corporations.

First, we document the relationship between the value of tax credits given to U.S. corporations in Puerto Rico, and the number of U.S. firms filing for tax credits. We also estimate the relationship between the value of tax credits given to U.S. Possessions Corporation in Puerto Rico and their expenditures on worker compensation. Our data on U.S. Possessions Corporations is biannual, starting in 1993 and ending in 2005.

We estimate a fixed effects model described by the following equation:

$$Log(USFirms_{it}) = \alpha + \beta_1 LTaxCredits_{it} + \beta_2 LDepAssets_{it} + \beta_3 LIntanAssets_{it} + \beta_4 LBusReceipts_{it} + \sum_i Ind_i + \sum_t Year_t + \varepsilon_{it} \quad (1)$$

Where USFirms is the number of U.S. possessions corporations filing for tax exemption in industry i and year t. *TaxCredit* is the value of tax credits awarded to U.S. possessions corporations by the IRS. *DepAssets*, *IntanAssets* and *BusReceipts* represent respectively the value of depreciable assets, intangible assets and business receipts for U.S. possessions corporations. Ind is a group of industry dummy variables and Year is a group of year dummy

variables. We estimate a similar regression using total worker compensation as the dependent variable. All variables are in logs and all regressions are estimated using industry cluster standard errors.

We estimate a second regression equation to analyze the impact of the elimination of IRS Section 936 in Puerto Rico's manufacturing industry using a difference in difference estimation method. The first difference is before IRS Section 936 was eliminated (1982 to 1992), during the ten-year phase out period (from 1995 to 2005) and after the elimination of IRS Section 936 (after 2005). The second difference measures the difference in the industry level trends for the same periods for Puerto Rico and a control group.

It is difficult to find a perfect control group for Puerto Rico's manufacturing industries since Puerto Rico has significantly lower wages than all states in the U.S., its location is far from the mainland, and because it is an island and requires maritime and air transportation for all goods. For this reason, we estimate regressions using 3 alternative control groups. The first control group is the entire United States, which including all 50 states. The second and third control groups are made of states. State control group 1 includes Indiana, North Carolina and Oregon. State control group 2 includes Indiana, North Carolina, Oregon and New Jersey. The reason Indiana and North Carolina were selected is that they have the largest manufacturing share of GDP in the U.S. Oregon was selected because, like Puerto Rico, it has a large proportion of workers in food and beverages. New Jersey was selected because it has a large share of employment in chemical and allied products, mostly pharmaceuticals. Comparisons of manufacturing industries in Puerto Rico, the U.S., Indiana, North Carolina, New Jersey and Oregon are shown in Appendix C.

We estimate the following difference in difference equation:

$$Log(Establishments_{ijt}) = \alpha + \beta_1 TaxCreditPhaseOut_{ijt} + \beta_2 AfterTaxCredit_{ijt} +$$

$$+\beta_3 dPR_j + \beta_4 dPR_j * TaxCreditPhaseOut_{ijt} + \beta_5 dPR_j * AfterTaxCredit_{ijt} + \sum_i Ind_i +$$

$$\varepsilon_{ijt} \quad (2)$$

where *Establishments* is the number of manufacturing establishments in location j (PR or Control Group) industry i and time t. *TaxCreditPhaseOut* is a dummy variable that equals 1 if the year is during the ten-year phase out period of IRS Section 936 (1995 to 2005) and 0 otherwise. *AfterTaxCredit* is a dummy variable that equals 1 if the year is after the elimination of the IRS Section 936 (after 2005). dPR is a dummy variable that equals 1 if the observation is from Puerto Rico and zero otherwise. The interaction terms between the *PhaseOut* and *AfterTaxCredit* variables and the Puerto Rico dummy variable capture the differences between Puerto Rico and the control group during the phase out and elimination of IRS Section 936. These coefficients, β_4 and β_5, are the difference in difference estimators and thus capture the impact of the phase out and elimination of the IRS Section 936 tax exemption program in Puerto Rico.

We estimate similar difference in difference regression equations using value added (sales or shipments)), employment and average wages as the dependent variable.[6] All dependent variables are in logs. All variables are measured in 5-year intervals. All regressions are estimated using industry location cluster standard errors to account for correlation within industries and location. When the U.S. is the control group, we use industry-PR and Industry-US specific standard errors. When the control group is a group of states, we use industry-PR and Industry-State$_i$ standard errors, where i is state control group 1 or state control group 2.

[6] The mainland U.S. Economic Census provides information on value added at the national level but only sales and value of shipments at the state level. The U.S. Economic Census for Outlying Areas includes both value added, and sales or shipments. For this reason, we use value added as the dependent variable when the control group is the United States, and sales or shipments when the control group is a group of states.

6. Description and Trends for Section 936 Corporations

Figure 1 shows tax credits given to U.S. corporations operating in U.S. territories from 1983 to 2005. Tax credits awarded to U.S. possessions corporations increased from 1983 to 1993, and declined continuously from 1995 to 2005. The decline in tax credits can be attributed to the ten-year phase out of IRS Section 936 starting in 1995 and its elimination on January 2006. The number of US Corporations applying for IRS Section 936 tax credits decreased from 1983 to 2005, however, there is a sharp decline after 1997. This suggests that while some of the trends in the number of U.S. possessions corporations is unrelated to the tax exemption program, the phase out of IRS Section 936 may be responsible for a large drop in the number of manufacturing establishments.

Figure 2 shows manufacturing figures for Puerto Rico from 1982 to 2012 using data from the U.S. Economic Census for Outlying Areas. The number of manufacturing establishments in Puerto Rico gradually declined from 1982 to 1997, increased from 1997 to 2002, and sharply declined after 2002. Employment in manufacturing continuously increased from 1982 to 1997 and experienced a sharp declined after 1997. The sharp decline in employment coincides with the ten-year phase out and elimination of the IRS Section 936. These statistics suggests that some of the decline in the number of manufacturing establishments and employment in Puerto Rico maybe due to the phase out and elimination of IRS Section 936.

Table 1 shows industry level statistics for U.S. possessions corporations operating under IRS Section 936 from the IRS Statistics of Income for US Possessions Corporation, 1993. These statistics show four industries received most of the tax credits: food and kindred products (12.6%), chemical and allied products (49.9%), electrical and electronic equipment (22.5%), and

instruments and related products (9.5%). The chemical and allied products industry, mostly pharmaceuticals, was the largest industry group.

Table 2 shows the importance of U.S. possessions corporations in Puerto Rico's manufacturing industry using a report from the Junta de Planificación of Puerto Rico with statistics on firms filing under IRS Section 936 for the year 1987. These data show U.S. possessions corporations filing under IRS Section 936 accounted for 82.8% of manufacturing production in the island. Moreover, firms filing under IRS Section 936 accounted for over 90% of production in tobacco products, textile mills, chemical and allied products, petroleum and coal products, leather and leather products, industrial machinery, electronic and other equipment, and instruments and related products. Overall, these statistics show Section 936 firms accounted for most manufacturing production in Puerto Rico in 1987.

7. Results

Table 3 shows estimates of the relationship between the number of U.S. corporations filing for tax credits under IRS Section 936 and the value of tax credits granted by the IRS using data from Statistics of Income for US Possessions Corporations from 1983 to 2005. The dependent variable is the number of U.S. possessions corporations filing for Section 936 tax credits and independent variables include the value of tax credits given to US Corporations under IRS Section 936, firm tangible and intangible assets and business receipts. Regressions show that as the value of U.S. corporations tax credits increased within an industry, the number of US Corporations filing for tax credits increased. The coefficient on value of tax credits is significant at the 5 percent level.

These regressions are descriptive as it is difficult to establish a causality. An increase in the value of tax exemption given to U.S. corporations can attract additional U.S. corporations to do business in Puerto Rico and file under IRS Section 936. At the same time, an increase in the number of U.S. corporations filing under IRS Section 936 can increase the value of tax credits. The purpose of these regressions is to show that increasing Section 936 tax credits from 1983 to 1994 is associated with increasing numbers of U.S. corporations filing for tax credits and the decline in tax credits received by U.S. corporations was associated with a decline in the number of U.S. corporations filing for tax credits.

Regression results in table 3 also show there is no evidence that U.S. corporations receiving greater amounts of tax credits through IRS Section 936 spent a larger amount of money on worker compensation. We regressed expenditures on salaries and wages by U.S. corporations operating under IRS Section 936 on value of tax credits received and other financial variables. We find that the coefficient on value of tax credits is statistically insignificant and thus we cannot reject the possibility it is equal to zero. This validates some of the criticism of IRS Section 936 since firms that received a greater amount of tax credits did not appear to have a greater amount of expenditures on workers and presumably did not employ proportionally more workers. The only variable significantly related to expenditures on salaries and wages is business receipts, the coefficient is positive and statistically significant at the 5% level.

Table 4 shows the difference in difference estimates of the impact of Section 936 on the number of manufacturing establishments, value added (sales or shipments)), employment and average wages of workers in manufacturing industries using the U.S. (all 50 states) as the control group. The difference in difference coefficients are captured by the interaction terms between the Puerto Rico dummy variable, and the dummy variable for the ten-year phase out period of

IRS Section 936, and the years after the elimination of IRS Section 936. These coefficients show differences between industries in Puerto Rico and the United States during the years Section 936 was phased out and eliminated. The results show no significant impact of the elimination of Section 936 on the log number of establishments, value added, and employment in Puerto Rico (columns 1, 2 and 3). Coefficients on the interaction terms are insignificant. However, we find a significant effect of the elimination of IRS Section 936 on average wages (column 4) in Puerto Rico. The coefficient on the interaction term between the Puerto Rico dummy variable and the end of Section 936 tax credit dummy variable is significant at the 10% level. The estimated coefficient is -.167 and shows average manufacturing wages in Puerto Rico declined by approximately 16.7% relative to manufacturing wages in the U.S. Other coefficients in these regressions have the expected signs.

Table 5 shows estimates of the impact of the phase out and elimination of IRS Section 936 on Puerto Rico's manufacturing using state control group 1, Indiana, North Carolina and Oregon. Results show no impact of the elimination of IRS Section 936 on sales or shipments, employment and average wages in Puerto Rico (columns 2, 3 and 4). However, estimates show a significant impact of IRS Section 936 on the number of manufacturing establishments (column 1). The coefficients on the interaction term between the Puerto Rico dummy variable and the dummy variables for the ten-year phase out period and elimination of IRS Section 936, are significant at the 10% level and are estimated to be -.186 and -.280 respectively. This suggests the elimination of IRS Section 936 may be responsible for an 18.7% to 28.0% reduction in the number of manufacturing establishments in Puerto Rico.

Table 6 shows estimates of the impact of the phase out and elimination of IRS Section 936 on Puerto Rico's manufacturing using state control group 2, Indiana, North Carolina, Oregon

and New Jersey. The difference between control group 1 and control group 2 is the inclusion of New Jersey. New Jersey was added to the control group because it has one of the largest concentrations of pharmaceuticals in the United States. Regression result using control group 2 show no impact of the elimination of Section 936 on the number of manufacturing establishments, sales or shipments, employment and average wages in Puerto Rico. All coefficients on the interaction terms between the Puerto Rico dummy and the IRS phase out, and elimination dummies are insignificant (columns 1, 2, 3, 4). This suggests that our results are sensitive to the states included in the control group. Which state control group is most appropriate for Puerto Rico? We answer this question by conducting an event study and additional data analysis.

8. Event Study and Additional Data Analysis

Differences between Puerto Rico, the U.S. and states in the control group are important to consider. In 1987, manufacturing wages in Puerto Rico were significantly lower than those in the control group. Wages in Puerto Rico were 53.4% of the average wage in the U.S. There were significant differences when compared to states in the control group. Puerto Rico's wages were only 48% of those in New Jersey but significantly higher relative to those in North Carolina, 67% (see Appendix C). While 19.9% of the labor force in Puerto Rico was employed in manufacturing, above the 17% average in the U.S., the percent of employment in manufacturing in Puerto Rico was lower than in the four states in the control group. North Carolina's had the largest percent of workers in manufacturing, 35.1%, while New Jersey had the lowest, 22.3%. For our estimation, differences between Puerto Rico and the control group are allowed, however,

trends in value added, number of establishments, employment and wages need to be similar prior to the phase out and elimination of Section 936.

Borusyak and Jaravel (2016) argue that the difference in difference estimation assumes no pre-trends between the control and the experiment group. Puerto Rico should have experienced similar economic conditions as the control group before the elimination of tax exemption for U.S. corporations. We test the validity of the three control groups by estimating an event study regression model described in equation 3.

$$Log(Establishments_{ijt}) = \alpha + \beta_1 1987_{ijt} + \beta_2 1992_{ijt} + \beta_3 1997_{ijt} + \beta_4 2002_{ijt} + \beta_5 2007_{ijt} + \beta_6 2012_{ijt} + \beta_7 PR_j + \beta_8 dPR_j * 1987_{ijt} + \beta_9 dPR_j * 1992_{ijt} + \beta_{10} dPR_j * 1997_{ijt} + \beta_{11} dPR_j * 2002_{ijt} + \beta_{12} dPR_j * 2007_{ijt} + \beta_{13} dPR_j * 2012_{ijt} + \sum_i Ind_i + \varepsilon_{ijt} \quad (3)$$

The year left out of the regression is 1982. If the control group is valid, results from this regression most show no pre-trends. That means we should find that $\beta_8 = 0 \; and \; \beta_9 = 0$.

We estimated equation 3 using the three control groups: U.S., state control group 1 (IN, NC, OR) and state control group 2 (IN, NC, OR, NJ). We find no evidence of pre-trends in most regressions. We will discuss event studies corresponding to some these regressions. Figure 3 shows event study coefficients and standard errors for the dependent variable average wages using the U.S. as a control group. Coefficients on the interaction term between the Puerto Rico dummy and years before and after the phase out and elimination of Section 936 are all insignificant. There are no pre-trends. Moreover, only when the years of the phase out, and elimination of Section 936 are grouped together there is significant evidence of an effect on average wages (shown in Table 4).

Figure 4 shows event study coefficients and standard errors for regressions on the number of establishments using state control group 1. The estimated coefficient on the interaction term

between the Puerto Rico and the 1987 dummy is insignificant, showing no pre-trends. However, the interaction term between the Puerto Rico dummy and the 1992 dummy are significant at the 5% level, with a coefficient of -.14. This suggests firms could have been expecting a change in the tax exemption program as early as 1992. It is clear from the estimations that trends for 1992 and 1997 are not similar. The event study shows an abrupt and significant decline in the estimated coefficient for number of establishments in 1997, during the phase out of IRS Section 936, a coefficient of -.269. The coefficient drops even further in 2012 after the elimination of Section 936, the interaction term is estimated to be -.408. Event study results on number of manufacturing establishments using state control group 1 show evidence of a strong negative impact of the phase out and elimination of IRS Section 936.

Event study regression results for number of establishments using state control group 2, which includes New Jersey, show no pre-trends. All interaction terms between the Puerto Rico dummy and year dummy variables for years before and after the elimination of section 936 are insignificant. The question remains, which control group is best for Puerto Rico, state group 1 or state group 2? To answer this question, we compared trends in the number of manufacturing establishments in all states of the control groups. We focus on the chemicals and allied products industry, which includes pharmaceuticals (see Figure 5), because it was the most important industry during IRS Section 936 tax years. For New Jersey to be a valid control group, trends in the number of establishments in the chemicals and allied products industry should be similar to those in Puerto Rico prior to the phase out of IRS Section 936. Figure 5 shows statistics for number of establishments in NC, IN, NJ, OR and PR in the chemicals and allied products industry from 1982 to 2012. The graph shows that prior to 1997, New Jersey's chemical and allied products industry was experiencing a large decline in the number of establishments that

was uncharacteristic of PR, NC, IN and OR. This suggests New Jersey, is not a good control for Puerto Rico due to its large declining trends in the number of establishments before the phase out and elimination of IRS Section 936.

9. Conclusions

After decades of offering tax exemption programs to U.S. corporations located in Puerto Rico, Congress phased out IRS Section 936 between 1995 and 2005, and eliminated the program in 2006. Theoretical models and empirical studies of the impact of taxes on FDI predict the elimination of tax credits should have reduced the number of U.S. corporations located in Puerto Rico. Prior to this research, there has been no econometric analysis of the impact of the phase out of IRS Section 936 on the manufacturing industry in Puerto Rico.

Using industry panel data, compiled from the IRS Statistics of Income for U.S. Possessions Corporations, the U.S. Economic Census for Outlying Areas, and the mainland U.S. Economic Census, we analyze the effects of the phase out and elimination of IRS Section 936. Regression results show the elimination of IRS Section 936 had a negative impact on average manufacturing wages in Puerto Rico when using the U.S. as a control group. We estimated manufacturing wages in Puerto Rico declined by 16.7% relative to those in the U.S. after the elimination of IRS Section 936. We also estimated the elimination of IRS Section 936 may be responsible for an 18.7% to 28.0% reduction in the number of manufacturing establishments in Puerto Rico, when compared with the states of Indiana, North Carolina, and Oregon. Results are sensitive to the inclusion of New Jersey in the control group. However, we show that prior to the phase out and elimination of IRS Section 936, New Jersey had a declining trend in the number of

manufacturing establishments in the chemicals and allied products industry that was unrepresentative of those in Puerto Rico and other states in control group.

How could the elimination of the IRS Section 936 tax exemption program affect the number of establishments and average wages but not the number of manufacturing workers? Our data shows Puerto Rico experienced a decline in manufacturing jobs from 1995 to 2012. This also occurred in the control groups: U.S. (all states), Indiana, North Carolina, Oregon and New Jersey. The jobs that IRS Section 936 created in Puerto Rico were mostly in high paying industries: pharmaceuticals, medical devices and electronic equipment. Reductions in these types of jobs had the effect of decreasing average manufacturing wages in Puerto Rico. Our research suggests the phase out and elimination of the IRS Section 936 tax exemption program contributed to the economic deterioration of the manufacturing industry in Puerto Rico.

Bibliography

An, Zhiyong (2012), "Taxation and foreign direct investment (FDI): empirical evidence from a quasi-experiment in China." *International Tax Public Finance* 19: 660–676.

Bellak, C., Leibrecht, M. and Damijan, J.P. (2009), "Infrastructure endowment and corporate income taxes as determinants of foreign direct investment in Central and Eastern European countries," *The World Economy* 32: 267–290.

Blonigen, Bruce A. Lindsay Oldenski, and Nicholas Sly (2014), "The Differential Effects Bilateral Tax Treaties." *American Economic Journal: Economic Policy 2014, 6(2): 1–18*

Borusyak, Kirill and Xavier Jaravel (2016) "Revisiting Event Study Designs," mimeo SSRN: https://ssrn.com/abstract=2826228.

Devereux, Michael P., Clemens Fuest, and Ben Lockwood. (2015), "The Taxation of Foreign Profits: A Unified View", Journal of Public Economics, v. 125, pp. 83-97.

Devereux, M.P. and Lockwood, B. (2006), "Taxes and the size of the foreign-owned capital stock: which tax rate matters?" Paper presented at the European Tax Policy Forum 2006, London.

Feld, Lars P., and Jost Henrich Heckemeyer. (2011), "FDI and Taxation: A Meta-Study." Journal of Economic Surveys, April 2011, v. 25, iss. 2, pp. 233-72

Fuest, C., Huber, B. and Mintz, J. (2005), "Capital mobility and tax competition." *Foundations and Trends in Microeconomics* 1: 1–62.

Grubert, Harry and Joel Slemrod (1998), "The Effect of Taxes on Investment and Income Shifting to Puerto Rico," The Review of Economics and Statistics, Vol. 80, No. 3 (Aug., 1998), pp. 365-373.

Helpman, E. (1984), "A simple theory of international trade with multinational corporations," *Journal of Political Economy* 92: 451–471.

Helpman, E. (1985), "Multinational corporations and trade structure." *Review of Economic Studies* 52: 443–458.

Hexner, Thomas J and Glenn P. Jenkins (1995), "Puerto Rico and Section 936: A Costly Dependence." Tax Notes International, January 16, pp. 235-254.

Holik, Daniel S. (2009) "US Possessions Corporations, 2005." Statistics of Income Bulletin, Vol Spring, pp. 92-105.

Horstmann, I.J. and Markusen, J.R. (1992), "Endogenous market structures in international trade," *Journal of International Economics* 32: 109–129.

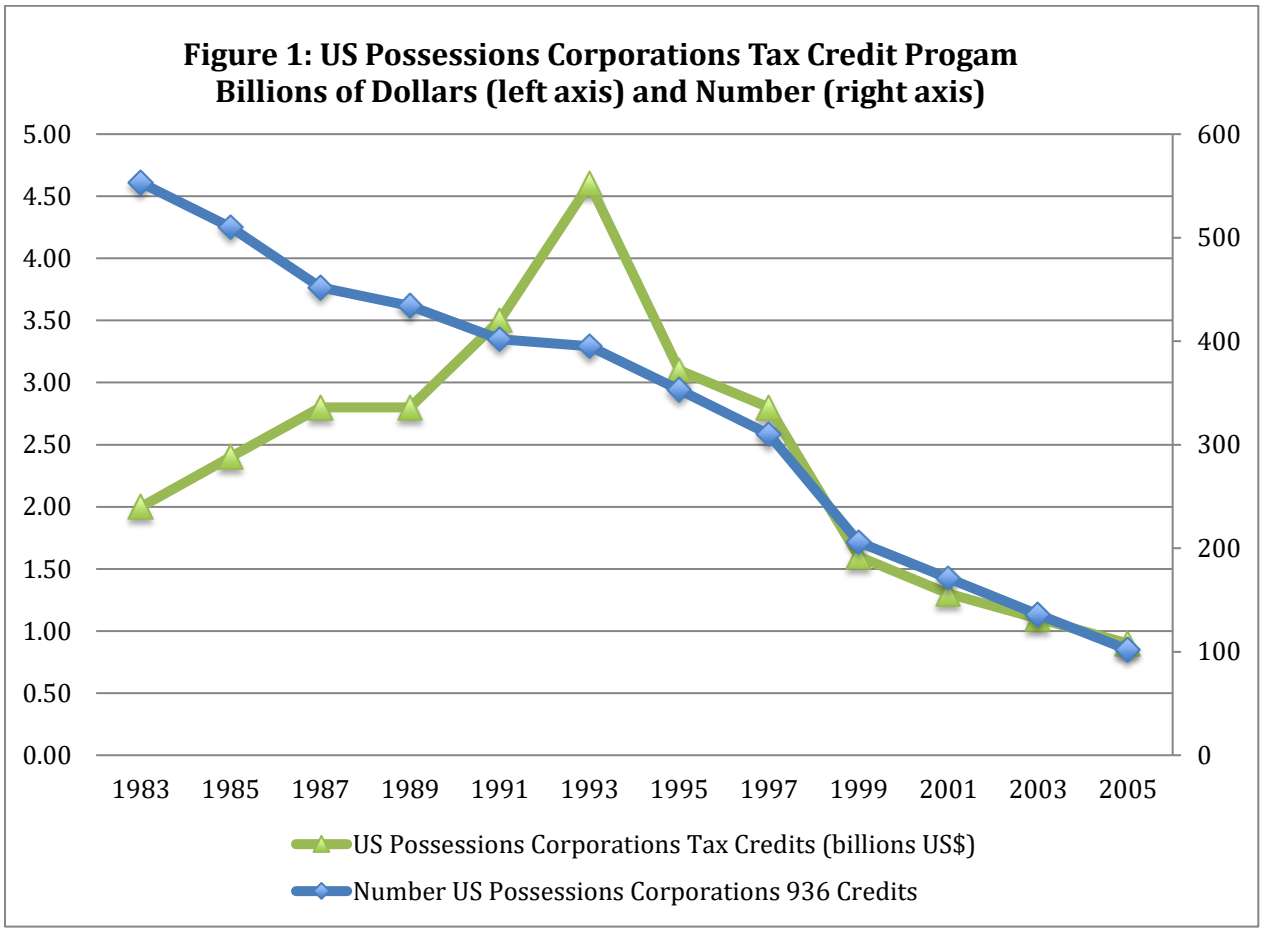
Krueger, Anne O., Ranjit Teja and Andrew Wolf (2015), "Puerto Rico – A Way Forward," report for the Commonwealth of Puerto Rico and the Government Development Bank of Puerto Rico, June 29th, 2015.

Puerto Rico, Junta de Planificación (1993), "Impacto de las Firmas Manufactureras 936 sobre la Economía de Puerto Rico: Un ánalisis usando la técnica de Insumo-Prodcuto." Oficina del Gobernador, Estado Libre Associated de Puerto Rico.

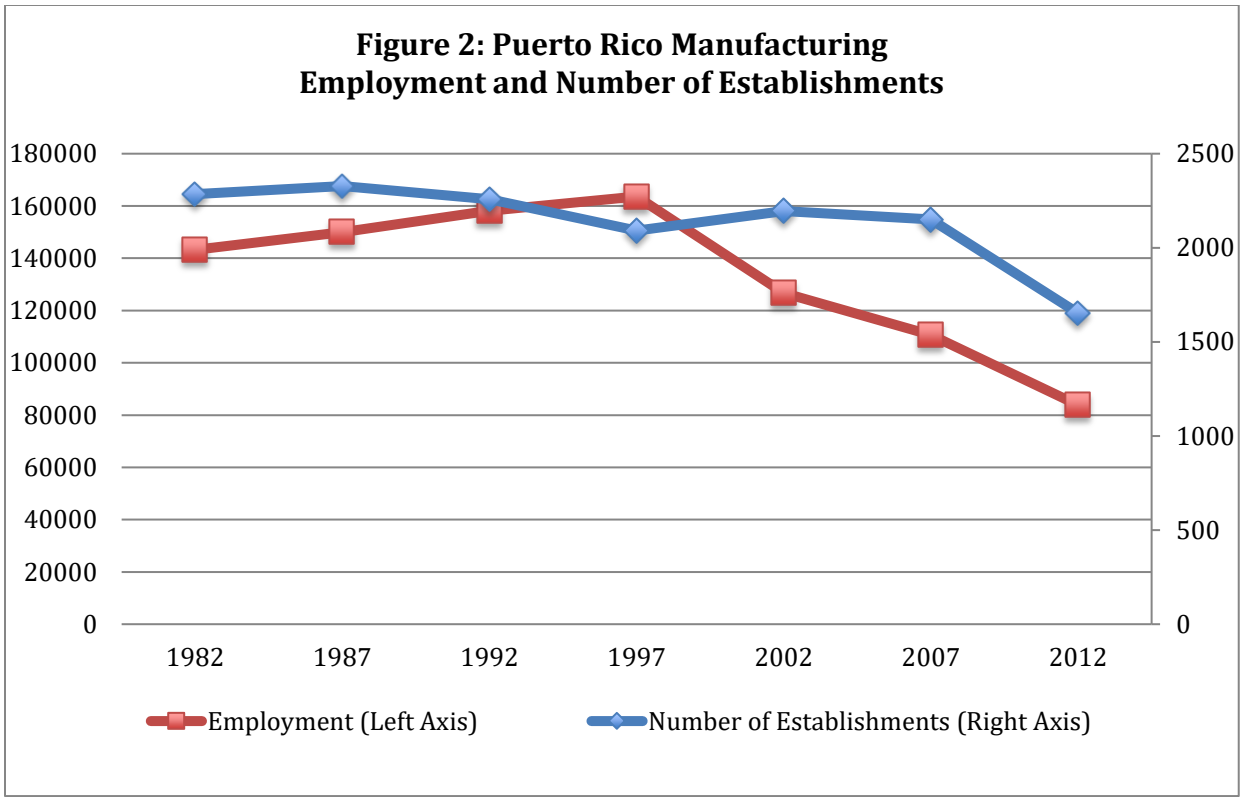
Rohter, Larry (1993), "Puerto Rico Fighting to Keep Its Tax Breaks for Businesses", *New York Times*, May 10, 1993.

Scurria, Andrew and Heather Gillers. (2017), "Puerto Rico to Square Off with Creditors," Wall Street Journal, May 4.

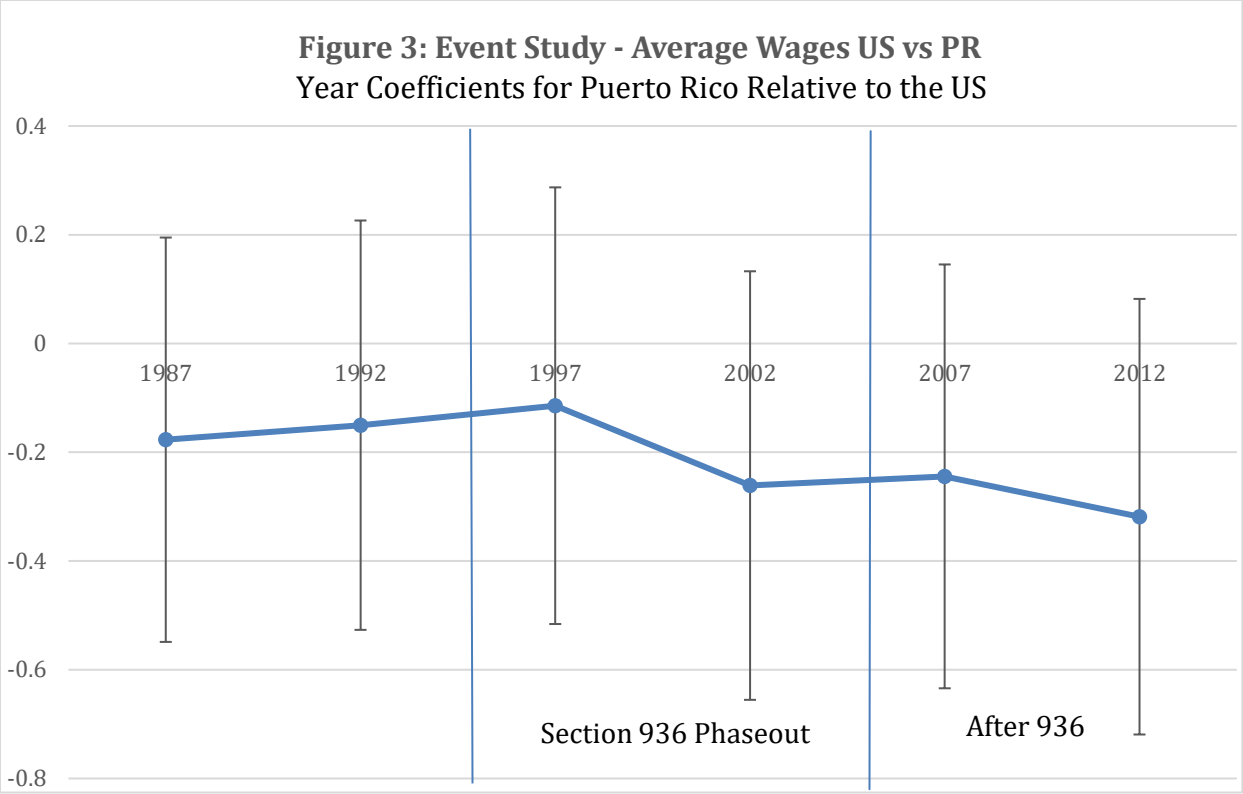
United States Internal Revenue Service, Statistics of Income for US Possessions Corporations, (1993-2005).



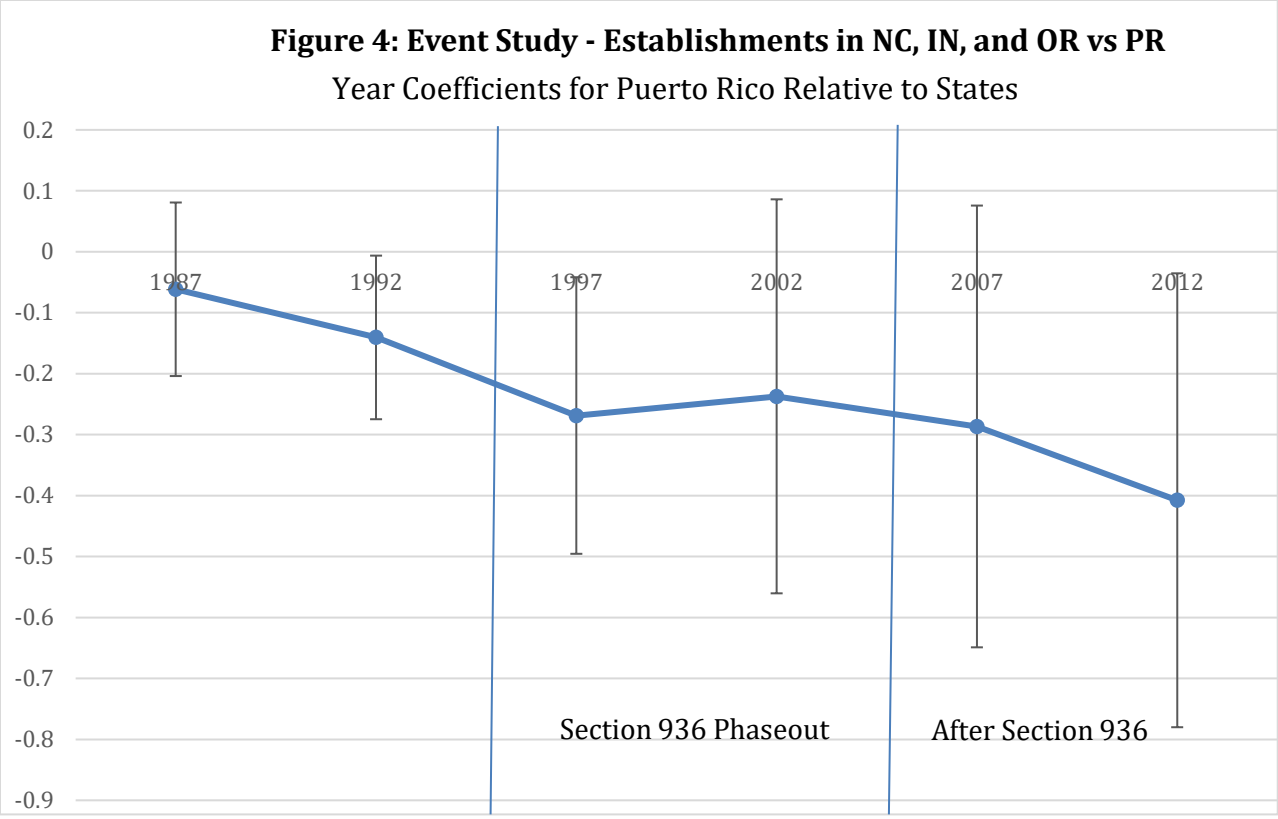
U.S. Posessions territories include Puerto Rico, Guam, American Samoa, Northern Mariana Islands and US Virgin Islands.
Source: US Possessions Corporations, Statistics of Income, US Internal Revenue Service, 2005.



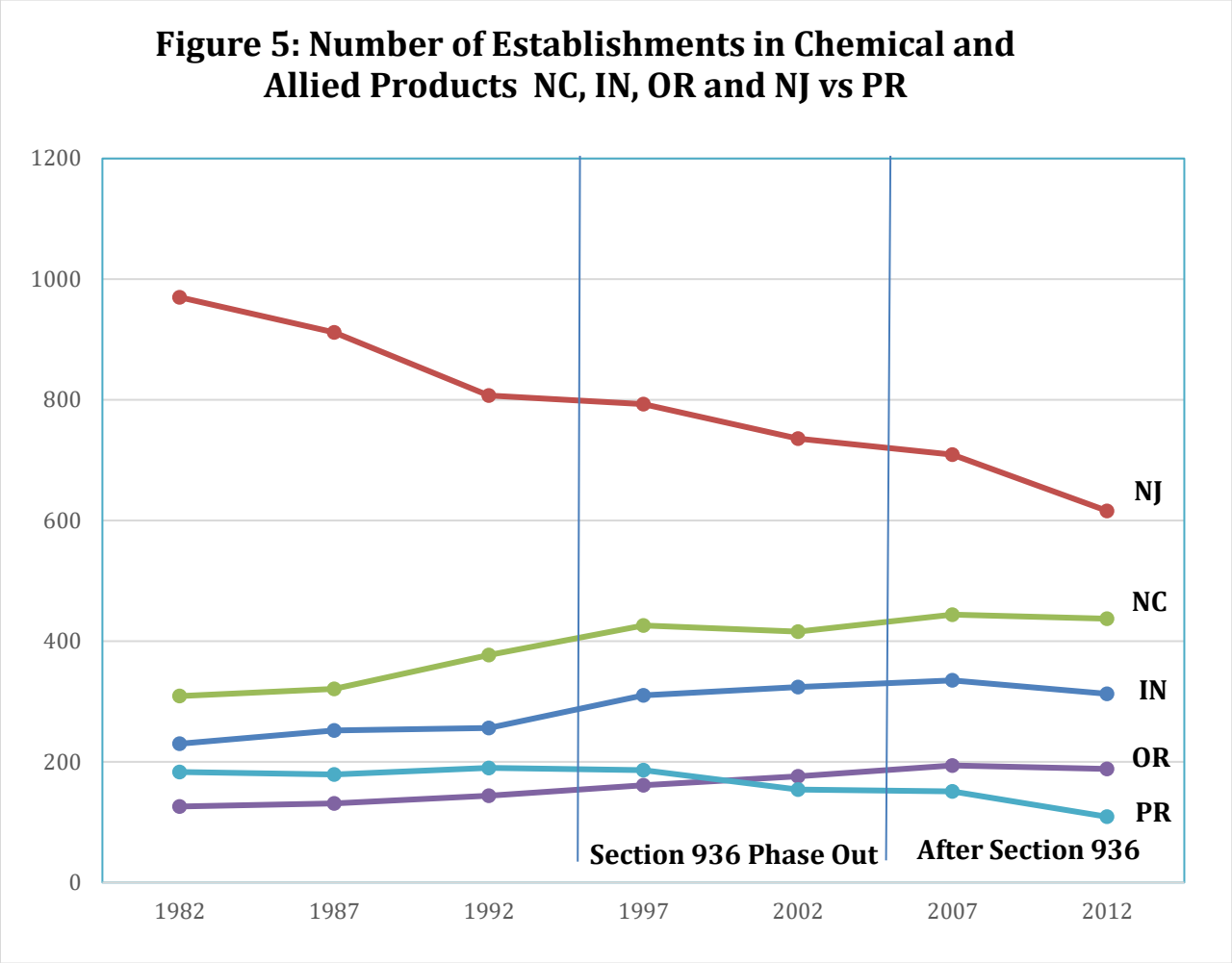
Source: U.S. Economic Census of Outlaying Areas.



Source: Coefficients from event study regressions. Standard errors are shown for each estimated coefficient.



Source: Coefficients from event study regressions. Standard errors are shown for each estimated coefficient.



Source: U.S. Economic Census and U.S. Economic Census of Outlaying Areas.

Table 1: U.S. possessions corporations, 1993

	Number of 936 returns	Percent of 936 returns	Percent of 936 Tax Credits
Manufacturing Totals	368		
Food and kindred products	27	7.34	12.58
Textile mill products	5	1.36	0.02
Apparels and other textile products	49	13.32	1.73
Paper and allied products	10	2.72	0.10
Printing and publishing	10	2.72	0.14
Chemicals and allied products	88	23.91	49.85
Petroleum and Coal Products	4	1.09	0.27
Rubber and Miscellaneous Products	16	4.35	0.18
Leather and leather products	13	3.53	0.46
Stone, clay, and glass products	4	1.09	0.08
Fabricated metal products	19	5.16	0.12
Machinery, except electrical	10	2.72	1.04
Electrical and electronic equipment	46	12.50	22.48
Transportation equipment	4	1.09	0.29
Instruments and related products	41	11.14	9.50
Miscellaneous manufacturing	22	5.98	1.15

Note: Includes Puerto Rico, Guam, American Samoa, Northern Mariana Islands and the U.S. Virgin Islands. Money amounts are in thousands of dollars

Source: Statistics of Income, US Possessions Corporations, Internal Revenue Service.

Table 2: Percent of manufacturing production in Section 936 U.S. possessions corporations in Puerto Rico, 1987.

SIC Code	Industry Description	Production by 936 firms within Industry (%)
20	Food and kindred products	72.6
21	Tobacco products	99.3
22	Textile mill products	91.0
23	Apparel and other textile products	77.6
24	Lumber and wood products	3.4
25	Furniture and fixtures	3.4
26	Paper and allied products	44.8
27	Printing and publishing	9.0
28	Chemicals and allied products	99.6
29	Petroleum and coal products	94.6
30	Rubber and miscellaneous	70.4
31	Leather and leather products	93.6
32	Stone, clay, and glass	11.8
33	Primary metal industrial products	83.0
34	Fabricated metal products	32.2
35	Industrial machinery	97.8
36	Electronic and other	96.2
37	Transportation equipment	84.7
38	Instruments and related	96.9
39	Miscellaneous manufacturing	87.5
	All Manufacturing industries	82.8

Source: Junta de Planificación de Puerto Rico, 1993

Table 3: Determinants of number of U.S. corporations claiming Section 936 tax credits and expenditures on salaries and wages, 1993-2005

Independent Variables	Log Number US Corporations Filing for Tax Credits		Log Total Expenditures on Salaries and Wages	
Log Value US Corporations Tax Credits	.200 (.085)	**	-.121 (.084)	
Log Net Depreciating Assets	.005 (.090)		.216 (.117)	*
Log Net Intangible Assets	.035 (.021)		-.001 (.027)	
Log Business Receipts	.094 (.080)		.531 (.116)	**
Number of Industries	23		23	
Industry Dummy Variables	Yes		Yes	
Year Dummy Variables	Yes		Yes	
Observations	136		136	
R-Squared	.41		.41	

Cluster standard errors. * Significant at the 10% level, ** Significant at the 5% level
Source Data: IRS Statistics of Income, US Possessions Corporations

Table 4: Manufacturing in Puerto Rico before and after the elimination of tax exemption for U.S. corporations, U.S. as control group.

Independent Variables	Log Number of Establishments		Log Value Added		Log Employment		Log Average Wage	
Tax Credit Phase out (1995-2005)	.002 (.104)		.644 (.263)	**	.050 (.247)		.498 (.059)	**
End of Tax Credit (2005-2012)	-.144 (.123)		.788 (.318)	**	-.263 (.277)		.787 (.061)	**
Puerto Rico	-4.892 (.146)	**	-4.819 (.344)	**	-4.752 (.289)	**	-.490 (.055)	**
Puerto Rico x Tax Credit Phase out	-.079 (.130)		-.091 (.313)		-.108 (.275)		-.074 (.071)	
Puerto Rico x End of Tax Credit	-.098 (.186)		-.333 (.483)		-.172 (.345)		-.167 (.093)	*
Industries	14		14		14		14	
Industry Dummy Variables	Yes		Yes		Yes		Yes	
Year Dummy Variable	Yes		Yes		Yes		Yes	
Observations	196		191		192		192	
R-Squared	.98		.88		.91		.80	

Clustered standard errors. * Significant at the 10% level, ** Significant at the 5% level
Source Data: U.S. Economic Census, and U.S. Economic Census of Outlaying Areas.

Table 5: Manufacturing in Puerto Rico before and after the elimination of tax exemption for U.S. corporations, with Indiana, North Carolina, and Oregon as control group.

Independent Variables	Log Number of Establishments		Log Sales or Shipments		Log Employment		Log Average Wage	
Tax Credit Phase out (1995-2005)	.108 (.066)		.536 (.076)	**	.001 (.067)		.433 (.012)	**
End of Tax Credit (2005-2012)	.038 (.080)		.755 (.113)	**	-.248 (.099)	**	.695 (.020)	**
Puerto Rico	-1.27 (.188)	**	-1.606 (.388)	**	-1.477 (.348)	**	-.457 (.049)	**
Puerto Rico x Tax Credit Phase out	-.186 (.100)	*	-.159 (.170)		-.047 (.138)		-.004 (.043)	
Puerto Rico x End of Tax Credit	-.280 (.157)	*	-.433 (.343)		-.211 (.225)		-.080 (.069)	
Industries	14		14		14		14	
Industry Dummy Variables	Yes		Yes		Yes		Yes	
Year Dummy Variables	Yes		Yes		Yes		Yes	
Observations	392		379		379		378	
R-Squared	.87		.67		.71		.80	

Clustered standard errors. * Significant at the 10% level, ** Significant at the 5% level
Source Data: U.S. Economic Census, and U.S. Economic Census of Outlaying Areas.

Table 6: Manufacturing in Puerto Rico before and after elimination of tax exemption for U.S. corporations, with Indiana, North Carolina, New Jersey and Oregon as control group.

Independent Variables	Log Number of Establishments		Log Sales or Shipments		Log Employment		Log Average Wage	
Tax Credit Phase out (1995-2005)	.033 (.060)		.430 (.065)	**	-.096 (.059)		.349 (.059)	**
End of Tax Credit (2005-2012)	-.088 (.076)		.617 (.102)	**	-.367 (.086)	**	.333 (.093)	**
Puerto Rico	-1.328 (.183)	**	-1.682 (.380)	**	-1.547 (.342)	**	-2.000 (.368)	**
Puerto Rico x Tax Credit Phase out	-.110 (.096)		-.064 (.164)		.042 (.132)		.027 (.130)	
Puerto Rico x End of Tax Credit	-.154 (.154)		-.295 (.338)		-.086 (.220)		-.172 (.255)	
Industries	14		14		14		14	
Industry Dummy Variables	Yes		Yes		Yes		Yes	
Year Dummy Variables	Yes		Yes		Yes		Yes	
Observations	490		473		473		472	
R-Squared	.87		.67		.70		.70	

Clustered standard errors. * Significant at the 10% level, ** Significant at the 5% level
Source Data: U.S. Economic Census, and U.S. Economic Census of Outlaying Areas.

Appendix A: **IRS industry classification of US possessions corporations**	SIC Codes
food and kindred products	20
textile mill products	22
textiles and apparel	23
paper products	26
printing	27
chemical products	28
petroleum and coal products	29
plastics and rubber products	30
leather and leather products	31
nonmetallic mineral products	32
primary and fabricated metals	34
industrial machinery and equipment	35
computers and electric equipment	36
transportation equipment	37
medical equipment and supplies	38
miscellaneous manufacturing	39
finance	60-67
agriculture, forestry, and fishing	01-09
construction	15-17
transportation and public utilities	40
wholesale trade	50-51
retail trade	52--59
services	70-89

Appendix B: SIC to NAICS concordance			
Industrial Groups	**Description**	**SIC**	**NAICS**
1	Food, beverage and tobacco	20, 21	311, 312
2	Textiles	22, 23	313, 314, 315
3	Leather and leather products	31	316
4	Lumber and wood products	24	321
5	Paper and allied products	26	322
6	Printing and publishing	27	323
7	Petroleum and coal products	29	324
8	Chemicals and allied products	28	325
9	Rubber and misc. plastics products	30	326
10	Stone, clay and glass products	32	327
11	Primary metal industries	33	331
12	Fabricated metal products	34, 35, 36, 37, 38	332, 333, 334, 335, 336
13	Furniture and Fixtures	25	337
14	Misc. manufacturing	39	339

Appendix C: Manufacturing Statistics for Puerto Rico, US totals, Indiana, North Carolina, New Jersey, and Oregon, 1987

Ind	Description	PR	US	IN	NC	NJ	OR
All	Average annual wages (US $)	12,974	24,184	26,174	19,342	26,853	23,495
All	Employees	149,968	17,716,000	602,000	842,400	690,800	202,900
All	Labor force in manufacturing (%)	19.9	17.0	31.1	35.1	22.3	23.0
All	Percent of GDP in Manufacturing (%)	62.8	19.4	30.9	30.9	18.8	21.8
Ind	Employment Distribution						
1	Food, beverage and tobacco	15.62	8.43	6.43	8.60	6.25	11.32
2	Textiles	20.62	9.90	.	35.49	7.43	1.73
3	Leather and leather products	4.40	0.73	.	0.44	0.48	0.31
4	Lumber and wood products	1.34	3.94	3.99	4.88	1.11	32.94
5	Paper and allied products	1.34	3.45	.	2.73	4.29	3.77
6	Printing and publishing	3.41	8.43	6.32	3.29	10.92	6.68
7	Petroleum and coal products	0.98	0.65	0.65	.	0.71	0.25
8	Chemicals and allied products	14.87	4.59	5.05	4.19	13.29	1.27
9	Rubber and misc. plastics products	4.05	4.69	8.00	4.43	6.25	2.04
10	Stone, clay and glass products	2.82	2.96	.	2.58	3.81	1.63
11	Primary metal industries	0.52	3.96	12.36	1.19	3.12	5.05
12	Fabricated metal products	26.24	43.27	52.95	21.95	36.94	29.88
13	Furniture and fixtures	1.52	2.88	4.25	10.26	2.04	1.33
14	Misc. manufacturing	2.26	2.11	.	.	3.36	1.78

Source: U.S. Economic Census, and U.S. Economic Census of Outlaying Areas.