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The effects of business demography on regional
employment and output growth**

by

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**A Business-Demographics Adjusted Shift-Share Analysis:
the effects of business demography on regional employment and output growth**

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Abstract: this paper proposes a business-demographics adjusted shift-share analysis. This can be used when data availability does not allow direct association of employment changes to business demographics at the regional level. The method may be also used as an exploratory step before any explanatory econometric work is undertaken as a means of identifying classes of potential control variables. Applying the method to Greek data suggests that firm-size heterogeneity should not be ignored, that local conditions matter more than regional economic structure and that the latter are not symmetrical across sectors when it comes to the effects of business demographics on regional employment or output growth.

1. Introduction

The aim of this paper is to make a methodological proposition that helps one draw conclusions on the effects of business demographics on regional employment and/or output growth in cases where the available data do not directly associate employment (output) with firm births, deaths and incumbents' expansion or contraction. The basic underlying motivation for this has been a result discussed by Hamermesh (1993). In particular, the author (*ibid.* p. 155), by 'averaging' over a number of studies in different country contexts (studies from U.S.A, Canada, Indonesia, Belgium, Italy, the regions of Lower Saxony in Germany and the state of Pennsylvania in U.S. and some OECD country evidence), derives that employment change (ΔE) is primarily attributed to the growth of existing plants (G) and the contraction of existing plants (C), and less so to firm births (B) and deaths (D). In particular the 'average' relationship established by Hamermesh (1993, p. 155) was:

$$\Delta E \equiv B + G - D - C$$

$$1 \equiv 3.5 + 6.0 - 3.0 - 5.5$$

Thus, the author points out that “these results suggest that...the major source of net changes in employment within an aggregate is the difference between the expansion and contraction of employment within existing plants” (ibid. p. 155). However, he further clarifies that “the data show that over a period of five to ten years changes in employment due to births or deaths of plants are as important as changes due to growth or contraction within existing plants. That is less true for markets that are observed more frequently, but even there job dynamics through entry and exit of firms are a major fraction of total changes in the number of jobs” (ibid. p. 161).

But what about when the available data do not allow a direct association between business demographics and employment (or output)?

Interest for the effect of firm births and deaths on regional employment change has been recently renewed and a new wave of studies on this subject matter has emerged (Acs and Storey, 2004). These studies using suitable data sets were able to examine the effect of longer time lags in firm births on regional employment change (Fritsch and Mueller, 2004; Van Stel and Storey, 2004). Their findings suggest that the effect of firm births on regional employment growth can be positive or negative. However, what seems to be most important is that an empirical regularity seems to be emerging in relation to the timing of the signed effects. The pattern begins with a positive initial direct effect that becomes negative (up to 4-5 year lags) as firm births lead to firm deaths (consisting of both failing entrants and exit of less efficient incumbents), and positive again as the more efficient and innovative firms surviving the market selection process have enriched the firm stock.

The paper is organized as follows. In the next section the proposed methodology is presented for both employment change and output change versions. An application to a recently released dataset from Greece is presented in the third section. Some concluding remarks are given in the final section.

2. The business-demographics adjusted shift-share analysis.

Shift-share analysis has a long history in analyzing regional employment change (Dunn 1960; Perloff et al, 1960) and continues to be used in analyzing interregional disparities in labor productivity in the EU (Esteban, 2000) and employment growth and variability in the US (Garcia-Mila and McGuire, 1993). This method is primarily an accounting device where differences between regional and national performance are attributed to industry-mix within a region and to a residual effect that is thought of as a surrogate of local conditions (differential component). An early criticism has been that the method provides little or no theory on regional growth (Stilwell, 1970). Some later efforts have attempted to tackle this criticism by providing some theoretical underpinning. Thus, Casler (1989) provides a theoretical context for shift-share analysis that is drawn on the firm cost-minimization hypothesis, the derived demand for labor and an additional restriction of unit elasticity of employment with respect to output. This follows the assumption that the elasticity of employment with respect to output is equal across regions and industries. In this model, input growth (employment growth) is derived from growth of output which in turn necessitates the use of inputs. Thus, causality runs from output demand to input demand. Graham and Spence (1998) extend Casler's model to allow for input price effects and technological growth effect on labor demand. Chalmers and Beckhelm (1976) relate shift-share analysis to industrial location theory. In particular, within this analytical framework spatial variations in input prices create a 'cost topography' that is particular to a given quantity of a given product. On the other hand, there is also a 'space-revenue topography', given factory price, that is determined by the spatial distribution of customers and their demand curves as well as the location of other suppliers of the same product. The difference of these two topographies yields a 'space-profit topography'. A positive shift in a space-profit curve induces entry of new firms and expansion of existing ones. In this sense, employment change in a region-sector combination is determined by a change in profits in the corresponding region and sector. The magnitude of its effect is adjusted by relative locational profitability. The shift-share differential component is then associated to the model just described and the resulting formulation is put to empirical testing. Theoretical support to shift-share analysis is thus provided indirectly as far as the empirical evidence provided supports that the spatial variations of the

differential component can, to a great extent, be explained by factors that are theoretically expected to affect spatial variations in profitability. It is interesting to note here that in Hammermesh's (1993) non-spatial model of labor demand that allows for the effects of firm entry, perceived post-entry profitability that conditions the decision to enter is determined by wage rates. It is through this that employment elasticity, with respect to firm entry, can be derived.

A second serious criticism of shift-share is that the effect of the industry-mix component could be seriously underestimated when compared with the differential effect. A supporting argument is that shift-share ignores linkages between industries and multiplier effects at the regional level. This implies that some industries may grow faster in one region than in another because of better links with other industries within the same region rather than inherited efficiency advantages (Mackay, 1968). This means that, to some extent, the differential component and the industry-mix effect are inseparable. Another source of intermingling of the mix and growth components is that the latter may not be independent of the specialization of regional manufacturing. Esteban (1972) disentangles the effect of specialization from the differential component by using the notion of homothetic employment - that is, the employment that sector i would have in region r if the employment structure in that region were the same as that of the nation. It is maintained that when deriving the differential component, the use of homothetic employment leaves the latter unaffected by the effect of industry mix. Thus, this manipulation results in the substitution of the conventional differential component by two new ones. The first refers to a 'purged' differential effect and the second to an 'allocation' effect. The allocation effect reflects whether or not a region is specialized in sectors of faster regional growth. Specialization is defined as the difference between the actual and homothetic employment.

An extension to the shift-share analysis that has been particularly influential to the present study is the one that adjusts the method to account for the effects of international trade on regional employment growth (Markusen et al 1991). This extension demonstrates the incorporation of national-accounting identity within the shift-share identity. The identity that concerns us here is:

$$N_{sr,t} \equiv I_{sr,t-1} + B_{sr,t} - D_{sr,t} \quad (1)$$

where N stands for number of firms, I for the number incumbents, B for number of births, D for the number of deaths, s for sector and r for region. The corresponding identity at some earlier point in time is:

$$N_{sr,t-1} \equiv I_{sr,t-2} + B_{sr,t-1} - D_{sr,t-1} \quad (2)$$

Subtracting (2) from (1) yields that: $\Delta N = \Delta I + \Delta B - \Delta D$.

Using E to denote employment, 0 to index the base year and reserving lower case letters for growth

rates, for example $e = \frac{\sum_s E_{s,t}^r - E_{s,0}^r}{\sum_s E_{s,0}^r}$, the components of the business-demographics shift-share analysis

can be derived as follows.

National Component:

$$\sum_s E_{s,0}^r e = E_0^r \underbrace{\left(i \frac{I_0}{N_0} \right)}_{\text{national_inc.}} + E_0^r \underbrace{\left(b \frac{B_0}{N_0} \right)}_{\text{national_births}} - E_0^r \underbrace{\left(d \frac{D_0}{N_0} \right)}_{\text{national_deaths}} + \underbrace{E_0^r (e - n)}_{\text{national_size adj.}} \quad (3)$$

The national component gives a hypothetical number of employees in region r if the national employment growth e is applied to the base year employment ($\sum_s E_{s,0}^r \cdot e$). This is the conventional shift-share analysis national component. This can be further decomposed to subcomponents that account for the effect of national level growth rates in the number of incumbent (i) firms, national birth growth rate of firms (b) and national death growth rate (d). These growth rates can be positive or negative. What is important in applying these growth rates is that it is implied that changes stemming from business demographics take place at the average firm size in employment terms. This may be a completely inaccurate description of reality. For this reason a fourth term is added to account for differences in the growth rates in employment and number of firms (stock) i.e. $(e - n)$. If this term is

positive, the average firm size in the economy has been increased. In contrast, if this term is negative some downsizing has taken place over the study period.

As an internal consistency check of the above formulation, it holds that $n = i \frac{I_0}{N_0} + b \frac{B_0}{N_0} - d \frac{D_0}{N_0}$.

Industry-Mix:

$$\begin{aligned} \sum_s E_{s0}^r (e_s - e) &= \underbrace{\sum_s E_{s0}^r \left(i_s \frac{I_{s0}}{N_{s0}} - i \frac{I_0}{N_0} \right)}_{\text{industry mix_inc.}} + \underbrace{\sum_s E_{s0}^r \left(b_s \frac{B_{s0}}{N_{s0}} - b \frac{B_0}{N_0} \right)}_{\text{industry mix_births}} - \\ &\quad - \underbrace{\sum_s E_{s0}^r \left(d_s \frac{D_{s0}}{N_{s0}} - d \frac{D_0}{N_0} \right)}_{\text{industry mix_deaths}} + \underbrace{\sum_s E_{s0}^r ((e_s - e) - (n_s - n))}_{\text{industry mix_size adj.}} \end{aligned} \quad (4)$$

It holds that $n_s = i_s \frac{I_{s0}}{N_{s0}} + b_s \frac{B_{s0}}{N_{s0}} - d_s \frac{D_{s0}}{N_{s0}}$.

The conventional shift-share analysis industry-mix component takes into account that at the national level different industries experience employment growth rates that differ from that of the national average. That is $(e_s - e)$. These differences are then applied on base year employment of each corresponding region-sector combination and the result is summed over sectors to yield the regional industry-mix component of the conventional method: $\sum_s E_{s0}^r (e_s - e)$.

Sectors, however, also differ from the corresponding national figure in terms of growth rates of incumbent firm numbers, firm-birth growth rates and firm-death growth rates. These differences are then applied to base year employment in the corresponding region-sector combinations and summed over regions to derive *incumbent*, *births* and *deaths* subcomponents of industry-mix. Again, the effects of business demography are assumed to take place at an average firm size level, i.e. whatever changes in each subcomponent tends to preserve the average firm size in employment firms at both the sectoral and nationwide levels. This unrealistic assumption is rectified by taking into account average firm-size shifts at the sectoral and national levels: $((e_s - e) - (n_s - n))$. This results in the addition of a fourth

subcomponent that corrects for possible changes in the average firm-size by making an appropriate adjustment.

Some further clarifications may be in order to help determine the sign of subcomponents. Take, for example, the birth subcomponent of the industry mix. This can be written as:

$$\sum_s E_{s0}^r \left(b_s \frac{B_{s0}}{N_{s0}} - b \frac{B_0}{N_0} \right) = \sum_s E_{s0}^r \left(\left(\frac{B_{st} - B_{s0}}{N_{s0}} \right) - \left(\frac{B_t - B_0}{N_0} \right) \right) \quad (5)$$

From the right hand side (RHS) of (5) it can be seen that the sign depends on the sign as well as the magnitude of both the sectoral and national change of births over the period as a share of the base year stock of firms. This subcomponent can thus assume both signs.

As far as the sign of industry-mix firm-deaths subcomponent is concerned, the latter may be written as:

$$-\sum_s E_{s0}^r \left(d_s \frac{D_{s0}}{N_{s0}} - d \frac{D_0}{N_0} \right) = -\sum_s E_{s0}^r \left(\left(\frac{D_{st} - D_{s0}}{N_{s0}} \right) - \left(\frac{D_t - D_0}{N_0} \right) \right) \quad (6)$$

It holds that $n_s^r = i_s^r \frac{I_{s0}^r}{N_{s0}^r} + b_s^r \frac{B_{s0}^r}{N_{s0}^r} - d_s^r \frac{D_{s0}^r}{N_{s0}^r}$.

Again it can be seen from the RHS of (6) that this can assume both signs insofar as this depends on the sign but also the relative magnitude of the factors involved.

Thus a region can have a positive industry-mix deaths subcomponent if, for example,

$$\sum_s E_{s0}^r \left(\left(\frac{D_{st} - D_{s0}}{N_{s0}} \right) < \sum_s E_{s0}^r \left(\frac{D_t - D_0}{N_0} \right) \right) \text{ and } \frac{D_{st} - D_{s0}}{N_{s0}} > 0, \frac{D_t - D_0}{N_0} > 0.$$

Similar reasoning applies to the sign of the size-adjustment industry-mix subcomponent (which can also assume both signs).

If the available data lack a regional dimension on changes (over a period) in the number of firm births, deaths and incumbent firms, then the analysis can stop here and derive the differential component as a

residual effect without its further decomposition. Alternatively, one can just calculate the conventional shift-share differential component: $\sum_s E_{s0}^r (e_s^r - e_s)$.

However, if the data availability permits it, the differential component can be further decomposed.

Differential component (local conditions):

$$\begin{aligned} \sum_s E_{s0}^r (e_s^r - e_s) = & \underbrace{\sum_s E_{s0}^r \left(i_s^r \frac{I_{s0}^r}{N_{s0}^r} - i_s \frac{I_{s0}}{N_{s0}} \right)}_{\text{differential_inc.}} + \underbrace{\sum_s E_{s0}^r \left(b_s^r \frac{B_{s0}^r}{N_{s0}^r} - b_s \frac{B_{s0}}{N_{s0}} \right)}_{\text{differential_births}} - \\ & - \underbrace{\sum_s E_{s0}^r \left(d_s^r \frac{D_{s0}^r}{N_{s0}^r} - d_s \frac{D_{s0}}{N_{s0}} \right)}_{\text{differential_deaths}} + \underbrace{\sum_s E_{s0}^r \left((e_s^r - e_s) - (n_s^r - n_s) \right)}_{\text{differential_size adj.}} \end{aligned} \quad (7)$$

This decomposition takes into account that a sector can behave differently in a region when compared to its national average behavior in all aspects of interest. Thus, what is usually termed as the local conditions effect can be further related to ‘conditions’ pertaining to each of the business demographics factor, i.e. stocks, births and deaths. As the effect of business demographics is assumed to take place in manner that would leave the average firm size in a region-sector combination unchanged, an additional factor that accounts for firm size shifts in every region-sector combination is included. This size adjustment, however, cannot relate exclusively to incumbents, entering or exiting firms. As in the previous cases, the subcomponents of the differential component can assume either sign. It can be easily proved that the subcomponents of each shift-share component sum up to the corresponding component of the conventional shift-share method and the latter sum up to the actual employment change at the regional level.

An output change version can also be available. The only notational changes required are that instead of E , Q is now used for output and q for output growth rate. The basic formulae for the output change version of the business-demographics adjusted shift-share analysis are presented below.

National Component (output version):

$$\sum_s Q_{s0}^r q = \underbrace{Q_0^r \left(i \frac{I_0}{N_0} \right)}_{\text{national_inc.}} + \underbrace{Q_0^r \left(b \frac{B_0}{N_0} \right)}_{\text{national_births}} - \underbrace{Q_0^r \left(d \frac{D_0}{N_0} \right)}_{\text{national_deaths}} + \underbrace{Q_0^r (q - n)}_{\text{national_productivity. adj.}} \quad (8)$$

Industry-Mix (output version):

$$\begin{aligned} \sum_s Q_{s0}^r (q_s - q) = & \underbrace{\sum_s Q_{s0}^r \left(i_s \frac{I_{s0}}{N_{s0}} - i \frac{I_0}{N_0} \right)}_{\text{industry mix_inc.}} + \underbrace{\sum_s Q_{s0}^r \left(b_s \frac{B_{s0}}{N_{s0}} - b \frac{B_0}{N_0} \right)}_{\text{industry mix_births}} - \\ & - \underbrace{\sum_s Q_{s0}^r \left(d_s \frac{D_{s0}}{N_{s0}} - d \frac{D_0}{N_0} \right)}_{\text{industry mix_deaths}} + \underbrace{\sum_s Q_{s0}^r \left((q_s - q) - (n_s - n) \right)}_{\text{industry mix_productivity adj.}} \end{aligned} \quad (9)$$

Differential component (output version):

$$\begin{aligned} \sum_s Q_{s0}^r (q_s^r - q_s) = & \underbrace{\sum_s Q_{s0}^r \left(i_s^r \frac{I_{s0}^r}{N_{s0}^r} - i_s \frac{I_{s0}}{N_{s0}} \right)}_{\text{differential_inc.}} + \underbrace{\sum_s Q_{s0}^r \left(b_s^r \frac{B_{s0}^r}{N_{s0}^r} - b_s \frac{B_{s0}}{N_{s0}} \right)}_{\text{differential_births}} - \\ & - \underbrace{\sum_s Q_{s0}^r \left(d_s^r \frac{D_{s0}^r}{N_{s0}^r} - d_s \frac{D_{s0}}{N_{s0}} \right)}_{\text{differential_deaths}} + \underbrace{\sum_s Q_{s0}^r \left((q_s^r - q_s) - (n_s^r - n_s) \right)}_{\text{differential_productivity adj.}} \end{aligned} \quad (10)$$

In this version of the proposed method changes in output due to business demographics are such as the output per firm is preserved. Thereby, the necessary adjustments needed to remedy this unrealistic assumption take into account the output growth firm-stock growth differentials at the appropriate level each time (national, sectoral, sectoral-regional). These adjustments may be broadly termed as ‘productivity’ adjustments.

3. Results.

Recently data on firm stocks, births and deaths were provided based on the “TAXIS” system of the Greek Tax Service for each 2-digit NACE sector and each of the thirteen NUTS II Greek regions.¹ Firm births and deaths are proxied by firm registrations and deregistrations for tax purposes². In this section TAXIS data are used along with employment and gross value added data for manufacturing branches provided by the National Statistical Service of Greece for the period 1997-2000. Both the employment and output versions of the business-demographic shift-share method are used.

The results of applying the proposed methodology for analyzing regional manufacturing-employment growth in Greece over the period 1997-2000 are presented in Table 1. Each row of Table 1 sums to actual employment change of the corresponding region. It should be noted that within each component

¹ I am grateful to Professor Helen Louri for providing me with this data set.

² No turnover threshold applies for registrations

of the shift-share analysis (national component, industry-mix, and differential component) the particular subcomponent that relates to firm deaths (D) has been already pre-multiplied by minus one.

TABLE 1

The subcomponents of the national components take the sign of the corresponding changes at the national level. These are summarized as “facts” below Table 1 and help in the interpretation of the results obtained. Note that over the period analyzed the death rate grew at a negative rate, hence its effect on regional employment change (as it is captured by the corresponding subcomponent of the national-component) is positive everywhere. It is also interesting to point out that within the industry-mix the subcomponent that relates to the growth rate in the number of incumbent firm is sizeable when compared to births (B) and deaths (D) subcomponents and it is negative everywhere. Thus, it appears that there is no industry-mix averaging in employment gains attributable to the incumbent firm population increases. This result may be contrasted with that of the size-adjustment that is positive everywhere and of comparable size. Although this implied increase in average firm size (in employment terms) cannot be solely attributed to incumbent firms, this perfect inverse symmetry in signs seems to suggest that increasing average firm size may be primarily attributed to incumbent firms.

Moreover, within the industry-mix component (but also within the national component) the sum of the absolute values of births and deaths subcomponents is much smaller than the sum of the absolute values of incumbent and size adjustment subcomponents. This may suggest that firms are far from homogeneous in respect to size and that employment turnover in regional economies takes place primarily within the incumbent firms, when the effect of regional structure on employment growth is concerned. This latter result accords with that of Hamermesh (1993) that has largely motivated this research.

When it comes to the differential subcomponent, the main conclusions drawn from the industry-mix still hold. That is, employment change is attributable to changes taking place within the incumbent firm population and that firms should not be treated as a homogeneous (in terms of size) population.

However, what seems to be far more interesting is that there are considerable discrepancies in the signs between the corresponding subcomponents of industry-mix and differential component (local conditions). This may suggest that the effects of local conditions are not symmetrical across sectors. To this result one should add the striking observation that when treated in pairs, each subcomponent of the differential component is, in most cases, much larger in absolute value than its corresponding one within the industry-mix component.

Thus, local conditions appear to be more important than structure when accounting for regional employment change within an extended for business demographics shift-share analysis framework.

In Table 2 the results of applying the output-change version of the method are presented. The basic results of the employment change analysis are repeated here.

TABLE 2

Here, the sum of births and deaths subcomponents (in absolute value terms) is smaller than the sum of incumbents and “productivity” adjustments in both the industry-mix and differential components. The magnitude of the productivity subcomponent of the industry mix is highly comparable with the corresponding incumbent-firms subcomponent but has the opposite sign. Again the subcomponents of the differential subcomponent are larger (in absolute value terms) than their corresponding industry-mix ones.

4. Concluding Remarks

A business-demographics adjusted shift-share analysis has been suggested in the present research as an alternative where available data cannot directly associate employment changes with business demographics across regions. The proposed methodology is quite simple to apply; it produces results for each spatial unit used in the analysis, and finds itself within a long regional science tradition. However, it also shares the limitations of the traditional shift-share analysis in that it is not explanatory (in an econometric model sense) but rather an “accounting” device. Future research may translate the business-demographics adjusted shift-share analysis to a 2-way analysis of variance or covariance model

(Weeden, 1974) or to an econometric—analogue of shift-share—analysis along the lines suggested by Patterson (1991).

Seen within these limitations, the basic results obtained here suggest that the absolute-value magnitude of the size adjustment in all cases is such that heterogeneity of firms should not be ignored. The differential component dominates over that of the industry-mix. This occurs in both total-terms as well as in by-parts (subcomponents) terms. Thus, local conditions appear to be more important than structure. This finding is particularly important as it justifies the use of the proposed method as an exploratory step taken before ‘explanatory’ econometric work in order to identify classes of potential explanatory variables. For example the results presented here suggest that explanatory variables used in econometric models aspiring to explain regional variations of employment (or output) growth should control for differences in ‘local conditions’. Discrepancies between the signs of corresponding coefficients between industry-mix and differential effect subcomponents have also been found. This seems to suggest that the effects of local conditions are not symmetrical across sectors.

The possibility of interaction between economic structure and local conditions has not been addressed here, but neither has this been addressed in any econometric-model aiming to address the effect of business demographics on regional employment or output growth. If present, such interaction effects would tend to underestimate the calculated mix-effect and overestimate the effect local conditions (differential component). Future research may also address this source of potential bias within the present research context.

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Table 1. Regional Manufacturing-Employment Change 1997-2000: a business demographics shift-share analysis

NUTSII	Actual change	<i>National Component</i>				<i>Industry Mix</i>				<i>Differential Component</i>			
		<i>I</i>	<i>B</i>	<i>D</i>	<i>Size Adj.</i>	<i>I</i>	<i>B</i>	<i>D</i>	<i>Size Adj.</i>	<i>I</i>	<i>B</i>	<i>D</i>	<i>Size Adj.</i>
East Macedonia and Thrace	1434	-1310	24	104	1007	-784	-32	25	642	3549	-311	-17	-1462
Central Macedonia	-6668	-6541	120	518	5026	-3464	-128	85	3670	14516	-667	348	-20152
West Macedonia	-2479	-737	14	58	566	-406	-31	26	71	-1295	-74	47	-718
Thessaly	1524	-1356	25	107	1042	-724	-16	14	638	-10083	-127	917	11086
Ipiros	1424	-444	8	35	341	-45	-6	-3	250	-1540	-59	35	2852
Ionian Islands	-1111	-265	5	21	204	-76	0	-4	294	-1429	-51	84	107
Western Greece	-205	-1087	20	86	835	-655	-17	14	683	-1340	413	-98	942
Central Greece	-4694	-1170	22	93	899	-242	3	-13	594	4554	336	31	-9801
Peloponnesus	-2468	-666	12	53	511	-170	6	-16	791	561	231	95	-3878
Attiki (Athens)	7327	-12234	225	969	9401	-7824	-137	142	6522	39079	7026	-10982	-24859
North Aegean Islands	396	-203	4	16	156	-100	2	-2	162	-136	25	-11	509
South Aegean Islands	899	-325	6	26	250	-220	0	0	254	-211	-7	-13	1140
Crete	1001	-675	12	53	519	-366	18	-13	589	-249	-50	29	1134

Facts: $e = -0.0060$, $n = -0.0402$, $i = -0.0448$, $b = 0.0169$, $d = -0.0824$

Table 2 .Regional Manufacturing-Output Change 1997-2000: a business demographics shift-share analysis (m. € in 1995 prices)

NUTSII	Actual change	<i>National Component</i>				<i>Industry Mix</i>				<i>Differential Component</i>			
		<i>I</i>	<i>B</i>	<i>D</i>	<i>Prod. Adj.</i>	<i>I</i>	<i>B</i>	<i>D</i>	<i>Prod. Adj.</i>	<i>I</i>	<i>B</i>	<i>D</i>	<i>Prod. Adj.</i>
East Macedonia and Thrace	116.00	-17.82	0.33	1.41	48.87	-8.38	-0.09	0.03	8.44	54.78	-5.10	-1.04	34.60
Central Macedonia	-88.00	-95.84	1.76	7.59	262.80	-44.93	-0.50	0.17	45.22	281.20	-7.69	-0.47	-537.30
West Macedonia	25.00	-11.72	0.22	0.93	32.13	-5.45	-0.06	0.02	5.52	-13.08	-0.64	0.94	16.20
Thessaly	5.00	-29.67	0.55	2.35	81.37	-13.91	-0.16	0.05	14.05	-216.78	-2.07	18.49	150.70
Ipiros	45.00	-6.42	0.12	0.51	17.59	-3.07	-0.04	0.01	3.12	-23.63	-0.70	0.93	56.60
Ionian Islands	-11.00	-1.65	0.03	0.13	4.52	-0.80	-0.01	0.00	0.83	-7.93	-0.04	0.64	-6.70
Western Greece	-17.00	-20.76	0.38	1.64	56.93	-9.74	-0.11	0.04	9.82	-29.01	6.68	-1.09	-31.80
Central Greece	-323.00	-92.58	1.70	7.33	253.88	-43.60	-0.49	0.17	43.99	468.35	41.95	-0.56	-1003.10
Peloponnesus	300.00	-27.53	0.51	2.18	75.51	-12.86	-0.14	0.04	12.94	72.11	21.72	4.48	151.00
Attiki (Athens)	804.00	-162.40	2.98	12.86	445.33	-76.27	-0.84	0.28	76.82	922.36	85.44	-134.06	-368.50
North Aegean Islands	1.00	-1.56	0.03	0.12	4.28	-0.75	-0.01	0.00	0.71	0.22	0.41	-0.04	-2.10
South Aegean Islands	4.00	-3.92	0.07	0.31	10.75	-1.78	-0.02	0.00	1.73	-1.79	-0.10	-0.32	-0.90
Crete	20.00	-7.00	0.13	0.55	19.18	-3.21	-0.03	0.01	3.21	-5.23	-0.15	0.64	11.90

Facts: $q = 0.0820$, $n = -0.0402$, $i = -0.0448$, $b = 0.0169$, $d = -0.0824$