

# **New Application of RAS Structural Decomposition Approach in the Regional Economies of China, 2002-2007**

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**Abstract:** The RAS structural decomposition approach is used to analyze the effects of technological change, which may be split up into its components: average substitution, average intermediate input intensity and cell-specific effects. However, it has never been implemented in examining the roles that different kinds of technological effects play at regional level. On the basis of the decomposition of gross output which is just chosen as a means to the end of the analysis of results, new application of RAS method addressed in this paper focuses on analyzing the influence that each kind of technological effects exert between regions, in order to investigate their relationship and find out the main underlying force for technological effects over time and across regions. The empirical realization is provided by reference to a series of regional input-output tables for a 30-region division of the Chinese economy (2002-2007). For every two regions, the RAS decomposition is applied in both directions in which we can get the percentages that every kind of technological effects account for the difference in gross outputs between regions. Empirical study of technological effects concentrates on three aspects: frequency distribution, areal distribution and changes over time. By applying the RAS decomposition to regional input-output tables of China, this paper aims to find out some rules, draw some valuable conclusions, and provide a foundation for exploring economic explanations.

**Keywords:** technological change; RAS method; regional input-output tables

## **1. Introduction**

Technological development is widely considered to be significant driving force of economic growth and has been subject to numerous studies. The input-output framework is a useful tool in this respect, for it coherently integrates information on the production technologies of the sectors. For the past years, there has been a vast body of literature dealing with the question how to measure technological change, among which the structural decomposition approach (Feldman *et al.*, 1987; Blair & Wyckoff, 1989; Afrasiabi & Casler, 1991; Miller & Shao, 1994; Wolff, 1994) has already had a long tradition. This method decomposes *e.g.* output or value added changes into a number of key determinants, one of which is technological change, as reflected by changes in the input-output structure of the economy. Typically, however,

this determinant is not decomposed further. In addition, earlier attempts to quantify the effects of the technological change answer hypothetical questions of the “what-if” type (West, 1982; Hewings *et al.*, 1989; Sonis & Hewings, 1992). That is, imposing specific changes in the matrix of input coefficients, the effects (upon *e.g.* output or value added), are examined under the assumption that all other things remain the same. In this way it is possible to single out (sets of) coefficients that are important, in the sense that a change induces large effects. Although such analyses provide important insight into the current production structure and the potential effects of technological change, they cannot be used to describe the sources of the changes as they have taken place.

The RAS structural decomposition approach (proposed by Van der Linden & Dietzenbacher, 2000) is also one of such techniques to analyze the effects of technological change, in which the change can be split up into its components: average substitution, average intermediate input intensity and cell-specific effects. The method as a describing tool aims at quantifying the underlying sources of technological change and measuring what actually has happened. What’s more, it allows for an economically meaningful interpretation.

By far, the RAS structural decomposition approach has been mainly applied to the time-series analysis of input-output tables. In Van der Linden & Dietzenbacher (2000), the method was applied to EU economy to study technological change by using input-output tables of European Union member states, as issued every five years between 1965 and 1985. Then based on constant price European interregional tables for 1975 and 1985, Dietzenbacher & Hoekstra (2002) used the method to analyze the effects of technological change and trade on the sectoral outputs in the Netherlands, and found that the technological effects played an important role in explaining the output increases when viewing the results at sectoral level.

Compared with time-series analysis, cross-section analysis of input-output tables is also of great importance. At present, regional economy has been a hot topic, which receives significant attention. Thus study on the role that technological effects play at regional level is of great importance in the integral coordinative development, which is helpful to explain regional economic disparity, identify and solve problems timely and effectively. However, it has been neglected. So by using a series of regional input-output tables for a 30-region division of the Chinese economy (2002-2007), new application of RAS method addressed in this paper focuses on analyzing the influence that each kind of technological effects exert between regions, in order to investigate their relationship and find out the main underlying force for technological effects over time and across regions. The paper is organized as follows. Section 2 introduces the RAS structural decomposition approach, while in Section 3 the decomposition of the

outputs which is just chosen as a means to the end of the analysis of empirical results is given a brief illustration. The method has been applied to Chinese regional economy, on the basis of which the percentages that each kind of technological effects occupy are calculated between regions respectively in 2002 and 2007. In addition, combining regional input-output tables of 2002 with those of 2007, attention is also put on further analysis of the change in size and areal distribution of technological effects between regions over time. Section 4 presents the empirical results. Section 5 contains summary and conclusions.

## 2. The RAS Structural Decomposition Approach

We follow the approach developed in Van der Linden and Dietzenbacher (2000). Given that the paper concentrates on the decomposition of technological effects at regional level, here the method is illustrated from the point view of cross-section analysis. Difference in the input coefficients between regions are decomposed into column-specific difference indicating the difference in a sector's intermediate intensity, row-specific difference reflecting the average substitution of intermediate inputs between sectors, and cell-specific difference (caused by other circumstances, i.e. the difference that is not explained by the row and column difference).

Let us introduce the following notation: define  $Z_m$  as the matrix of intermediate deliveries,  $A_m$  as the direct input coefficients matrix,  $x_m$  as the vector of sectoral outputs, where the subscript denotes region  $m$ . Now the decomposition of technological difference from region  $m$  to region  $n$  is taken as an example to illustrate the method.

Column-specific difference implies that the entire column in  $A_m$  for sector  $j$  is multiplied by  $s_j$ . The intermediate input intensity effect reflects that more output is produced per unit of primary inputs. It is thus assumed that structural difference of this type leave the mix of intermediate inputs constant, that is to say, compared with region  $m$ , a unit of output in region  $n$  is produced using the same percentage less or more of each intermediate input. It is clear that many different forms of structural difference do exist simultaneously within a single sector  $j$ . Hence, the multipliers  $s_j$  should be viewed as reflecting average column-specific effects.

Owing to row-specific difference, the entire row  $i$  in  $A_m$  is multiplied by  $r_i$ , which means that compared with region  $m$ , each sector in region  $n$  uses the same percentage less or more of intermediate input  $i$ . Again, the effects described by the multipliers  $r_i$  are average substitution effects and it is not to be expected that all types of substitution follow such a simple pattern.

Since the difference in the intermediate input intensities and the average

substitution effects exist simultaneously, the relationship between  $A_m$  and  $A_n$  can be expressed as follows.

$$a_{ij}^n = r_i a_{ij}^m s_j \quad \text{or} \quad A_n = \hat{r} A_m \hat{s} \quad (1)$$

where  $\hat{r}$  and  $\hat{s}$  are the diagonal matrices with the multipliers  $r_i$  and  $s_j$  respectively.

As mentioned before, it may not be expected that the column-specific and the row-specific difference alone are able to provide a full description of all the difference that exists. In other words,  $A_n$  will differ from  $A_m$ , which is due to the cell-specific difference that can't be captured by column-specific and row-specific difference alone. Therefore the cell-specific difference is defined as

$$\varepsilon_{ij} = a_{ij}^n - a_{ij}^m \quad \text{or} \quad \varepsilon = A_n - A_m \quad (2)$$

Now we have to find the multipliers  $r_i$  and  $s_j$ . Since both the column-specific and the row-specific difference are average effects, they should correctly reflect the average difference as they have occurred in each row and column. That is, they should satisfy the condition that the matrix of intermediate deliveries corresponding to  $A_n$  has the correct column and row sums. Let  $e$  denote the  $n$ -element summation vector, i.e.  $e' = (1, \dots, 1)$  where vectors are column vectors by definition and a prime is used to indicate transposition. The correct row sums are given by  $Z_n e = A_n x_n \equiv u_n$  and the correct column sums by  $e' Z_n = e' A_n x_n \equiv v_n'$ . The requirements fulfilled by the multipliers  $r_i$  and  $s_j$  are then as follows.

$$A_n x_n = u_n \quad \text{and} \quad e' A_n x_n = v_n' \quad (3)$$

The process of finding the multipliers  $r_i$  and  $s_j$  under the restrictions in (3) may be solved iteratively by the well-known RAS method. RAS was used to update direct input coefficients matrices under the precondition of known row and column totals as developed in Stone (1961). For an elaborate introduction to the RAS method we refer to Miller and Blair (1985), while more technical aspects are dealt with in Bacharach (1970) and MacGill (1977). Once the cell-specific difference is taken into account, the results then indicate how much of the actual difference that exists can be explained from (column-specific) difference in intermediate intensities, (row-specific) average substitution effects, and cell-specific effects.

Finally, it should be noted that the non-uniqueness of the outcomes  $r_i$  and  $s_j$ . That is, when multipliers  $r_i$  and  $s_j$  satisfy (3), also the multipliers  $\lambda r_i$  and  $\lambda^{-1} s_j$  do, for any arbitrary value  $\lambda$ . To overcome this problem one more restriction is added to ensure that the sum of all average substitution effects  $r_i$  is zero. In other words, the total intermediate use should be the same as in the case in which no substitution would have occurred, which is economically plausible. This yields

$$\frac{r' A_m \hat{s} x_n}{e' A_m \hat{s} x_n} = 1 \quad \text{or} \quad \frac{e' u_n}{e' \hat{r}^{-1} u_n} = 1 \quad (4)$$

From (2) we may now write  $\Delta A = A_n - A_m = \hat{r}A_m\hat{s} - A_m + \varepsilon$ . Note that  $A_m$  may be written as  $\hat{r}_0A_m\hat{s}_0$  with  $\hat{r}_0 = \hat{s}_0 = I$ . This yields

$$\Delta A = (\hat{r} - I)A_mI + \hat{r}A_m(\hat{s} - I) + \varepsilon \quad (5)$$

$$\Delta A = (\hat{r} - I)A_m\hat{s} + IA_m(\hat{s} - I) + \varepsilon \quad (6)$$

Taking average of the above so-called polar forms, we can now decompose  $\Delta A$  as follows.

$$\Delta A = \frac{1}{2}(\hat{r} - I)A_m(\hat{s} + I) + \frac{1}{2}(\hat{r} + I)A_m(\hat{s} - I) + \varepsilon \quad (7)$$

(see e.g. Van der Linden & Dietzenbacher, 2000, for a detailed introduction to the RAS structural decomposition approach.)

### 3. Applying the RAS Technique into the Decomposition of Outputs

As is mentioned before, the decomposition of the outputs is just chosen as a means to the end of the analysis of empirical results, so only a simple illustration will be presented here.

The standard Leontief model is given by  $x = Ax + f$ , where  $f$  denotes the vector of final demands,  $x$  and  $A$  have been described before. The solution for the Leontief model is given by  $x = (I - A)^{-1}f = Lf$ , where  $L \equiv (I - A)^{-1}$  denotes Leontief inverse. For the decomposition of the difference in the outputs between regions, several equivalent forms may be used. Now we continue to take the decomposition of difference in outputs from region  $m$  to region  $n$  as an example.

$$\Delta x = (\Delta L)f_n + L_m(\Delta f) \quad (8)$$

$$\Delta x = (\Delta L)f_m + L_n(\Delta f) \quad (9)$$

Taking average of the above so-called polar forms, we get

$$\Delta x = \frac{1}{2}(\Delta L)(f_m + f_n) + \frac{1}{2}(L_m + L_n)(\Delta f) \quad (10)$$

Note that  $\Delta L = L_m(\Delta A)L_n = L_n(\Delta A)L_m$  and thus

$$\Delta L = \frac{1}{2}L_m(\Delta A)L_n + \frac{1}{2}L_n(\Delta A)L_m \quad (11)$$

Substituting (7) into (11), and substituting the resulting expression for  $\Delta L$  into (10) implies that its term  $\frac{1}{2}(\Delta L)(f_m + f_n)$  can be decomposed into the following three terms.

$$\frac{1}{8}[L_m(\hat{r} - I)A_m(\hat{s} + I)L_n + L_n(\hat{r} - I)A_m(\hat{s} + I)L_m](f_m + f_n) \quad (12)$$

$$\frac{1}{8}[L_m(\hat{r} + I)A_m(\hat{s} - I)L_n + L_n(\hat{r} + I)A_m(\hat{s} - I)L_m](f_m + f_n) \quad (13)$$

$$\frac{1}{4}[L_m\varepsilon L_n + L_n\varepsilon L_m](f_m + f_n) \quad (14)$$

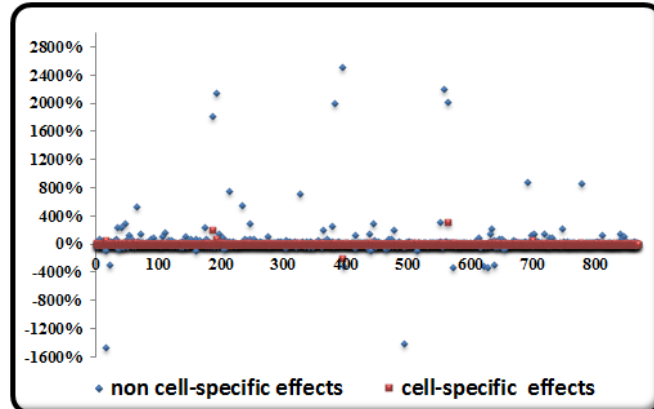
Equation (12) denotes the difference in the outputs between regions owing to the average substitution effects (i.e. row-specific effects). Equation (13) gives the consequences of the average intermediate input intensity effects (i.e. column-specific effects), and equation (14) describes the difference due to cell-specific effects.

#### 4. The Empirical Results of the Technological Effects for Chinese Regional Economy

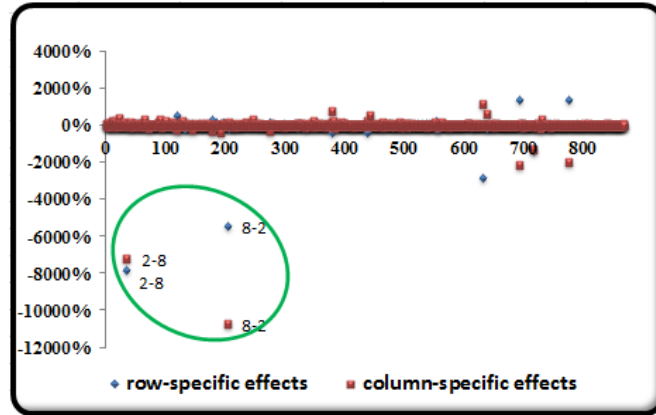
For our empirical analysis, we have measured the technological effects by reference to a series of regional input-output tables for a 30-region division of the Chinese economy. The original tables were published in a version recording 42 sectors with constant prices, for the years 2002 and 2007. These 42 sectors are given in Appendix A. From the above description of the RAS structural decomposition approach, it is apparent that the core of the method is the process of updating input-output matrices or tables. Therefore the 42-sector tables have been further aggregated to 33 sectors to ensure the feasibility of the method. The aggregation scheme from 42 to 33 sectors is also presented in Appendix A.

Now let's have an overview of the distribution of the percentages that the three kinds of technological effects account for the difference in gross outputs between regions through the following scatterplots. Figure1 gives the comparison between non cell-specific effects and cell-specific effects, which clearly shows that non cell-specific effects are undoubtedly dominating. The scatterplot of column-specific effects and row-specific effects is presented in Figure2. However, influenced by some outliers, we can't see the distribution vividly from the above two figures.

Figure1. Scatterplot of non cell-specific effects and cell-specific effects



**Figure2. Scatterplot of column-specific effects and row-specific effects**



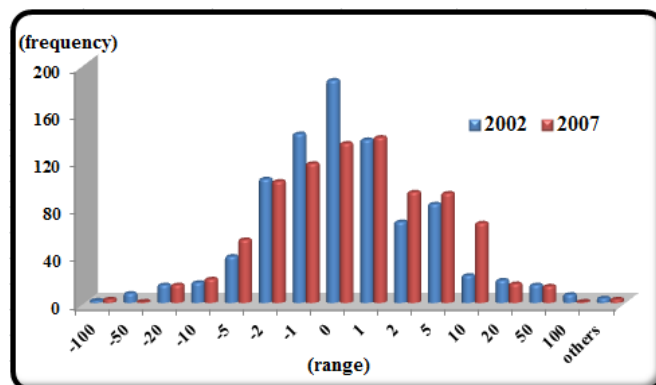
So the following analysis is divided into two parts. The first empirical application concentrates on the ratio of the column-specific and row-specific effects to study their relative size and consistency in sign. As to cell-specific effects, they are proved to be extremely small in traditional time-series analysis, which implies that the decomposition of technological effects into row-specific and column-specific effects provides a most adequate description of the actual changes. Therefore, the second part aims to test whether the above statement still holds water for cross-section analysis.

#### 4.1 Analysis of the Ratio of Column-Specific and Row-Specific Effects

Analysis of this part includes three aspects: frequency distribution, areal distribution and changes from 2002 to 2007.

Let's start from the first aspect. First of all, it should be noted again that the RAS decomposition is applied in both directions for every two regions, that is to say, each year the method is implemented for 870 ( $= A_{30}^2$ ) times in total, on the basis of which we get the percentages that every kind of technological effects account for the difference in gross outputs between regions. Figure3 and Figure4 provide a brief overview of the distribution of the ratios of column-specific and row-specific effects respectively in 2002 and 2007. At first sight, we can see that the majority of ratios are centralizedly distributed within absolute value 5 in both years. But changes do happen to the percentage within some ranges, which can be easily found in Table1.

**Figure3. Frequency distribution of the ratio of column-specific and row-specific effects**



**Table1. Comparison of percentage distribution between 2002 and 2007**

<b>Range \ Year</b>	<b>2002</b>	<b>2007</b>
(-∞,-100]	0.23%	0.34%
(-100,-50]	0.92%	0.11%
(-50,-20]	1.72%	1.72%
(-20,-10]	1.95%	2.30%
(-10,-5]	4.48%	6.09%
(-5,-2]	11.95%	11.72%
(-2,-1]	16.32%	13.45%
(-1,0]	21.49%	15.40%
(0,1]	15.75%	15.98%
(1,2]	7.82%	10.69%
(2,5]	9.54%	10.57%
(5,10]	2.64%	7.70%
(10,20]	2.18%	1.84%
(20,50]	1.72%	1.61%
(50,100]	0.80%	0.11%
(100,+∞)	0.46%	0.34%
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>

Then let's turn to the analysis of areal distribution of special ratios. Figure5 and Figure6 give the visual diagrams of areal distribution of big ratios respectively in 2002 and 2007. Here some explanations about the figures should be made. We can see that each number has two rows horizontally. The first line gives the outcomes of RAS method running from the region in the row direction to those in the column direction, while the results coming from the technique used in the opposite direction to the first line are presented in the second line. What's more, we also list some special ratios of 2002 and 2007 in Table2.

**Table2. Distribution of some big ratios in 2002 and 2007**

<b>Range \ Year</b>	<b>2002</b>	<b>2007</b>
ratio ≥ 100	region15-region20 region17-region29 region22-region28 region23-region27	region9-region30 region20-region30 region28-region14
ratio ≤ -100	region5-region23 region15-region26	region2-region15 region6-region20 region6-region28



Figure5. Areal distribution of the ratio of column-specific and row-specific effects in 2002

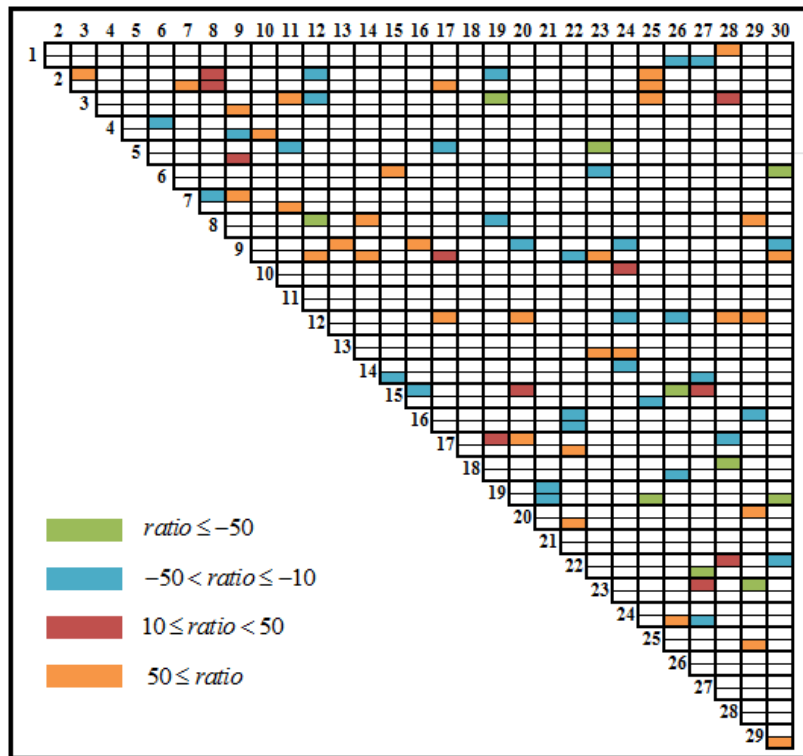
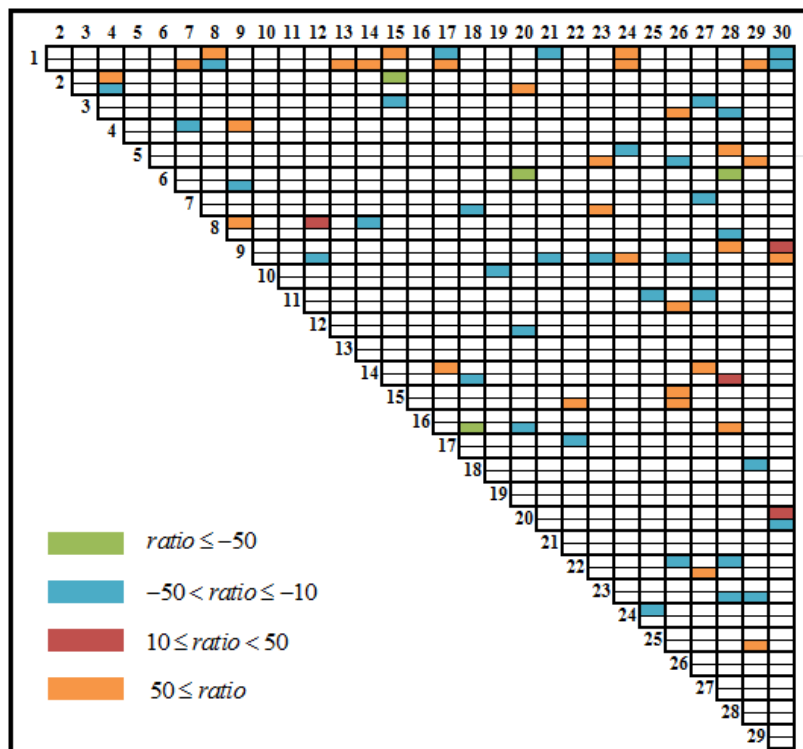


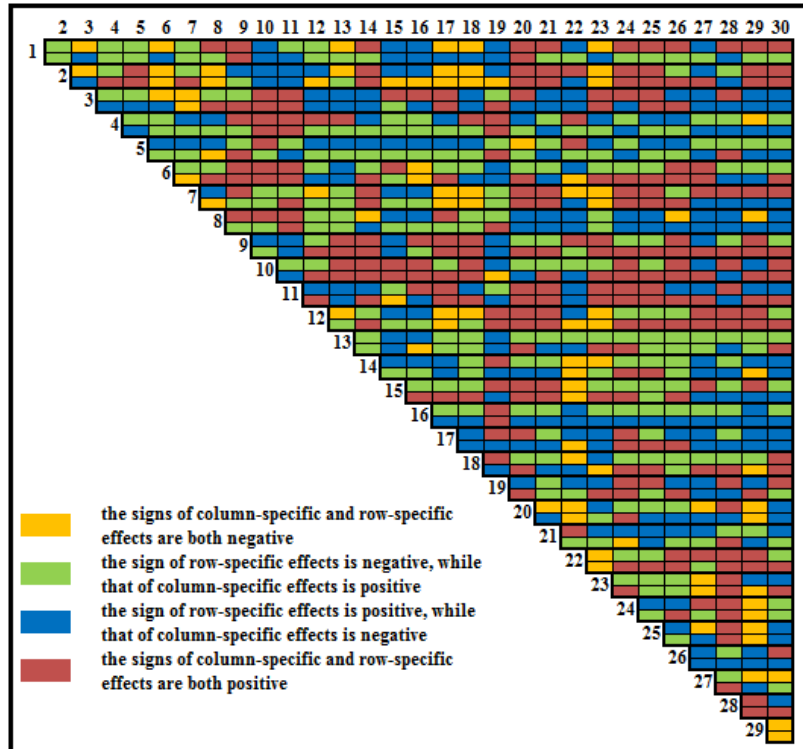
Figure6. Areal distribution of the ratio of column-specific and row-specific effects in 2007



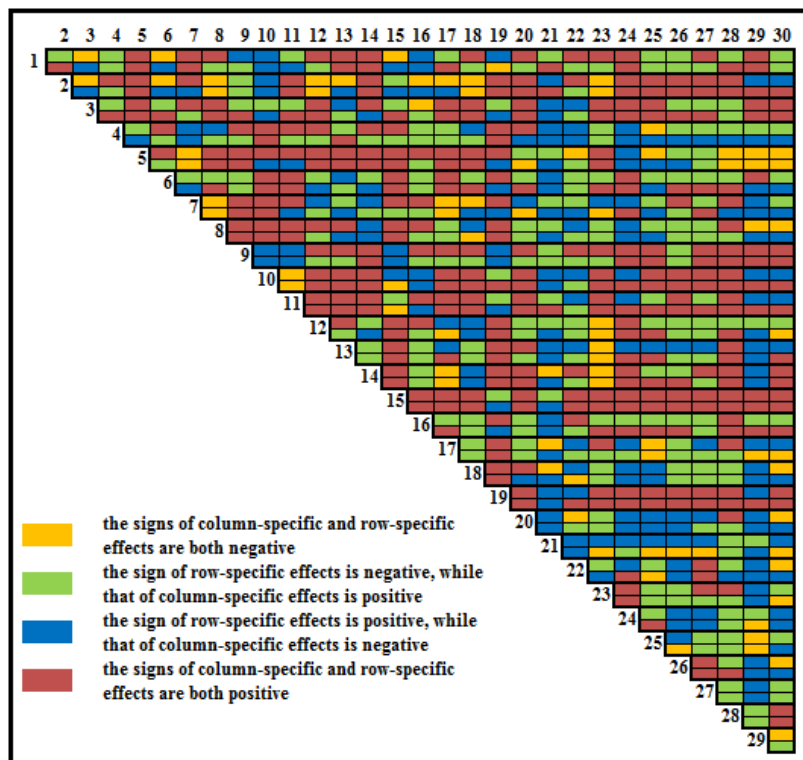
We also pay attention to the sign of the ratios that date back to the sign of column-specific and row-specific effects, which is shown in Figure7 and Figure8 intuitively. It should be admitted that the signs of the column-specific and

row-specific effects are chaotic at regional level yet do change a lot from 2002 to 2007. For more detailed information on the ratios in 2002 and 2007, refer to Table B1 and Table B2 of Appendix B.

**Figure7. Areal distribution of the sign of column-specific and row-specific effects in 2002**

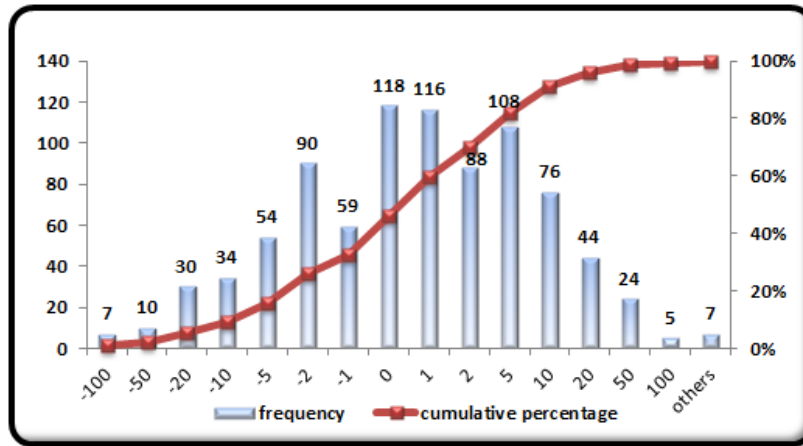


**Figure8. Areal distribution of the sign of column-specific and row-specific effects in 2002**



Now it is natural to study changes in the ratios from 2002 to 2007. Figure9 and Figure10 give the frequency distribution of absolute and relative changes of the ratios, from which we can see that most absolute changes opposite to relative changes are concentrated in the middle. To explain this phenomenon, let's recall the distribution of the ratios of column-specific and row-specific effects respectively in 2002 and 2007, which are both centralizedly distributed. Thus from 2002 to 2007, when changes do occur, the relative changes happen to be apparent.

**Figure9. Frequency distribution of absolute changes of the ratio**



**Figure10. Frequency distribution of relative changes of the ratio**

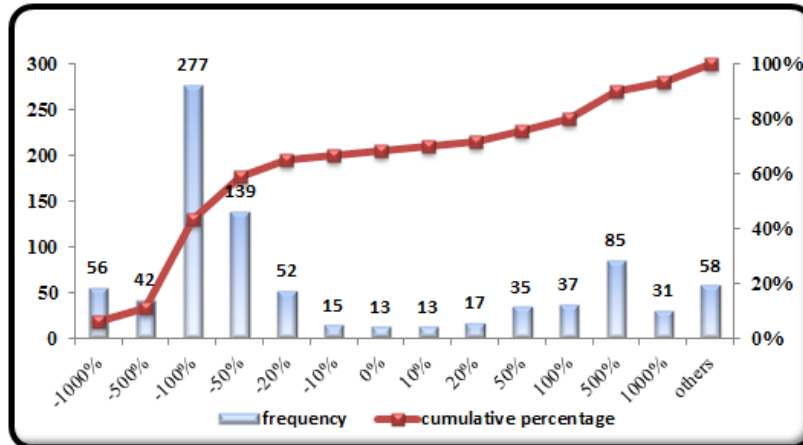


Figure11 and Figure12 give the visual diagrams of areal distribution of great absolute and relative changes in ratios from 2002 to 2007. Furthermore, we list the related regions with great changes through running the RAS technique in Table 3. For absolute changes, we list the related regions with absolute changes beyond 100. As for relative changes, we list the related regions with relative changes beyond 5000%. Full presentation of the ratios in 2002 and 2007 are given in Table B1 and Table B2 of Appendix B.

**Table3. Related regions with great changes**

range of the absolute change	related regions with special changes		range of the relative change
	absolute	relative	
$\leq -100$	region2-region15 region6-region20 region6-region28 region15-region20 region17-region19 region22-region28 region23-region27	region4-region2    region20-region3 region6-region19    region20-region10 region8-region26    region20-region30 region10-region15    region28-region14 region14-region15    region28-region30 region15-region21    region29-region18 region18-region7    region30-region18	$\leq -5000\%$
$\geq 100$	region5-region23 region8-region12 region9-region30 region15-region26 region20-region30 region27-region30 region28-region14	region2-region15    region18-region29 region3-region26    region20-region19 region5-region10    region22-region15 region6-region20    region28-region3 region6-region28    region28-region5 region18-region19    region28-region17	$\geq 5000\%$

**Figure11. Areal distribution of absolute changes of the ratio**

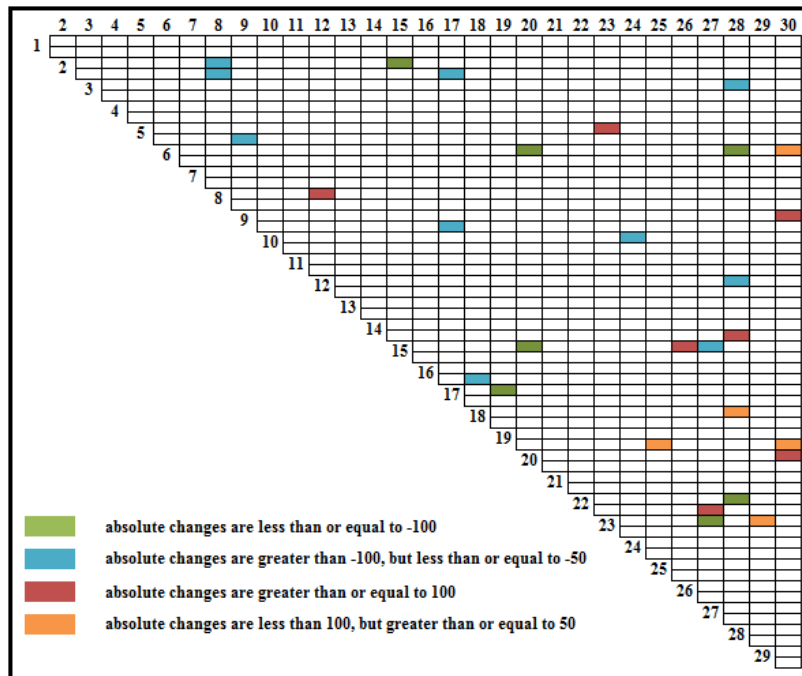
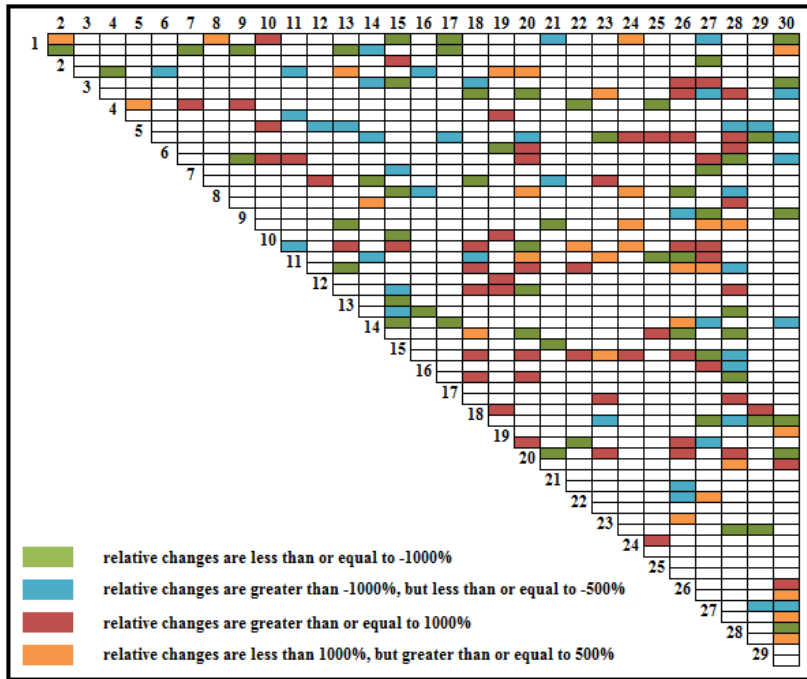


Figure12. Areal distribution of relative changes of the ratio

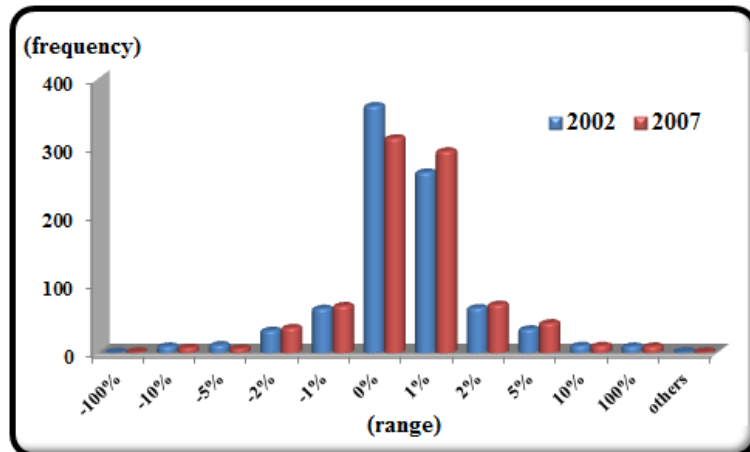


#### 4.2 Analysis of the Cell-Specific Effects

Similar to the above study on the ratio of column-specific and row-specific effects, analysis of this part includes the same three aspects.

Now let's start from the frequency distribution displayed in Figure13, which is in line with traditional theory of time-series analysis at first sight. However, as a check of the figure, we can see that some big values do exist in both 2002 and 2007, of which Table4 shows the areal distribution in detail.

Figure13. Frequency distribution of cell-specific effects in 2002 and 2007



**Table4. Related regions with big cell-specific effects**

<b>Range</b> \ <b>Year</b>	<b>2002</b>	<b>2007</b>
$\leq -10\%$	region6-region13 region7-region2 region7-region22 region8-region12 region14-region20 region14-region22 region15-region10 region18-region1 region20-region2 region26-region2 region26-region25	region1-region23 region2-region8 region7-region5 region15-region10 region16-region3 region16-region9 region20-region5 region22-region25 region26-region7 region27-region24
$\geq 10\%$	region1-region18 region2-region20 region2-region26 region7-region4 region7-region14 region7-region20 region7-region26 region12-region8 region20-region7 region20-region14 region27-region24	region3-region16 region4-region20 region5-region20 region7-region2 region7-region26 region8-region2 region9-region16 region10-region15 region14-region4 region23-region1 region24-region27 region25-region22

Then attention is turned to the changes in cell-specific effects from 2002 to 2007. Figure14 and Figure15 give the frequency distribution of absolute and relative changes of cell-specific effects, from which we can see that most absolute changes opposite to relative changes are concentrated in the middle. In fact, this phenomenon is easy to understand. Note that cell-specific effects in 2002 and 2007 are both centralizedly distributed. Thus from 2002 to 2007, when changes in cell-specific effects do occur, the relative changes happen to be apparent. Related regions with great changes in cell-specific effects are listed in Table5. Full presentation of cell-specific effects in 2002 and 2007 are respectively shown in Table B3 and Table B4 of Appendix B.

Figure14. Frequency distribution of absolute changes of cell-specific effects

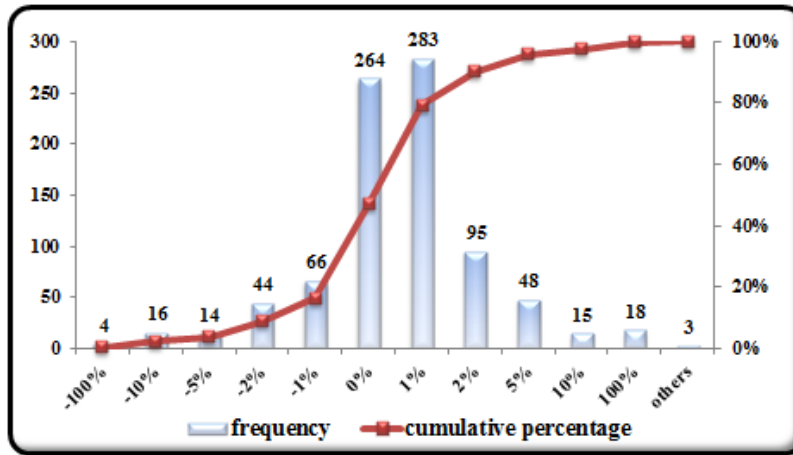


Figure15. Frequency distribution of relative changes of cell-specific effects

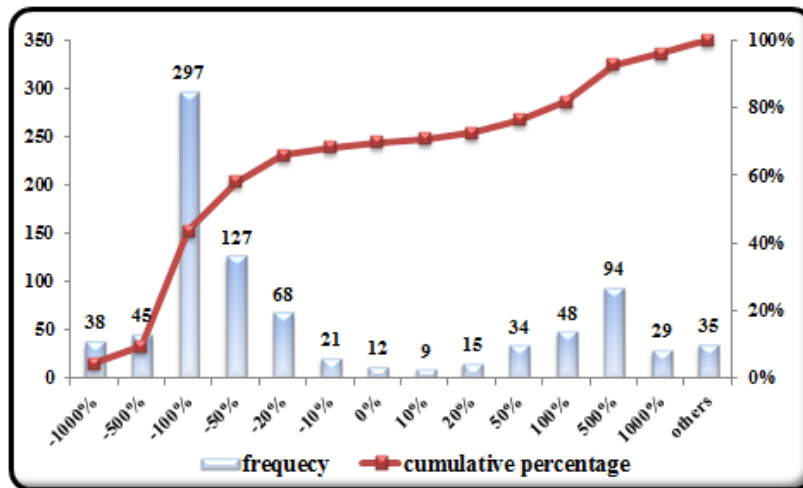


Table5. Related regions with great changes in cell-specific effects

range of the absolute change	related regions with great changes		range of the relative change
	absolute	relative	
$\leq -100\%$	region6-region8 region7-region14 region20-region14 region22-region25	region1-region20 region3-region15 region5-region8 region8-region25 region9-region23 region12-region26 region14-region5 region14-region12 region14-region24 region21-region3 region22-region25 region26-region12 region30-region18	$\leq -5000\%$
$\geq 100\%$	region8-region2 region14-region20 region25-region22	region2-region8 region3-region30 region9-region15 region14-region3 region14-region21 region14-region26 region16-region3 region25-region22 region26-region15	$\geq 5000\%$

## 5. Summary and Conclusions

Technological development is of great importance to economic growth and has been subject to numerous studies. The RAS structural decomposition approach is used to analyze the effects of technological change, which may be split up into its components: average substitution, average intermediate input intensity and cell-specific effects. However, it has long been neglected to examine the roles that different kinds of technological effects play at regional level.

On the basis of the decomposition of gross outputs which is just chosen as a means to the end of the final analysis, new application of RAS method addressed in this paper focuses on analyzing the influence that each kind of technological effects exert between regions by reference to a series of regional input-output tables for a 30-region division of the Chinese economy (2002-2007), in order to investigate their relationship and find out the main underlying force for technological effects over time and across regions.

Therefore, after having a brief overview of the distribution of the percentages that the three kinds of technological effects account for the difference in gross outputs between regions through two scatterplots, our empirical analysis is divided into two parts. The first application concentrates on the ratio of the column-specific and row-specific effects to study their relative size and consistency in sign, which includes three aspects: frequency distribution, areal distribution and changes from 2002 to 2007. Results show that the majority of ratios are centralizedly distributed in the two years yet changes with time do happen to ratios in both size and sign, which are shown in a series of visual diagrams. As for the second part about cell-specific effects, in order to test whether the traditional statement still holds water for Chinese regional economy, study is also carried out from the viewpoint of the above three aspects, furthermore, the answer of which is proved to be yes. In other words, the results of Chinese regional economy verify the RAS method as a useful tool for descriptive purposes empirically.

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## Appendix A: Sector Definitions

### *Corresponding Relationship between 42-Sector Disaggregation and 33-sector Classification*

<b>42-Sector Disaggregation</b>		<b>33-Sector Classification</b>
1	Agriculture, Forestry, Animal Husbandry & Fishery	1
2	Mining and Washing of Coal	2
3	Extraction of Petroleum and Natural Gas	2
4	Mining of Metal Ores	2
5	Mining and Processing of Nonmetal Ores	2
6	Manufacture of Foods and Tobacco	3
7	Manufacture of Textile	4
8	Manufacture of Wearing Apparel, Leather, Fur, Feather(Down) and Its products	5
9	Processing of Timbers and Manufacture of Furniture	6
10	Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities	7
11	Processing of Petroleum, Coking, Processing of Nuclear Fuel	8
12	Chemical Industry	9
13	Manufacture of Nonmetallic Mineral Products	10
14	Smelting and Rolling of Metals	11
15	Manufacture of Metal Products	12
16	Manufacture of General Purpose and Special Purpose Machinery	13
17	Manufacture of Transport Equipment	14
18	Manufacture of Electrical Machinery and Equipment	15
19	Manufacture of Communication Equipment, Computer and Other Electronic Equipment	16
20	Manufacture of Measuring Instrument and Machinery for Cultural Activity & Office Work	16
21	Other Manufacture	16
22	Scrap and Waste	16
23	Production and Supply of Electric Power and Heat Power	17
24	Production and Distribution of Gas	17
25	Production and Distribution of Water	17
26	Construction	18
27	Traffic, Transport and Storage	19
28	Post	20
29	Information Transmission, Computer Services and Software	21
30	Wholesale and Retail Trades	22
31	Hotels and Catering Services	23
32	Financial Intermediation and Insurance	24
33	Real Estate	25
34	Leasing and Business Services	26
35	Tourism	27
36	Scientific Research	28
37	Comprehensive Technical Services	29
38	Other Services	30
39	Education	31
40	Health, Social Security and Social Welfare	32
41	Culture, Sports and Entertainment	33
42	Public Management and Social Organization	33

## Appendix B: Empirical results for Chinese regional economy

Table B1. Full presentation of the ratios of column-specific and row-specific effects in 2002

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-0.38	3.64	-2.74	-3.46	2.60	-1.84	3.00	2.43	-0.40	-2.43	-7.08	1.50	1.28	-1.57	-2.47
	-0.09	-1.54	-5.10	-4.54	-1.76	-1.14	-3.24	0.08	-0.92	-0.78	-1.81	-0.92	-3.22	-1.23	-1.94
2		<b>23.01</b>	-5.23	7.83	2.28	-3.09	<b>70.43</b>	-2.67	-1.27	-1.55	<b>-16.36</b>	3.60	2.45	-2.30	-2.93
		-6.65	0.16	0.72	0.44	<b>11.67</b>	<b>79.69</b>	-0.69	-1.71	-1.35	3.43	-0.19	3.08	4.62	0.49
3			-2.13	-1.35	1.28	1.59	-2.00	-9.07	5.56	<b>42.97</b>	<b>-11.27</b>	-1.25	-0.14	2.74	3.23
			-0.30	-1.08	-1.92	2.46	1.10	<b>17.97</b>	2.20	1.16	-2.47	-1.23	-0.10	-2.98	-0.71
4				-0.96	<b>-32.06</b>	-0.37	-1.30	2.17	5.01	0.80	0.27	1.46	-1.40	-7.81	-0.96
				-1.16	-2.34	-3.29	-0.64	<b>-12.69</b>	<b>10.73</b>	0.55	-1.75	-1.42	-0.75	-1.96	-1.10
5					-0.79	-0.04	-2.59	-8.28	0.00	<b>-37.43</b>	-0.32	-0.19	-1.76	-0.78	-1.43
					-1.15	-2.13	3.65	<b>53.90</b>	-1.47	-0.30	-2.14	-1.19	-0.59	-1.67	-0.90
6						-0.49	-1.59	3.09	2.09	1.16	-0.60	-0.76	-4.30	<b>11.59</b>	5.70
						2.45	0.56	2.16	0.02	0.07	-1.93	-1.06	1.56	-2.13	0.30
7							<b>-12.27</b>	<b>40.86</b>	-2.35	-3.47	4.16	-1.65	3.72	-0.70	-2.01
							0.19	-3.40	-1.14	<b>48.94</b>	-0.02	-1.05	0.10	-1.33	-0.54
8								9.12	1.30	7.22	<b>-55.15</b>	-7.29	<b>16.93</b>	-0.17	-0.92
								-3.11	-1.79	2.20	-3.33	-1.50	-1.33	-3.70	-1.01
9									-1.03	-2.10	-3.44	<b>34.08</b>	1.55	-6.07	<b>20.10</b>
									-1.01	-1.06	<b>11.66</b>	0.09	<b>11.61</b>	-8.01	-6.20
10										-0.85	-1.64	0.59	1.31	0.04	0.30
										-1.42	0.57	0.09	1.09	0.14	0.59
11											-0.13	-0.27	-0.22	-0.26	0.40
											1.17	-0.17	1.01	1.56	-0.12
12												4.81	-3.73	-1.00	-4.37
												-0.77	1.36	-1.03	-0.66
13													-1.95	-0.54	-2.65
													-4.60	-0.14	0.03
14														-0.04	-1.51
														<b>-12.95</b>	-0.87
15															<b>-22.99</b>
															0.69

Table B1 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	0.70	1.09	-0.87	3.56	1.57	-1.11	1.15	1.51	3.41	0.75	-0.61	<b>30.49</b>	0.73	2.26
	-1.95	-3.84	-1.09	4.10	-5.47	-0.79	-3.29	-6.79	-4.30	<b>-36.09</b>	<b>-37.91</b>	-0.44	-3.72	-3.93
2	3.31	2.39	<b>-28.91</b>	3.68	4.18	0.39	2.07	8.96	<b>31.60</b>	-7.53	-0.04	-3.66	1.48	1.58
	<b>47.52</b>	1.63	0.03	1.13	0.18	-0.52	9.92	1.77	<b>15.27</b>	1.06	0.72	-0.38	1.07	3.26
3	2.45	-0.60	<b>-51.72</b>	0.80	-0.62	-1.53	0.55	1.50	<b>10.48</b>	-0.11	-0.93	<b>52.40</b>	-3.98	-0.16
	1.13	-0.48	0.40	-0.11	-0.90	-2.50	0.20	-0.17	0.08	1.18	-0.70	-0.17	-0.89	-0.22
4	-0.72	0.45	4.32	-1.31	-0.89	0.20	-2.20	-1.53	-0.73	-1.18	-0.93	-1.83	0.20	-1.71
	-1.22	-1.47	0.36	-0.70	-1.32	-4.73	-0.86	-0.61	-1.18	-0.53	-0.88	-0.66	-1.94	-0.61
5	<b>-23.06</b>	-1.04	-2.32	2.58	-0.90	0.71	<b>-115.36</b>	-5.30	-1.30	-1.62	-0.95	-1.70	-0.19	-1.52
	-0.35	-0.95	0.57	-0.28	-2.29	-2.11	-0.71	-0.18	-0.18	-0.42	-1.07	0.01	-1.48	-0.67
6	-3.10	-2.51	-0.01	-2.00	-1.22	-2.93	<b>-10.72</b>	-2.52	-1.38	4.27	4.42	-2.56	-1.50	<b>-69.05</b>
	2.69	-0.42	-0.54	0.31	-0.58	2.07	1.09	0.36	1.27	0.68	0.08	-0.22	-0.33	0.10
7	9.49	0.96	-1.73	3.91	4.51	0.44	3.64	6.00	9.19	-6.38	0.38	3.20	0.29	2.78
	0.68	0.04	-1.38	0.12	0.18	-1.21	0.73	0.30	0.55	1.35	-0.20	-0.14	-0.43	-0.43
8	9.61	-7.77	<b>-43.41</b>	-0.89	-4.78	-9.39	-3.73	-0.17	-2.99	0.01	-3.41	-0.41	<b>16.75</b>	-1.25
	-2.10	-1.49	2.37	-1.08	-1.90	-2.80	-1.20	-0.82	-1.79	-2.05	-2.11	-0.92	-4.53	-1.19
9	3.64	1.28	-1.64	<b>-22.08</b>	-5.20	0.17	1.67	<b>-12.25</b>	-4.62	1.86	-0.22	-4.19	1.98	<b>-10.49</b>
	<b>72.81</b>	2.47	-1.58	1.60	1.50	<b>-43.74</b>	<b>11.30</b>	2.88	3.73	5.54	0.84	0.18	3.37	<b>19.31</b>
10	-9.51	0.60	-1.22	-1.47	-1.97	-1.05	-5.46	<b>71.11</b>	-1.41	0.42	-0.62	2.60	-0.30	1.18
	2.06	0.55	0.27	-0.05	0.35	-0.78	1.09	0.14	2.25	0.56	0.05	-0.46	0.12	0.86
11	0.78	-0.19	-0.28	0.10	1.14	-0.94	0.05	0.64	0.52	-0.12	-0.66	4.51	-0.27	-0.23
	3.55	0.47	-1.55	0.74	1.44	-0.16	2.38	0.37	1.35	1.58	0.44	-0.25	0.42	0.88
12	<b>19.13</b>	2.51	0.08	<b>27.61</b>	1.08	-1.10	5.94	<b>-16.24</b>	-5.39	<b>-18.24</b>	2.51	<b>43.78</b>	<b>10.40</b>	-8.68
	2.22	-0.30	0.11	0.96	0.39	0.73	0.95	1.78	3.04	2.69	1.35	0.45	1.33	0.42
13	-1.67	-1.77	-0.55	-2.35	-1.06	-0.92	-2.58	-2.87	-1.50	-1.44	-1.25	-2.33	-1.56	-4.61
	-2.45	-2.61	-0.38	5.53	-0.41	-1.77	<b>42.55</b>	<b>36.96</b>	-4.39	-3.55	-5.20	-0.29	-1.45	5.43
14	-1.38	-8.53	2.90	-2.42	-0.54	1.52	1.04	<b>-15.23</b>	-1.21	-0.55	-3.23	-3.05	-3.34	-0.43
	-1.05	-1.95	-0.39	-0.09	-1.77	2.71	-0.70	1.49	0.06	-0.51	<b>-39.19</b>	-0.07	5.14	-0.99
15	-5.39	-2.41	0.96	<b>141.19</b>	0.09	1.73	-8.71	-7.04	-2.03	<b>-315.77</b>	<b>67.21</b>	-6.29	0.99	-2.94
	6.52	0.39	-0.66	0.17	0.17	0.26	0.38	0.09	<b>-17.71</b>	1.29	-0.38	-0.74	-0.62	-0.48

Table B1 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	-0.96	-0.77	0.03	-1.08	-0.95	-12.63	-1.02	-1.15	-0.97	-0.71	-0.16	-1.36	-18.30	-1.08
	-1.86	-1.83	0.20	-0.86	-1.70	-21.60	-0.96	-0.68	-1.34	-1.95	-1.36	-0.94	-1.55	-0.88
		-2.78	115.86	11.64	-1.14	-8.52	-0.37	3.51	-1.70	-0.43	-1.50	-41.88	-2.07	-0.62
		-2.13	-0.12	-0.35	-1.58	10.67	-0.11	0.57	0.16	2.71	-2.07	-0.07	-2.61	-0.80
			0.00	-2.09	-1.20	1.04	-9.84	-2.86	-1.84	-1.83	-1.02	-76.60	-0.40	0.43
			-0.43	1.08	-0.92	-1.76	0.27	0.99	4.35	-10.18	0.16	0.37	0.08	0.06
				-0.06	-23.95	-1.03	-0.35	0.08	6.77	-0.25	-0.84	1.59	-0.50	0.13
				0.01	-11.02	-0.51	1.17	1.49	-94.70	0.45	-0.40	-0.71	0.85	-67.78
					0.30	2.24	-0.30	-1.90	-0.81	-0.36	4.30	0.34	18.55	-2.00
					-2.99	12.95	-1.36	1.08	-6.90	-3.30	-3.88	-0.42	2.20	-2.54
						3.08	-3.24	-3.81	-1.40	-1.23	-1.56	-1.77	-1.43	-2.11
						-4.19	-0.81	0.26	-4.18	-0.94	-1.00	2.87	-1.04	-0.38
							0.34	-7.35	-1.61	2.54	0.50	143.74	0.34	-10.87
							4.78	4.42	6.06	5.50	-97.76	0.17	1.02	0.92
							-4.83	-1.07	-0.67	125.74	2.30	-57.00	-0.34	
							1.35	-0.50	-0.51	2.45	0.85	2.16	1.98	
								-0.33	-0.41	1.47	3.68	7.11	-7.45	
								-6.62	32.55	-36.68	0.45	4.01	-5.77	
									-0.89	2.40	0.88	7.02	-2.92	
									-1.21	-6.44	0.17	22.31	-2.01	
										-1.39	-3.70	-3.96	0.27	
										-6.68	-0.48	-2.70	-0.28	
											-7.82	1.28	0.99	
											0.55	-2.75	-0.35	
												1.75	-0.02	
												2.13	0.83	
													1.07	
													29	15.51

**Table B2. Full presentation of the ratios of column-specific and row-specific effects in 2007**

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	-3.62	2.27	-6.53	4.89	2.96	2.81	<b>21.45</b>	-0.64	-4.65	-0.51	2.94	7.18	5.06	<b>27.17</b>	-7.12	
	3.04	-1.61	-5.71	4.19	-3.07	<b>11.06</b>	<b>-13.78</b>	-1.13	-1.88	-1.00	-3.94	<b>16.55</b>	<b>21.66</b>	-1.42	-7.30	
	2	1.22	<b>11.07</b>	0.83	1.57	0.68	0.92	-2.48	-1.15	1.08	2.94	0.76	2.13	<b>-181.3</b>	2.37	
		-3.72	<b>-13.66</b>	1.10	-3.02	-0.67	1.98	-1.54	-2.14	9.98	0.87	-1.91	2.52	-0.49	-2.23	
	3	-1.74	1.92	-2.44	1.13	2.63	-3.35	-3.16	-5.80	1.05	-0.35	0.86	<b>-37.12</b>	3.40		
		0.39	1.78	0.06	-3.39	2.30	1.49	-0.16	1.16	0.24	-3.64	-0.03	1.54	-0.53		
	4	-7.95	7.00	<b>-13.43</b>	-1.58	<b>26.76</b>	0.68	0.82	0.23	-1.84	1.93	3.42	-2.13			
		-0.48	-3.30	-1.25	-0.72	-3.06	9.30	-3.88	-1.18	0.16	-1.76	-5.81	-1.85			
	5	0.11	0.11	0.43	7.12	0.24	0.82	2.35	1.25	3.35	0.99	1.02				
		-6.79	4.10	1.21	0.38	-0.17	0.00	5.12	1.58	5.07	2.04	-2.99				
	6	-1.17	-1.89	-6.31	3.13	3.35	-1.43	-0.70	-1.08	5.88	-0.72					
		-0.84	0.26	<b>-30.05</b>	0.22	1.89	-0.67	-1.50	-0.71	6.35	-0.70					
	7	2.50	1.26	2.95	4.42	-1.90	-0.96	-0.75	4.14	0.00						
		0.98	2.80	0.30	-0.04	-0.40	-1.95	-3.44	-7.73	-1.44						
	8	<b>33.93</b>	2.26	3.74	<b>72.86</b>	2.21	<b>-14.48</b>	3.13	5.20							
		6.54	0.62	0.14	-1.76	-0.11	-9.04	4.43	-1.70							
9	-4.10	-6.70	3.53	2.21	2.69	-0.32	6.24									
	-2.64	-1.23	<b>-27.41</b>	-3.13	5.17	-0.99	-4.71									
10	0.68	1.39	0.08	1.09	-1.98	-0.37										
	9.15	0.89	3.06	1.80	2.50	-0.12										
11	0.46	0.63	0.92	-0.11	0.98											
	1.11	3.19	1.71	5.68	-0.03											
12	0.48	-0.64	1.04	0.53												
	-1.41	-1.43	8.57	-1.33												
13	-0.77	5.07	-1.48													
	-0.28	1.28	-1.31													
14	5.23	-2.67														
	5.33	-1.02														
15	1.52															
	0.15															

Table B2 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	<b>-25.57</b>	5.03	-2.62	3.46	<b>-12.19</b>	0.78	1.99	<b>11.74</b>	-9.91	-2.31	2.79	-8.30	0.23	<b>-27.54</b>
	<b>45.56</b>	-5.14	1.18	-8.28	3.85	-4.14	-4.09	<b>11.43</b>	-5.05	-4.44	-3.88	1.49	<b>12.43</b>	<b>-25.48</b>
2	1.03	4.19	0.38	1.52	-0.82	1.47	1.59	0.22	2.79	2.00	1.40	9.35	-0.45	-0.14
	-5.35	2.87	0.29	<b>10.01</b>	1.03	-3.05	3.45	2.17	1.87	1.13	1.32	0.54	0.71	1.14
3	0.74	4.53	-2.89	1.95	-0.85	-0.02	0.88	0.44	1.21	-8.01	<b>-12.59</b>	-9.57	1.56	1.72
	3.52	7.58	-0.46	5.60	-0.80	-3.28	1.93	0.56	0.36	<b>18.16</b>	4.18	<b>-12.09</b>	1.52	0.90
4	-1.06	-0.91	0.77	0.20	-2.43	-4.20	-1.60	-1.50	9.50	-1.21	-1.51	-2.23	-0.76	-1.17
	-1.22	-1.02	6.87	-0.47	-1.45	-3.34	-1.17	-1.32	-1.25	-0.76	-0.75	-0.65	-1.12	-0.87
5	6.19	0.10	0.79	-0.22	-0.05	2.45	6.12	<b>-13.08</b>	1.45	-0.48	-0.70	<b>10.86</b>	1.15	1.06
	2.88	0.06	-0.32	1.71	-6.55	-0.24	<b>16.15</b>	-6.59	-4.87	<b>-13.91</b>	-0.18	0.71	<b>40.37</b>	5.46
6	0.93	-2.34	7.33	<b>-121.0</b>	-1.01	-2.30	-6.28	0.92	-7.58	-2.20	-7.53	<b>-185.3</b>	0.06	-1.37
	1.91	0.66	-0.22	7.54	-1.02	-1.34	0.56	0.63	-0.07	2.75	2.44	9.13	-0.34	-0.61
7	0.34	0.71	1.90	-3.82	-0.86	-0.86	-9.47	-0.39	-2.48	0.77	<b>-15.01</b>	6.10	-0.76	-0.23
	0.15	<b>-16.77</b>	-0.13	0.13	-1.26	-2.34	<b>37.16</b>	0.38	-0.25	-4.25	0.27	-0.65	-0.93	-1.40
8	-0.71	-3.50	2.82	-5.46	-0.42	-6.58	-1.19	-1.47	-0.53	-1.24	-2.02	3.52	8.58	0.23
	-0.71	1.99	0.60	-5.36	-2.22	-0.53	-1.12	-1.92	-2.12	-1.66	-3.84	<b>-20.13</b>	-9.57	-4.69
9	3.38	3.72	-1.28	1.96	-3.01	1.01	1.75	1.96	2.92	-8.23	5.48	<b>11.80</b>	0.09	<b>137.28</b>
	-8.58	-9.58	-1.29	-5.85	<b>-22.58</b>	-2.77	<b>-16.10</b>	<b>22.64</b>	9.02	<b>-16.14</b>	5.73	1.42	4.76	<b>22.00</b>
10	0.50	1.47	<b>-24.18</b>	0.34	-0.78	-0.30	0.47	-0.13	0.04	1.49	0.26	6.03	-0.53	-0.21
	3.08	9.18	0.37	3.43	-0.07	-8.51	1.45	1.48	0.57	7.24	1.91	1.34	0.41	0.15
11	0.68	1.23	-0.39	0.85	-3.47	-0.23	0.40	-0.11	<b>-22.98</b>	1.13	<b>-14.91</b>	3.45	-0.15	-0.26
	3.00	9.34	-2.00	9.87	0.23	-6.03	2.93	0.70	0.86	<b>16.93</b>	3.50	1.76	0.70	0.16
12	-3.58	-4.05	3.55	-2.46	-0.94	-1.35	1.18	2.15	-1.59	-1.44	-1.98	-7.18	-1.18	-0.81
	1.69	-5.70	1.53	<b>-12.10</b>	-1.10	-1.00	0.14	0.59	0.23	-7.67	-4.03	8.41	-1.28	0.77
13	-0.04	-4.20	1.39	0.66	-0.98	-1.00	6.34	-0.42	-0.21	-0.11	-0.28	1.20	-0.99	-0.71
	2.08	-4.75	0.03	-5.25	-1.24	-0.85	2.37	2.65	0.53	-2.54	-3.33	4.68	-0.78	0.35
14	<b>38.63</b>	-4.37	6.57	7.87	0.14	0.14	1.40	0.18	-3.30	-4.36	<b>15.12</b>	3.03	-0.28	2.52
	1.50	<b>-11.92</b>	0.36	3.76	-0.97	-1.17	1.97	0.62	0.73	5.11	-8.66	<b>174.23</b>	-0.37	1.42
15	2.65	8.62	-0.92	3.49	-7.35	0.54	3.50	0.46	2.56	<b>10.52</b>	1.79	2.07	0.73	0.83
	1.90	6.54	-1.10	3.55	-0.40	<b>17.80</b>	2.37	2.06	1.80	<b>15.95</b>	9.99	5.58	1.51	1.02

Table B2 Continued

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	-3.71	-1.73	0.19	-3.46	-0.82	5.93	-2.17	-5.24	-1.96	-1.52	-2.41	6.74	-1.74	-1.24
	2.12	<b>-60.66</b>	-0.42	<b>-35.38</b>	-0.96	-1.61	0.29	1.58	5.33	3.23	-5.90	<b>20.77</b>	0.11	0.08
	17	-1.32	6.96	-3.30	1.97	<b>-11.73</b>	1.36	-0.95	1.35	-0.71	-0.27	1.57	-2.44	-1.78
		-1.27	0.11	-1.55	-3.27	-0.26	-3.91	-0.32	0.21	-1.13	-1.61	-8.69	8.42	0.94
	18	5.74	0.84	1.19	-2.70	-2.27	-1.14	-2.65	-0.62	-1.33	-5.02	<b>-21.30</b>	0.18	
		0.24	-0.08	-1.40	0.20	-1.85	-1.41	-1.58	-0.89	-1.83	-2.98	-8.00	-5.90	
	19	0.05	-0.81	-0.25	0.23	0.11	0.20	0.27	0.17	2.43	-0.66	0.97		
		4.37	-0.57	9.49	1.99	3.78	5.20	8.27	3.35	0.48	0.53	0.61		
	20	-3.91	0.69	-4.88	-1.38	-2.30	-4.39	-0.85	8.31	-3.14	<b>4665.0</b>			
		-1.92	-0.18	-3.00	-2.30	-2.31	-3.95	-1.71	-3.65	-3.45	<b>-37.01</b>			
	21	-1.15	-1.46	-2.96	-1.81	-1.76	-1.93	-1.91	-1.28	-2.22				
		-1.16	1.52	-0.19	7.21	5.17	0.17	-9.98	-1.02	0.74				
	22	-0.84	-0.66	-0.40	<b>-18.56</b>	3.14	<b>-30.02</b>	-0.91	0.18					
		-1.99	0.92	0.95	-2.35	<b>37.79</b>	-0.24	-0.80	-2.99					
23	0.28	-1.88	-6.15	1.59	1.30	-2.81	-0.65							
	7.56	-2.47	-2.58	-1.98	<b>-18.41</b>	<b>-27.70</b>	7.32							
24	<b>-15.66</b>	-1.48	-1.53	-0.90	-0.25	-1.07								
	3.01	-1.55	-1.45	-0.93	1.25	-0.80								
25	-1.51	-1.41	-0.28	0.98	-0.57									
	4.82	-1.74	-0.34	<b>24.83</b>	-3.68									
26	0.39	-2.22	-1.76	9.03										
	0.99	0.96	-1.85	-2.04										
27	-0.72	-6.10	-6.45											
	-0.86	-6.88	-2.28											
28	-1.58	2.18												
	-2.22	8.12												
29	3.49													
	-0.22													



**Table B3. Full presentation of cell-specific effects in 2002**

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	5.47%	1.70%	0.17%	-2.23%	1.36%	-1.49%	-1.27%	0.38%	-0.72%	0.53%	-0.18%	-1.17%	0.29%	0.91%	-0.98%
	-4.05%	-0.28%	0.04%	1.48%	-0.82%	0.31%	-6.09%	-0.50%	1.53%	-1.43%	-4.24%	-5.01%	-0.78%	-1.36%	3.48%
	2	0.12%	2.62%	-2.02%	-0.05%	6.20%	-2.64%	-0.27%	-0.28%	-0.17%	-2.03%	-0.14%	5.85%	-0.48%	-0.33%
		0.14%	-0.97%	0.58%	-0.69%	-11.61	4.45%	1.01%	0.91%	1.27%	2.98%	0.61%	-6.46%	0.46%	1.76%
	3	0.57%	-1.61%	2.02%	2.89%	1.41%	9.52%	-0.53%	1.01%	0.57%	0.26%	-0.44%	-0.01%	-1.42%	
		0.07%	0.19%	-1.34%	-0.57%	-0.44%	-8.30%	0.35%	-1.17%	-0.32%	0.99%	0.00%	-0.37%	-0.02%	
	4	-4.46%	-0.24%	-2.20%	-0.87%	-0.07%	0.10%	0.76%	-0.38%	0.31%	-2.66%	0.06%	0.24%		
		0.41%	-0.30%	13.82	0.76%	0.52%	0.64%	0.04%	1.23%	-0.14%	1.57%	-0.19%	-0.41%		
	5	-0.28%	-1.30%	-0.04%	0.85%	-0.58%	-0.04%	0.31%	-0.08%	0.40%	0.30%	0.20%			
		-0.82%	2.92%	-1.46%	-2.18%	-0.17%	-0.83%	-1.96%	-1.04%	-0.08%	-0.92%	-1.10%			
	6	1.55%	-0.27%	-1.73%	-0.81%	0.75%	1.12%	-12.88	0.54%	0.19%	0.46%				
		-1.31%	0.16%	2.15%	-0.04%	-1.67%	-0.51%	8.99%	-0.26%	-0.79%	3.25%				
	7	-1.20%	-0.44%	-0.37%	-0.35%	-1.37%	-2.02%	187.91	-0.02%	-1.51%					
		0.21%	0.27%	0.76%	0.87%	1.16%	-0.48%	9.84%	-1.01%	4.97%					
	8	0.08%	-0.31%	0.11%	-16.94	0.21%	0.65%	0.15%	-0.14%						
0.91%		1.12%	0.18%	19.49	-1.13%	-0.80%	-0.65%	1.69%							
9	0.17%	1.59%	0.45%	1.89%	-0.28%	-0.01%	3.69%								
	-0.50%	-2.50%	-0.22%	-2.27%	-0.02%	-1.03%	-4.35%								
10	-0.79%	1.15%	0.42%	0.02%	4.45%	1.07%									
	0.04%	-0.73%	-0.31%	-0.44%	-10.06	-0.86%									
11	1.20%	0.30%	-0.91%	0.29%	0.94%										
	-0.54%	-1.00%	-0.06%	-0.59%	-0.39%										
12	-0.54%	-0.85%	0.02%	-0.04%											
	-0.04%	0.39%	-0.17%	0.56%											
13	-0.84%	0.48%	1.57%												
	0.17%	0.22%	0.83%												
14	0.09%	0.08%													
	-0.87%	-0.02%													
15	-0.47%														
	0.29%														

**Table B3 Continued**

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	2.52%	<b>48.50%</b>	-0.18%	0.01%	-0.94%	-2.27%	3.88%	-0.42%	-1.26%	-0.19%	-0.15%	-0.48%	-0.18%	-0.85%
	-0.37%	<b>-16.53</b>	1.42%	-2.07%	0.15%	1.01%	4.87%	0.02%	1.36%	-1.12%	0.22%	-0.25%	-0.06%	0.17%
2	-0.49%	-0.46%	-0.27%	<b>10.61%</b>	-0.92%	<b>-5.94%</b>	-0.87%	1.34%	-1.56%	<b>10.22%</b>	2.29%	1.09%	0.78%	0.46%
	1.44%	1.04%	0.79%	<b>-10.84</b>	-0.30%	-4.53%	1.98%	-0.08%	-1.56%	<b>-10.27</b>	-1.31%	-0.05%	-0.86%	-1.52%
3	0.19%	0.47%	-0.51%	0.21%	-0.69%	0.03%	-0.70%	0.44%	0.47%	0.47%	0.74%	0.47%	0.90%	0.00%
	-0.03%	-0.38%	-0.46%	-0.09%	0.00%	-0.13%	0.30%	-0.02%	-0.35%	-0.17%	-0.13%	-0.24%	-0.08%	-0.16%
4	0.14%	-0.28%	0.18%	-1.86%	-0.32%	1.70%	0.05%	0.21%	4.53%	<b>-7.47%</b>	1.09%	-0.77%	-0.23%	1.12%
	0.48%	0.34%	-0.25%	3.27%	-0.13%	<b>9.55%</b>	-0.15%	-0.04%	<b>38.83%</b>	4.60%	-0.77%	-0.07%	-0.24%	-1.43%
5	0.18%	-0.17%	0.40%	1.22%	-0.48%	1.88%	0.17%	-1.08%	1.47%	1.02%	-0.69%	-0.29%	-0.76%	-2.41%
	-1.62%	-0.11%	-0.66%	-0.91%	0.17%	-1.76%	-0.64%	0.00%	-1.33%	-0.48%	-0.19%	-0.67%	-0.29%	<b>-6.88%</b>
6	1.68%	-0.47%	0.06%	-0.09%	-1.64%	-3.74%	0.27%	0.72%	1.05%	0.58%	1.06%	0.35%	0.44%	-1.08%
	-1.73%	0.91%	-0.48%	-0.19%	-0.31%	-0.28%	-0.89%	-0.36%	-0.43%	-0.55%	-0.24%	-0.05%	-0.23%	-0.24%
7	-0.27%	-0.54%	-0.80%	<b>65.33%</b>	1.07%	<b>-11.80</b>	-1.78%	0.81%	3.88%	<b>10.22%</b>	1.05%	0.57%	2.21%	-0.83%
	1.21%	-0.32%	-0.05%	<b>13.08%</b>	1.63%	-1.76%	2.48%	1.90%	-0.37%	<b>-9.74%</b>	-1.36%	-0.38%	1.72%	3.48%
8	0.35%	0.24%	-0.31%	-0.80%	-0.26%	<b>-5.70%</b>	0.05%	0.13%	0.02%	-0.71%	-0.51%	-0.30%	-0.49%	-0.47%
	0.58%	1.08%	0.36%	0.67%	-0.22%	-0.30%	0.19%	-0.16%	-0.28%	-0.59%	0.17%	-0.20%	-0.09%	0.14%
9	1.03%	0.31%	0.50%	0.26%	-0.45%	-1.80%	0.00%	0.73%	0.77%	0.62%	1.38%	1.17%	1.03%	-0.28%
	-0.79%	0.61%	-0.69%	-0.13%	0.49%	0.09%	0.89%	-0.03%	-0.30%	-0.35%	-0.47%	0.27%	-0.11%	0.15%
10	0.34%	0.40%	-1.77%	0.50%	-0.75%	-0.04%	0.64%	0.28%	0.77%	1.08%	1.48%	1.41%	0.98%	0.21%
	-0.38%	-0.67%	-0.25%	-0.77%	-0.06%	-0.43%	-0.78%	-0.66%	-0.61%	-0.74%	-0.53%	0.13%	-0.48%	-0.84%
11	0.12%	-0.08%	-0.88%	-1.00%	-0.73%	-0.22%	-0.85%	0.30%	0.54%	0.23%	1.16%	1.64%	0.73%	-0.10%
	-0.24%	-0.19%	-1.55%	-0.10%	0.31%	-0.28%	-0.05%	-0.44%	-0.30%	-0.41%	-0.18%	0.04%	-0.31%	-0.63%
12	-0.42%	0.60%	-0.84%	-0.70%	-0.52%	-2.69%	0.68%	-0.35%	0.12%	-0.02%	-0.19%	0.29%	0.10%	-0.37%
	0.88%	0.33%	0.77%	-0.04%	0.27%	-0.01%	-0.49%	0.16%	-0.24%	0.00%	0.07%	0.16%	-0.08%	0.37%
13	2.06%	-3.82%	-1.27%	-0.94%	-2.31%	-1.96%	-2.34%	-0.05%	0.37%	-0.86%	-0.96%	-0.22%	-0.14%	-1.70%
	-1.66%	3.45%	0.68%	0.39%	-0.48%	-0.72%	-1.45%	0.24%	-0.12%	-0.27%	0.29%	0.03%	-0.25%	0.18%
14	0.25%	-0.31%	-0.17%	<b>-202.25</b>	0.00%	<b>-13.40</b>	0.03%	-0.01%	2.45%	0.09%	0.12%	0.14%	0.15%	-0.79%
	-0.78%	0.54%	-0.19%	<b>297.46</b>	-0.13%	0.88%	-0.04%	0.06%	-4.09%	0.80%	-0.10%	0.00%	-0.20%	0.51%
15	0.03%	-0.88%	-2.92%	-0.41%	-0.82%	-2.35%	-1.00%	-0.07%	-1.32%	-0.21%	-0.51%	0.29%	-0.03%	-0.69%
	-0.16%	0.08%	0.22%	0.02%	-0.10%	-0.33%	0.16%	0.11%	0.15%	0.00%	0.25%	-0.01%	0.15%	-0.07%

**Table B3 Continued**

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	0.06%	1.08%	-1.51%	-0.28%	-0.56%	-1.61%	0.29%	-0.35%	0.77%	0.06%	0.56%	0.71%	0.25%	0.32%
	-0.19%	-0.44%	1.42%	0.04%	0.02%	-0.29%	0.20%	0.21%	-0.12%	0.35%	-0.12%	0.19%	0.02%	-0.31%
17	-1.47%	-0.25%	-0.52%	-0.99%	-0.48%	-3.28%	-0.20%	0.69%	-0.20%	0.44%	0.95%	0.56%	-1.00%	
	0.76%	0.11%	0.26%	0.02%	-0.16%	2.92%	0.08%	-0.25%	-0.04%	-0.08%	-0.03%	-0.18%	-0.01%	
18	-0.56%	-0.02%	-0.73%	-1.42%	<b>6.25%</b>	0.17%	0.27%	0.48%	0.34%	0.31%	0.33%	-0.77%		
	0.33%	-0.13%	-0.34%	-0.16%	-4.64%	-0.01%	-0.32%	-0.07%	-0.21%	0.09%	-0.17%	0.01%		
19	0.44%	-0.35%	-0.15%	0.47%	0.54%	0.39%	0.75%	1.54%	1.09%	0.66%	-0.27%			
	-1.29%	-0.06%	0.10%	-0.72%	-0.27%	0.03%	-0.38%	-0.10%	-0.90%	-0.20%	-0.75%			
20	-0.82%	2.69%	0.08%	0.27%	2.78%	-2.03%	-0.81%	-0.41%	0.70%	-2.09%				
	-0.22%	<b>-9.19%</b>	0.03%	0.02%	0.49%	-0.47%	0.18%	-0.06%	-0.28%	1.65%				
21	0.12%	-0.30%	-0.19%	-0.21%	-0.21%	0.39%	-0.83%	-1.45%	-0.23%					
	0.08%	-0.87%	-3.01%	-1.07%	-0.25%	-2.80%	3.34%	2.71%	-0.42%					
22	-0.62%	-0.43%	<b>6.85%</b>	<b>5.07%</b>	-1.29%	1.05%	1.48%	-4.32%						
	-0.22%	0.18%	4.78%	4.16%	2.86%	-0.40%	-0.94%	<b>8.53%</b>						
23	-0.27%	-0.45%	-0.27%	-0.12%	-0.49%	0.29%	-1.02%							
	0.07%	0.22%	-0.07%	-0.03%	0.13%	-0.15%	0.22%							
24	-0.21%	-0.02%	<b>-8.08%</b>	0.44%	0.93%	1.13%								
	0.07%	-0.14%	<b>10.28%</b>	0.15%	-0.42%	-1.00%								
25	-0.78%	0.15%	0.26%	0.20%	-1.67%									
	<b>-13.26</b>	-0.87%	0.32%	-0.42%	0.69%									
26	0.69%	-0.70%	0.30%	-1.61%										
	-0.43%	0.19%	-0.07%	1.32%										
27	-0.10%	0.10%	1.58%											
	0.05%	-0.03%	-1.87%											
28	3.27%	0.49%												
	<b>-5.21%</b>	-0.77%												
29	0.27%													
	-1.09%													

**Table B4. Full presentation of cell-specific effects in 2007**

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-0.22%	0.49%	1.42%	1.04%	-2.31%	0.42%	0.01%	-0.72%	0.14%	1.59%	-0.53%	-1.83%	-1.20%	0.13%	-0.54%
	-2.16%	-1.27%	-0.64%	-0.61%	3.94%	0.90%	-3.28%	1.09%	0.98%	-1.92%	0.80%	0.59%	1.22%	0.42%	4.01%
2	0.15%	<b>5.56%</b>	1.66%	-0.60%	<b>7.38%</b>	<b>-910.77</b>	-0.67%	-0.12%	0.01%	-2.19%	-1.07%	1.70%	-0.12%	0.13%	
	-0.48%	3.21%	-2.29%	0.90%	<b>12.09</b>	<b>214.10</b>	0.97%	0.56%	-0.31%	0.39%	0.90%	-3.69%	-0.09%	0.31%	
3	0.65%	0.87%	-0.75%	-0.12%	0.96%	<b>-5.53%</b>	0.55%	1.17%	0.71%	-0.56%	0.40%	0.33%	<b>14.47</b>		
	-0.07%	-0.57%	0.63%	0.20%	-0.73%	<b>5.26%</b>	-1.22%	-1.85%	-0.23%	0.36%	-0.30%	-0.27%	<b>-12.66</b>		
4	<b>9.14%</b>	-0.05%	0.16%	-4.24%	-0.98%	-0.06%	0.35%	-3.33%	0.47%	<b>-5.24%</b>	-0.14%	0.68%			
	<b>-7.82%</b>	-0.03%	1.10%	2.75%	2.03%	0.51%	0.75%	2.43%	0.10%	<b>28.87</b>	0.10%	-0.63%			
5	-0.51%	0.52%	2.19%	-0.73%	-0.38%	-0.88%	-1.89%	-0.95%	-2.69%	-0.14%	-0.09%				
	1.05%	<b>-14.12</b>	1.12%	1.42%	1.69%	0.56%	1.25%	0.77%	<b>8.15%</b>	0.89%	1.18%				
6	0.52%	1.08%	-3.85%	-0.18%	0.25%	1.07%	0.60%	0.67%	0.03%	0.28%					
	0.21%	-0.49%	3.53%	0.15%	0.25%	-0.64%	-1.41%	-0.51%	-0.35%	0.55%					
7	-3.55%	0.57%	0.25%	1.14%	0.32%	0.60%	-0.84%	0.13%	0.12%						
	2.98%	1.39%	0.11%	-0.44%	0.23%	0.53%	0.82%	-0.49%	-0.08%						
8	-1.38%	-0.30%	-0.84%	-1.29%	-1.89%	-1.22%	-0.04%	-0.34%							
	2.57%	1.34%	1.75%	-0.55%	0.38%	-1.78%	0.34%	1.13%							
9	-0.04%	0.45%	0.99%	0.84%	0.58%	-1.17%	<b>24.51</b>								
	0.18%	0.38%	-0.51%	-1.11%	-0.57%	0.71%	<b>-26.87</b>								
10	-1.04%	0.36%	0.27%	0.36%	<b>13.61</b>	1.04%									
	0.23%	-0.02%	-0.09%	-0.09%	<b>-10.87</b>	-0.50%									
11	0.01%	0.18%	-0.42%	-1.71%	1.68%										
	-0.32%	-0.15%	-0.14%	1.02%	-1.69%										
12	-1.29%	1.16%	0.08%	-0.29%											
	2.28%	-1.42%	0.35%	1.07%											
13	-0.31%	0.09%	-1.10%												
	0.27%	-0.37%	1.67%												
14	0.06%	0.08%													
	0.19%	0.78%													
15	0.32%														
	0.08%														

**Table B4 Continued**

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	-0.35%	-0.62%	0.30%	-1.69%	-2.21%	-1.98%	<b>-11.17</b>	-0.76%	-2.24%	0.70%	0.50%	0.30%	0.11%	0.27%
	-2.59%	0.38%	2.28%	1.50%	0.29%	1.39%	<b>17.04%</b>	0.11%	1.26%	-1.97%	-0.40%	-1.05%	-0.17%	-1.13%
2	-1.78%	1.22%	-0.33%	-2.60%	1.62%	-1.73%	0.07%	-0.70%	0.45%	4.47%	1.58%	0.48%	0.75%	2.80%
	2.30%	-3.51%	-0.07%	1.00%	0.54%	2.51%	-0.34%	-0.58%	-2.50%	-2.36%	-0.28%	0.20%	-0.17%	-1.00%
3	0.05%	-0.50%	-0.06%	0.43%	1.14%	-0.84%	-0.62%	0.15%	0.93%	1.23%	0.49%	-0.97%	0.43%	1.47%
	0.59%	0.16%	-1.93%	-0.12%	0.15%	0.36%	0.57%	-0.05%	-0.48%	-0.37%	-0.17%	-0.06%	-0.06%	-0.37%
4	0.48%	-0.43%	-0.26%	<b>13.20%</b>	2.09%	-0.05%	-0.20%	-0.77%	0.04%	<b>9.83%</b>	-0.40%	0.05%	0.04%	-0.26%
	-0.98%	0.38%	1.35%	<b>-9.60%</b>	0.10%	-0.16%	-0.19%	0.46%	-3.08%	-1.08%	-0.67%	0.36%	0.17%	-0.69%
5	-0.19%	-1.16%	-0.30%	<b>12.63%</b>	-0.04%	0.17%	-0.01%	-0.20%	-0.93%	<b>5.45%</b>	-0.71%	0.22%	0.06%	-1.15%
	-0.84%	1.45%	0.91%	<b>-11.91</b>	0.63%	-0.81%	-0.32%	-0.07%	0.08%	-4.62%	-0.26%	0.07%	-0.19%	0.77%
6	2.21%	-0.34%	-0.45%	-0.11%	0.19%	-1.40%	0.46%	-0.79%	0.70%	-0.07%	0.30%	-0.40%	-0.60%	0.28%
	-1.50%	0.26%	0.41%	-0.08%	0.22%	0.15%	-0.65%	0.06%	-0.64%	-0.30%	-0.06%	-0.13%	0.11%	-0.16%
7	-0.57%	-0.47%	-0.19%	<b>6.30%</b>	0.71%	-0.84%	-0.75%	1.37%	<b>5.69%</b>	<b>17.11%</b>	-0.09%	-0.67%	-0.84%	3.27%
	1.56%	0.61%	1.23%	-4.39%	0.36%	1.30%	0.73%	-0.88%	-1.31%	<b>-19.34</b>	-0.77%	-0.68%	-0.50%	-0.51%
8	1.08%	-1.72%	-0.83%	1.26%	2.45%	1.10%	0.01%	-0.71%	-1.62%	-0.38%	-0.40%	1.48%	-0.55%	-0.22%
	0.02%	0.98%	2.15%	2.29%	0.81%	0.90%	-0.41%	0.80%	2.92%	0.35%	-0.19%	-0.17%	-0.03%	-0.04%
9	1.73%	1.12%	0.44%	-0.15%	0.29%	-0.17%	1.39%	0.17%	0.48%	1.61%	2.61%	-0.11%	0.69%	2.03%
	-2.04%	-0.65%	-0.56%	-0.09%	-0.36%	0.81%	0.05%	-0.32%	-0.73%	-1.71%	-1.03%	0.34%	-0.83%	-1.11%
10	0.40%	-0.61%	3.97%	0.00%	-0.65%	-0.83%	0.04%	-0.33%	0.91%	0.89%	1.01%	-1.33%	0.44%	1.43%
	-0.02%	0.38%	-3.35%	0.02%	0.36%	0.18%	0.04%	0.15%	-0.51%	-0.42%	-0.17%	-0.21%	-0.21%	-0.44%
11	0.35%	-0.76%	-2.54%	-0.60%	-1.03%	-1.20%	-0.22%	-0.78%	0.82%	0.67%	1.22%	-0.32%	-0.39%	1.30%
	-0.31%	0.22%	-0.65%	-0.05%	-0.02%	0.28%	-0.13%	-0.22%	-0.85%	-1.17%	-0.54%	0.43%	-0.50%	-0.82%
12	-0.79%	0.09%	-0.27%	0.43%	-0.03%	0.00%	0.02%	-0.28%	0.42%	1.91%	0.23%	0.18%	-0.56%	-0.19%
	1.49%	-1.46%	-0.05%	-0.11%	0.09%	0.17%	-0.40%	0.04%	-0.42%	-2.53%	-0.44%	-0.01%	-0.05%	-0.16%
13	2.94%	-1.04%	-0.72%	0.18%	-0.71%	-2.07%	3.29%	-0.24%	1.83%	0.14%	1.26%	-0.05%	0.05%	0.24%
	0.86%	-2.53%	0.88%	-0.07%	0.77%	0.11%	-4.24%	-0.11%	-1.48%	-1.43%	-0.66%	-0.58%	-0.20%	-0.72%
14	0.01%	-0.12%	0.05%	<b>7.31%</b>	1.27%	-0.88%	0.11%	0.85%	2.84%	<b>7.90%</b>	0.62%	0.61%	0.08%	0.83%
	-0.66%	0.86%	0.12%	<b>-6.79%</b>	-0.04%	0.03%	-0.18%	-0.47%	-2.33%	-3.67%	-0.70%	0.08%	-0.13%	-0.80%
15	-0.06%	-0.23%	-2.35%	0.16%	-1.11%	-0.93%	-0.19%	-0.41%	0.38%	0.15%	-0.07%	-0.78%	0.25%	0.37%
	-0.06%	0.26%	3.07%	0.03%	0.43%	0.15%	0.04%	0.20%	-0.20%	-0.20%	-0.06%	-0.17%	-0.21%	-0.24%

**Table B4 Continued**

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	0.42%	-0.36%	-1.90%	0.61%	-0.21%	0.39%	0.58%	-0.15%	0.36%	0.74%	0.16%	-0.37%	0.24%	0.81%
	0.03%	0.32%	1.49%	-0.08%	0.16%	-0.16%	-0.22%	0.13%	-0.03%	-0.32%	0.07%	-0.01%	-0.04%	0.13%
	17	-1.01%	-0.44%	0.82%	-0.79%	1.57%	0.59%	-0.48%	0.21%	1.18%	0.54%	0.74%	-0.73%	-1.04%
		-0.31%	0.87%	0.03%	-0.13%	-0.67%	-1.17%	0.27%	-0.10%	-0.95%	-0.22%	0.03%	0.07%	0.17%
	18	-0.64%	0.39%	0.58%	-0.13%	0.16%	-0.53%	0.11%	1.88%	0.07%	0.34%	-0.47%	0.56%	
		-0.21%	0.00%	-0.13%	-0.24%	0.04%	0.23%	-0.32%	-1.91%	-0.10%	0.01%	-0.02%	-0.53%	
	19	-0.58%	0.34%	-0.94%	0.40%	-0.18%	0.35%	1.08%	2.14%	-0.01%	0.73%	2.81%		
		0.07%	-0.26%	0.29%	-0.27%	-0.10%	-0.31%	-0.67%	-0.73%	-1.22%	-0.87%	-1.62%		
	20	-0.69%	-0.16%	-0.13%	-0.18%	2.04%	4.51%	-0.23%	0.27%	-0.21%	-1.35%			
		0.64%	0.14%	0.50%	-0.50%	-1.98%	-7.49%	-1.16%	-0.55%	-0.52%	0.27%			
	21	0.44%	0.21%	1.40%	0.08%	1.28%	0.52%	3.51%	-8.43%	1.29%				
		-0.06%	-1.09%	-1.12%	0.60%	0.74%	3.17%	-4.76%	1.50%	2.95%				
	22	-0.34%	0.44%	-513.25	1.01%	-1.16%	0.41%	-0.79%	-1.59%					
		0.73%	-1.75%	458.67	2.37%	-0.73%	-1.17%	-0.83%	0.82%					
23	-0.32%	-0.28%	0.50%	-0.33%	0.58%	-0.45%	-0.57%							
	0.11%	0.15%	-0.70%	-0.07%	0.02%	-0.01%	0.14%							
24	0.06%	-0.09%	56.81%	0.32%	-1.13%	2.70%								
	-0.79%	0.70%	-73.85	0.30%	0.50%	-3.85%								
25	-4.77%	0.78%	0.46%	-0.36%	-2.97%									
	4.92%	-0.85%	-0.20%	0.00%	2.00%									
26	-0.03%	1.96%	0.44%	-1.37%										
	-0.49%	-0.68%	-0.18%	0.08%										
27	0.94%	-0.66%	2.47%											
	0.04%	0.12%	-3.85%											
28	2.88%	-0.21%												
	-3.36%	2.83%												
29	0.31%													
	-0.70%													