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EMPLOYMENT GROWTH IN CEARA: A SHIFT-SHARE ANALYSIS (2000-2005)

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Abstract: Between 2000 and 2005, formal employment grew by 33.15% in Ceara (Brazil). Hence, the main objective of this paper was to analyze which municipalities and sectors contributed the most to such growth through a shift-share analysis of employment. The results indicate a considerable dispersion among municipalities in terms of job creation according to the composition of their productive structures and specific factors that yield them (or not) differential competitive advantages. More specifically, a regression indicated that this differential effect is positively correlated to the municipalities' population density up to a point where agglomeration diseconomies actually reduce employment creation. Furthermore, municipalities with economic clusters tend to have a greater differential effect than others and this effect is smaller the further away they are located from Fortaleza, the State's capital. Finally, considering the Fortaleza Metropolitan Area (FMA), the results show that employment grew at a slower pace in the capital if compared to almost all other neighbouring municipalities, which is due to strong agglomeration diseconomies in Fortaleza.

Key words: Employment, Shift-share, agglomeration diseconomies, clusters.

1. INTRODUCTION

This paper examines the dynamics of employment growth in the State of Ceara and its municipalities between 2000 and 2005, with special emphasis in the Fortaleza Metropolitan Area (FMA), according to the data available in the *Relação Anual de Informações Sociais* (RAIS/MTE).

The main motivation for this study comes from the fact that, during the referred period, formal employment grew by 33.15% in Ceara and this process revealed an interesting feature: formal employment in the State's capital, Fortaleza, is growing at a much smaller rate than in other municipalities, specially the ones that are part of the Fortaleza Metropolitan Area (FMA). This is probably a result of Ceara's industrial development policy, adopted since the 1990s, through the use of tax incentives schemes and regional development funds that aimed an increased regional balance, bringing more opportunities to poorer municipalities, according to the perception that the State's economic activities are very concentrated in the capital.

Furthermore, it would be interesting to analyze which factors affect the process of job creation at the municipal level, which is done through the traditional framework of the shift-share analysis, a well-known method that is often used in applications of Regional and Urban Economics. According to Dunn (1960) the main objective of the share-shift technique is the quantification of geographical changes by decomposing growth rates in structural and competitive components. The shift-share analysis was applied to empirical analysis as early as in the 1960s and underwent numerous extensions and improvements, see Richardson (1978). Following this approach several studies such as Esteban (2000) which evaluated the process of regional convergence in Europe, or in Eastern Europe economies as in Traistaru and Wolf (2002) and Andrade (1980) for the Brazilian case, tried to find the determinants of growth patterns in employment at differential component level.

Among other studies that used the same framework, one can mention, for example, the paper from Seyfried (2007), that examed he composition of the growth of the Southern United States in the 1980s. In Brazil, Alves (2005) investigated, through the structural-differential method, the creation of jobs in Brazil, having as comparative base the Brazilian Federated States, from 1970 to 1980; and Souza and Souza (2007) analyzed the dynamics of the employment in the municipalities of the Porto Alegre Metropolitan Area from 1990 to 2000, and concluded that industrial jobs are moving from Porto Alegre and its neighboring municipalities to other regions due to strong external diseconomies, a result that is very similar to the ones found here.

This paper begins by examining the performance of employment growth indicators in the municipalities of Ceara, and the productive sectors of each municipality, with special emphasis to the FMA. This study will contribute to the identification of geographical areas with higher employment growth, understanding how their productive structures and endogenous charactristics contribute to their performances in terms of job creation. The results yielded will give subsidies to the formulation public policies that encourage the creation of new opportunities in Ceara.

2. METHODOLOGY: SHIFT-SHARE ANALYSIS AND EXTENSIONS

The shift-share method is often used to retrospectively decompose variations in economic indicators such as GDP, value of output, employment etc. Through a descriptive analysis of the productive structure, it allows the comparison of regional differences within a country, region or state (SIMÕES, 2004; WIKIPEDIA, 2007b).

This method could be used to analyze a specific economic sector of a certain geographic area or it could be aggregated, including all sectors in the area, depending on the type of information needed. It is not uncommon to perform both types of analysis simultaneously.

As indicated previously, the economic variable that will be considered in the present study is (formal) employment[3]. Hence, if e_{ij} represents formal employment in sector "*i*" in municipality "*j*", then, it is possible to compute the employment's growth rate (*EGR*) during a certain period[4] as follows:

$$EGR_{ij} = \frac{e_{ij}^{t} - e_{ij}^{0}}{e_{ij}^{0}} = \frac{e_{ij}^{t}}{e_{ij}^{0}} - 1 \qquad [1]$$

Based on expression [1], it is possible to compute the change in employment ($\Delta e_{ij}^{0,t}$) during the period in analysis as:

$$\Delta e_{ij}^{0,t} = e_{ij}^{t} - e_{ij}^{0} = e_{ij}^{0}.EGR_{ij} = e_{ij}^{0}.\left(\frac{e_{ij}^{t}}{e_{ij}^{0}} - 1\right) \qquad [2]$$

Thus, the shift-share method decomposes the expression above into mutually exclusive components as follows:

$$\Delta e_{ij}^{0,t} = e_{ij}^{t} - e_{ij}^{0} = e_{ij}^{0}.\left(\frac{E^{t}}{E^{0}} - 1\right) + e_{ij}^{0}.\left(\frac{E_{i}^{t}}{E_{i}^{0}} - \frac{E^{t}}{E^{0}}\right) + e_{ij}^{0}.\left(\frac{e_{ij}^{t}}{e_{ij}^{0}} - \frac{E_{i}^{t}}{E_{i}^{0}}\right), \qquad [3]$$

where "*E*" represents total employment in the state and "E_i" indicates employment in sector "*i*" within the state.

Based on expression [3], one could derive three distinct components: the **net component (NC)**, the **mix component (MC)** and the **share component (SC)**. The definition and the interpretation of these effects vary according to the analysis at hand.

[3] This methodology presented is based mainly on Alves (2005), Wikipedia (2007b) and Simões (2004).
[4] More specifically, "0" will indicate the beginning and "t" the end of the period in consideration.

2.1 Analysis of a specific sector

When one analyzes a single economic sector "*i*" within a municipality "*j*", then the net component (NC_{ij}) will be given by the difference between the actual change in employment in that sector within the municipality and the change in employment had it grown at the same rate as the state during the period in consideration, i.e.,

$$NC_{ij} = \Delta e_{ij}^{0,t} - e_{ij}^{0}.\left(\frac{E^{t}}{E^{0}} - 1\right). \qquad [4]$$

One can verify that if $NC_{ij} > 0$, then, employment grew in sector "*i*" within a municipality "*j*" at a faster pace than the state's total employment, and *vice-versa*.

Hence, expression [3] could be re-written as follows:

$$NC_{ij} = \Delta e_{ij}^{0,t} - e_{ij}^{0}.\left(\frac{E^{t}}{E^{0}} - 1\right) = e_{ij}^{0}.\left(\frac{E_i^{t}}{E_i^{0}} - \frac{E^{t}}{E^{0}}\right) + e_{ij}^{0}.\left(\frac{e_{ij}^{t}}{e_{ij}^{0}} - \frac{E_i^{t}}{E_i^{0}}\right) = MC_{ij} + SC_{ij}. \qquad [5]$$

And, the two terms on the righthand side of expression [5] will be exactly the other two components mentioned previously.

More specifically, the mix component for sector "*i*" within a municipality "*j*" (MC_{ij}) is given by the difference between employment growth in sector "*i*" in the state and the state's total employment, i.e.,

$$MC_{ij} = e_{ij}^{0}.\left(\frac{E_i^{t}}{E_i^{0}} - \frac{E^{t}}{E^{0}}\right). \qquad [6]$$

If $MC_{ij} > 0$, then, one can conclude that the sector in analysis is dynamic at the state level and, therefore, boosts employment growth in the municipalities where it is significantly present in their economic structures.

Finally, the last term on righthand side of expression [5] indicates the share component, also known as diferential or competitive effect, that consists in the difference between employment growth in sector "*i*" within municipality "*j*" and in sector "*i*" within the state, i.e.,

$$SC_{ij} = e_{ij}^{0}.\left(\frac{e_{ij}^{t}}{e_{ij}^{0}} - \frac{E_i^{t}}{E_i^{0}}\right). \qquad [7]$$

If $SC_{ij} > 0$, then, the municipality "*j*" has locational and intrinsic advantages in sector "*i*", since employment grew faster there than the state's average.

An interesting challenge while using this method is when $e_{ij}^{0} = 0$ and $e_{ij}^{t} \neq 0$, since the employment growth rate would be infinite (on the limit) in this case. Hence, it would not be accurate to consider the net component equal to the share component because the specialization of the state's economic toward some specific economic sectors could also influence significantly on employment growth in a certain municipality. On the other hand, it would not be correct to consider the net component equal to the mix component either, since locational and intrinsic characteristics certainly play a very important part on employment growth in any municipality. Thus, whenever this is the case, one could use e_{ij}^{t} as the basis to compute the previously defined components as follows:

$$NC_{ij} = \Delta e_{ij}^{0,t} - e_{ij}^{t}.\left(1 - \frac{E^{0}}{E^{t}}\right) = e_{ij}^{t}.\left(\frac{E^{0}}{E^{t}} - \frac{E_{i}^{0}}{E_{i}^{t}}\right) + e_{ij}^{t}.\left(\frac{E_{i}^{0}}{E_{i}^{t}} - \frac{e_{ij}^{0}}{e_{ij}^{t}}\right) = MC_{ij} + SC_{ij} \quad [8]$$

Hence, in sum, according to Simões (2004) this method generates a typology of six variations, as can be seen below:

	MC_{ij}	SC_{ij}	Categories
$NC_{ij} > 0$	+	+	A1
	+	-	A2
	-	+	A3
$NC_{ij} < 0$	-	+	B1
	+	-	B2
	-	-	B3

All sectors in a municipality "*j*" classified as A1, A2 or A3 had a positive net component, indicating that, during a certain period of time, employment grew faster there than in the state as a whole. This is due either because both the mix and share components were positive or because one of these components were positive and large enough to compensate the reduction in employment growth caused by the other. Inversely, all sectors in a municipality "*j*" classified as B1, B2 or B3 had a negative net component, providing evidence that employment grew at a lower pace there than in the state as whole, which is due either because both the mix and share components were negative or because one of these components were positive but not large enough to compensate the reduction in employment growth caused by the other.

Hence, according to the analysis of the data, it is possible to identify which case describes more accurately each specific situation.

2.2 Analysis of a specific municipality

When one is interested in analyzing a certain municipality, the only difference in relation to what was presented before is that, in each component, one needs to sum up the results of all sectors. Hence, for a municipality "*j*" it should be the case that

$$NC_j = \sum_i NC_{ij} = \sum_i MC_{ij} + \sum_i SC_{ij} = MC_j + SC_j \quad [9]$$

On the other hand, in terms of interpretation of the components, there are some important differences. For instance, the net component now indicates if a municipality was able or not to increase the number of jobs in all sectors faster than the State's general average.

The mix component reflects the change in employment within the municipality that can be explained by the composition of the State's productive structure. This component, whenever positive, indicates that the municipality is specialized in high-employment-growth sectors.

Hence, when this component is analyzed, it is important to confront the results obtained with the sectoral specialization indicator (SSI), that is computed in a certain year for sector "*i*" within a municipality "*j*" as follows:

$$SSI_{ij} = \frac{e_{ij}}{e_j} \times 100\% , \quad [10]$$

where e_j represents total employment in municipality "*j*".

SSI_{ij} represents the participation of sector "*i*" in total employment within a certain municipality and, based on its definition, another indicator, the participation of low-employment-growth sectors (PLEGS), can be proposed as follows:

$$PLEGS_j = \sum_{i \in \Omega} SSI_{ij} , \quad [11]$$

where "Ω" represents the set of sectors that presented employment growth rates smaller than the State's average during the period in analysis. One should expect that there is a statistacally significant negative correlation between this indicator and the mix component, indicating that municipalities with an expressive participation of these sectors tend to have a negative mix component.

Finally, the share component could be understood in this case as a result of structural and locational advantages of the municipality, and such component helps to determine which sectors will be more or less dynamic in terms of employment creation therein. Thus, if it is positive, one can conclude that endogenous characteristics of the municipality favor the attraction of relatively

more dynamic sectors and/or induce a faster growth in some sectors (not necessarily the dynamic ones in the State's perspective)[5].

Furthermore, it is important to explain why certain characteristics provide differential advantages to some municipalities in comparison to others. This can be done through a regression analysis where the share component is the dependent variable. Several explanatory variables should be tested, and the best model found presented. This will be done in the next section, along with other analyses described throughout this section.

3. RESULTS

Between 2000 and 2005, formal employment grew by 33.15% in Ceara, as mentioned before. However, when the performances in terms of formal employment growth are analyzed at the municipal level, a wide range of results can be identified, as Table 1 indicates.

Table 1: Performances in terms of employment growth – Descriptive Statistics – Ceara's municipalities - 2000/2005

Descriptive Statistics	Values
Maximum	10,450.00%
Minimum	-90.31%
Median	54.28%
Mean	171.48%
Standard Deviation	831.72%
Coefficient of Variation (C.V.)	4.85
Tharudike's C.V.	15.32

Source of the data: RAIS/MTE.

The wide dispersion of the performances can be inferred from the values of the Coefficient of Variation and from Tharudike's Coefficient of Variation, which indicated, respectively, that the standard deviation was 4.85 times the value of the mean[6] and 15.32 times the value of the median of the performances.

Table 2 shows the 10 best performances amongst Ceara's municipalities in terms of formal employment growth. More specifically, the best performance was presented by Itatira that increased its amount of formal workers from 6, in 2000, to 633, in 2005, which represents a realtive growth of 10,450% during the period. All municipalities considered in this table presented very impressive performances, and considerably higher than the State's average.

[5] In other words, there could be cases where the mix component is negative but the share component is positive so that the net component is positive (corresponding to "A3" in the tipology previously presented).

[6] Whenever this value is greater than one, a series is considered high-variance (WIKIPEDIA,2007a). A similar argument can be done on the analysis of Tharudike's C.V.

Table 2: 10 best performances in terms of employment growth - Ceara's municipalities - 2000/2005

Municipalities	Formal Employment			
	2000	2005	%Δ	Ranking (%Δ)
Itatira	6	633	10,450.00	1
Capistrano	17	593	3,388.24	2
Potengi	27	631	2,237.04	3
Penaforte	31	617	1,890.32	4
Coreau	86	966	1,023.26	5
Jijoca de Jericoacoara	83	854	928.92	6
General Sampaio	206	901	337.38	7
Antonina do Norte	126	468	271.43	8
Salitre	115	415	260.87	9
Itarema	518	1,828	252.90	10

Source of the data: RAIS/MTE.

Table 3, on the other hand, presents the 10 worst performances amongst Ceara's municipalities in terms of formal employment growth. The very worst performance was presented by Tarrafas, that increased its amount of formal workers from 6, in 2000, to 633, in 2005, which represents a realtive growth of 10,450% during the period. All municipalities considered in this table presented very impressive performances, and considerably higher than the State's average.

Table 3: 10 worst performances in terms of employment growth - Ceara's municipalities - 2000/2005

Municipalities	Formal Employment			
	2000	2005	%Δ	Ranking (%Δ)
Ipaporanga	403	365	-9.43	175
Paramoti	461	417	-9.54	176
Granjeiro	233	209	-10.30	177
Aiuaba	431	377	-12.53	178
Moraujo	519	451	-13.10	179
Campos Sales	1,096	927	-15.42	180
Hidrolandia	431	361	-16.24	181
Paracuru	4,980	2,512	-49.56	182
Uruoca	3,006	384	-87.23	183
Tarrafas	1,455	141	-90.31	184

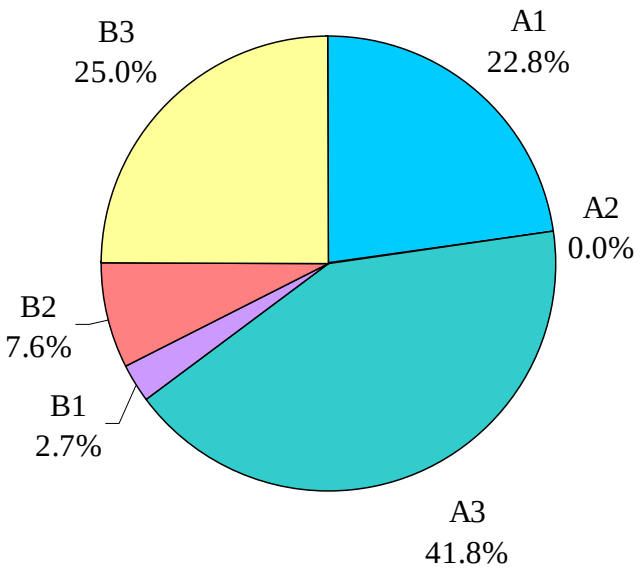
Source of the data: RAIS/MTE.

An interesting result is that only 20 out of the 184 municipalities of the State presented negative growth in employment during this period, whereas nothing less than 119 of them presented a positive net component, according to the definition provided previously.

In agreement with the shift-share methodology, this component can be decomposed into the mix and the share components. And, depending on the values of each of them a municipality can be

classified according to the tipology defined by Simões (2004), presented earlier. The results for Ceara's municipalities are showed in Graph 1, below.

Graph 1: Categorization of Ceara's municipalities according to the values of the mix and share components - 2000/2005



Source of the data: RAIS/MTE.

As this graph indicates, approximately 64.6% of Ceara's municipalities presented a positive net component and none of them had a negative share component (i.e., there is no municipality classified as A2). This suggests that endogenous and locational advantages that a municipality has are indeed very important to yield high formal employment growth rates. This argument is strengthened by the fact that the majority of the municipalities that presented a negative net component also had a negative share component (approximately 32.6% of the total were classified as B2 or B3). The values of the net, mix and share components as well as the categorization of all municipalities is available at Table A.1 in the appendix.

The mix component, associated with the specialization of a municipality productive structure, is also fundamental in terms of employment creation. More specifically, the concentration in activities where the State has comparative/competitive advantages may induce a faster growth of formal employment. As Graph 1 indicated, 128 of Ceara's municipalities, which represents approximately 69.5% of the total, presented a negative mix component during the period between 2000 and 2005 (those in categories A3, B1 and B3).

In order to compute this component it is essential to analyze the performance of each economic sector, which is done with the help of Table 4.

Table 4: Sectoral performances in terms of formal employment growth - Ceara - 2000/2005

Economic Sectors	Formal Employment				
	2000	2005	% Δ	Ranking (% Δ)	% Δ_{SECTOR} > % Δ_{CE}?
Mineral Extraction	2,714	1,816	-33.09	25	No
Non-Metallic Minerals	7,186	7,495	4.30	23	No
Metallurgical Industry	5,502	7,601	38.15	10	Yes
Mechanical Industry	2,364	2,776	17.43	18	No
Electronics and Communications Equip.	1,321	2,049	55.11	5	Yes
Transportation Materials	1,211	2,212	82.66	2	Yes
Wood and Furniture	4,955	5,619	13.40	20	No
Paper and Printing	4,336	5,862	35.19	11	Yes
Rubber, Tobacco and Leather	3,894	6,009	54.31	6	Yes
Chemical Industry	6,162	9,284	50.67	7	Yes
Textile Industry	48,485	52,449	8.18	21	No
Footware Industry	27,287	44,268	62.23	3	Yes
Foods and Beverages	30,900	35,641	15.34	19	No
Public Utility Services	6,472	6,946	7.32	22	No
Civil Construction	27,746	28,372	2.26	24	No
Retail Commerce	78,051	113,395	45.28	8	Yes
Wholesale Commerce	15,202	19,959	31.29	13	No
Financial Institutions	10,218	12,418	21.53	15	No
Real estate and technical services	44,248	70,920	60.28	4	Yes
Transportation and communications	26,302	30,953	17.68	17	No
Lodging, catering and maintenance services	61,957	88,613	43.02	9	Yes
Medical, odontological and veterenary servs.	22,812	26,868	17.78	16	No
Educational Services	26,244	33,269	26.77	14	No
Public Administration	215,087	284,380	32.22	12	No
Agriculture	10,434	20,987	101.14	1	Yes
Others/Ignored	3	0	-100.00	-	No
Total	**691,093**	**920,161**	**33.15**	**-**	**-**

Source of the data: RAIS/MTE.

According to this table, the sector that presented the best performance in terms of formal employment growth was agriculture, with a 101.14% increase during the period between 2000 and 2005. The worst performance occurred in the mineral extraction sector, with a decrease of 33.09% in employment. Furthermore, 11 sectors amongst the 25 analyzed here (excluding others/ignored) presented better performances than the State's average. This indicates that municipalities more specialized in these sectors have a better chance of having a positive mix component.

Thus, as it was mentioned before, it is expected a significant negative correlation between the participation of low-employment-growth sectors (PLEGS) and the mix component, indicating that municipalities with expressive participation of less dynamic sectors tend to have a negative

mix component. In fact, the data analyzed here indicate that the correlation between the mix component and the average[7] participation of low-employment-growth sectors was equal to –0.2447, which is statistically significant at the 1% level[8].

Furthermore, it would be very interesting to explain why formal employment grew faster in some municipalities than in others in accordance to their endogenous and locational factors, which was referred to as the share (differential) component. In other words, it would be interesting to explain why, 124 out of the 184 municipalities in Ceara, representing approximately 67.3% of the total as Graph 1 showed[9], presented a positive share component in the period considered. This component is particularly important since approximately 96.0% of the municipalities that had a positive share component also presented a positive net component and there was no municipality classified as A2.

As indicated by Seyfried (2007), one way to explain this component is through a regression analysis where the data for the independent variables should be considered at the beginning of the period studied (the year 2000 in this case). The analysis of several independent variables showed that the best model that fits the data is the following:

$$SC_i = \beta_1 + \beta_2 .Density_i + \beta_3 .Density_i^2 + \beta_4 .Cluster_i + \beta_4 .Cluster_i .Distance_i + \varepsilon_i ,$$

where:

$SC_i =$ Value of municipality *i*'s share component;

$Density_i =$ Municipality *i*'s population density, in inhabitants per square kilometer;

$Cluster_i =$ Dummy variable that is equal to 1 whenever municipality *i* has an identified economic cluster according to Holanda & Petterini (2005), and 0 otherwise; and

$Distance_i =$ Municipality *i*'s distance to Fortaleza (in kilometers).

The estimates of the proposed model are presented in Table 5, below. As this table indicates, the model presented very satisfactory results, since it explained approximately 94.46% of the share component and all parameters can be considered statistically significant at the 5% level or, in the case of β_4, marginally significant (at the 10% level). Furthermore, the equation was considered significant at the 1% percent level and the model was deemed adequate according to Ramsey's RESET test[10]. It was detected that the residuals were marginally heteroskedastic[11], a problem which was corrected by using White's heteroskedasticity consistent covariance matrix.

[7] Average value of PLEGS using 2000 and 2005 data.
[8] The significance test produced a t-statistic equal to –3.41 that is smaller than the distrbution's critical value at the 1% level (- t_c = -2,60) with 182 degrees of freedom.
[9] These are the municipalities classified as A1, A3 and B1.
[10] See Table A.2 in the appendix.
[11] The test produced an F-statistic equal to 1.7883 and a probability of 0.0592, which indicates that null hypothesis of homoskedastic errors can be rejected at the 10% level, but not at the 5% level.

Table 5: Regression estimates

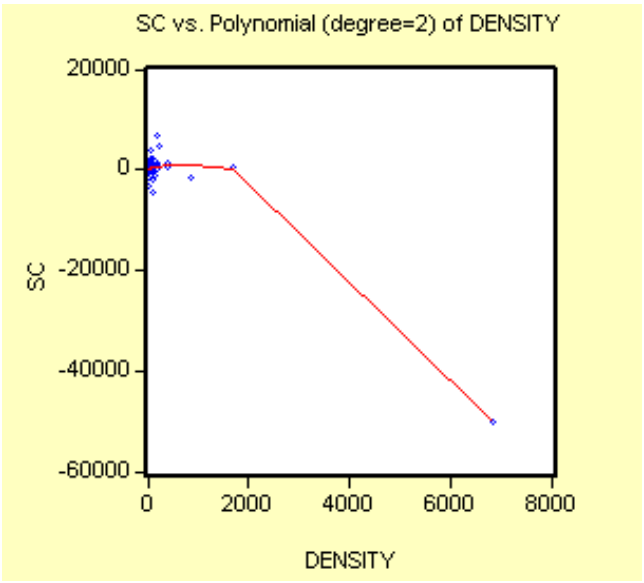
Dependent Variable: Share Component (SC)
Method: Least Squares
Included observations: 184
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.42226	68.11630	1.430234	0.1544
DENSITY	2.591206	0.631637	4.102363	0.0001
$DENSITY^2$	-0.001456	9.30E-05	-15.65297	0.0000
CLUSTER	1533.354	725.7387	2.112818	0.0360
CLUSTER*DISTANCE	-6.593559	3.390726	-1.944586	0.0534
R-squared	0.944613	F-statistic		763.2006
Adjusted R-squared	0.943375	Prob(F-statistic)		0.000000

Source of the data: RAIS/MTE. IBGE. IPECE. Holanda & Petterini (2005).

Considering the parameter estimates for each explanatory variable and the model's specification, one can notice that there is a statistically significant second-degree polynomial relationship between the share component and population density. It is also possible to verify that the estimated relationship is concave according to parameter estimates, which indicates that the share component grows with density up to a point and then falls, as Graph 2 shows.

Graph 2: Scatter plot and statistical relationship between the differential component and population density – Ceara's municipalities



Source of the data: RAIS/MTE. IBGE.

This result indicates that the share component could be associated with the existence of agglomeration economies/diseconomies (POLÈSE,1998). More specifically, when population density is low, it is somewhat difficult to provide certain types of services and to boost economic infrastruture, which negatively affects formal employment creation. For example, a low density municipality is not very likely to have large training and healthcare facilities due to the small

scale of operation, which impacts on human capital formation and consequently on the ability of the local economy to create new jobs.

This argument becomes even more robust when one provides evidences that population density could be associated with other important variables that have influence on the dynamics of a municipality's economy. Hence, as Table 6 illustrates, population density is positively and significantly correlated at the 1% level with the municipalities' population, the Human Development Index (HDI), the municipalities' social and economic infrastructure[12] (Infra), and urbanization.

Table 6: Correlations – Density vs. other variables – Ceara (2000[a])

Variables	Correlation	t-statistic[b]	Prob.
Population	0.971881	55.68	0.0000
HDI	0.399359	5.88	0.0000
Infra	0.342946	4.93	0.0000
Urbanization	0.330574	4.73	0.0000

Source of the data: IBGE. UNDP. Holanda & Petterini (2005).

Notes: [a] Except Infra that was calculated for 2001 by Holanda & Petterini (2005).
[b] Test considering a t-distribution with 182 degrees of freedom.

On the other hand, as density increases, municipalities enhance their ability to diversify their infrastructure and productive base, since economies of agglomeration begin to emerge due to the concentration of the population and economic activities. This is a process that enables certain activities to reach the minimum scale of operation and allows that sinergies and complementarities among different sectors occur more intensively, which has a potential positive effect on the creation of new jobs.

But, what happens when density reaches very high levels? As the data suggests, after a threshold, costs due to concentration tend to outweigh the benefits generated. These agglomeration diseconomies are basically a consequence of a series of factors such as the congestion of public and transportation services, inadequate living conditions for part of the population, environmental damages, higher real estate and services prices, shortage of specialized labor, increasing unemployment rates, higher crime rates etc. This list is not exhaustive and, in reality, the mix of factors that actually contribute varies according to specific regional conditions and with time.

As Graph 2 indicated, only Fortaleza's share component is negatively influenced by agglomeration diseconomies. In 2000, the State's capital had a density of approximately 6,840 inhabitants per square kilometer, which is much higher than in any other municipality in Ceara.

[12] "Infra" was computed to Ceara's municipalities by Holanda & Petterini (2005) for the year 2002. It is an index composed by a series of *per capita* indicators such as: number of health professionals of the *Sistema Único de Saúde (SUS)*; number of teachers in primary and secondary education; number of telephone lines in operation; water connections; and the number of vehicles. In order to compute the index, the authors first divide each indicator by its standard deviation (across municipalities) and then sum them up.

This phenomenon can be associated with the concentration of economic activities (since Fortaleza is responsible for a very significant part of the State's GDP, universities and training facilities, high complexity health services, financial services etc.) and infrastructure in the capital. But, at the same time, increasing costs due to this excessive concentration end up influencing the location of certain economic activities, providing incentives to new or expanding firms to locate their activities elsewhere, specially in the other municipalities of the Fortaleza Metropolitan Area as will be discussed in further detail in the next section.

Additionally, the data indicated that there is a statistically significant relationship between the existence of economic clusters within the municipality and the share component. According to Holanda & Petterini (2005) economic clusters reflect intrinsic comparative/competitive advantages that a certain municipality has, since they are formed spontaneously. Furthermore, these authors present evidences that the presence of economic cluters within a municipality positively influence its Municipal Comparative Advantage Index, which was computed by them to Ceara's municipalities with 2001 data. The same dummy variable defined by Holanda & Petterini is used in this study. More specifically, this variable will be equal to 1 whenever there is an identified economic cluster within the municipality, and 0 otherwise.

This dummy was also combined with the distance to Fortaleza, and the evidences indicate that the further away a municipality is located from Fortaleza, the less important will be the presence of economic clusters there in terms of the share component. This result indeed makes sense since Fortaleza is the major consumer market in the State and its relatively better infrastructure and diversified economy generates significant spillover effects to other municipalities, specially to those that are somewhat closer, whose economic clusters (when present) tend to be benefited the most.

Furthermore, one could argue that the effect due to the presence of economic clusters within a municipality is not fully captured by this analysis since there could be several informal jobs in a certain cluster, specially those formed solely by small and medium enterprises.

4. A SPECIAL CASE: FORTALEZA METROPOLITAN AREA (FMA)

4.1 FMA: Characterization

The Fortaleza Metropolitan Area is one of the largest metropolitan areas in Brazil. It was created by Federal Law n. 14 of June 8, 1973 which established, also, the other metropolitan areas in the country. It was formed initially by only five cities: Fortaleza, Caucaia, Maranguape, Pacatuba and Aquiraz, with a population around 1 million inhabitants. In 1986, Maracanaú, also by federal law, became part of FMA. In 1991 two more counties were added: Eusebio and Guaiuba. And, finally, in 1999, 5 more cities joined this metropolitan area: Itaitinga, Chorozinho, Pacajus, Horizonte and Sao Goncalo do Amarante. Today it is the third largest metropolitan area in the Northeast of Brazil and the sixth at national level. Its area of influence is around the state of Ceara, west of Rio Grande do Norte, the center-north of Piaui, the eastern portion of Maranhao and the boundaries of Pernambuco.

According to the United Nations' World Urbanization Prospects 2005, the FMA occupies the 94th position in the world ranking of the largest metropolitan areas overcoming, for example, the metropolitan areas of Athens in Greece and Nagoya in Japan. Estimates of this study show that the population of FMA will grow 18.9% until 2015. And, according to the United Nations Development Program, the FMA has an average Human Development Index of 0.680[13] and population around 3,436,515 million inhabitants. Furthermore, the FMA was responsible for 64.3% of all wealth produced in Ceara in 2004[14].

The FMA is represented by eight municipalities among the fifteen largest municipal GDPs in Ceara. The city of Fortaleza alone represents about 47.5% of the State's GDP and his responsible for a large part of Ceara's tax revenues[15]. Maracanaú and Caucaia, respectively, are the second and the fourth largest municipal GDPs in the State. And, these three municipalities represented approximately 88.8% of the FMA's GDP, according to Table 7, below.

Table 7: GDP – Ceara's Municipalities – 2004

Municipalities	GDP [a] (2004)	% GDP_{FMA}
Aquiraz	388,273	1.83
Caucaia	982,866	4.64
Chorozinho	50,221	0.24
Eusebio	567,860	2.68
Fortaleza	15,797,377	74.59
Guaiuba	46,607	0.22
Horizonte	466,616	2.20
Itaitinga	69,501	0.33
Maracanau	2,026,388	9.57
Maranguape	378,806	1.79
Pacajus	297,314	1.40
Sao Goncalo do Amarante	107,935	0.51
Total	**21,179,764**	**100.0**

Source: Ipece and IBGE.

Note: [a] In thousands of Brazilian Reals.

Thus, with more than three times the initial population and more than twice the number of municipalities, the main challenge that the FMA faces nowadays is the decentralization of urban infrastructure and services, since they are still very concentrated in Fortaleza, even though economic activities have been deconcentrating in the recent years.

[13] Source: UNDP.
[14] Source: IPECE and IBGE.
[15] Source: IPECE.

Maracanau was, in fact, the municipality that was first benefited by this process of decentralization during the 1980s, with predominance of industrial activities. Caucaia, on the other hand, maintain a productive strucuture somewhat similar to Fortaleza's, with predominance of the service sector. The tipology of productive structures of the municipalities that are part of the FMA are presented below in Table 8.

Table 8: Tipology of productive structures – FMA's Municipalities – 2004

Municipalities	Tipology (2004)
Aquiraz	Balance Industry and Services
Caucaia	Services
Chorozinho	Services
Eusebio	Predominance Industry
Fortaleza	Services
Guaiuba	Services
Horizonte	Predominance Industry
Itaitinga	Predominance Services
Maracanau	Predominance Industry
Maranguape	Industry
Pacajus	Industry
Sao Goncalo do Amarante	Services

Source: Ipece and IBGE.

Hence, it is essencial to investigate how this relative centralization urban infrastructure and services in the capital and the recent deconcentration of economic activities from Fortaleza have been affecting formal employment growth within FMA's municipalities. The findings from a shift-share analysis for the period between 2000 and 2005 to these municipalities are presented ahead.

4.2 FMA: A shift-share analysis of formal employment (2000-2005)

A shift-share analysis of formal employment in the Fortaleza Metropolitan Area yielded interesting results. The net, mix and share components of all municipalities are presented in Table 9, ahead.

The most striking result presented in this table is that Fortaleza's components are all negative and, therefore, this municipality was classified as B3 (as defined before). Additionally, the magnitude of the net and share components are indeed noticiable. More specifically, according to the methodology discussed previously, the negative net component indicates that formal employment grew at a slower pace if compared to the State's average. And, the large negative

share component indicates that this phenomenon can be explained in great part by endogenous characteristics of the municipality. According to the regression results presented earlier, there is evidence that formal employment in Fortaleza has been growing slower than the average or even decreasing in some cases, specially in the industrial sector, due to strong agglomeration diseconomies. The high costs of land, transportation and other services in Fortaleza ended up forcing some firms to relocate to other municipalities.

Table 9: Shift-share analysis of formal employment - FMA's Municipalities – 2000-2005

Municipalities	NC	MC	SC	Category
Aquiraz	1.588,44	564,26	1.024,18	A1
Caucaia	6.186,82	-451,20	6.638,01	A3
Chorozinho	-555,40	-202,63	-352,78	B3
Eusebio	2.786,99	2.267,75	519,24	A1
Fortaleza	-54.595,88	-4.360,22	-50.235,66	B3
Guaiuba	532,37	4,02	528,35	A1
Horizonte	5.263,70	742,83	4.520,87	A1
Itaitinga	834,93	-76,42	911,35	A3
Maracanau	-2.110,48	-2.516,61	406,13	B1
Maranguape	-342,92	806,67	-1.149,59	B2
Pacajus	993,66	-212,78	1.206,44	A3
Pacatuba	1.033,02	-323,30	1.356,32	A3
Sao Goncalo do Amarante	619,28	-56,00	675,29	A3

Source of the data: RAIS/MTE.

The municipality has a somewhat diversified economy, but the data, presented in table 10, indicates that the State's capital has comparative and competitive advantages in sectors with high aggregate value products and services, like electronics and comunications equipment, real estate and technical services, and educational services, which presented positive share components during the period in analysis.

In fact, in accordance with this table these were basically the only sectors that presented positive share components in Fortaleza[16]. Even the sectors where the State presented comparative and competitive advantages (i.e., the ones with a positive mix component) were somewhat burdened by the negative share component, so that in some cases the net component ended up being negative, like in the metallurgical industry; rubber, tobacco and leather; chemical industry; footware industry; and agriculture.

[16] Mineral extraction also presented a positive share component, eventhough it was not large enough to compensate the negative mix component.

Table 10: Shift-share analysis of formal employment – Economic sectors – Fortaleza – 2000-2005

Economic Sectors	NC	MC	SC
Mineral extraction	-186,06	-215,92	29,87
Non-metallic minerals	-694,09	-344,71	-349,39
Metallurgical industry	-3.049,79	192,45	-3.242,24
Mechanical industry	-785,41	-189,40	-596,01
Electronics and communications equipment	425,19	217,22	207,96
Transportation materials	226,70	273,81	-47,10
Wood and furniture	-798,40	-413,66	-384,74
Paper and printing	-207,66	61,95	-269,61
Rubber, tobacco and leather	-476,39	331,71	-808,11
Chemical industry	-1.041,64	532,07	-1.573,71
Textile industry	-9.818,36	-7.673,04	-2.145,32
Footware industry	-1.360,58	892,05	-2.252,63
Foods and beverages	-3.318,79	-2.455,53	-863,27
Public utility services	-1.388,10	-1.178,77	-209,33
Civil construction	-7.444,84	-6.778,72	-666,12
Retail commerce	1.364,36	6.731,07	-5.366,71
Wholesale commerce	-438,57	-201,88	-236,69
Financial institutions	-1.336,26	-974,63	-361,64
Real estate and technical services	14.544,65	8.579,89	5.964,75
Transportation and communications	-3.985,73	-3.292,47	-693,26
Lodging, catering and maintenance services	2.347,88	4.013,58	-1.665,69
Medical, odontological and veterenary services	-3.011,67	-2.375,68	-635,98
Educational services	-600,32	-1.190,53	590,21
Public administration	-31.816,04	-1.081,71	-30.734,32
Agriculture	-1.744,65	2.181,95	-3.926,60
Others/ignored	-1,33	-1,33	0,00
Total	**-54.595,88**	**-4.360,22**	**-50.235,66**

Source of the data: RAIS/MTE.

In some other cases, the mix and the net components were both positive, but the negative share component worsened the performance of these sectors in terms of formal job creation during the period 2000-2005. This was the case of the following sectors: transportation materials; retail commerce; and lodging, catering and maintenance services.

Furthermore, one can easily notice the significant negative magnitude of the net and share components of the public administration sector in Fortaleza. The number of formal jobs in this sector actually grew during the period 2000-2005, from 116,377 in 2000 to 123,135 in 2005. But, as the signals and magnitudes of components mentioned above indicate, formal employment in

this sector advanced in Fortaleza in a much slower pace than the State's average and the sector's average. This sinalizes a smaller dependence of the municipality on this sector, since its participation in total employment decreased from 28.11% in 2000 to 24.80% in 2005[17].

Fortaleza's performance in terms of formal job creation contrasts with the performances of some of the other municipalities in the FMA. In fact, according to Table 9, nine out of the thirteen municipalities of the referred metropolitan area presented positive net and share components, which indicates that they are benefiting from the economic decentralization from Fortaleza due to their specific characteristics. They are usually small (in terms of area) but somewhat populated municipalities, with fairly diversified economies and social conditions usually better than Ceara's average, as Table 11 exemplifies. Furthermore, according to the regression results presented earlier, these nine municipalities are benefiting from agglomeration economies and from their proximity to Fortaleza; and Aquiraz and Horizonte have identified economic clusters according to Holanda & Petterini (2005), which favours good results in terms of formal employment creation since these are factors that positively impact on their share components. Thus, even in sectors where the mix component were negative, some of these municipalities were able to have positive net components, which was the case of food and beverages and transportation and communications in Aquiraz; food and beverages, civil construction, and textiles in Eusebio; and footware industry in Horizonte (see Table A.3 in the appendix for further details).

Table 11: FMA's Municipalities – Selected Indicators –2000

Municipalities	HDI	Population Density	Urbanization (%)
Aquiraz	0.670	125.72	90.43
Caucaia	0.721	203.99	90.26
Chorozinho	0.633	67.19	50.62
Eusébio	0.684	411.32	100.00
Fortaleza	0.786	6,838.48	100.00
Guaiuba	0.652	74.42	78.51
Horizonte	0.679	211.22	83.23
Itaitinga	0.680	193.76	90.86
Maracanau	0.736	1,700.46	99.69
Maranguape	0.691	149.17	74.05
Pacajus	0.678	173.21	77.83
Pacatuba	0.716	390.37	90.97
Sao Goncalo do Amarante	0.639	42.68	62.00
Ceara	**0.699**	**50.90**	**71.50**

Source: UNDP, IBGE and Ipece.

[17] It is worth mentioning that employment in this sector is not determined by market forces.

Finally, Maracanau is also an interesting case, since it is one of the most industrialized municipalities in Ceara and is responsible for approximately 9.57% of the FMA's GDP, and presented a negative net component basically due to its productive structure, somewhat concentrated in low-employment-growth sectors, which yielded a significant negative mix component, large enough to more than compensate its positive share component. In this specific case, one can argue that Maracanau has competitive advantages in more capital intensive sectors, in contrast with other municipalities of the FMA, which can partially explain the negative mix component.

5. CONCLUDING REMARKS

This study aimed to determine the dynamics of employment growth in Ceara and its municipalities between 2000 and 2005. In that period most municipalities presented a positive net component and none of them (the ones with positive net components) had negative share components. Thus the importance of the local aspects of each municipality appears to be decisive in generating new formal jobs. Among the ten best performances none belonged to the Fortaleza Metropolitan Area. This indicates that rural areas and non-metropolitan areas of Ceara had benefited the most from the overall employment performance in the period. In terms of formal employment, the sector that the economic growth reached the highest result was agriculture.

In order to explain why employment growth patterns differ amongst Ceara's municipalities, a regression analysis showed that population density played a key role in the employment growth process. Since population density is positively and significantly correlated with the Human Development Index (HDI), social and economic infrastructure and the urbanization level, municipalities with high population density, with the exception of Fortaleza, tended to benefit the most due to agglomeration economies. Additionally, evidence from the presence of clusters affecting the share component has been proven significant although its effect turns weaker as further away the municipality is located from Fortaleza.

Fortaleza, on the other had, can be considered a case apart from the rest because of the presence of strong agglomeration diseconomies. This municipality has the State´s highest population density which brings up to light many problems such as higher transportation services costs, inadequate living conditions for part of the population, congestion in public services, increasing real estate and services prices etc. For this reason many firms are now relocating their activities in surrounding areas of the FMA or elsewhere, where such costs are lower. Another relevant issue is that Fortaleza's main activities are related to the service sector and the above average level of informal employment in such sector can also explain its negative results, since the data consider only formal employment.

The municipalities located in the Fortaleza Metropolitan Area with few exceptions performed positively in terms of net component. The decentralization process of job creation from Fortaleza gave the opportunity to small size municipalities like Aquiraz, Eusebio and Horizonte, for example, to diversify and expand the job creation enhancing their share components.

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A P P E N D I X

Table A.1: Net, Mix and Share components - Ceara's municipalities - 2000/2005

Municipalities	NC	MC	SC	Category
Abaiara	-48.73	-4.00	-44.73	B3
Acarape	-223.49	-59.68	-163.81	B3
Acarau	1,272.70	25.15	1247.56	A1
Acopiara	65.33	-16.27	81.60	A3
Aiuaba	-196.86	-3.59	-193.27	B3
Alcantaras	-23.74	-3.52	-20.22	B3
Altaneira	-109.18	-0.50	-108.68	B3
Alto Santo	-172.26	-100.86	-71.40	B3
Amontada	355.77	17.56	338.21	A1
Antonina do Norte	299.49	-0.52	300.01	A3
Apuiares	89.74	-1.69	91.43	A3
Aquiraz	1,588.44	564.26	1024.18	A1
Aracati	2,005.05	84.41	1920.64	A1
Aracoiaba	-108.18	0.81	-108.98	B2
Ararenda	277.55	-1.59	279.15	A3
Araripe	49.34	0.30	49.05	A1
Aratuba	-135.11	-7.91	-127.20	B3
Arneiroz	78.84	-2.30	81.14	A3
Assare	60.50	-1.20	61.70	A3
Aurora	1,000.75	-7.95	1008.70	A3
Baixio	59.46	-0.85	60.30	A3
Banabuiu	-165.88	-5.74	-160.14	B3
Barbalha	-28.99	-125.31	96.32	B1
Barreira	-3.83	-2.75	-1.08	B3
Barro	-271.79	-7.55	-264.24	B3
Barrouquinha	205.03	-43.28	248.31	A3
Baturite	-101.12	-18.97	-82.15	B3
Beberibe	1,731.09	181.31	1549.78	A1
Bela Cruz	13.42	-42.83	56.25	A3
Boa Viagem	-18.57	-8.51	-10.06	B3
Brejo Santo	348.03	9.26	338.77	A1
Camocim	2,350.70	217.00	2133.69	A1
Campos Sales	-533.02	-49.55	-483.48	B3
Caninde	1,031.95	-25.35	1057.30	A3
Capistrano	569.87	0.78	569.09	A1
Caridade	-158.45	109.56	-268.01	B2
Carire	56.33	-8.28	64.61	A3
Caririacu	37.40	-19.21	56.61	A3
Carius	92.89	-3.07	95.96	A3
Carnaubal	31.38	-2.60	33.98	A3

Table A.1: Net, Mix and Share components - Ceara's municipalities - 2000/2005 (cont.)

Municipalities	NC	MC	SC	Category
Cascavel	-340.81	-182.50	-158.30	B3
Catarina	130.71	-2.80	133.50	A3
Catunda	-72.55	-1.59	-70.96	B3
Caucaia	6,186.82	-451.20	6638.01	A3
Cedro	16.87	-12.69	29.57	A3
Chaval	238.17	-87.25	325.42	A3
Choro	-118.24	-2.87	-115.38	B3
Chorozinho	-555.40	-202.63	-352.78	B3
Coreau	629.94	-18.55	648.49	A3
Crateus	747.75	-14.67	762.43	A3
Crato	-1,313.08	657.46	-1970.53	B2
Croata	43.16	-9.31	52.47	A3
Cruz	376.06	-4.45	380.51	A3
Deputado Irapuan Pinheiro	-17.29	-2.53	-14.76	B3
Erere	99.95	-2.72	102.67	A3
Eusebio	2,786.99	2267.75	519.24	A1
Farias Brito	-336.74	-17.29	-319.45	B3
Forquilha	-111.86	-58.82	-53.04	B3
Fortaleza	-54,595.88	-4360.22	-50235.66	B3
Fortim	-19.74	13.17	-32.91	B2
Frecheirinha	253.51	-28.61	282.12	A3
General Sampaio	514.94	21.72	493.23	A1
Graca	358.86	-3.67	362.53	A3
Granja	989.23	19.55	969.68	A1
Granjeiro	-103.72	-6.02	-97.70	B3
Groairas	-100.60	-6.59	-94.00	B3
Guaiuba	532.37	4.02	528.35	A1
Guaraciaba do Norte	-148.42	-8.67	-139.75	B3
Guaramiranga	67.32	0.84	66.48	A1
Hidrolandia	-213.61	-10.19	-203.42	B3
Horizonte	5,263.70	742.83	4520.87	A1
Ibaretama	125.98	8.19	117.79	A1
Ibiapina	-294.33	42.71	-337.04	B2
Ibicuitinga	250.10	-0.62	250.72	A3
Icapui	836.00	240.68	595.32	A1
Ico	252.77	9.82	242.95	A1
Iguatu	1,773.13	154.68	1618.44	A1
Independencia	560.77	-16.58	577.34	A3
Ipaporanga	-172.08	-2.61	-169.46	B3
Ipaumirim	-157.62	-2.06	-155.56	B3

Table A.1: Net, Mix and Share components - Ceara's municipalities - 2000/2005 (cont.)

Municipalities	NC	MC	SC	Category
Ipu	-55.64	-43.34	-12.29	B3
Ipueiras	166.61	-17.86	184.46	A3
Iracema	171.84	2.51	169.34	A1
Iraucuba	-90.04	1.49	-91.53	B2
Itaicaba	213.54	-22.34	235.87	A3
Itaitinga	834.93	-76.42	911.35	A3
Itapage	2,282.82	14.39	2268.43	A1
Itapipoca	3,583.75	-202.46	3786.21	A3
Itapiuna	-58.82	1.50	-60.31	B2
Itarema	1,133.82	69.74	1064.08	A1
Itatira	472.16	-2.88	475.04	A3
Jaguaretama	44.13	-4.90	49.02	A3
Jaguaribara	-212.89	-122.04	-90.85	B3
Jaguaribe	-150.33	-37.20	-113.13	B3
Jaguaruana	-25.54	0.37	-25.91	B2
Jardim	445.57	-1.84	447.41	A3
Jati	-17.99	-5.34	-12.65	B3
Jijoca de Jericoacoara	732.54	1.28	731.26	A1
Juazeiro do Norte	-1,012.21	521.17	-1533.38	B2
Jucás	322.22	-71.31	393.53	A3
Lavras da Mangabeira	-0.10	-12.74	12.64	B1
Limoeiro do Norte	1,557.58	-308.15	1865.73	A3
Madalena	276.09	14.26	261.83	A1
Maracanau	-2,110.48	-2516.61	406.13	B1
Maranguape	-342.92	806.67	-1149.59	B2
Marco	561.03	-52.30	613.32	A3
Martinopole	-77.47	-2.98	-74.48	B3
Massapé	72.58	-49.24	121.82	A3
Mauriti	459.73	-24.85	484.58	A3
Meruoca	23.03	-0.56	23.60	A3
Milagres	-75.53	-32.26	-43.27	B3
Milha	122.42	-5.26	127.68	A3
Miraima	69.49	-2.72	72.21	A3
Missao Velha	12.36	-12.43	24.79	A3
Mombaca	407.61	3.96	403.65	A1
Monsenhor Tabosa	-129.51	-7.80	-121.71	B3
Morada Nova	693.82	-101.97	795.80	A3
Moraujo	-244.26	-8.70	-235.56	B3
Morrinhos	296.38	-11.36	307.73	A3
Mucambo	180.15	-3.44	183.60	A3

Table A.1: Net, Mix and Share components - Ceara's municipalities - 2000/2005 (cont.)

Municipalities	NC	MC	SC	Category
Mulungu	-20.98	1.11	-22.09	B2
Nova Olinda	40.47	-118.91	159.38	A3
Nova Russas	71.29	-5.40	76.69	A3
Novo Oriente	-2.01	-6.77	4.76	B1
Ocara	-694.95	163.63	-858.58	B2
Oros	-332.44	-17.77	-314.67	B3
Pacajus	993.66	-212.78	1206.44	A3
Pacatuba	1,033.02	-323.30	1356.32	A3
Pacoti	115.02	-5.99	121.01	A3
Pacuja	53.83	-3.90	57.72	A3
Palhano	38.15	-17.40	55.55	A3
Palmacia	135.08	-5.65	140.73	A3
Paracuru	-4,123.89	577.62	-4701.51	B2
Paraipaba	746.25	-57.55	803.80	A3
Parambu	51.26	-10.10	61.37	A3
Paramoti	-196.80	-13.80	-183.01	B3
Pedra Branca	-43.63	-9.47	-34.16	B3
Penaforte	433.83	-0.40	434.22	A3
Pentecoste	916.87	55.09	861.78	A1
Pereiro	-44.70	-7.39	-37.30	B3
Pindoretama	115.04	22.25	92.79	A1
Piquet Carneiro	306.99	-1.53	308.51	A3
Pires Ferreira	58.12	-1.43	59.55	A3
Poranga	141.68	-2.88	144.56	A3
Porteiras	511.84	6.30	505.55	A1
Potengi	594.05	1.10	592.96	A1
Potiretama	-46.51	-1.97	-44.55	B3
Quiterianopolis	330.90	4.29	326.61	A1
Quixadá	888.51	138.63	749.88	A1
Quixelo	395.20	-5.07	400.27	A3
Quixeramobim	135.00	-51.88	186.88	A3
Quixere	2,032.74	674.06	1358.68	A1
Redenção	-648.66	11.90	-660.56	B2
Reriutaba	-215.76	-7.59	-208.16	B3
Russas	980.84	447.46	533.39	A1
Saboeiro	285.87	-1.97	287.84	A3
Salitre	261.38	-5.79	267.17	A3
Santana do Acarau	286.39	-36.60	323.00	A3
Santana do Cariri	243.53	-59.19	302.72	A3
Santa Quiteria	981.75	-77.38	1059.13	A3

Table A.1: Net, Mix and Share components - Ceara's municipalities - 2000/2005 (cont.)

Municipalities	NC	MC	SC	Category
Sao Benedito	862.58	33.27	829.31	A1
Sao Gonçalo do Amarante	619.28	-56.00	675.29	A3
Sao Joao do Jaguaribe	-7.31	-15.04	7.73	B1
Sao Luis do Curu	7.66	0.75	6.91	A1
Senador Pompeu	31.39	19.83	11.55	A1
Senador As	215.76	-2.15	217.92	A3
Sobral	3,468.63	2049.73	1418.90	A1
Solonopole	87.40	-33.66	121.06	A3
Tabuleiro do Norte	230.36	-24.82	255.18	A3
Tamboril	354.93	-4.13	359.06	A3
Tarrafas	-1,801.50	-179.44	-1622.05	B3
Taua	775.70	42.97	732.72	A1
Tejucuoca	-72.37	-5.54	-66.83	B3
Tiangua	702.22	153.69	548.52	A1
Trairi	628.33	-3.63	631.96	A3
Tururu	208.59	-1.95	210.54	A3
Ubajara	266.94	141.46	125.48	A1
Umari	-103.30	-2.32	-100.99	B3
Umirim	238.83	26.02	212.81	A1
Uruburetama	374.61	137.10	237.51	A1
Uruoca	-3,619.86	-490.86	-3128.99	B3
Varjota	661.57	-25.00	686.57	A3
Varzea Alegre	-77.44	-24.34	-53.09	B3
Vicosa do Ceara	457.77	-1.04	458.81	A3

Source of the data: RAIS/MTE.

Table A.2 – Regression – Ramsey RESET Test:

1 additional term:			
F-statistic	0.323580	Probability	0.570181
2 additional terms:			
F-statistic	1.271242	Probability	0.283031
3 additional terms:			
F-statistic	0.887961	Probability	0.448548

Table A.3: Shift-share analysis of formal employment – Economic sectors – FMA's municipalities (except Fortaleza) – 2000-2005

Economic Sectors	Aquiraz			Caucaia			Chorozinho		
	NC	MC	SC	NC	MC	SC	NC	MC	SC
Mineral extraction	-16,58	-31,13	14,55	-115,39	-216,58	101,20	0,00	0,00	0,00
Non-metallic minerals	-64,49	-78,75	14,26	-79,35	-150,86	71,51	22,75	-12,40	35,15
Metallurgical industry	0,00	0,00	0,00	352,15	21,72	330,43	0,00	0,00	0,00
Mechanical industry	-5,33	-0,63	-4,70	373,71	-3,93	377,64	0,00	0,00	0,00
Electronics and communications equipment	0,00	0,00	0,00	-0,66	0,44	-1,10	0,00	0,00	0,00
Transportation materials	0,00	0,00	0,00	41,69	4,95	36,73	0,00	0,00	0,00
Wood and furniture	7,35	-2,17	9,53	-97,76	-60,62	-37,14	0,00	0,00	0,00
Paper and printing	-260,95	4,14	-265,09	-73,09	2,66	-75,75	0,00	0,00	0,00
Rubber, tobacco and leather	7,51	1,03	6,48	-60,05	31,96	-92,01	0,00	0,00	0,00
Chemical industry	-4,13	80,94	-85,07	776,39	36,27	740,12	0,00	0,00	0,00
Textile industry	82,47	-18,48	100,95	222,34	-45,70	268,04	-57,03	-40,70	-16,33
Footware industry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foods and beverages	1.140,79	-74,77	1.215,56	-724,82	-238,91	-485,90	-571,35	-157,02	-414,33
Public utility services	29,04	-5,42	34,46	87,87	-28,15	116,02	0,00	0,00	0,00
Civil construction	-6,77	-37,99	31,22	-440,78	-146,11	-294,67	15,02	-4,54	19,56
Retail commerce	106,88	13,96	92,92	782,46	116,28	666,19	-14,58	5,34	-19,92
Wholesale commerce	38,38	-0,48	38,86	-122,63	-6,91	-115,72	0,00	0,00	0,00
Financial institutions	11,02	-1,05	12,06	-6,88	-7,67	0,79	1,50	-0,14	1,65
Real estate and technical services	-7,50	71,63	-79,14	-848,16	266,17	-1.114,33	1,50	0,25	1,25
Transportation and communications	209,48	-12,37	221,85	-53,03	-107,77	54,75	15,02	-1,97	16,99
Lodging, catering and maintenance services	17,13	59,56	-42,43	6.202,08	56,90	6.145,19	3,38	2,57	0,81
Medical, odontological and veterenary services	-2,66	-0,77	-1,89	-247,18	-39,49	-207,69	3,76	-0,49	4,25
Educational services	18,02	-0,77	18,79	-87,94	-24,62	-63,32	-18,64	-0,89	-17,75
Public administration	384,43	-8,74	393,17	427,86	-24,09	451,95	34,24	-2,83	37,06
Agriculture	-95,66	606,51	-702,17	-122,02	112,87	-234,89	9,03	10,20	-1,17
Others/ignored	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	**1.588,44**	**564,26**	**1.024,18**	**6.186,82**	**-451,20**	**6.638,01**	**-555,40**	**-202,63**	**-352,78**

Table A.3: Shift-share analysis of formal employment – Economic sectors – FMA's municipalities (except Fortaleza) – 2000-2005

(Continued)

Economic Sectors	Eusebio			Guaiuba			Horizonte		
	NC	MC	SC	NC	MC	SC	NC	MC	SC
Mineral extraction	46,72	-18,55	65,26	0,00	0,00	0,00	58,58	-57,99	116,57
Non-metallic minerals	45,47	-21,35	66,82	-9,15	-28,85	19,70	-1,26	-10,67	9,41
Metallurgical industry	797,46	3,40	794,06	0,00	0,00	0,00	6,67	0,05	6,62
Mechanical industry	309,41	-6,44	315,85	0,00	0,00	0,00	26,67	-0,16	26,83
Electronics and communications equipment	4,51	0,64	3,87	0,00	0,00	0,00	-6,97	3,29	-10,27
Transportation materials	84,07	17,82	66,24	0,00	0,00	0,00	96,46	120,32	-23,86
Wood and furniture	-37,14	-20,34	-16,80	0,75	-0,13	0,88	8,26	-1,44	9,70
Paper and printing	119,16	1,78	117,38	0,75	0,01	0,74	-6,94	0,68	-7,61
Rubber, tobacco and leather	69,79	14,18	55,61	0,00	0,00	0,00	12,34	1,06	11,28
Chemical industry	770,39	36,27	734,12	14,27	1,66	12,61	9,90	21,72	-11,83
Textile industry	104,38	-50,19	154,57	6,34	-0,50	6,84	-46,07	-301,39	255,32
Footware industry	3,01	0,87	2,13	0,00	0,00	0,00	5.098,10	636,10	4.462,01
Foods and beverages	3.548,72	-100,05	3.648,77	6,01	-0,53	6,54	-10,13	-19,40	9,28
Public utility services	10,51	-2,53	13,04	0,00	0,00	0,00	0,00	0,00	0,00
Civil construction	671,62	-101,94	773,55	1,50	-0,45	1,96	-12,90	-15,75	2,85
Retail commerce	3,42	48,55	-45,13	35,39	3,88	31,51	118,16	10,20	107,96
Wholesale commerce	-221,77	-8,88	-212,89	0,00	0,00	0,00	-2,28	-0,57	-1,70
Financial institutions	54,39	-3,37	57,76	2,25	-0,22	2,47	3,67	-0,46	4,14
Real estate and technical services	-1.998,91	1.845,02	-3.843,93	0,00	0,00	0,00	-295,85	69,46	-365,31
Transportation and communications	792,44	-8,66	801,10	7,67	-0,15	7,82	-7,22	-8,97	1,74
Lodging, catering and maintenance services	-2.475,20	551,07	-3.026,27	-1,66	0,49	-2,15	-267,70	33,58	-301,28
Medical, odontological and veterenary services	-5,66	-0,77	-4,89	0,00	0,00	0,00	-1,66	-0,31	-1,36
Educational services	1,09	-3,06	4,15	-27,96	-1,34	-26,62	17,01	-0,19	17,20
Public administration	212,50	-9,10	221,60	243,78	-3,85	247,62	645,13	-5,58	650,70
Agriculture	-123,38	103,35	-226,73	252,43	34,00	218,43	-178,26	269,26	-447,52
Others/ignored	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	**2.786,99**	**2.267,75**	**519,24**	**532,37**	**4,02**	**528,35**	**5.263,70**	**742,83**	**4.520,87**

Table A.3: Shift-share analysis of formal employment – Economic sectors – FMA's municipalities (except Fortaleza) – 2000-2005

(Continued)

Economic Sectors	Itaitinga			Maracanau			Maranguape		
	NC	MC	SC	NC	MC	SC	NC	MC	SC
Mineral extraction	-11,50	-58,95	47,45	0,10	-33,78	33,87	0,00	0,00	0,00
Non-metallic minerals	52,10	-14,71	66,81	-185,28	-162,11	-23,17	3,76	-14,13	17,89
Metallurgical industry	5,38	1,30	4,08	2.011,03	18,56	1.992,46	89,81	3,80	86,01
Mechanical industry	3,76	-0,50	4,26	-211,50	-69,94	-141,55	452,88	-17,60	470,48
Electronics and communications equipment	0,00	0,00	0,00	-126,44	65,89	-192,33	0,00	0,00	0,00
Transportation materials	24,78	6,72	18,07	48,59	155,97	-107,38	3,76	1,02	2,74
Wood and furniture	-10,90	-10,66	-0,24	-117,75	-96,95	-20,80	-21,97	-3,55	-18,41
Paper and printing	0,00	0,00	0,00	44,46	5,04	39,42	-1,91	0,98	-2,89
Rubber, tobacco and leather	0,00	0,00	0,00	283,57	27,10	256,48	-136,14	21,80	-157,94
Chemical industry	32,37	3,50	28,87	281,96	182,90	99,05	64,79	11,74	53,05
Textile industry	32,05	-5,99	38,04	-2.782,70	-2.436,08	-346,62	-259,93	-275,67	15,74
Footware industry	0,00	0,00	0,00	3,00	0,54	2,47	-1.865,07	919,68	-2.784,75
Foods and beverages	-66,23	-9,79	-56,44	-705,43	-402,52	-302,91	-9,06	-57,50	48,44
Public utility services	0,00	0,00	0,00	50,44	-14,46	64,90	-0,33	-0,26	-0,07
Civil construction	-3,65	-2,47	-1,18	-290,93	-176,07	-114,86	-19,94	-9,27	-10,68
Retail commerce	29,18	11,65	17,53	581,89	121,98	459,90	109,89	35,93	73,96
Wholesale commerce	-11,98	-0,22	-11,76	-137,03	-16,17	-120,87	-6,26	-0,69	-5,58
Financial institutions	0,01	-0,35	0,35	7,81	-9,18	16,99	-3,60	-4,41	0,82
Real estate and technical services	-6,30	5,16	-11,45	24,72	200,78	-176,06	71,35	98,76	-27,41
Transportation and communications	289,35	-1,24	290,59	38,37	-85,66	124,04	-69,94	-32,16	-37,78
Lodging, catering and maintenance services	0,75	4,25	-3,50	466,84	62,03	404,81	-18,38	15,31	-33,69
Medical, odontological and veterenary services	2,25	-0,29	2,55	416,43	-35,49	451,93	179,08	-34,27	213,35
Educational services	15,02	-0,76	15,78	22,42	-14,16	36,57	-42,39	-9,50	-32,88
Public administration	455,49	-4,08	459,57	-1.775,69	-31,26	-1.744,43	943,22	-12,64	955,86
Agriculture	3,00	1,02	1,99	-59,38	226,42	-285,80	193,47	169,31	24,16
Others/ignored	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	**834,93**	**-76,42**	**911,35**	**-2.110,48**	**-2.516,61**	**406,13**	**-342,92**	**806,67**	**-1.149,59**

Table A.3: Shift-share analysis of formal employment – Economic sectors – FMA's municipalities (except Fortaleza) – 2000-2005

(Continued)

Economic Sectors	Pacajus			Pacatuba			Sao Goncalo do Amarante		
	NC	MC	SC	NC	MC	SC	NC	MC	SC
Mineral extraction	0,00	0,00	0,00	0,34	-1,32	1,66	0,00	0,00	0,00
Non-metallic minerals	-167,06	-41,83	-125,24	25,74	-11,54	37,28	-29,19	-21,92	-7,27
Metallurgical industry	3,34	0,10	3,24	5,26	0,19	5,07	-2,66	0,10	-2,76
Mechanical industry	-14,65	-1,73	-12,92	29,67	-0,16	29,83	0,00	0,00	0,00
Electronics and communications equipment	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Transportation materials	7,51	2,04	5,47	0,00	0,00	0,00	0,00	0,00	0,00
Wood and furniture	9,76	-1,70	11,46	24,03	-4,18	28,22	11,37	-3,36	14,72
Paper and printing	-45,63	4,05	-49,68	0,00	0,00	0,00	147,21	2,23	144,98
Rubber, tobacco and leather	18,03	2,47	15,55	0,00	0,00	0,00	0,00	0,00	0,00
Chemical industry	-80,16	16,47	-96,63	85,02	1,58	83,44	0,00	0,00	0,00
Textile industry	321,24	-253,70	574,93	213,53	-337,10	550,63	0,00	0,00	0,00
Footware industry	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foods and beverages	81,84	-48,42	130,27	-107,61	-37,39	-70,22	46,42	-8,37	54,79
Public utility services	0,00	0,00	0,00	1,35	-2,07	3,41	2,67	-0,26	2,93
Civil construction	-17,62	-7,10	-10,52	10,34	-1,54	11,89	-156,02	-52,20	-103,81
Retail commerce	213,75	26,82	186,92	97,17	10,92	86,25	-4,49	11,53	-16,02
Wholesale commerce	302,38	-0,43	302,80	2,25	-0,03	2,28	0,67	-0,02	0,69
Financial institutions	-13,60	-4,07	-9,54	0,02	-1,05	1,06	-1,65	-0,93	-0,72
Real estate and technical services	8,68	1,90	6,78	-23,86	20,35	-44,21	19,03	4,07	14,96
Transportation and communications	-9,91	-7,42	-2,49	-10,98	-1,39	-9,59	218,01	-0,46	218,47
Lodging, catering and maintenance services	-51,49	9,38	-60,87	-9,16	9,28	-18,44	36,11	5,93	30,19
Medical, odontological and veterenary services	-12,30	-2,46	-9,84	222,31	-29,00	251,32	-1,33	-0,15	-1,18
Educational services	373,11	-3,83	376,94	-91,35	-10,84	-80,51	-10,94	-2,10	-8,83
Public administration	-37,85	-7,37	-30,47	633,39	-6,89	640,28	166,04	-8,44	174,48
Agriculture	104,29	104,03	0,26	-74,45	78,87	-153,32	178,05	18,36	159,69
Others/ignored	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Total	**993,66**	**-212,78**	**1.206,44**	**1.033,02**	**-323,30**	**1.356,32**	**619,28**	**-56,00**	**675,29**

Source of the data: RAIS/MTE.