DIW Berlin

German Institute
for Economic Research

Discussion Papers

735

Boriss Siliverstovs
Dieter Schumacher

The Missing Globalization Puzzle: Another Explanation

Berlin, October 2007

Opinions expressed in this paper are those of the author and do not necessarily reflect views of the institute.

IMPRESSUM

DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin
Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
http://www.diw.de

ISSN print edition 1433-0210
ISSN electronic edition 1619-4535

The Missing Globalization Puzzle: Another Explanation[§]

Boriss Siliverstovs *

DIW Berlin

Dieter Schumacher**

Europe University Viadrina / DIW Berlin

October 13, 2007

Abstract

This study suggests another explanation of the "missing globalization puzzle" typically observed in the empirical gravity models. In contrast to the previous research that focused on aggregated trade flows, we employ the trade flows in manufacturing products broken down by 25 three-digit ISIC Rev.2 categories. We estimate the distance coefficient using the log-linear specification of the standard as well as the generalized gravity equations. Our data set comprises trade flows for 22 OECD countries that span the time period from 1970 till 2000. We observe a substantial decline in the value of the distance elasticity in most manufacturing industries.

Keywords: Gravity model, missing globalization puzzle, distance coefficient

JEL code: F12.

[§]The paper has benefited from comments by K. A. Kholodilin and by the participants at the 9th Annual Conference of the European Trade Study Group (ETSG), Athens, Greece.

[*]DIW Berlin, Mohrenstraße 58, D–10117 Berlin, Germany, e-mail: bsiliverstovs@diw.de

[**]DIW Berlin, Mohrenstraße 58, D–10117 Berlin, Germany, e-mail: dschumacher@diw.de

1 Introduction

The "missing globalization puzzle" or "distance puzzle" is well established in the traditional literature on empirical applications of the gravity model. Coe et al. (2002, 2007) argue that the standard gravity models that are usually estimated in the log-linear form are unable to capture the significant decline in the trade costs brought by globalization of the world economy. In particular, they point out that even so these gravity models based on cross-sectional regressions are able to explain the pattern of international trade relatively well, the magnitude of the estimated distance coefficient remains stable over time. Assuming that namely the magnitude of the distance coefficient serves as a proxy for trade-related costs, the reported stability of the distance coefficient remains a puzzling and counterintuitive result. Coe et al. (2002, p. 3) conclude that "globalization is everywhere but in estimated gravity models". This fact prompts the authors to talk about the "missing globalization puzzle". Thus, they confirm Leamer and Levinsohn (1995) who concluded that, contrary to popular notions of globalization, the world is not "getting smaller".

Indeed, Coe et al. (2007) base their argument on numerous studies (Frankel, Stein, and Wei, 1997; Eichengreen and Irwin, 1998; Helliwell, 1998; Frankel and Rose, 2000; Soloaga and Winters, 2001; Brun, Carrère, Guillaumont, and de Melo, 2005, *inter alia*), where results of the estimated gravity models are compared for different time periods with the typical conclusion that the distance coefficient varies in the interval between -0.5 and -1.0 or higher and, what is more important, its value reveals no tendency to decline over time. Hence, this conclusion on the stability of the distance coefficient seems to be robust across different sample sizes and regression specifications.

There are several theories in the literature that explain the apparent stability of the distance coefficient over time. (Coe et al., 2002, p. 6) mention the following four types of possible explanations of the missing globalization puzzle: "the decline in average costs relative to marginal costs of trade over time; the increased dispersion of economic activity; the changing composition of trade; and the importance of relative rather than absolute costs in determining bilateral trade". Coe et al. (2002) also provide in-depth discussion of the proposed explanations for this puzzle. Next, (Brun et al., 2005) argue that the observed puzzle may be due to misspecification of the transport cost function in the standard gravity models. Finally, Buch et al. (2004, p. 297) argue that stability typically observable over time in the distance coefficient is not that surprising because "interpretation of distance coefficients as indicators of a change in distance costs is misleading".

Besides the theoretical considerations, there is a number of studies that argue that the problem of zero observations that is inherent in the log-linear estimation approach of the gravity models and, especially, various ad hoc methods used in the literature to solve this problem may have created "the missing globalization puzzle". For example, Coe et al. (2007) suggest to solve the missing globalization puzzle empirically by reconsidering the estimation method of the parameters of the gravity model. In particular, they propose to dispense with the (historically most popular) log-linear form of the gravity equation and to directly consider the nonlinear specification of the gravity equation. Indeed, using the nonlinear specification of the gravity model the authors show that the distance coefficient value shows trendwise decrease over time. At the same time Coe et al. (2007, p. 36) conclude that their results "also confirm that the standard log-linear specification does not yield evidence of globalization". Similarly, Felbermayr and Kohler (2006) show that applying a Tobit estimation of the gravity equation may resolve the distance puzzle. Dissecting trade growth after World War II into growth of already established trade relations and establishing new trade between countries that have not traded with each other in the past they find that distance plays an ever decreasing role over time. This, however, has to be contrasted with the estimation of the gravity model in the log-linear form where such decline in the value of the distance coefficient was not noticeable.

In this paper, we suggest another solution to the "missing globalization puzzle" in the gravity equation. In this respect we would like to point out that Coe et al. (2007) and the rest of the articles cited above estimate the gravity models using aggregated trade data. On the contrary, in our paper we employ the trade flows at different levels of disaggregation: (i) for all products combined, (ii) for agriculture, mining and quarrying, and manufacturing products as a whole as well as (iii) for manufacturing products broken down by 25 three-digit ISIC Rev.2 industries. The yearly data are collected for the 22 OECD countries and encompass the time period from 1970 till 2000.

Initially, we base our estimation results on the gravity model specified in the log-linear form in its *most basic form*. Next, we estimate the generalized gravity model of Bergstrand (1989) by augmenting the basic gravity equation by the relative factor endowment of the exporting country and the per capita income of the importing country. The influential study of Bergstrand (1989) provides the theoretical foundation for the gravity equation applied to disaggregated trade flows. As we apply the traditional estimation method of the gravity equation, we unavoidably face the problem of zero observations which we solve in the natural way by substituting them with the smallest value observed. In this way we keep all the observations in our sample.

Our main finding is that when estimating the gravity model parameters, using trade flows broken down by 25 three-digit ISIC Rev.2 industries, the often observed result in the models estimated using aggregated trade flows that the distance coefficient is stable over time does not generally hold. In a large number of manufacturing industries we find a trendwise change such that the (absolute) value of the distance elasticity is up to 45 percent smaller in 2000 than 1970. At the same time, our estimation results obtained for the gravity models estimated for all products combined as well as separately for agriculture and for all manufacturing products suggest that the (absolute) magnitude of the distance coefficient remains rather stable over time. On the contrary, we find that for mining and quarrying it substantially increases. Thus, our findings conform with the results reported in other studies that estimate the log-linear gravity models using aggregated trade flows.

2 Data

In the empirical analysis, for the dependent variable we employ the annual trade flows of the years from 1970 till 2000 (in US $ million) for all products combined, agriculture, mining and quarrying, manufacturing products as a whole and broken down by 25 three-digit ISIC Rev.2 industries among 22 OECD countries.[1]

[1] Member countries in 1993, excluding Iceland and taking Belgium/Luxembourg together.

For this purpose the OECD foreign trade figures are appropriately re-coded from the original SITC categories.

The data on GNP (in US $ million) are taken from World Bank publications. The distance D_{ij} (in miles) between the countries i and j is calculated as the shortest line between their economic centres EC_i and EC_j by latitudinal and longitudinal position.[2] The dummy variables cover: adjacency, Adj_{ij}, membership in a preference area: European Union, EU_{ij}, European Free Trade Agreement, $EFTA_{ij}$, the Free Trade Agreement between EU and EFTA, $EU-EFTA_{ij}$, the North-American Free Trade Agreement, $NAFTA_{ij}$, and Asia-Pacific Economic Co-operation, $APEC_{ij}$, in order to capture effects of regional trade liberalisation, ties by language, Lan_{ij}, and colonial-historical ties, Col_{ij}. The value of the dummy variable is 1, if the two countries i and j have a common land border, belong to the respective preference zone considering the changes over time according to membership, or have the same language or historical ties.[3] Otherwise the value of the dummy variables is zero.

3 Model Specification

Our baseline specification of the gravity model in the log-linear form reads as follows

$$\ln(X_{ij}^a) = \beta_0 + \beta_1 \ln(Y_i) + \beta_3 \ln(Y_j) + \beta_5 \ln D_{ij} + \gamma' DUM_{ij} + \eta_{ij}, \tag{1}$$

where X_{ij}^a denotes the trade flows in the respective ISIC category from a country i to a country j, the variables Y_i and Y_j denote the GNP of the corresponding countries, and $DUM_{ij} = (Adj_{ij}, EU_{ij}, EFTA_{ij}, EU - EFTA_{ij}, NAFTA_{ij}, APEC_{ij}, Lan_{ij}, Col_{ij})'$ is the vector of dummy variables as defined above in Section 2. In sequel, we refer to the model in equation (1) as $OLS2$.

We check the robustness of our estimation results using the generalized gravity equation of Bergstrand (1989) in the following form:

$$\ln(X_{ij}^a) = \beta_0 + \beta_1 \ln(Y_i) + \beta_2 \ln\left(\frac{Y_i}{P_i}\right) + \beta_3 \ln(Y_j) + \beta_4 \ln\left(\frac{Y_j}{P_j}\right) + \beta_5 \ln D_{ij} + \gamma' DUM_{ij} + \eta_{ij}, \tag{2}$$

where P_i and P_j are the population of the exporting and importing countries, respectively. The per capita income of country i is a proxy of the capital-labour endowment ratio of the exporting country, the per capita income of country j represents the import demand conditions of the importing country. We refer to the model in equation (2) as $OLS4$.

Given the available sample of yearly data that covers the period from 1970 till 2000, we estimate equations (1) and (2) – where for simplicity the time index is omitted – for every year $t = 1970, 1971, ..., 2000$ using the OLS procedure. This gives us a time series of 31 cross-sectional estimates of each coefficient. However, since our main concern is investigation of the "missing globalization puzzle", we will focus only on the analysis of the time pattern of the values of the estimated distance coefficient $\widehat{\beta}_5^t$ for $t = 1970, 1971, ..., 2000$. The next

[2] The national capitals were taken as the economic centre (EC) except for Canada (Montreal), the United States (Kansas City as a geographical compromise between the centres of the East and West Coasts), Australia (Sydney), and West Germany (Frankfurt/Main). The formulae are: $cosD_{ij} = \sin\varphi_i * \sin\varphi_j + \cos\varphi_i * \cos\varphi_j * \cos(\lambda_j - \lambda_i)$ and $D_{ij} = \arccos(\cos D_{ij}) * 3962.07$ miles for $EC_i = (\varphi_i; \lambda_i)$ and $EC_j = (\varphi_j; \lambda_j)$ with $\varphi =$ latitude, $\lambda =$ longitude.

[3] 0.5 for second languages and 0.5 for historical ties until 1914.

section presents estimation results.

4 Results

4.1 Aggregated trade flows

In this subsection we discuss the estimation results of the distance elasticity obtained for aggregated trade flows collected for all products combined (0) as well as for the one-digit ISIC industries such as agriculture (1), mining and quarrying (2), and manufacturing products as a whole (3)[4]. Figures 1 and 3 display the sequence of the estimated coefficients of interest using equations (1) and (2), respectively.

Observe that in both figures the estimated distance coefficient more or less fluctuates around the same level for all products combined (0), for agriculture (1), and for manufacturing products as a whole (3) whereas for mining and quarrying (2) it even substantially increases over time in the absolute value. Thus, our results obtained for the aggregated trade flows further support the evidence that favors the "missing globalization puzzle" and thus conform with the bulk of the previous literature that investigated this question.

4.2 Disaggregated trade flows in manufacturing

Next, we describe the estimation results obtained for disaggregated trade flows in manufacturing at the three-digit ISIC level. Figures 2 and 4 display the sequence of the estimated distance elasticity using equations (1) and (2), respectively.

First, observe that the distance elasticity estimated using either equation (1) or (2) is very similar. Second, despite some year-to-year fluctuations it is rather safe to conclude that for most manufacturing industries the magnitude of the distance elasticity seems to decline in the absolute value which implies that over the observation period from 1970 till 2000 the role of distance has (substantially) decreased. This is the main finding of our paper and, in this respect, we would like to emphasize that this result is based on the estimation of the standard log-linear specification of the gravity model in its most basic form and it also holds when we estimate the generalized gravity equation of Bergstrand (1989).

Our results obtained for disaggregated trade flows in manufacturing products suggest that by estimating the gravity equations using aggregated trade flows – either for all products combined or only for manufacturing as a whole – one overlooks the crucial information on the time evolution of the distance elasticity contained in the disaggregated trade flows.

Furthermore, it is of interest to quantify changes observed in the distance elasticity. In order to smooth out year-to-year variation in the estimated distance elasticity and for the sake of robustness check we calculate the absolute and relative change in the parameter of interest in the following two ways. First, we use the auxiliary regressions where we regress a time series of values of the estimated distance elasticity obtained for every ISIC category on a constant and a linear deterministic trend. The corresponding fitted values from such auxiliary regressions are reported for each product category in the respective graphic. Then, we

[4]The corresponding ISIC number is given in parentheses.

compare the predicted values from this regression for 1970 (the initial year in our sample) and for 2000 (the final year in our sample). Second, we compare the average value of the actual values of the distance elasticity computed for the first three years (1970–1972) and for the last three years (1998–2000) in our sample.

Tables 1 and 2 present the results obtained by comparing the predicted values from the auxiliary regressions and the averaged actual values for the first and the last three years in our sample, respectively. Each table contains the estimated value of the distance elasticity in the beginning and in the end of the period (columns *initial* and *last*). The columns *absolute change* and *relative change* contain the absolute and the relative differences between the numbers that are present in the *initial* and *last* columns, respectively.

Comparison of the relative change in the distance elasticity reveals that the results are robust with respect to the specification of the gravity model as well as to the calculation method. As seen from Tables 1 and 2, in the following industries we observe substantial decline in the value of the distance coefficient such that its (absolute) value is up to 45% smaller in 2000 than that in 1970. These industries include food, beverages, and tobacco (31), leather and leather products (323), footwear (324), wood and wood products (331), furniture (332), paper and paper products (341), printing and publishing (342), industrial chemicals (351), other chemical products (352), rubber products (355), plastic products (356), glass and glass products (362), structural clay products (369), fabricated metal products (381), machinery (382), electrical machinery (383), transport equipment (384), measuring, photo, and optical equipment (385), and other manufacturing (390).

It is worthwhile mentioning that only for one industry – textiles (321) – we find that the distance elasticity has substantially increased in the absolute value and this finding is robust regarding the estimated model and calculation of the relative difference between the beginning and the end of the observation period. The likely reason is the huge transfer of textile production from the OECD countries to the other – mainly developing – countries, which are not included in our sample, that took place in the course of the period under consideration.

For the remaining five industries which include wearing apparel (322), petroleum refineries (353-4), pottery and china (361), iron and steel (371), and basic non-ferrous metals (372), we find that the estimated distance elasticity exhibits neither strong nor robust evidence of change in either direction and hence we conclude that for these industries it remains more or less the same over the observation period. Observe that this group of industries is intensive in natural resources and at least three of them are closely related to the mining and quarrying (2) where we find ever increasing role of distance, as discussed above.

In order to demonstrate the close correspondence between estimation results obtained for different specifications of the gravity equations (*OLS2* vs *OLS4*) as well as different computation method of the magnitude of relative change (the approach based on the auxiliary regression *aux* vs the averaging approach *ave*) we show the corresponding cross-plots of the estimated relative change observed for each industry in Figure 5. For example, the upper left graph in Figure 5 displays the relative change in the estimated distance elasticity computed by the averaging approach for the basic gravity model (OLS2ave) plotted against that for the generalized gravity model (OLS4ave), etc. It is worthwhile noting that the robustness of the results is also supported by the high values of the correlation coefficient $\hat{\rho}$ between the relative changes computed in different ways. This correlation coefficient lies in the interval between 0.94 and 0.97.

4.3 Declining role of distance and changing trade composition

We calculated the share of each manufacturing industry in total trade of all manufacturing products observed for each year in our sample, see Figure 6. First, we observe that there are substantial differences in the shares of each industry in the total trade volume. For example, trade in industries such as machinery (382), electrical machinery (383), transport equipment (384) each comprise more than 10% in total trade of manufacturing products. On the other hand, there are industries where the corresponding trade volume is less than or about 1% of total trade, e.g., leather and leather products (323), footwear (324), furniture (332), printing and publishing (342), rubber products (355), plastic products (356), pottery and china (361), glass and glass products (362), and structural clay products (369). Second, we also observe that the composition of trade changed over time. There are industries whose share in total trade significantly increased over time, e.g., other chemical products (352), electrical machinery (383), transport equipment (384), measuring, photo, and optical equipment (385), and there are industries whose share substantially decreased over time, e.g., food, beverages, and tobacco (31), textiles (321), wearing apparel (322), iron and steel (371), and basic non-ferrous metals (372), etc. Table 3 quantifies absolute and relative changes in the trade share of each manufacturing industry.

In order to investigate the relationship between the declining role of distance observed in certain industries and the changing composition in intra-OECD trade, we made cross-plots of the relative change in the distance coefficient (calculated for the generalized gravity model(2) using the averaging approach) and the relative and absolute changes in trade shares as reported in Table 3. Figures 7 and 8 display the respective cross-plots. On the one hand, we find that for those five industries – wearing apparel (322), petroleum refineries (353-4), pottery and china (361), iron and steel (371), and basic non-ferrous metals (372) – for which we observe very little change in the distance coefficient over time as well as for the textile industry (321) we also observe a substantial decline in their respective shares in total trade volume, measured both in relative and absolute terms. On the other hand, those industries like other chemical products (352), electrical machinery (383), transport equipment (384), measuring, photo, and optical equipment (385) for which we find the largest decrease in the absolute value of distance elasticity also experienced a substantial rise in their shares in total trade measured either in relative or absolute terms. The corresponding correlation coefficients inferred from Figures 7 and 8 are 0.61 and 0.69, respectively.

5 Conclusions

In this study, we investigate whether the phenomenon of non-decreasing distance elasticity, labeled as the "missing globalization puzzle" in Coe et al. (2002, 2007), that typically is found in the gravity models estimated for aggregated trade flows, also holds for (manufacturing) trade flows disaggregated at the three-digit ISIC level. For this purpose, we employ a data set that covers international trade flows among 22 OECD countries from 1970 till 2000. Using this data set we estimate the standard gravity model in its most basic form as well as the generalized gravity model of Bergstrand (1989).

Our findings are twofold. First, when we estimate the gravity model using aggregated trade flows for all goods combined, for agriculture, for mining and quarrying, and for manufacturing products as a whole we find no signs that the distance elasticity declines over time in the absolute value. Moreover, for mining and quarrying industry we find rather strong evidence that the absolute value of the distance elasticity has increased over time. Thus, our results based on aggregated data seem to conform with the rest of the literature on the persistence of the missing globalization puzzle. Observe that our results are based on a more homogenous sample of the developed OECD countries and in this respect complements the rest of the relevant studies that use more heterogenous samples of countries including both developed as well as developing ones.

Second, when we consider manufacturing trade flows disaggregated at the three-digit ISIC level we found that for 19 out of 25 categories the distance elasticity in 2000 has declined up to 45% compared with its value obtained in 1970. At the same time, we find that only for one industry (textile) the distance elasticity value has substantially increased. For the remaining five industries, we find no robust evidence that the distance elasticity has changed over the sample period.

Our results obtained for the disaggregated trade flows in manufacturing products suggest that by estimating the gravity equations using aggregated trade flows – either for all products combined or only for manufacturing as a whole – one overlooks the crucial information on the time evolution of the distance elasticity contained in the disaggregated trade flows. Hence, the aggregation issue seems to be relevant for explaining the missing globalization puzzle typically observed in standard gravity models in addition to the number of explanations that already have been put forward in the previous literature.

We also find that the manufacturing industries for which we observe the largest decline in the value of distance elasticity are those whose share in total intra-OECD trade substantially increased over time. On the contrary, those industries for which we find no evidence of a declining role of distance are those whose share in total trade decreased over the three decades. Thus, our analysis suggests that transportation costs decreased in particular for long distances in the most important and dynamic manufacturing industries.

References

Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and the factor proportions theory in international trade. *The Review of Economics and Statistics 71*(1), 143–153.

Brun, J.-F., C. Carrère, P. Guillaumont, and J. de Melo (2005). Has distance died? Evidence from a panel gravity model. *World Bank Economic Review 19*(1), 99–120.

Buch, C. M., J. Kleinert, and F. Toubal (2004). The distance puzzle: On the interpretation of the distance coefficient in gravity equations. *Economics Letters 83*(3), 293–298.

Coe, D. T., A. Subramanian, and N. T. Tamirisa (2007). The missing globalization puzzle: Evidence of the declining importance of distance. *IMF Staff Papers 54*(1), 34–58.

Coe, D. T., A. Subramanian, N. T. Tamirisa, and R. Bhavnani (2002). The missing globalization puzzle. IMF Working Papers 02/171, International Monetary Fund.

Eichengreen, B. and D. A. Irwin (1998). The role of history in bilateral trade flows. In J. A. Frankel (Ed.), *The Regionalization of the World Economy*. Chicago and London: University of Chicago Press.

Felbermayr, G. J. and W. Kohler (2006). Exploring the intensive and extensive margins of world trade. *Review of World Economics (Weltwirtschaftliches Archiv) 127*(4), 642–674.

Frankel, J. A. and A. Rose (2000). Estimating the effect of currency unions on trade and output. National Bureau of Economic Research Working Paper 7857.

Frankel, J. A., E. Stein, and S. J. Wei (1997). Regional trading blocs in the world economic system. Wahington, D.C.: Institute for International Economics.

Helliwell, J. F. (1998). How much do national borders matter? Brookings institution (Washington, D. C.).

Leamer, E. E. and J. Levinsohn (1995). International trade theory: The evidence. In G. M. Grossmand and K. Rogoff (Eds.), *Handbook of Internatinal Economics*, Volume 3. Elsevier.

Soloaga, I. and L. A. Winters (2001). Regionalism in the nineties: What effect on trade? Centre for Economic Policy Research Working Paper 2183.

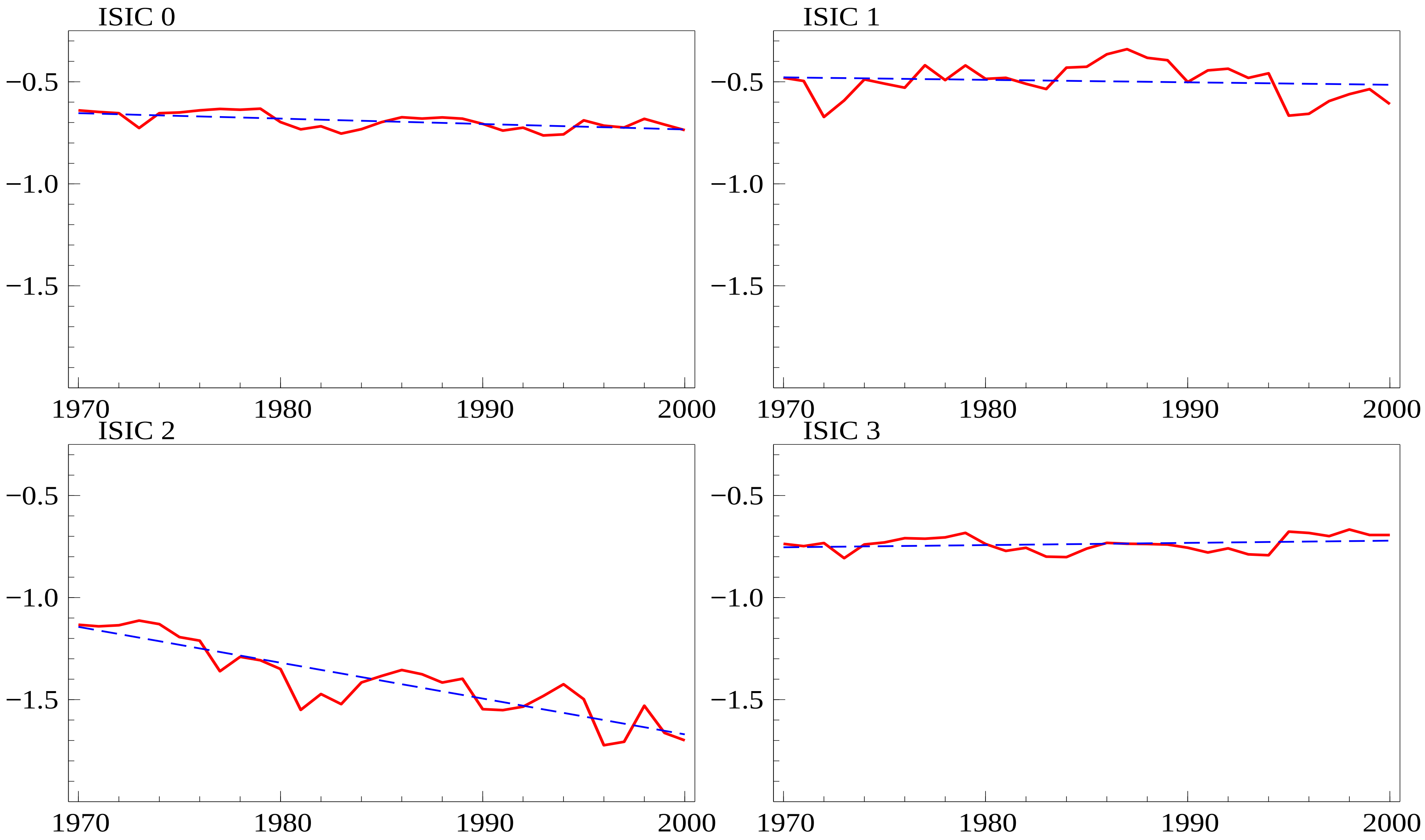

Figure 1: The sequence of the estimated distance coefficients $\widehat{\beta}_5^t$ with $t = 1970, ..., 2000$ (solid line) using the basic gravity equation (1) and the fitted linear trend (dashed line): All products combined and one-digit ISIC categories.

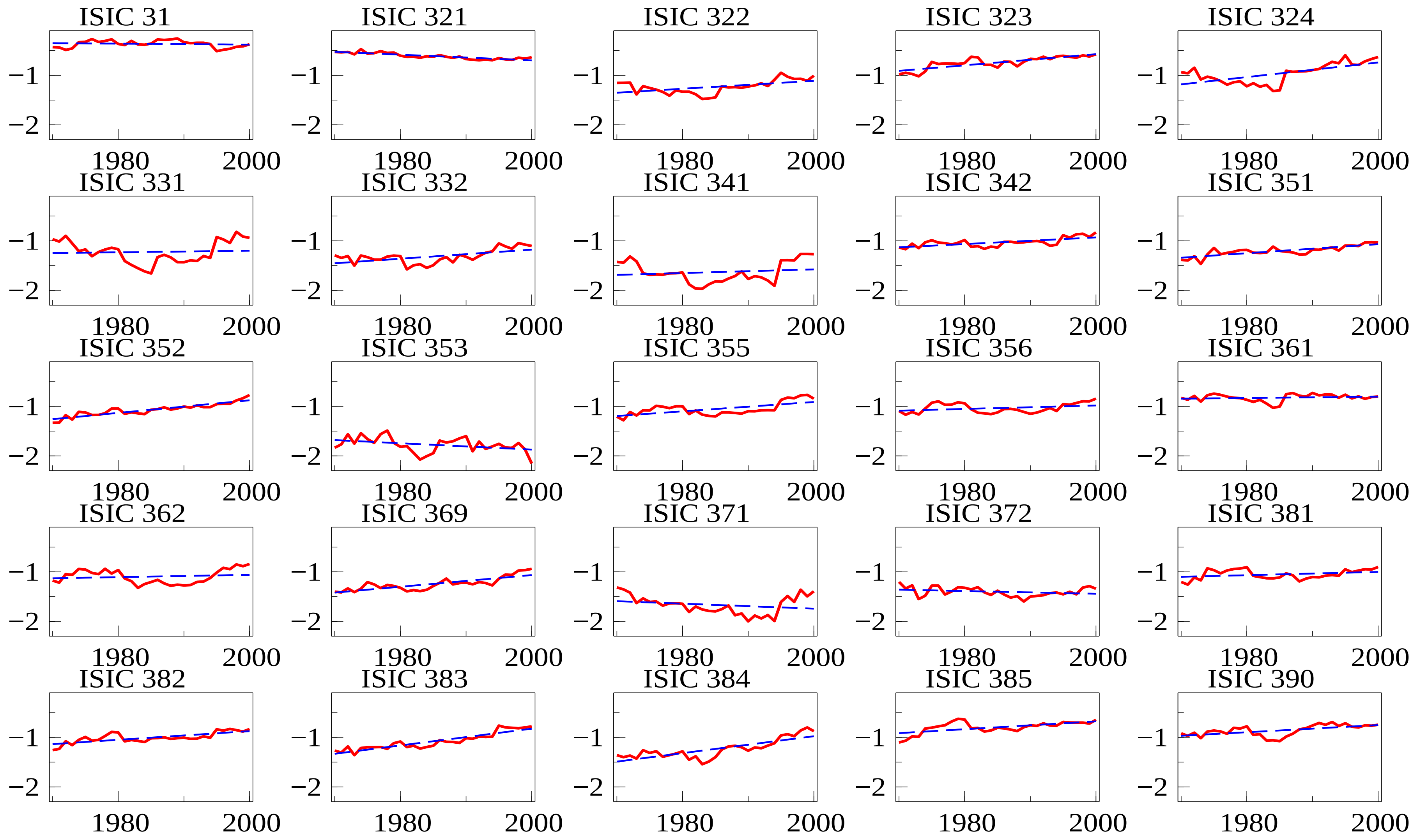

Figure 2: The sequence of the estimated distance coefficients $\widehat{\beta}_5^t$ with $t = 1970, ..., 2000$ (solid line) using the basic gravity equation (1) and the fitted linear trend (dashed line): Manufacturing industries broken down by three-digit ISIC categories.

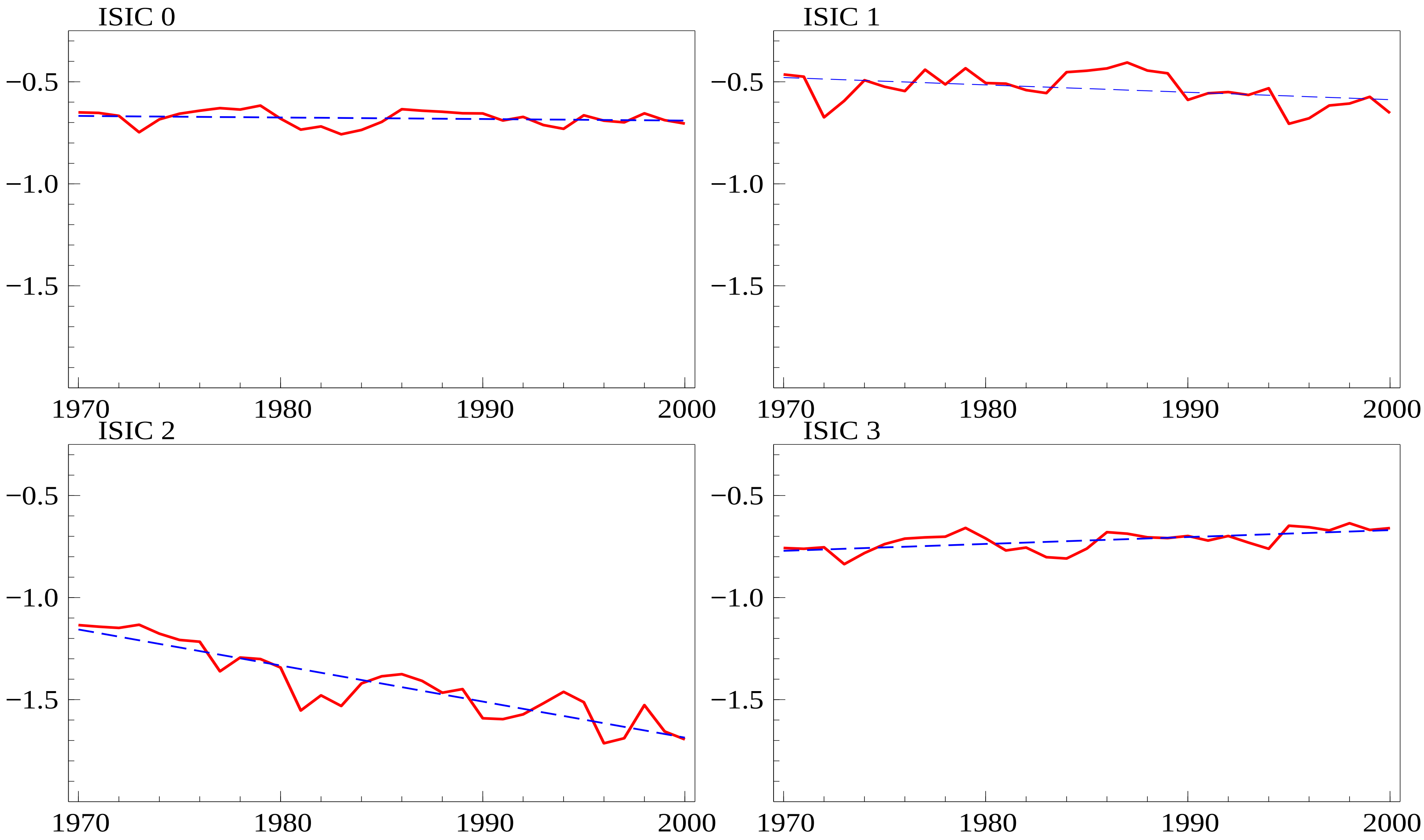

Figure 3: The sequence of the estimated distance coefficients $\widehat{\beta}_5^t$ with $t = 1970, ..., 2000$ (solid line) using the generalized gravity equation (2) and the fitted linear trend (dashed line): All products combined and one-digit ISIC categories

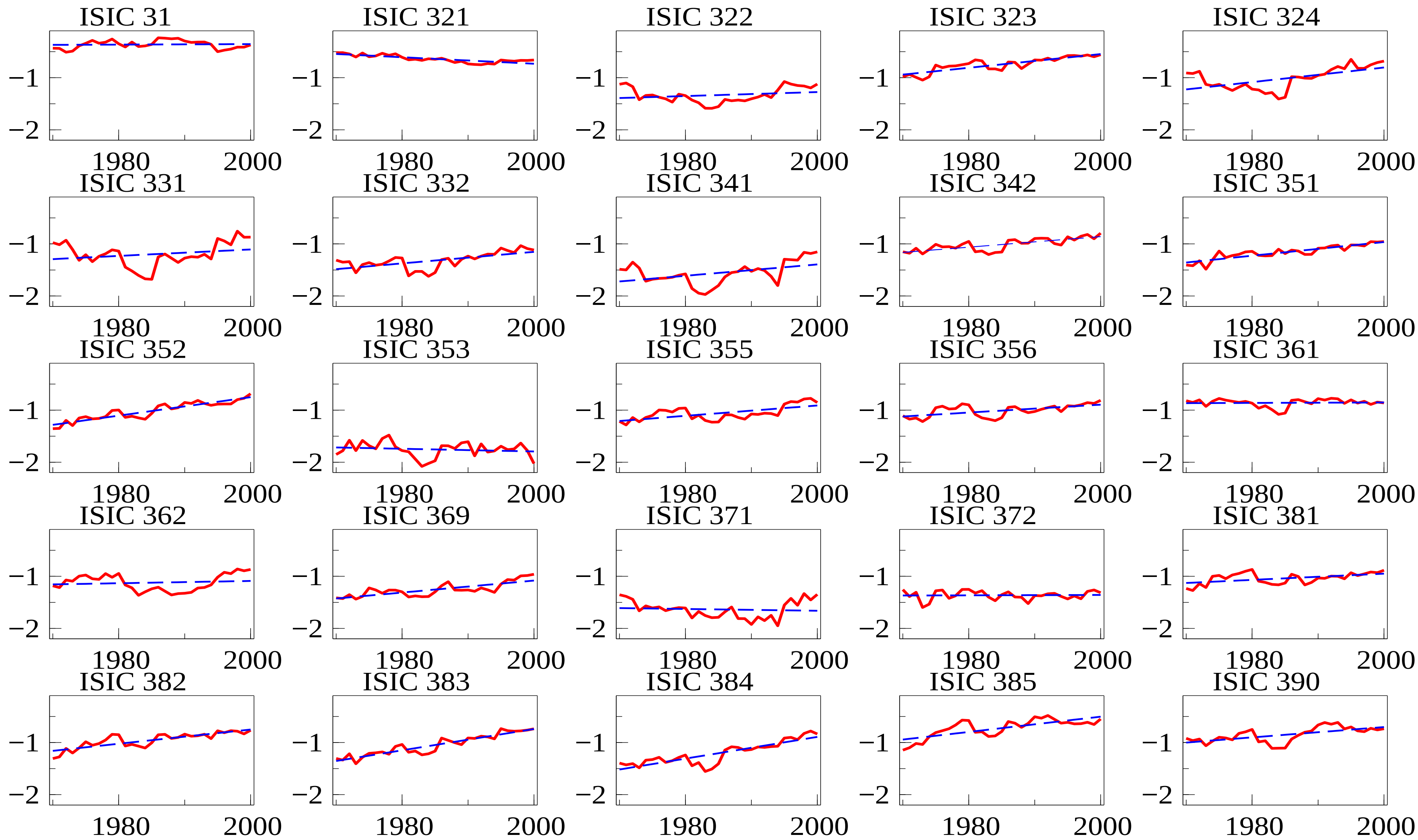

Figure 4: The sequence of the estimated distance coefficients $\widehat{\beta}_5^t$ with $t = 1970, ..., 2000$ (solid line) using the generalized gravity equation (2) and the fitted linear trend (dashed line): Manufacturing industries broken down by three-digit ISIC categories

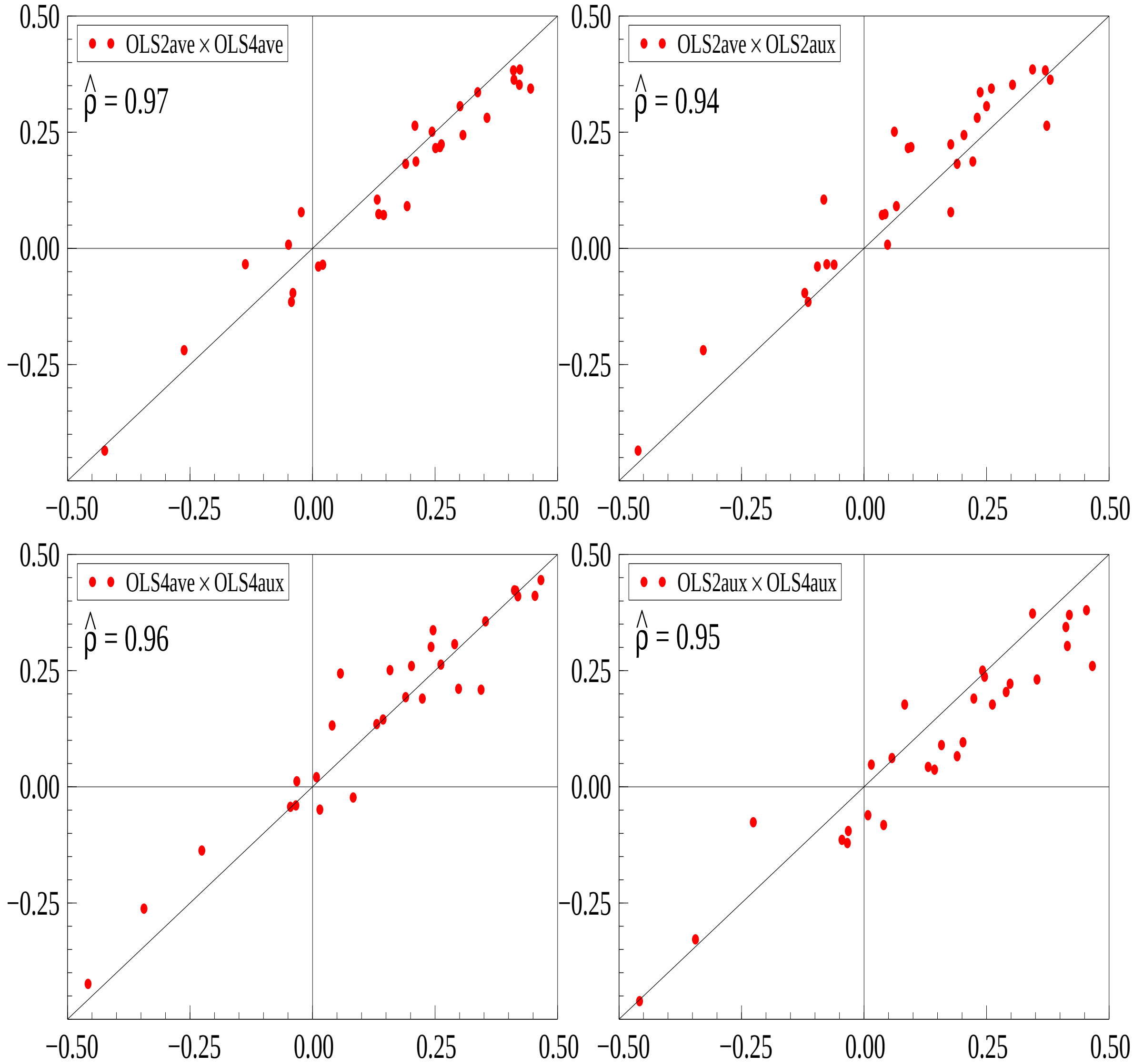

Figure 5: Cross plot of calculated relative change in the values of the estimated distance coefficient between the beginning of the sample and of the end of the sample; based on Tables 1 and 2

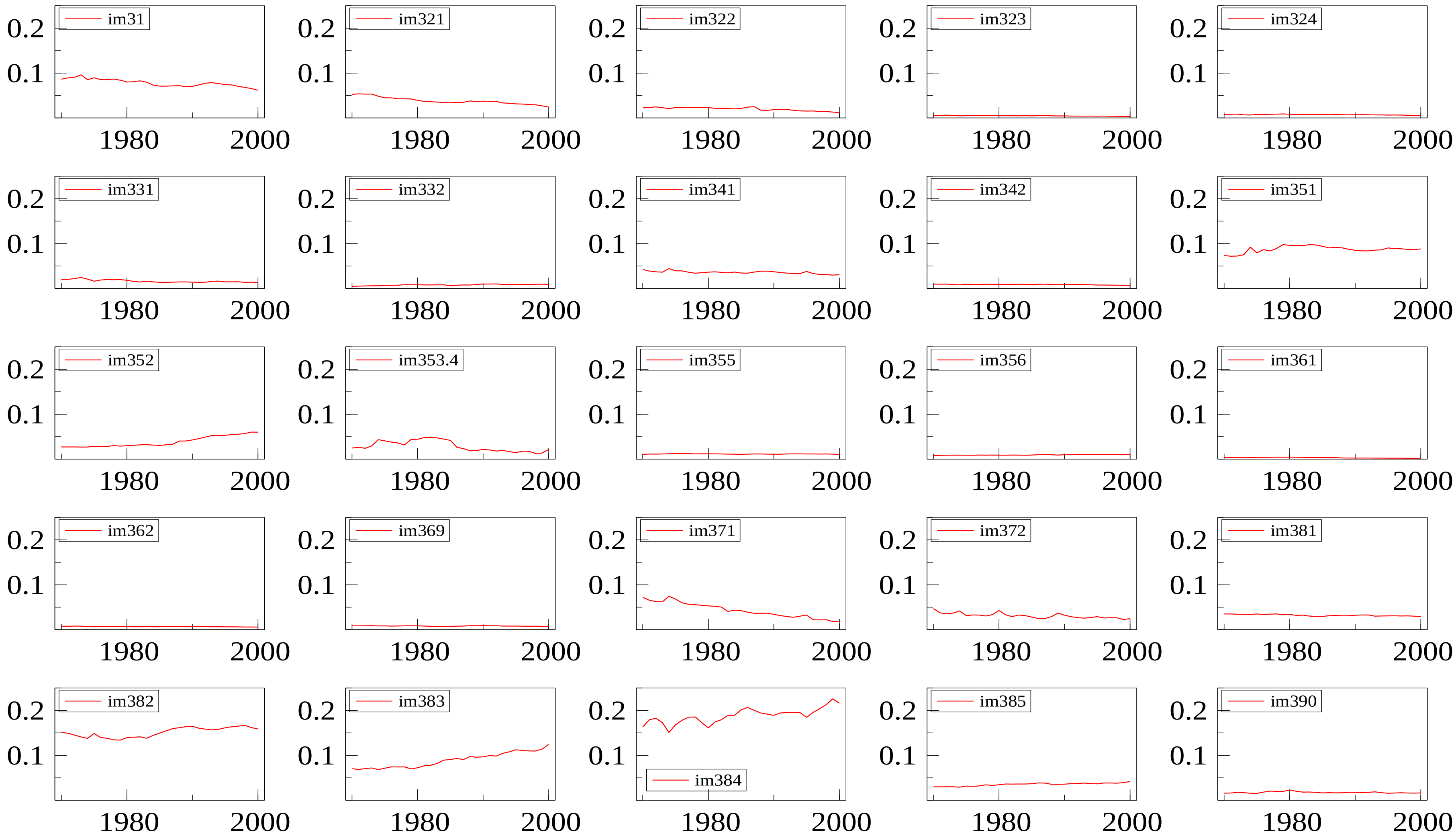

Figure 6: Share of each manufacturing industry in total trade of all manufacturing products among OECD countries

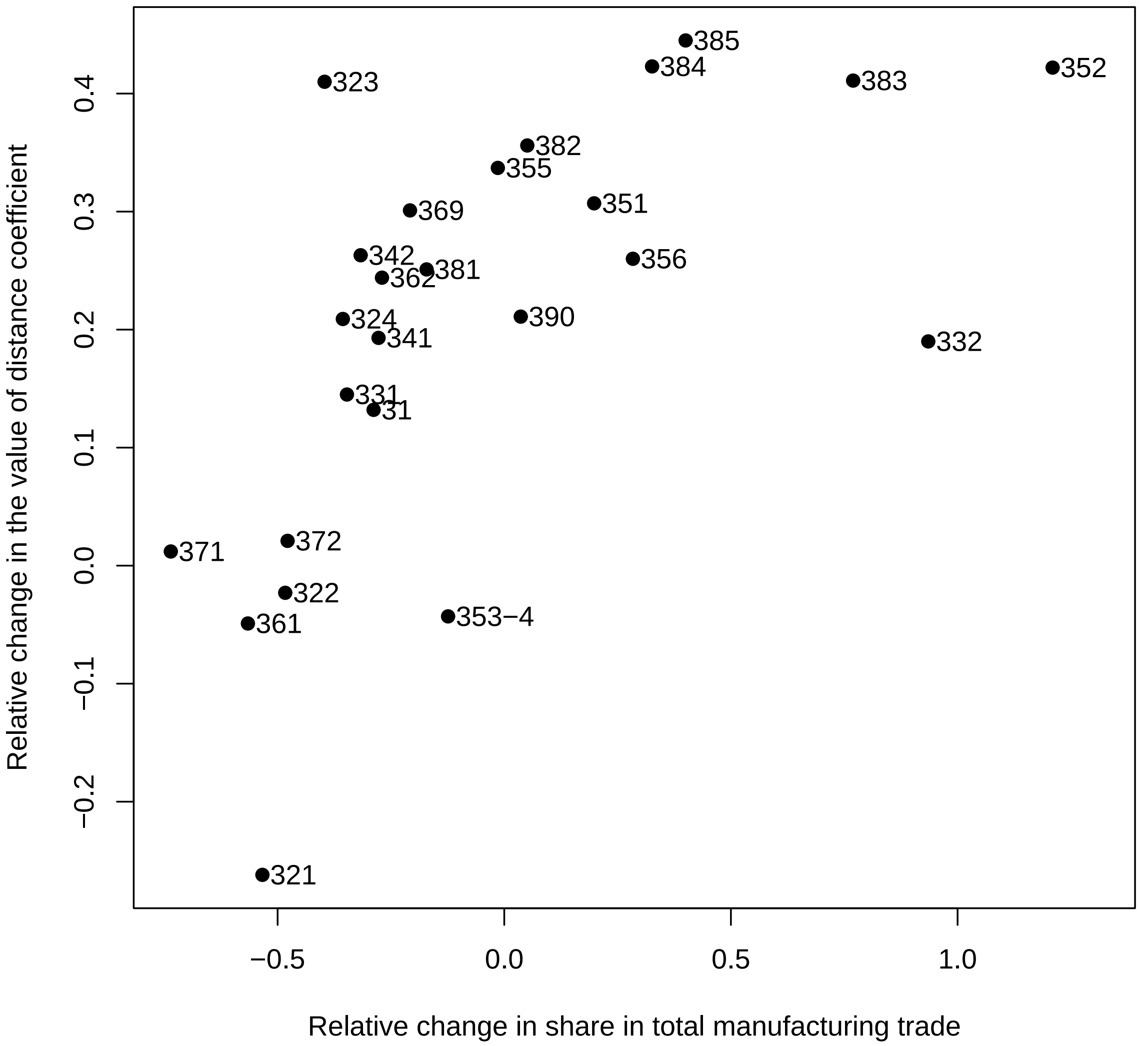

Figure 7: Cross plot of calculated relative change in the values of the estimated distance coefficient (OLS4ave) and of relative change in share in total manufacturing trade between the beginning and of the end of the sample period; based on Tables 2 and 3

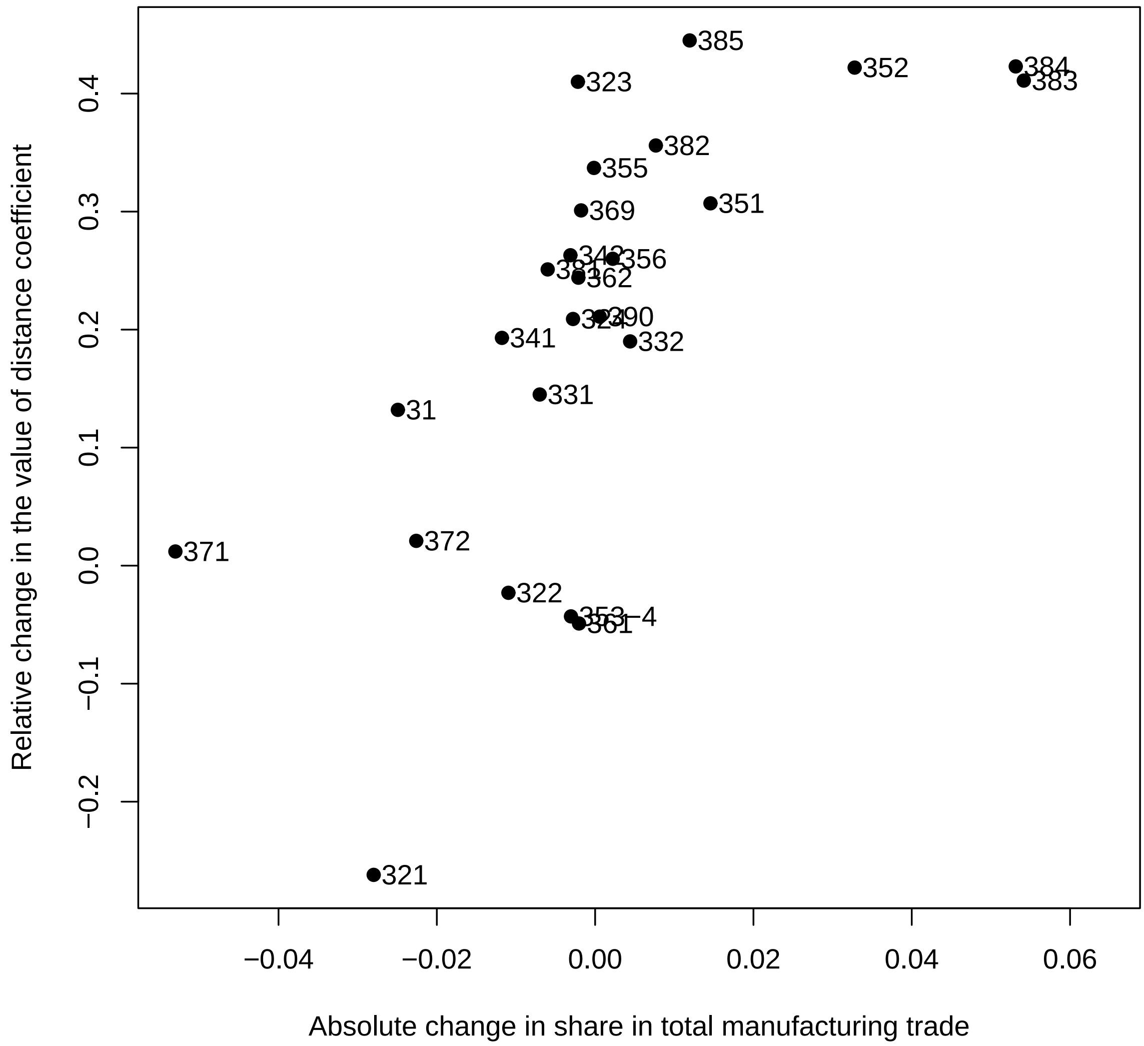

Figure 8: Cross plot of calculated relative change in the values of the estimated distance coefficient (OLS4ave) and of absolute change in share in total manufacturing trade between the beginning and of the end of the sample period; based on Tables 2 and 3

Table 1: Estimated change in the absolute and relative values of the distance coefficient (auxiliary regression)

		OLS2aux				OLS4aux				
ISIC	Sector	initial	last	absolute change	relative change	ISIC	initial	last	absolute change	relative change
0	All products	-0.654	-0.733	-0.079	-0.121	0	-0.668	-0.690	-0.023	-0.034
1	Agriculture	-0.478	-0.515	-0.036	-0.076	1	-0.479	-0.588	-0.108	-0.226
2	Mining, quarrying	-1.144	-1.670	-0.527	-0.461	2	-1.156	-1.686	-0.530	-0.458
3	Manufacturing	-0.754	-0.721	0.033	0.043	3	-0.771	-0.670	0.101	0.131
31	Food, beverages, tobacco	-0.352	-0.380	-0.029	-0.082	31	-0.369	-0.354	0.015	0.040
321	Textiles	-0.526	-0.699	-0.173	-0.328	321	-0.544	-0.731	-0.187	-0.344
322	Wearing apparel	-1.352	-1.113	0.239	0.177	322	-1.390	-1.275	0.115	0.083
323	Leather, leather products	-0.910	-0.574	0.337	0.370	323	-0.940	-0.546	0.394	0.419
324	Footwear	-1.183	-0.742	0.441	0.373	324	-1.224	-0.804	0.421	0.344
331	Wood, wood products	-1.248	-1.201	0.046	0.037	331	-1.292	-1.106	0.185	0.144
332	Furniture	-1.454	-1.178	0.276	0.190	332	-1.484	-1.152	0.332	0.224
341	Paper, paper products	-1.689	-1.577	0.112	0.066	341	-1.721	-1.393	0.328	0.190
342	Printing, publishing	-1.133	-0.932	0.201	0.177	342	-1.163	-0.859	0.304	0.262
351	Industrial chemicals	-1.342	-1.068	0.274	0.204	351	-1.357	-0.963	0.394	0.290
352	Other chemical products	-1.260	-0.879	0.382	0.303	352	-1.283	-0.751	0.532	0.415
353-4	Petroleum refineries and products	-1.682	-1.874	-0.192	0.114	353	-1.716	-1.793	-0.076	-0.045
355	Rubber products	-1.196	-0.913	0.284	0.237	355	-1.209	-0.911	0.298	0.246
356	Plastic products	-1.088	-0.984	0.104	0.096	356	-1.122	-0.895	0.227	0.202
361	Pottery, china, earthware	-0.846	-0.805	0.041	0.048	361	-0.866	-0.853	0.013	0.015
362	Glass, glass products	-1.131	-1.061	0.070	0.062	362	-1.154	-1.089	0.066	0.057
369	Structural clay products	-1.420	-1.066	0.354	0.250	369	-1.426	-1.082	0.345	0.242
371	Iron and steel basic industries	-1.593	-1.744	-0.151	-0.095	371	-1.610	-1.661	-0.051	-0.032
372	Basic non-ferrous metals	-1.361	-1.443	-0.083	-0.061	372	-1.368	-1.357	0.011	0.008
381	Fabricated metal products	-1.101	-1.002	0.099	0.090	381	-1.127	-0.949	0.179	0.158
382	Machinery	-1.137	-0.875	0.262	0.231	382	-1.159	-0.750	0.409	0.353
383	Electrical machinery	-1.333	-0.826	0.507	0.380	383	-1.353	-0.739	0.614	0.454
384	Transport equipment	-1.490	-0.978	0.513	0.344	384	-1.517	-0.892	0.625	0.412
385	Measuring, photo, optical equipment	-0.916	-0.678	0.238	0.260	385	-0.943	-0.503	0.440	0.466
390	Other manufacturing	-0.968	-0.753	0.215	0.222	390	-1.000	-0.703	0.298	0.298

Table 2: Estimated change in the absolute and relative values of the distance coefficient (average of the three first and three last values)

		OLS2ave				OLS4ave				
ISIC	Sector	initial	last	absolute change	relative change	ISIC	initial	last	absolute change	relative change
0	All products	-0.647	-0.71	-0.062	-0.096	0	-0.657	-0.683	-0.026	-0.040
1	Agriculture	-0.55	-0.569	-0.019	-0.034	1	-0.538	-0.611	-0.074	-0.137
2	Mining, quarrying	-1.136	-1.631	-0.494	-0.435	2	-1.142	-1.626	-0.484	-0.424
3	Manufacturing	-0.739	-0.684	0.055	0.074	3	-0.757	-0.655	0.102	0.135
31	Food, beverages, tobacco	-0.452	-0.405	0.048	0.105	31	-0.460	-0.399	0.061	0.132
321	Textiles	-0.531	-0.648	-0.116	-0.219	321	-0.527	-0.666	-0.138	-0.262
322	Wearing apparel	-1.152	-1.062	0.089	0.078	322	-1.133	-1.159	-0.026	-0.023
323	Leather, leather products	-0.968	-0.597	0.371	0.383	323	-0.970	-0.573	0.397	0.410
324	Footwear	-0.915	-0.673	0.242	0.264	324	-0.901	-0.713	0.188	0.209
331	Wood, wood products	-0.961	-0.891	0.069	0.072	331	-0.973	-0.832	0.141	0.145
332	Furniture	-1.316	-1.076	0.24	0.182	332	-1.333	-1.080	0.254	0.190
341	Paper, paper products	-1.395	-1.268	0.127	0.091	341	-1.445	-1.166	0.280	0.193
342	Printing, publishing	-1.121	-0.87	0.251	0.224	342	-1.137	-0.837	0.299	0.263
351	Industrial chemicals	-1.365	-1.031	0.334	0.244	351	-1.382	-0.958	0.424	0.307
352	Other chemical products	-1.281	-0.83	0.451	0.352	352	-1.301	-0.752	0.549	0.422
353-4	Petroleum refineries and products	-1.724	-1.922	-0.199	-0.115	353	-1.737	-1.812	-0.075	-0.043
355	Rubber products	-1.202	-0.798	0.404	0.336	355	-1.214	-0.804	0.410	0.337
356	Plastic products	-1.127	-0.881	0.246	0.218	356	-1.144	-0.847	0.298	0.260
361	Pottery, china, earthware	-0.829	-0.822	0.007	0.008	361	-0.825	-0.865	-0.040	-0.049
362	Glass, glass products	-1.147	-0.86	0.288	0.251	362	-1.156	-0.873	0.282	0.244
369	Structural clay products	-1.384	-0.96	0.424	0.306	369	-1.398	-0.978	0.420	0.301
371	Iron and steel basic industries	-1.363	-1.417	-0.054	-0.039	371	-1.393	-1.377	0.016	0.012
372	Basic non-ferrous metals	-1.271	-1.316	-0.044	-0.035	372	-1.316	-1.288	0.028	0.021
381	Fabricated metal products	-1.192	-0.934	0.258	0.216	381	-1.215	-0.910	0.305	0.251
382	Machinery	-1.191	-0.857	0.335	0.281	382	-1.232	-0.793	0.439	0.356
383	Electrical machinery	-1.254	-0.799	0.455	0.363	383	-1.286	-0.757	0.528	0.411
384	Transport equipment	-1.376	-0.846	0.53	0.385	384	-1.409	-0.813	0.596	0.423
385	Measuring, photo, optical equipment	-1.052	-0.69	0.362	0.344	385	-1.088	-0.604	0.484	0.445
390	Other manufacturing	-0.931	-0.757	0.174	0.187	390	-0.938	-0.740	0.198	0.211

Table 3: Share of individual manufacturing industries in total manufacturing trade among OECD countries

ISIC	Sector	1970	2000	Absolute change	Relative change
31	Food, beverages, tobacco	0.0864	0.0615	-0.0249	-0.288
321	Textiles	0.0524	0.0245	-0.0280	-0.534
322	Wearing apparel	0.0227	0.0117	-0.0110	-0.483
323	Leather, leather products	0.0055	0.0033	-0.0022	-0.396
324	Footwear	0.0078	0.0051	-0.0028	-0.356
331	Wood, wood products	0.0202	0.0132	-0.0070	-0.347
332	Furniture	0.0047	0.0091	0.0044	0.935
341	Paper, paper products	0.0425	0.0307	-0.0118	-0.277
342	Printing, publishing	0.0099	0.0067	-0.0031	-0.317
351	Industrial chemicals	0.0735	0.0881	0.0146	0.198
352	Other chemical products	0.0271	0.0599	0.0328	1.210
353-4	Petroleum refineries and products	0.0246	0.0216	-0.0031	-0.124
355	Rubber products	0.0105	0.0103	-0.0001	-0.014
356	Plastic products	0.0078	0.0101	0.0022	0.284
361	Pottery, china, earthware	0.0036	0.0016	-0.0020	-0.566
362	Glass, glass products	0.0078	0.0057	-0.0021	-0.270
369	Structural clay products	0.0085	0.0068	-0.0018	-0.208
371	Iron and steel basic	0.0721	0.0191	-0.0530	-0.736
372	Basic non-ferrous metals	0.0473	0.0247	-0.0226	-0.478
381	Fabricated metal products	0.0350	0.0290	-0.0060	-0.171
382	Machinery	0.1510	0.1587	0.0077	0.051
383	Electrical machinery	0.0704	0.1245	0.0542	0.770
384	Transport equipment	0.1630	0.2161	0.0531	0.326
385	Measuring, photo, optical equipment	0.0299	0.0418	0.0119	0.400
390	Other manufacturing	0.0158	0.0164	0.0006	0.036