EU, US and Tax Incentives: An Application

Carlos F. Liard-Muriente

Abstract—The purpose of this paper is to shed light on the controversial subject of tax incentives to promote regional development. Although extensive research has been conducted, a review of the literature gives an inconclusive answer to whether economic incentives are effective. One reason is the fact that for some researchers "effective" means the significant location of new firms in targeted areas, while for others the creation of jobs regardless if new firms are arriving in a significant fashion. We present this dichotomy by analyzing a tax incentive program via both alternatives: location and job creation. The contribution of the paper is to inform policymakers about the potential opportunities and pitfalls when designing incentive strategies. This is particularly relevant, given that both the US and Europe have been promoting incentives as a tool for regional economic development.

Keywords—Employment, Foreign Investment, Tax Incentives.

I. INTRODUCTION

A contested area in economics relates to the incentives local governments give to firms in an effort to diversify location of production (spatial concern), and create jobs (development concern). Although the literature about incentives is extensive, we still do not have a clear understanding about their effectiveness.

The US and Europe have been promoting incentives in an effort to reinvigorate local/regional economic development. According to [1], states and regions in both the US and the EU increasingly are choosing incentives as a vehicle to attract investment in an effort to spur local development. However, this reliance on incentives follows little or no empirical corroboration about their effectiveness.

If investment decisions have become more sensitive to incentives, for example, this will be consistent with the notion that technological advances and the eroding of capital controls and trade restrictions have increased the ease with which capital can cross national borders [2]. If different regions become closer substitutes for the location of production, then investment decisions become increasingly responsive to incentives.

On the one hand, regional development polices could be described as a zero-sum game, with local job reshuffling as the outcome. After all, if one area accomplishes growth, it will be at the expense of another area. Thus, overall welfare is unchanged. Also, opponents of incentives argue that they have little influence on investment decisions, that revenue

Manuscript received May 29, 2007. Carlos F. Liard-Muriente is an Assistant Professor at the Department Economics, Robert Vance Academic Center 208, Central Connecticut State University, 1615 Stanley St., New Britain, CT 06050 USA (phone: 860-832-2732; fax: 860-832-2730; e-mail: liardcaf@ccsu.edu).

forgone outweighs benefits, and that they induce distortion in the location and form of foreign investment, create local resentment and grant unintended benefits. Furthermore, that other factors play a role in the emphasis some regions put on incentives.

On the other hand, proponents of tax incentives argue that the social and economic advantages accruing from incentives outweigh their disadvantages. For them, incentives will result in substantial increases in the level of investment and economic activity. Thus, the impact and importance to development will outweigh any administrative hurdles, forgone revenues, and equity costs. Furthermore, as [3] argues, even if the outcome of such polices is the reshuffling of jobs, this may be a benefit and not a cost.

From a theoretical standpoint, it could be argued that the assertion that incentives are too small to affect business decisions is unsatisfactory. From a business standpoint, states or regions might be close substitutes, offering similar access to markets and supplies. Thus, even a small production cost differential might be the trigger for a particular business location decision. Also, competition for jobs may have a positive impact on national growth. In local areas, higher subsidies for the expansion of employment and output may increase national output and decrease the average unemployment.

II. THE EXPERIENCE WITH INCENTIVES

An introspective look at the literature shows that it is difficult to arrive at a definite conclusion regarding the effectiveness of incentive programs because not only results vary across countries but also within countries. Even studies analysing similar programs arrive at different conclusions. For example, both [4] and [5] evaluate the enterprise zones program in the state of Indiana. While [4] find positive results about the program and conclude that zones gained significantly more jobs than counterpart areas, [5] is not as positive and concludes that zones have significantly less capital after designation than before.

In the case of Europe, on the one hand [6] and [7] argue that unlike the US, Europe seems to have clear objectives regarding regional development. For example, programs such as the Structural Funds are part of the effort to minimize disparities among regions. However, [8] argue that for the UK competition among regions of England, Scotland and Wales has attracted large foreign investment with employment creation as an aftermath only in winning regions; that there seems to be no clear national strategy. In contrast, the nation-state *has rather relied on coercion, financial grants, and interagency collaborations at the regional level to achieve economic development.* ([8], p. 1254)

Furthermore, [9] argue that investment in peripheral regions of the EU has a positive impact on innovation. However, [10] argue that the value of regional development strategies in Europe that depend on geographical clusters is questionable

The final impact of policies depends upon the institutional mechanism available at the national level for the coordination and implementation of regional incentives. As [7] agues, the US has no ground rules when it comes to the use of incentives to attract foreign investment, while the EU has enforcement mechanisms to improve coordination among member states to avoid zero-sum results at the national level. Furthermore, as [6] explains, in contrast to the US, the EU seems to have clear objectives regarding regional development. The contrast between the US and the EU is important because, as [11] argue, regional disparities in the EU are higher than in the US.

III. METHODOLOGICAL APPROACHES

From one perspective, the location of firms is not the ultimate goal but the creation of jobs. Of course, firms must locate in targeted areas to create jobs, but not in a statistically significant fashion. For example, if an incentive program is only able to attract one firm to a targeted area, this will be an inefficient result from a location perspective. In other words, the program was not effective in attracting a significant amount of firms (size of firm is not relevant, only amount of firms). However, if that only firm is relatively big, it could be an engine of growth in terms of job creation for that particular area. Thus, from an employment creation perspective, the program is effective. The Shift-Share technique has been a methodology of choice when evaluating the impact of incentives on job creation (see [13]-[17] for the original presentation; see [18]-[20] for recent applications).

The "location" perspective goal is to understand if firms do locate in targeted areas, in a statistical significant fashion, while relying on a different array of econometric techniques. Policymakers must understand that one major limitation of many econometric studies is the fact that they rely on aggregate data. This presents problems because of the errors that are generated in the aggregation process, which then creates specification difficulties to researchers when trying to estimate a model. In this area, the work by [21] and [22] established the standard in location studies; [21] tested the probability that a firm will locate in a metropolitan area in the U.S. An important contribution from [22] was the introduction of a discrete choice model obtained from [23] to model the location decision via Conditional Logit (CL). Ever since, many innovations based on the CL and alternative models have been presented, in particular the Poisson regression (see [24] and [25 for a discussion).

IV. APPLICATION: PUERTO RICO'S TAX INCENTIVE PROGRAM

To confront the Location vs. Employment dichotomy, we will analyze the tax incentive program in place in the Commonwealth of Puerto Rico, a US territory. Tax incentives have been the development instrument of choice in Puerto Rico. The development vision has been to make Puerto Rico attractive to US capital, and this goal has been achieved by subsidizing the cost of capital by means of tax exemptions.

Although, as [26] explain, Puerto Rico experienced one of the world=s most rapid growth rates during the decades of 1940s-1960s, the impressive growth rates led to massive development of infrastructure and urban growth, mostly located in 293.64 square kilometres that constitute the Metropolitan area. Firms gravitated to the metropolitan area due to economies of scale and ever since 1978, the local government has been trying to entice manufacturing firms to locate outside the metropolitan area by introducing a new Tax Incentive program that targets both diversification of location and job creation. Table I shows the declining tax schedule instituted in 1978 and that it still in place today.

TABLE I
DECLINING TAX SCHEDULE

Years of Exemption	High Indus. Zone	Int. Indus. Zone	Low Indus. Zone
1-5	90%	90%	90%
6-10	75%	75%	75%
11-15	0	65%	65%
16-20	0	0	55%

As Table I shows, a 10-year partial exemption is available for firms locating in the high industrial zone (metropolitan area). Firms locating in the intermediate industrial zone enjoy fifteen years of incentives, and firms locating in the low industrial zone enjoy twenty years of incentives. The Industrial Incentive Act of 1978 provides as well for the complete exemption from municipal fees over the span of the exemption.

Two thousand two hundred and seventy new firms located in the 78 municipalities of Puerto Rico from 1979 to 2000. Half of all new firms located in the municipalities within the high industrial zone, with about one third of new firms locating in the intermediate industrial zone, and the remaining 20% in the low industrial zone.

Is Puerto Rico's Tax Incentive Program effective? Studies arguing the contrary have been criticized in terms of estimation issues [27], or for analyzing the location issue from a perspective not relevant to the local incentive program. [28]. However, and more important, these studies focused only on the location perspective. Thus, it is incoherent to claim that a program is effective without knowing its impact on job creation.

V. MEASURING EFFECTIVENESS

To understand the effectiveness of Puerto Rico's program we will first confront the location question implementing a Poisson regression method. Then, we will confront the job creation question implementing a Shift-Share analysis.

A. Poisson Regression

In the Poisson model, as [24] and [25] explain, the estimated Hessian for the model is based on the actual second derivative of the log-likelihood. To implement the model, we will follow typical methodological approach in location

analysis (see [27] and [29]). We are going to control for agglomeration of firms (AGL), population density (POP), transportation cost via distance to a major highway (WAY) and distance to the capital city and centre of the metropolitan area San Juan (SJ), a dummy variable for the second largest municipality and recipient of a large amount of new locations (PONCE), and two dummy variables that account for the intermediate industrial zone (AREA 1) and the low industrial zone (AREA 2). Again, the dependent variable is the number of new manufacturing firms locating in the different zones from 1979-2000.

As Table II shows, we expect that the coefficients for AREA1, AREA 2, AGL, POP, and PONCE should be positive. In other words, tax incentives, the number of existing firms in a location, and population density will have a positive impact on the number of new firms because will be attracted to incentives, to the benefits of having more firms in a particular area and availability of workers. At the same time, new firms will be attracted to PONCE because of economics of scale. However, the coefficients for SJ and WAY should be negative, as they represent a cost.

TABLE II
VARIABLES AND EXPECTED SIGNS

Variable	Definition	Expected Sign
AREA1	1 if location is in the intermediate industrial zone, 0 otherwise.	+
AREA2	1 if location is in the low industrial zone, 0 otherwise.	+
AGL	Average (current and two prior years) number of establishment	+
POP	Population density	+
PONCE	1 if the municipality is Ponce, 0 otherwise.	+
SJ	Road distance to a major highway (kilometres).	-
WAY	Road distance to San Juan (kilometres).	-

B. Results

As Table III shows, all coefficients have signs as expected. Here, P-values are in parenthesis. At the same time, '**' stands for statistically significant at the .01 level, and '*' at the .05 level. Also, yearly-time dummies are not included in the table. For our analysis, the relevant coefficients are the ones for AREA 1 and AREA 2. As Table III shows, the coefficient for AREA 1 is significant but the same is not true for AREA

2. In other words, firms are locating in a statistically significant fashion in the Intermediate Industrial Zone (AREA 1), but not in the Low Industrial Zone (AREA 2).

Can we are argue that the Puerto Rico's Incentive Program is an effective one? It will be simple to answer this question if both coefficients (AREA 1 and AREA 2) were significant. However, since this is not the case, it is difficult to argue that the program is effective. Firms did not locate in a statistically significant fashion in the Low Industrial Zone; the zone with the longer duration of exemptions.

TABLE III
REGRESSION RESULTS

Variable	Results
AREA 1	.1748** (0.002)
AREA 2	.3305 (0.97)
PONCE	1.2511** (0.003)
AGL	.1345** (0.008)
POP	.8974** (0.006)
WAY	-.2277** (0.003)
SJ	-.5043* (0.02)
Log Likelihood	-1979.07

Nonetheless, to complement these results, we turn to the job creation analysis following the Shift-Share analysis.

C. Shift-Share Analysis

The Shift-Share (SS) technique has been used to describe core/national and periphery/regional factors related with changes in manufacturing employment, income or output in a region. The goal of the SS is to obtain the residual component of growth not attributable to growth in the **Core** economy or differences in the differential between **Core** and **Periphery** growth. The SS technique is three-part decomposition. First, the sum of the employment growth rate from all industries combined at the **Core** is applied to the employment level at the **Periphery**, to obtain a hypothetical job gain (loss) if **Periphery** grows at the same rate of all industries at **Core** combined. We call this component the *Core Share* (**CS**). Second, recognizing that not all industries at **Core** grow at the same rate, we take the sum of the difference between the employment growth rate of each individual industry at **Core** and the overall **Core** employment growth rate obtained previously. We then apply this differential growth rate to the employment level at the **Periphery** to obtain the job gain (loss) from individual industries growing faster (slower) than the growth rate of all industries combined. We call this component the *Differential Shift* (**DS**). Finally, we want to identify if industries at the **Periphery** have different growth rates than those at the **Core**, given the relative location advantages existing at the **Periphery**. We measure this

Periphery Shift (**PS**) as the sum of the difference between the growth rates of individual industries at **Core** and **Periphery**, and apply this value to the employment level at the **Periphery**. **PS** is the most important component of the decomposition. A positive **PS** shows **Periphery** gains in employment resulting from the impact of relative location advantages on the redistribution of the industries among regions. On the other hand, a negative **PS** will show that the **Periphery** is losing its competitive advantage. Finally, by adding **DS** and **PS**, we get the realized change in employment. In other words, employment in excess (or below) of what would have occurred at the overall **Core** growth rate for all industries combined.

Employment data in the manufacturing sector from 1980 to 2000 will be used in the analysis for the SS technique for two main reasons: (1) data availability and (2) the importance of manufacturing location in employment creation, as reflected by the incentive programs that different governments offer. As with the regression model for the location analysis, the data for the implementation of SS analysis comes from the U.S. Bureau of the Census and from Puerto Rico=s Economic Development Administration. For the analysis among the three industrial zones, the high industrial zone is taken as the **Core** and the intermediate (AREA 1) and low (AREA 2) industrial zones as **Periphery**.

D. Shift-Share Results

Table IV shows the results from the SS analysis. It is clear that AREA 1 and AREA 2 would have experienced a decrease in employment if growing at the Core employment growth as the *Core Share* (**CS**) shows.

TABLE IV
SHIFT SHARE RESULTS

	AREA 1	AREA2
(CS)	-9,866	-4,571
(DS)	-478	-329
(PS)	53,728	16,252

Also, industries experienced growth rates below the growth rates of all industries combined in both AREA 1 and AREA 2, as the *Differential Shift* (**DS**) component shows. However, industries at the Periphery (AREA 1 and AREA 2) seem to be competitive, as measured by the *Periphery Shift* (**PS**).

In sum, AREA 1 and AREA 2 should have experienced a decrease in employment of 9,866 and 4,571 respectively, if they had grown at the same growth rate of the high industrial zone. We must adjust these figures downward at AREA 1 and AREA 2 by 478 and 329 respectively, because some industries experienced growth rates below than that of all industries combined at the high industrial zone. However and most important, due to specific competitiveness attributes at AREA 1 and AREA 2, these zones expanded employment by 53,728 and 16,252 respectively. The realized change in employment at both AREA 1 and AREA 2 was respectively 53,250 and 15,923, in excess of what would have occurred at

the overall high industrial zone rate for all industries combined. As expected, the SS analysis shows a competitiveness advantage at both the intermediate and low industrial zones, when compared with the high industrial zone. However, the Shift-Share analysis only shows the regional competitive advantage, but does not accounts for the factors explaining such advantage. The bulk of these factors will not vary much among locations. Labour costs, for example, follow a uniform minimum wage that is set across municipalities and the issue of the local minimum wage has been explored in other studies ([30]-[33]). Energy costs are also uniform among municipalities, as well as capital costs. Firms either received external financing from parent firms or from a fund administered by Puerto Rico's Economic Development Administration. Thus, a reasonable explanation is the longer duration of tax incentives at both the Intermediate and Low industrial zones. These results show that Puerto Rico=s program seems to be effective in terms of job expansion, given the fact that the unemployment rate in both AREA 1 and AREA 2 is above 11 percent (with a combined labour force of about 400,000).

VI. CONCLUSION

Notwithstanding extensive research, the effectiveness of incentives is still a controversial subject. Much of the controversy is the result of the interpretation of the term effectiveness. In general, incentives are designed to lure foreign investment to less developed areas. Thus, if firms do not locate in targeted areas in a statistically significant fashion, the incentive program is labelled as ineffective. However, our application shows than even when firms do not locate in a statistically significant fashion, as it was the case with the Low Industrial Zone, the firms that located in this area were responsible for a significant proportion of jobs created.

In terms of regional development policies, policymakers must consider, as [9] explain, regional-specific socio-economic characteristics when designing policies, not just significant location. In the case of the EU, for example, as [12] argue, after the EU enlargement, priority should be given to efficient policies that promote regional development, with the goal of converging with countries with higher levels of employment and per capita income. Attention must also be given to the goals of development itself because as [34] argue, greater regional policy coordination between countries could lead to more specialization, which goes against the intended goal of diversification in interregional allocations of foreign investment. In other words, that international capital flows might become more concentrated in an integrated economy, in contrast to the objectives of regional policy of the European Union. Finally, as it has been argued elsewhere [35]-[36], globalization erodes the effectiveness of national policy tools. Thus, incentives by themselves are not likely to bring optimal results in terms of regional development. However, incentives as part of a comprehensive development strategy that considers regional features should be an effective tool for

regional development.

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