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Oosterhaven, Jan; Broersma, Lourens

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Sector Structure and Cluster Economies:

A Decomposition of Regional Labour Productivity

Jan Oosterhaven & Lourens Broersma[1]

Faculty of Economics, University of Groningen,

P.O. Box 800, 9700 AV Groningen, the Netherlands

Email oosterhaven@eco.rug.nl, fax +31-50-363.7337

Abstract

It is shown that regional differences in labour productivity can be decomposed into a sector structure, a cluster economies and a residual regional component. The decomposition is applied to Dutch regional productivity levels and growth rates for 1990-2001. Sector structure accounts for about a quarter of the differences in both the level and growth of productivity. Cluster economies account for a quarter of the differences in levels and a third of the differences in growth rates. Static cluster economies are predominantly positive, whereas positive and negative dynamic cluster economies balance. Econometric analysis shows both components to be statistically highly significant.

Keywords

Labour productivity, sectoral structure, agglomeration economies, The Netherlands

JEL-codes

D24, J24, O18, R11

1.   **Introduction**

The European Union struggles to improve its economic performance, trying to implement its so-called Lisbon agenda, while the Dutch government, partly in response to that, is redefining its regional policy in order to stimulate its national economy. At both levels, increasing productivity is seen as one of the main goals of policy. An efficient policy to increase productivity of course requires knowledge of the factors explaining why some regions and countries do rather better than others. Here we will concentrate on regional differences (for national differences, see McGuckin & Van Ark, 2004). Within Europe, as opposed to national differences, within-nation regional differences have not narrowed, and in some cases (UK, Italy, Netherlands, Austria and Germany) have actually increased (Gardiner, Martin & Tyler, 2004).

Internal economies of scale and localized external economies play an important role in explaining interregional differences in economic performance, both in old spatial economics (Marshal, 1890, Isard, 1956) and in new spatial economics (Krugman, 1991, Fujita et al. 1999). In most of this literature, economic performance is interpreted in an absolute sense, leading to the analysis of spatial agglomeration. Here, we interpret economic performance in relative terms and concentrate on the study of regional differences in labour productivity as one of the prime determinants of regional differences in welfare (Oosterhaven, 1997).

The standard approach to explaining differences in national or regional labour productivity starts with a production function, and views differences in productivity as the result of rational reactions of firms to national or regional differences in relative prices. Productivity analysis can be based on an econometric approach, based on

observations of output and of labour and other inputs (see Broersma & Oosterhaven, 2004, for a regional application). As an alternative, productivity can also be explained by means of a growth accounting approach (see Broersma & van Dijk, 2005, for a regional application). Both methods have their merits and drawbacks as discussed by the OECD (2001).

International trade theory adds to the production function approach that firms do not only react to relative price differences by substituting factors of production, but also by increasing or decreasing production (e.g. Van Marrewijk, 2002). This leads to emphasising differences in national or regional sector structure. Spatial economics further adds to the production function approach that firms do not only react to differences in relative costs, but also to differences in the transportability and the location of the market demand for their output (e.g. McCann, 1998). This further emphasises the importance of differences in sector structure.

Besides, economic geography and spatial economics suggest a continuum of localized external economies of scale as a major source of disembodied technology differences (Glaeser et al. 1992, van Oort, 2004). The most important distinction relates to the level at which these economies operate, namely from the level of an individual industry (localisation economies), via the level of groups of closely interacting industries, which we label as cluster economies, to the level of the economy as a whole (urbanisation economies). Here we will concentrate on measuring the impact of localisation and cluster economies, along with measuring the impact of the sector structure on the level and growth of labour productivity.

Traditionally, the impact of the sector structure on the value any kind of aggregate variable is measured in a deterministic way by means of decomposition analysis, known as shift-and-share analysis in regional economics and as constant-

market-share analysis in international economics. In Section 2 we discuss why the standard decomposition in two components is not suited for our goal. The preferred decomposition adds a third component that happens to be just perfect to measure the impact of localisation and cluster economies. Furthermore, section 2 discusses the problem of decomposing a variable that consist of the ratio of two ratios, i.e. the growth of labour productivity. As the existing method does not have an easy interpretation, we develop a new method that combines a decomposition of production growth with a decomposition of employment growth.

Section 3 summarises the development of regional labour productivity and the empirical outcomes of the decomposition of its levels and growth rates for the Netherlands for the period 1990-2001, based on a classification with 21 sectors and 40 regions. Differences in sector structure are shown to account for about a quarter of the differences in both regional productivity levels and growth rates. Localisation and cluster economies at the level of the 21 sectors distinguished predominately prove to be positive as regards productivity levels, and account for a quarter of the differences in levels and a third of the differences in growth rates.

A major objection against decomposition analysis is its deterministic character (Houston, 1967, Richardson, 1978). The components are considered to be of relevance by definition. Section 4 analyses the seriousness of this objection by summarising the results of the econometric study by Broersma & Oosterhaven (2004), which inter alia tests whether the sector structure component and the localisation economies component are statistically significant. This shows that both are highly significant in explaining differences in levels as well as in growth rates. Besides, the econometric analysis also shows urbanisation economies and diseconomies to be significant simultaneously. Section 5 concludes.

2.　Decomposition of labour productivity, methodology

The decomposition of any aggregate is almost never unique (for complex cases, see Oosterhaven & van der Linden, 1997, Dietzenbacher & Los, 1998). The decomposition of regional differences in labour productivity levels is relatively simple, but still a choice has to be made. The decomposition of productivity growths rates proves to be a little more complex and so does the choice that has to be made in that case.

2.1　Decomposition of productivity levels

In a single-region analysis of a simple variable, such as regional employment growth in shift-and-share analysis, the difference with the national growth rate is mostly decomposed into a sector structure or industry mix component that measures whether fast growing industries are over-presented, and a regional component that measures the regionally weighted difference between regional and national industry growth rates. This standard decomposition, however, is only one of five possible alternatives (Oosterhaven & van Loon, 1979).

　　　If the research purpose is to compare the same components over several different regions, each component needs to be weighed or measured with the same (mostly national) reference weights or values. As a consequence, for interregional comparisons only one of the five alternatives is acceptable, namely:

$$V^r - V^n = \Sigma_i \, (S_{ri} - S_{ni}) \, V_{ni} + \Sigma_i \, (S_{ri} - S_{ni}) \, (V_{ri} - V_{ni}) + \Sigma_i \, S_{ni} \, (V_{ri} - V_{ni}) = SS + LE + RC \qquad (1)$$

In (1), the aggregate regional value of the variable at hand, V^r, equals the correctly weighted sum of its sectoral values, $\Sigma_i\ S_{ri}V_{ri}$. The aggregate national value, V^n, is defined analogously.

In the case of a decomposition of labour productivity $V = Y/L$, with $Y =$ production volume and $L =$ labour volume, the correct weights equal the labour volume shares: $S_i = L_i\ /\ (\Sigma_i\ L_i)$, as can be verified easily. In that case, the three components of (1) have the following interpretation:

SS = sector structure (or industry mix) component. *SS* measures the impact of a region's sector structure on its labour productivity. It is positive if regionally over-represented sectors ($S_{ri} > S_{ni}$) have a nationally high productivity and/or if regionally under-represented sectors ($S_{ri} < S_{ni}$) have a nationally low productivity. *SS* may also be measured by means of V_{ri} instead of V_{ni}, but this leads to a different decomposition that uses a different measurement for each different region, which is not acceptable for interregional comparisons.

LE = localisation (or cluster) economies component. *LE* measures the impact of a region's sectoral specialisation on its labour productivity. It is positive if regionally over-represented sectors ($S_{ri} > S_{ni}$) have a value that is regionally higher than nationally ($V_{ri} > V_{ni}$) and/or if regionally under-represented sectors ($S_{ri} < S_{ni}$) have a value that is regionally lower than nationally($V_{ri} < V_{ni}$). Thus, *LE* indicates whether it pays off to specialise, which is why this component may rightfully be interpreted as indicating either localisation economies or cluster economies, where the adjective depends on sectoral classification of the empirical analysis.

RC = regional (or residual) component. *RC* measures the impact of all remaining region-specific variables, not included in *SS* or *LE*, on a region's labour productivity.

It is positive if the (nationally weighted) average regional sector has a productivity that regionally higher than nationally ($V_{ri} > V_{ni}$). In single-region analyses, this component is often weighted with regional shares, and then *LE* is incorporated into *RC*, as can easily be verified. For single-region analysis this produces an acceptable decomposition, which is slightly inferior to (1) as the information contained in *LE* gets lost. For interregional comparisons, however, combining *LE* and *RC* is not acceptable as it implies using a different weighting scheme for each different region.

In the empirical decomposition of the regional differences in productivity level in the next section, all components of (1) are expressed in % of the average national level of productivity of the year at hand. As a consequence, there is no need correct for differences in price levels between different years.

2.2   **Decomposition of productivity growth rates**

A decomposition of productivity growth is more complex, as the growth rate of labour productivity is defined as the ratio of two ratios, namely $v = (Y_1/L_1)/(Y_0/L_0)-1$. We have not found a way in which the aggregate value of regional productivity growth can be written as the simple weighted average of the underlying sectoral values, as is required for applying (1). In the literature, this problem has been solved by separately applying (1) to the productivity levels of the current period *1* and of the base period *0*; after which the corresponding terms of the two sub-decompositions are combined (Timmer, 1999, 109-115). If that approach is applied to (1), the decomposition of the difference between regional and national productivity growth will equal the sum of the changes in *SS*, *LE* and *RC* from period *0* to period *1*, which is a generalisation of

the Timmer-method that only uses two components, namely *SS* and *LE+RC* combined.

To get a better understanding of the economic content of this generalisation, we rearrange the change in *SS*, *LE* and *RC* from (1), as follows:

$$\Delta SS = \Sigma_i \, (S_{ri0} - S_{ni0}) \, \Delta V_{ni} + \Sigma_i \, \Delta(S_{ri} - S_{ni}) \, V_{ni0} + \Sigma_i \, \Delta(S_{ri} - S_{ni}) \, \Delta V_{ni} \qquad (2.1)$$

$$\Delta LE = \Sigma_i \, (S_{ri0} - S_{ni0}) \, \Delta(V_{ri} - V_{ni}) + \Sigma_i \, \Delta(S_{ri} - S_{ni}) \, (V_{ri0} - V_{ni0}) + \Sigma_i \, \Delta(S_{ri} - S_{ni}) \, \Delta(V_{ri} - V_{ni}) \quad (2.2)$$

$$\Delta RC = \Sigma_i \, S_{ni0} \, \Delta(V_{ri} - V_{ni}) + \Sigma_i \, S_{ni0} \, \Delta(V_{ri} - V_{ni}) + \Sigma_i \, \Delta S_{ni} \, \Delta(V_{ri} - V_{ni}) \qquad (2.3)$$

The first term of (2.1) does indeed give some measure of the effect of the sector structure on productivity growth. But it relates to the absolute growth of productivity by sector, ΔV_{ni}, and not to the growth rate by sector, $\Delta V_{ni}/V_{ni0}$. The second term of (2.1) gives the effect of the change in sector structure on the level of productivity, which is informative but which does not equal the effect on the growth rate. The third term gives the interaction effect between the first two components. To simplify (2.1), the last two terms may be combined into $\Sigma_i \, \Delta(S_{ri} - S_{ni}) \, V_{ni1}$, which inadequately measures the effect of the change in sector structure not in terms of the old productivity levels but in terms of the new levels. The last two terms of (2.2) and (2.3) may also be combined to, respectively, $\Sigma_i \, \Delta(S_{ri} - S_{ni})(V_{ri1} - V_{ni1})$ and $\Sigma_i \, S_{ni1} \, \Delta(V_{ri} - V_{ni})$, which also results in inadequately measuring the impact of a change in terms of the new values. Although the separate terms are clear, the economic interpretation of the entire decomposition (2) is rather complex.

Therefore, we propose a different decomposition, namely that of the difference between the growth rates of value added and of labour volume, which for small differences equals that of labour productivity, i.e. $v \approx y - l = (\Delta Y/Y_0) - (\Delta L/L_0)$. Of course, value added shares have to be used for the decomposition of value added growth and labour volume shares for the decomposition of labour volume growth, while in both cases the sectoral shares of period 0 need to be used, as may easily be verified by rearranging (1). Next, as with the Timmer-method, we combine the corresponding terms of both sub-decompositions:

$$(y^r - y^n) - (l^r - l^n) = (SS \text{ of } y) - (SS \text{ of } l) + (LE \text{ of } y) - (LE \text{ of } l) + (RC \text{ of } y) - (RC \text{ of } l) \quad (3)$$

In (3), the sector structure component of productivity growth (SS of v) equals the sector structure component of value added growth (SS of y) minus that of labour volume growth (SS of l). The economic interpretation now is simple. When the sector structure has a larger (positive) effect on value added growth than on labour volume growth, its effect on productivity growth will be positive, and visa versa. The same holds for the interpretation of the localisation or cluster economies component (LE of v) and the regional or residual component (RC of v). For this reason, we prefer (3) above (2).

Note that all differences in growth rates in (3) represent %-points deviations from the national growth rate. This means that the national component of regional price inflation is cancelled out. This still leaves regional deviations from the national rate of inflation to be considered. If these are substantial, (3) – and for that matter (2) – will give a misrepresentation of the differences in real productivity growth. Unfortunately, there is no systematic information on Dutch regional prices. At the

level of some ten industries Statistics Netherlands publishes regionally weighted (national) price indices, but these only equals the sector structure component of a real regional price index. It would be false to correct the regional deviation from the nominal national value added growth with this sector structure component, and to suggest that the result equals the regional deviation from the real national value added growth.

Instead of using this partial correction, we prefer to keep the sector structure component of regional price inflation included in the sector structure component of nominal value added growth. An empirical reassurance is that regional differences in price inflation will be close to negligible for integrated, geographically small economies, such as the Netherlands.

3.   Decomposition of productivity levels and growth, outcomes

Before presenting the results of decompositions (1) and (3), we first summarize the actual differences in productivity levels and productivity growth in the Netherlands over the period 1990-2001. Labour productivity is calculated as gross values added in market prices divided by labour volume of employees in full time equivalents, per year (CBS, 1990-2001a). Only in the case of agriculture, the labour volume of employees could be increased with the labour volume of the employers (CBS, 1990-2001b).

3.1   Regional labour productivity in the Netherlands, 1990-2001

Appendix 1 and Figures 1-4 show the regional level of labour productivity (in 1990 and 2001) and the regional annual growth of value added and productivity (average of twelve yearly rates for 1990-2001) compared to the corresponding national totals.

-- Figures 1-4 somewhere here --

In 1990 the highest levels of productivity are found in the peripheral southwest and northeast harbour regions 31 and 2, which both have a large chemical industry, and in the northeast region 8, which housed most of the Dutch winning of natural oil. Experts on the Netherlands will be surprised by the low level for the northern region 3, where the huge Groningen natural gas field is located. The exploitation of natural gas, however, is excluded from the analysis, as its unique institutional character and its size unduly influence regional and even national totals. Finally, productivity is high in the northern region 4 (with a concentration of agriculture and financial services), and in the western regions of greater Rotterdam, IJmond (two more harbour regions, with heavy industry) and greater Amsterdam (the national financial centre with Schiphol airport). Obviously, sectoral characteristics must be important in explaining these differences.

The volume growth of both production and employment shows an interesting spatial pattern along two infrastructural axes, namely one along the A7/A6 motorway from greater Amsterdam through the polder province of Flevoland to the northeast, and a second from greater Amsterdam through the central province of Utrecht along the A2 motorway to the southeast. Comparing Figure 3 and 4, however, shows that

absolute growth in production (and jobs, see Appendix 1) is only weakly related to relative growth in productivity (and welfare, not shown).

Productivity growth is highest in central regions 13 and 17. In Veluwe it is combined with strongly lagging job growth, and in Utrecht it is combined with strongly growing production and jobs. As shown in Appendix 1, the downward deviations in productivity growth are much larger than these two upward deviations. Region 8 shows a strong downward deviation because of the almost termination of the winning of oil winning in 1996. The relative fall of productivity is also large in the three harbour regions 31, 20, and 2, which suffered from reductions of production that were much larger than the accompanying fall in employment.

As a consequence of these changes, the spatial pattern of the level of productivity in 2001 has changed from that of 1990, but only little (compare Figure 1 and 2). In fact, when the differences in level and growth rates between the regions in Appendix 1 are compared with those between the sectors in Appendix 2, it is obvious that the sectoral differences in productivity levels are far larger than the regional differences. Hence, we expect that regional differences in sector structure (as summarised in Appendix 3) will have a large impact on regional differences in productivity levels. The same holds for productivity growth rate differences, but there the differences between sectors and those between regions are smaller. So we expect the impact of sector structure on productivity growth rates to be smaller than the influence on productivity levels.

3.2   Decomposition of regional labour productivity levels, 1990-2001

Appendix 4 and the Figures 5 and 6 show the results of applying (1) to the level of labour productivity for each year.

-- Figure 5-6 somewhere here --

The spatial pattern of the sector structure component only partly reflects the pattern of the regional differences in level in Figure 1 and 2. The positive deviations of greater Amsterdam, greater Rotterdam and IJmond are indeed (at least partly) due to their favourable sector structure. Some of the negative deviations are partly due to the impact of a unfavourable sector structure, such as for several eastern and south-eastern regions. In most of these regions this is the consequence of an over-representation of agriculture with a nationally low level of productivity, combined with an under-representation of the government sector with a nationally high level of value added per worker.

Figure 6 shows that the positive deviation of the southwest and northeast harbour regions is not so much due to a favourable sector structure, but rather to cluster economies within their chemical industries. The Rotterdam heavy industries also show positive localisation effects, with regional productivity levels – in their sectors of specialisation – that are larger than the comparable national levels. The same holds for the western region 27, where specialisation in horticulture produces a higher productivity than the national average of agriculture. For the north-eastern region 8, we find that the winning of natural oil has a higher productivity than the national average of mining and quarrying. These examples show that a positive

localisation economies component might well hide a positive sector structure component at a more detailed level of sector classification (see also Oosterhaven & van Loon, 1979). The only sizeable negative localisation effect is found in the administrative capital of The Hague, where the over-represented (central) government sector has a lower productivity than the government sector in the rest of the country.

Table 1 summarises the results of the 480 decompositions of regional labour productivity levels (12 periods and 40 regions) numerically. The unweighted average deviation from the national level is -1.9%. But this only signifies that economically small regions with negative deviations outnumber the economically large regions with positive deviations. The correctly weighted average equals zero by definition. The same holds for the unweighted average of the sector structure component and the regional component, as may easily be verified by summing *SS* and *RC* in (1) over all regions.

The only term for which this weighted equality to zero does not hold is the localisation economies component *LE*. The positive value of its average signifies that it clearly pays off to regionally specialise in certain industries. On the average this will result in a 1.6% higher level of labour productivity. Given the aggregate character of the sector classification with only 21 sectors (see Appendix 2), these economies might best be labelled as *cluster economies*.

The mean absolute regional deviation in productivity levels is 6.9%, 2.4%-point of this may be attributed to regional differences in sector structure, and 2.5%-point to cluster economies. The remaining 5.3%-point remains unexplained. Of course the three different components compensate each other partly. Scaling the total of the three to 100%, it may be concluded that 23% of the regional differences may be attributed to sector structure differences and 24% to cluster economies.

3.3   Decomposition of regional labour productivity growth, 1990-2001

Next, we investigate whether the same or, as we expect, smaller parts of the differences in growth rates may be attributed to differences in sector structure and to dynamic as opposed to static localisation economies. Appendices 5-7 and Figures 7 and 8, give the detailed results for the 40 Dutch regions.

The spatial structure of the sector structure component (Figure 7) roughly looks like that of productivity growth (Figure 4), with faster growth in the central regions, but it does not show the faster growth of some peripheral regions. That aspect of Figure 4 is found in the spatial pattern of Figure 8, with the economies of sector localisation.

The spatial pattern of the dynamic cluster economies in Figure 8, however, does not bear any resemblance to that of the static cluster economies in Figure 6. Regional specialisation has a positive impact on the productivity level in almost all regions, whereas its impact of productivity growth is much more diverse (positive as well as negative) and different for different regions. Most remarkable is the absence of even the slightest core-periphery pattern in the effect of specialisation on growth.

Table 2 numerically summarises the 440 decompositions of labour productivity growth (11 periods and 40 regions) according to (3), and its constituent sub-decompositions of value added growth and employment growth according to (1).

Again the average deviation in the first three columns would equal zero, if we had taken weighted averages.

The zero value for the average of the dynamic cluster economies, however, does have an economic interpretation. Comparing Table 1 and 2 shows that the spatial clustering of economic activities only has a positive impact on the level of productivity, but not on its growth rate. This is not too surprising, because if it had this would lead to a process of cumulative causation of increasing productivity, which is something found in new spatial economics theory as regards the levels of economic activity that might well all end up in a single region (Krugman, 1991; Fujita et al. 1999). Such extreme spatial agglomeration equilibria, however, are hardly found in reality, and not in the Netherlands.

The negative values of dynamic cluster economies in the case of production and employment in Table 2 also have a clear economic interpretation. They signify that sectors that are over-represented in a certain region, on the average, show a slower grow than the national industry average, whereas the sectors that are under-represented on the average growth faster. This means that there is a clear tendency of convergence of regional sector structures to the national sector structure, at least in the Netherlands at the level of the 21 sectors of Appendix 2. This convergence tendency appears to be rather consistent as it has been found earlier, for longer periods and for different sector classifications (Oosterhaven & Pellenbarg, 1994).

Furthermore, after rescaling the contributions of the three components, Table 2 shows that 25% of the differences in productivity growth may be attributed to regional differences in sector structure, and 27% and 23% of the differences in production and employment growth. Thus, the expectation that sector structure is of lesser importance

in explaining growth differences than in explaining level differences is not confirmed. The importance is of a comparable size.

In the case of the cluster (dis)economies, contrary to expectation, the importance even becomes larger, as 34% of the differences in growth rates may be attributed to differences in cluster economies and diseconomies.

-- Table 2 somewhere here --

4. On the statistical significant of the two decompositions

A well-known objection against decomposition analysis is its deterministic character. Sector structure and localisation economies are assumed to be of importance in explaining regional differences, in our case of productivity levels and productivity growth rates. One way to solve this problem is to replace the decomposition analysis with an analysis of variance (Weeden, 1974). Another way is to use constrained regression analysis (Buck & Atkins, 1976, Patterson, 1991). A quite different approach is to use the deterministic components along with competing variables and test whether their contribution is still significant (Blien & Wolf, 2002). Broersma & Oosterhaven (2004) have used this approach as part of a broader attempt to explain regional productivity differences.

Equation (4) reproduces the preferred productivity level equation from Broersma & Oosterhaven (2004). It gives a statistical explanation of the regional deviation from the national level of labour productivity, $V = V^r - V^n$ (n = 480, adjusted $R^2 = 0.734$, with t-values between brackets):

$$V = 0.012+0.677*SS+0.462*LE+0.310*KL+0.050*DR-0.028*DS-0.115*LS+0.214*DI$$

$$(0.907) \quad (4.008) \quad (2.969) \quad (8.379) \quad (6.576) \quad (-3.619) \quad (-4.458) \quad (2.542) \quad (4)$$

in which, additionally to (1), all in %(-point) deviation from the national average, per region, per year:

KL = capital/labour ratio,

DR = job density of the own region,

DS = potential of the job density in surrounding regions,

LS = share of lower schooled labour in total employment,

DI = diversification index, ranging from 0 to 100% similarity with the national sector structure.

Clearly, (4) shows that both the sector structure and the localisation economies component (SS and LE) are statistically highly significant, with t-values of 4.0 and 3.0. This sufficiently counters the major objection against decomposition analysis, at least in our case.

Furthermore of interest in (4) is the combination of the positive impact of a region's own job density (+0.050) and the negative impact of the job density of surrounding regions (–0.028). Job density is correlated with a series of other variables, all related to the spatial agglomeration of economic activities, which is why it represents a good indicator of the external economies of urbanisation. The positive effect of such urbanisation economies on the own productivity level is as expected, and implies that a doubling of job density raises regional productivity with 5%. This is comparable to the results found for the US and some large European countries (Ciccone & Hall, 1996; Ciccone, 2002). The negative impact of the job density in

surrounding regions is a surprise, but one with a relatively straightforward interpretation. Firms in surrounding regions will compete for the external effects with firms in the own region, and when there are many of them close by this then will lower the own effect.

Finally, the positive impact of a diversified sector structure confirms the Jane Jacobs (1969) argument that diversity stimulates the spillover of innovation between sectors.

Next, we reproduce the preferred productivity growth equation from Broersma & Oosterhaven (2004). It explains the regional deviation from the national productivity growth, $v = v^r - v^n$, but instead of the localisation component of output growth we here use that of productivity growth. This gives the following equation for v (n = 440, adjusted R^2 = 0.622, with t-values between brackets):

$$v = -0.005 + 0.777*SS + 0.481*LE + 0.132*KL - 0.004*DR + 0.002*DS + 0.003*RD + 0.035*GE$$

  (-4.183)   (4.987)   (4.416)   (6.237)   (-4.098)   (1.932)   (3.213)   (1.965)   (5)

all in %(-point) deviation of the national average, per region, per year, with different from (4) and in addition to (4):

SS = sector structure component of productivity growth,

LE = localisation component of productivity growth,

KL = growth of the K/L ratio,

RD = share of R&D expenditures in gross value added,

GE = growth of the export share in total output,

Clearly, again both the sector structure and the localisation economies component are statistically highly significant, with t-values of 5.0 and 4.4, which

again counters the major objection against decomposition analysis. Moreover, as with the decomposition results, now the impact of the localisation economies component has clearly increased, both in terms of coefficient value and in terms of statistical significance, compared to (4).

Furthermore, note that the impact of both density variables now has reversed quite surprisingly. But this reversal does make sense. The own job density has a positive impact on the level of productivity, indicating clear static economies of urbanisation. But it has a negative impact on the further growth of that productivity due to diseconomies of agglomeration at high density levels, such as traffic congestion, and shortages of land and labour, which – at least in the Netherlands – are obvious to any casual observer. In such cases, the external economies of information exchange will be passed on to firms in surrounding regions, and that is precisely why a high job density in surrounding regions has a positive impact on the own productivity growth.

Finally, a diversified economy did have a positive effect on the level of productivity in (4), but (5) shows that diversity do not have a dynamic impact on the further growth of productivity.

5.   Conclusion

Compared to the existing literature, this paper has developed a new method for the decomposition of a double ratio, such as the growth of regional labour productivity. Furthermore, it has shown that the seldom used third (interaction) component of traditional shift-and-share analyses may be given a meaningful economic

interpretation, namely as an indication of the existence of static and dynamic localisation and/or cluster economies, with the adjective depending on the sectoral scale of the analysis.

Empirically, the paper has shown that both the regional sector structure and localisation and cluster economies have a significant impact on the level and the growth of labour productivity, a result that also proves to be highly significant statistically. Empirically, the paper has further shown the significance of simultaneously existing economies and diseconomies of agglomeration and urbanisation.

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Appendices

A1. Regional labour productivity, value added and labour volume growth, 1990-2001

Nr.	In %-point of national total, yearly average Region	Labour productivity 1990 level	Value added growth	Labour volume growth	Labour productivity growth	Labour productivity 2001 level
1	East-Groningen	-11.1	-0.6	-0.5	0.0	-11.4
2	Delfzijl and surroundings	17.8	-2.4	-1.8	-0.5	11.8
3	Rest of Groningen	-0.3	0.2	0.0	0.2	1.8
4	North Friesland	10.2	-1.2	-0.6	-0.6	3.8
5	Southwest Friesland	-8.1	-0.2	0.0	-0.2	-10.2
6	Southeast Friesland	-3.1	0.7	0.9	-0.2	-5.0
7	North Drenthe	-1.9	-0.1	0.1	-0.3	-4.6
8	Southeast Drenthe	16.5	-1.8	0.1	-1.9	-4.6
9	Southwest Drenthe	-8.6	-1.8	-1.5	-0.2	-10.7
19	North Overijssel	-7.5	-0.1	-0.2	0.2	-5.8
11	Southwest Overijssel	-12.2	-0.4	-0.6	0.2	-10.1
12	Twente	-9.9	-0.2	0.1	-0.2	-12.2
13	Veluwe	-12.1	0.1	-0.5	0.6	-6.9
14	Achterhoek	-12.4	-0.8	-0.7	-0.1	-12.9
15	Arnhem/Nijmegen	-1.2	-0.2	-0.1	-0.1	-2.5
16	Southwest Gelderland	-7.7	0.9	0.5	0.4	-4.2
17	Utrecht	3.1	1.2	0.7	0.4	8.0
18	Top of Noord-Holland	-9.4	-0.3	-0.2	-0.1	-10.7
18	Alkmaar and surroundings	5.5	-0.2	0.7	-0.9	-3.7
20	IJmond	11.7	-2.8	-1.7	-1.1	-0.1
21	Agglomeration Haarlem	5.2	-1.6	-1.4	-0.2	3.6

22	Zaanstreek	-1.0	-0.8	-0.1	-0.7	-8.1
23	Greater Amsterdam	7.8	0.6	0.5	0.1	9.2
24	Gooi and Vechtstreek	6.0	-0.7	-0.9	0.2	8.3
25	Leiden and Bollenstreek	-5.5	-0.2	-0.5	0.3	-2.1
26	Agglomeration The Hague	3.8	-0.3	-0.4	0.1	4.3
27	Delft and Westland	-3.4	-0.3	-0.3	0.1	-2.6
28	East Zuid-Holland	-4.7	0.8	0.7	0.1	-3.4
29	Greater Rijnmond	10.4	-0.4	-0.4	0.0	10.1
30	Southeast-Zuid-Holland	-0.6	0.7	0.6	0.0	-0.4
31	Zeeuwsch-Vlaanderen	48.7	-2.9	-0.7	-2.2	17.7
32	Rest of Zeeland	-0.7	-1.2	-0.8	-0.4	-4.6
33	West Noord-Brabant	2.0	0.0	-0.2	0.1	3.2
34	Middle Noord-Brabant	-9.8	-0.3	-0.2	-0.1	-10.9
35	Northeast Noord-Brabant	-1.6	0.9	1.0	-0.1	-2.6
36	Southeast Noord-Brabant	-6.9	0.6	0.5	0.0	-6.9
37	North Limburg	-9.8	-0.7	-0.3	-0.3	-12.8
38	Middle Limburg	-6.5	-0.7	-0.5	-0.2	-8.1
39	South Limburg	-1.8	-0.1	-0.3	0.3	1.1
40	Flevoland	-3.1	2.5	2.2	0.3	-0.1

Source: own calculations based on CBS, Regional Economic Accounts. The labour volume of agricultural

employees from the Regional Economic Accounts is increased with the labour volume of the independents

from the Agricultural Accounts 1989-2001.

A2. Sectoral classification and labour productivity, levels and growth, 1990-2000

Nr.	CBS-sector	(in % deviation of national total, yearly)	1990	Growth	2000
1	A+B	Agriculture and fishery	-51.9	0.3	-50.6
2	C	Mining and quarrying	558.0	0.7	603.0
3	DA	Food, beverages and tobacco industry	-1.6	3.4	37.3
4	DB+DC	Textiles, wearing apparel and leather industry	-31.1	2.6	-11.4
5	21+22	Paper, paper products, publishing and printing	-13.9	2.3	8.0
6	DF+DG+DH +27+28	Petroleum, chemicals, rubber, basic metals and metal products industry	-0.3	1.8	18.7
7	DL+DM	Electrical, optical and means of transportation	-32.9	2.8	-11.4
8	Other +E	Other industry and public utilities	-5.6	0.3	-3.1
9	F	Construction	-1.0	-1.5	-14.7
10	G	Trade and repair	-16.8	0.4	-13.1
11	H	Hotels, cafés, restaurants	-12.3	-1.3	-22.8
12	60+63+64	Land transportation, supporting transport services and communication services	-16.6	2.8	9.3
13	61+62	Sea and air transportation	14.8	4.4	76.2
14	J	Banking, finance and insurance	36.0	1.0	50.1
15	70	Operation of real estate	1163.8	-2.3	904.1
16	71-74	Other business services	-2.3	-1.7	-17.4
17	L	Public administration and social security	1.4	0.3	4.3
18	M	Education	-18.3	-0.6	-23.0
19	N	Health and welfare services	-14.9	-1.9	-29.6
20	90 91 93	Other public services	29.0	-1.8	7.9
21	92	Culture sport and recreation	49.0	-2.0	22.4

Source: see A1.

A3. Under-representation and over-representation of sectors in 1996*

		Labour volume share (X) in %-point deviation of national			
Nr.	Region	X < -4%	-4% < X < -2%	2% < X < 4%	X > 4%
1	East-Groningen		10, 14, 16, 17	1	8
2	Delfzijl and surroundings	10, 17	14, 16	19	6, 13
3	Rest of Groningen		6, 10	19, 16, 18	
4	North Friesland	10	6, 16	1, 14	
5	Southwest Friesland	17	16	9	1
6	Southeast Friesland	17		3, 7	1
7	North Drenthe	10	6, 16, 12		17, 19
8	Southeast Drenthe		10, 16, 14, 17, 19		1, 6
9	Southwest Drenthe	16	6, 12	7	1
19	North Overijssel				1
11	Southwest Overijssel		7, 14, 17	1, 5, 6, 16	
12	Twente		14, 16, 17	1, 6, 9	
13	Veluwe				17
14	Achterhoek	16, 17	14	5, 8, 6	1
15	Arnhem/Nijmegen		1	19	
16	Southwest Gelderland	16, 17	14, 19	9, 10	1, 8
17	Utrecht		1, 6		16
18	Top of Noord-Holland	16	6		1, 17
18	Alkmaar and surroundings		16	10, 19	
20	IJmond	1	7, 14, 16, 17		6
21	Agglomeration Haarlem	1	6	5, 16	19
22	Zaanstreek	1	17	9	3, 10
23	Greater Amsterdam	1	6, 8, 9		13, 14, 16

24	Gooi and Vechtstreek	1	8, 9, 12, 17	7	10, 21
25	Leiden and Bollenstreek		16	18, 19	10
26	Agglomeration The Hague	1, 6	7, 8, 9, 10	20,	16, 17
27	Delft and Westland		14, 17, 19		1, 18
28	East Zuid-Holland		7, 17	1, 9	10
29	Greater Rijnmond		1, 17		12
30	Southeast-Zuid-Holland		1, 14, 17	6, 10	9
31	Zeeuwsch-Vlaanderen	16	17, 18		1, 6
32	Rest of Zeeland	16		1, 6, 19	
33	West Noord-Brabant		16, 17	3	6
34	Middle Noord-Brabant		16	6, 10	
35	Northeast Noord-Brabant			3, 9	
36	Southeast Noord-Brabant		17		7
37	North Limburg	16	10,14,17,18,19	6	1, 7
38	Middle Limburg		10, 12, 17, 19	6, 7	1, 16
39	South Limburg		1	7, 8	
40	Flevoland		12	10, 16	1

* The numbers of the sectors correspond to A2. Source: see A1.

A4. Labour productivity level, %-points deviation from national, average 1990-2001

Nr.	Region*	Difference in level	Sector structure component	Regional component	Localisation economies component
1	East-Groningen	-13.8	-0.4	-12.4	-1.0
2	Delfzijl and surroundings	9.5	1.1	0.3	8.1
3	Rest of Groningen	-0.4	-3.4	0.8	2.1
4	North Friesland	5.7	-0.8	8.3	-1.8
5	Southwest Friesland	-7.8	-4.5	-1.7	-1.6
6	Southeast Friesland	-5.1	-4.1	-5.4	4.4
7	North Drenthe	-5.0	5.7	-10.2	-0.6
8	Southeast Drenthe	2.5	4.2	-9.2	7.5
9	Southwest Drenthe	-9.8	-3.0	-9.1	2.4
19	North Overijssel	-8.5	-3.0	-5.2	-0.2
11	Southwest Overijssel	-11.8	-1.1	-12.7	2.1
12	Twente	-11.5	-3.3	-9.4	1.2
13	Veluwe	-9.6	-0.5	-9.8	0.7
14	Achterhoek	-14.2	-2.3	-11.5	-0.4
15	Arnhem/Nijmegen	-0.6	-1.0	-0.7	1.1
16	Southwest Gelderland	-8.1	-2.3	-2.7	-3.1
17	Utrecht	5.8	0.4	3.8	1.6
18	Top of Noord-Holland	-9.9	-3.2	-7.4	0.8
18	Alkmaar and surroundings	-1.4	0.0	-3.0	1.7
20	IJmond	9.3	6.4	4.5	-1.6
21	Agglomeration Haarlem	5.1	0.2	1.1	3.8
22	Zaanstreek	-3.3	1.6	-5.9	1.0

23	Greater Amsterdam	10.5	5.2	4.9	0.4
24	Gooi and Vechtstreek	7.4	3.3	2.0	2.1
25	Leiden and Bollenstreek	-2.0	-0.8	-2.6	1.3
26	Agglomeration The Hague	5.0	2.3	7.3	-4.7
27	Delft and Westland	1.6	-8.3	0.1	9.8
28	East Zuid-Holland	-3.6	-3.7	-0.5	0.7
29	Greater Rijnmond	10.2	2.8	8.7	-1.3
30	Southeast-Zuid-Holland	0.3	-0.4	0.3	0.4
31	Zeeuwsch-Vlaanderen	22.9	-0.2	8.1	15.0
32	Rest of Zeeland	-2.5	-2.1	-1.8	1.4
33	West Noord-Brabant	3.1	-0.2	1.1	2.3
34	Middle Noord-Brabant	-10.3	-1.5	-10.0	1.2
35	Northeast Noord-Brabant	-3.4	-0.3	-3.6	0.5
36	Southeast Noord-Brabant	-6.0	-2.5	-5.6	2.1
37	North Limburg	-12.8	-4.1	-9.2	0.4
38	Middle Limburg	-13.5	-1.9	-9.1	-2.5
39	South Limburg	-0.5	0.4	-1.9	1.0
40	Flevoland	0.6	-2.2	-1.3	4.0

* The North, East, West and South of the Netherlands are distinguished by the extra lines. The polder province of Flevoland (40) is best considered to be part of the Western Netherlands.

A5. Labour productivity growth, %-points deviation from national, average 1990-2001*

Nr.	Region	Difference in growth	Sector structure component	Regional component	Localisation economies component
1	East-Groningen	0.0	0.0	0.2	-0.2
2	Delfzijl and surroundings	-0.4	-0.5	-0.4	0.5
3	Rest of Groningen	0.2	-0.2	0.2	0.2
4	North Friesland	-0.6	-0.3	-0.2	0.0
5	Southwest Friesland	-0.3	-0.3	-0.1	0.2
6	Southeast Friesland	0.0	-0.3	-0.1	0.4
7	North Drenthe	-0.3	-0.2	0.1	-0.2
8	Southeast Drenthe	-1.8	-0.5	-0.3	-1.0
9	Southwest Drenthe	-0.1	-0.1	-0.1	0.0
19	North Overijssel	0.2	-0.1	0.3	0.0
11	Southwest Overijssel	0.3	-0.2	0.2	0.3
12	Twente	-0.2	-0.1	-0.1	0.0
13	Veluwe	0.6	0.2	0.2	0.2
14	Achterhoek	0.0	-0.2	0.1	0.1
15	Arnhem/Nijmegen	-0.1	-0.1	-0.1	0.1
16	Southwest Gelderland	0.2	-0.2	0.4	0.0
17	Utrecht	0.5	0.2	0.3	0.0
18	Top of Noord-Holland	-0.5	-0.2	0.0	-0.3
18	Alkmaar and surroundings	-0.8	-0.2	-0.6	-0.1
20	IJmond	-0.8	-0.2	-0.1	-0.6
21	Agglomeration Haarlem	-0.2	0.0	-1.6	1.4
22	Zaanstreek	-0.6	0.1	-0.4	-0.3

23	Greater Amsterdam	0.2	0.3	-0.1	0.0
24	Gooi and Vechtstreek	0.3	0.0	0.1	0.3
25	Leiden and Bollenstreek	0.3	-0.1	0.3	0.0
26	Agglomeration The Hague	0.1	0.3	-0.1	0.0
27	Delft and Westland	-0.3	-0.9	0.8	-0.2
28	East Zuid-Holland	-0.1	-0.1	-0.3	0.3
29	Greater Rijnmond	0.0	-0.1	0.1	0.0
30	Southeast-Zuid-Holland	0.0	-0.1	0.2	-0.1
31	Zeeuwsch-Vlaanderen	-1.8	-0.7	-0.6	-0.7
32	Rest of Zeeland	-0.3	-0.2	0.2	-0.3
33	West Noord-Brabant	0.1	-0.1	0.2	0.1
34	Middle Noord-Brabant	-0.1	-0.1	0.0	0.0
35	Northeast Noord-Brabant	-0.1	0.1	-1.3	1.2
36	Southeast Noord-Brabant	0.1	0.1	0.6	-0.7
37	North Limburg	-0.3	-0.2	-0.1	0.0
38	Middle Limburg	-1.2	0.0	-1.0	-0.5
39	South Limburg	0.4	0.0	0.3	0.1
40	Flevoland	-0.1	-0.1	0.5	-0.3

* This decomposition is calculated by taking the difference between the corresponding terms of the

decomposition of value added growth (A6) and of labour volume growth (A7).

A6. Value added growth, %-points deviation from national, average 1990-2001

Nr.	Region*	Difference in growth	Sector structure component	Regional component	Localisation economies component
1	East-Groningen	-0.6	-0.3	0.1	-0.4
2	Delfzijl and surroundings	-2.4	-0.9	-1.6	0.1
3	Rest of Groningen	0.2	0.1	0.1	0.0
4	North Friesland	-1.2	-0.4	-0.6	-0.2
5	Southwest Friesland	-0.2	-0.5	0.6	-0.3
6	Southeast Friesland	0.7	-0.4	1.1	0.0
7	North Drenthe	-0.1	-0.3	0.7	-0.6
8	Southeast Drenthe	-1.8	-1.0	0.9	-1.7
9	Southwest Drenthe	-1.8	-0.4	-0.9	-0.4
19	North Overijssel	-0.1	-0.3	0.3	-0.1
11	Southwest Overijssel	-0.4	-0.2	-0.1	-0.1
12	Twente	-0.2	-0.4	0.4	-0.2
13	Veluwe	0.1	0.0	-0.1	0.2
14	Achterhoek	-0.8	-0.5	-0.1	-0.1
15	Arnhem/Nijmegen	-0.2	0.0	-0.2	0.0
16	Southwest Gelderland	0.9	-0.4	1.7	-0.3
17	Utrecht	1.1	0.6	0.5	0.1
18	Top of Noord-Holland	-0.3	-0.5	0.6	-0.5
18	Alkmaar and surroundings	-0.2	-0.1	0.2	-0.2
20	IJmond	-2.8	-0.7	-0.8	-1.3
21	Agglomeration Haarlem	-1.6	0.3	-1.9	0.0
22	Zaanstreek	-0.8	-0.1	-0.2	-0.5

23	Greater Amsterdam	0.6	0.7	-0.3	0.2
24	Gooi and Vechtstreek	-0.7	0.2	-0.5	-0.4
25	Leiden and Bollenstreek	-0.1	0.0	0.3	-0.4
26	Agglomeration The Hague	-0.3	0.5	-1.1	0.3
27	Delft and Westland	-0.3	-0.8	0.9	-0.3
28	East Zuid-Holland	0.8	0.1	0.5	0.3
29	Greater Rijnmond	-0.4	0.1	-0.2	-0.4
30	Southeast-Zuid-Holland	0.7	-0.2	0.9	-0.1
31	Zeeuwsch-Vlaanderen	-2.9	-1.0	-0.9	-1.0
32	Rest of Zeeland	-1.2	-0.4	-0.4	-0.4
33	West Noord-Brabant	0.0	-0.3	0.2	0.1
34	Middle Noord-Brabant	-0.3	-0.3	0.1	-0.1
35	Northeast Noord-Brabant	0.9	-0.1	0.0	1.1
36	Southeast Noord-Brabant	0.5	-0.2	1.7	-0.9
37	North Limburg	-0.7	-0.6	0.1	-0.1
38	Middle Limburg	-0.7	-0.5	-0.1	-0.2
39	South Limburg	-0.1	-0.1	0.0	0.1
40	Flevoland	2.5	0.1	3.1	-0.6

* The North, East, West and South of the Netherlands are distinguished by the extra lines. The polder

province of Flevoland (40) is best considered to be part of the Western Netherlands.

A7. Labour volume growth, %-points deviation from national, average 1990-2001

Nr.	Region*	Difference in growth	Sector structure component	Regional component	Localisation economies component
1	East-Groningen	-0.5	-0.3	-0.1	-0.2
2	Delfzijl and surroundings	-1.8	-0.4	-1.0	-0.4
3	Rest of Groningen	0.0	0.3	-0.1	-0.2
4	North Friesland	-0.6	-0.1	-0.3	-0.2
5	Southwest Friesland	0.0	-0.2	0.6	-0.5
6	Southeast Friesland	0.9	-0.1	1.3	-0.4
7	North Drenthe	0.1	-0.1	0.6	-0.4
8	Southeast Drenthe	0.1	-0.5	1.3	-0.7
9	Southwest Drenthe	-1.5	-0.3	-0.7	-0.5
19	North Overijssel	-0.2	-0.2	0.0	-0.1
11	Southwest Overijssel	-0.6	0.0	-0.2	-0.4
12	Twente	0.0	-0.3	0.5	-0.2
13	Veluwe	-0.5	-0.2	-0.3	0.0
14	Achterhoek	-0.7	-0.3	-0.1	-0.2
15	Arnhem/Nijmegen	-0.1	0.1	-0.1	-0.1
16	Southwest Gelderland	0.5	-0.2	1.1	-0.3
17	Utrecht	0.7	0.4	0.3	0.0
18	Top of Noord-Holland	-0.2	-0.3	0.3	-0.1
18	Alkmaar and surroundings	0.7	0.1	0.8	-0.2
20	IJmond	-1.7	-0.5	-0.5	-0.7
21	Agglomeration Haarlem	-1.4	0.3	-0.3	-1.4
22	Zaanstreek	-0.1	-0.2	0.3	-0.2

23	Greater Amsterdam	0.5	0.4	-0.1	0.2
24	Gooi and Vechtstreek	-0.9	0.3	-0.5	-0.6
25	Leiden and Bollenstreek	-0.5	0.1	-0.1	-0.5
26	Agglomeration The Hague	-0.4	0.2	-0.9	0.3
27	Delft and Westland	-0.3	0.1	-0.3	-0.1
28	East Zuid-Holland	0.7	0.1	0.5	0.0
29	Greater Rijnmond	-0.4	0.2	-0.3	-0.3
30	Southeast-Zuid-Holland	0.6	-0.1	0.7	0.0
31	Zeeuwsch-Vlaanderen	-0.7	-0.3	0.0	-0.4
32	Rest of Zeeland	-0.8	-0.2	-0.5	-0.1
33	West Noord-Brabant	-0.1	-0.2	0.1	0.0
34	Middle Noord-Brabant	-0.2	-0.2	0.2	-0.1
35	Northeast Noord-Brabant	1.0	-0.2	1.4	-0.1
36	Southeast Noord-Brabant	0.5	-0.4	1.1	-0.2
37	North Limburg	-0.3	-0.4	0.2	-0.1
38	Middle Limburg	-0.5	-0.5	-0.3	0.3
39	South Limburg	-0.3	-0.1	-0.2	0.0
40	Flevoland	2.2	0.2	2.3	-0.3

* The North, East, West and South of the Netherlands are distinguished by the extra lines. The polder

province of Flevoland (40) is best considered to be part of the Western Netherlands.

Table 1. Summary of the decompositions of levels, averages in %-points, 1990-2001
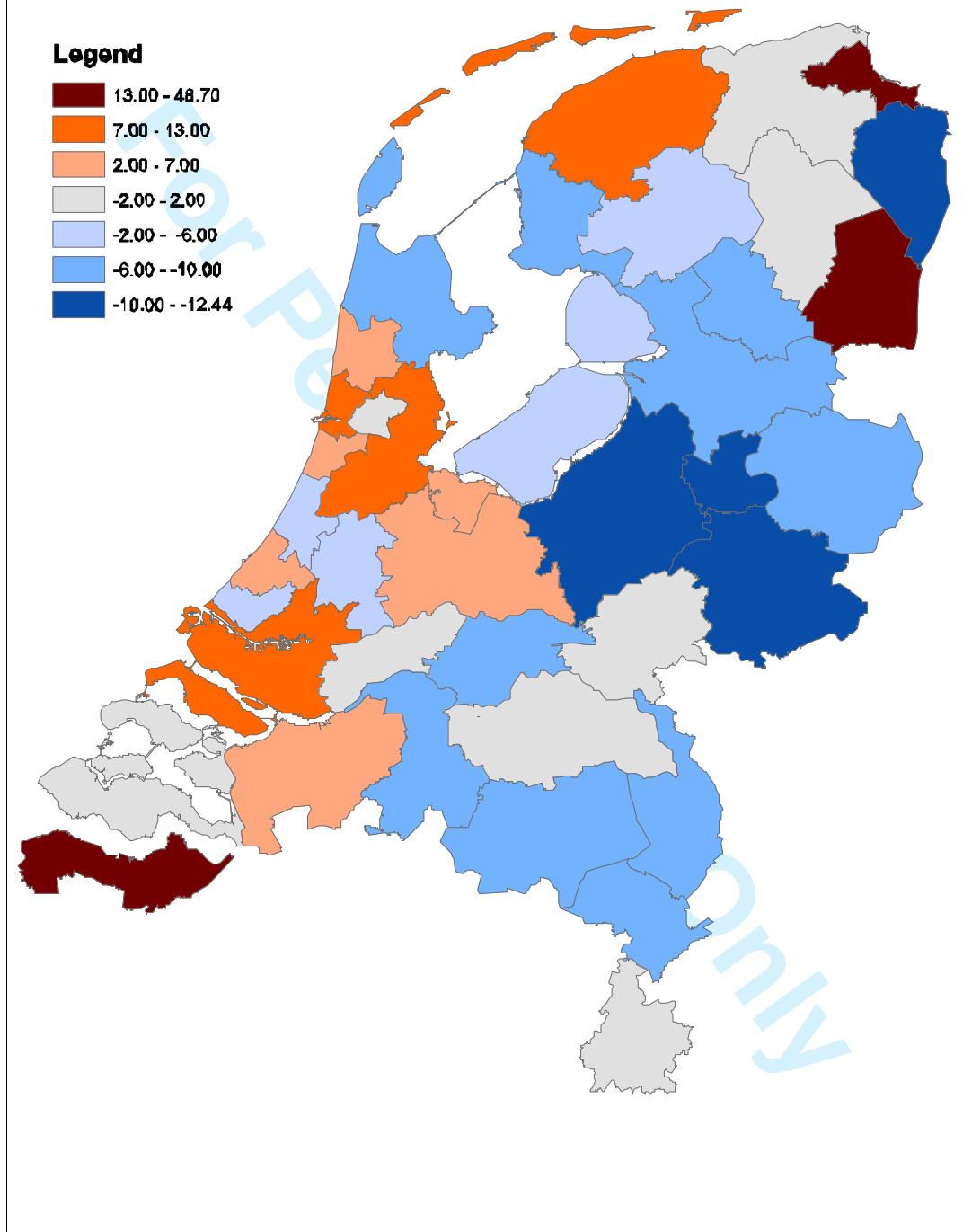
	Reg. deviation from national		Sector structure component		Regional component		Localisation economies component	
	Aver.	Abs.	Aver.	Abs.	Aver.	Abs.	Aver.	Abs.
Level of labour productivity	-1.9	6.87	-0.7	2.36	-2.8	5.33	+1.6	2.49

Table 2. Summary of decomposition analyses, averages in %-points, 1990-2001

	Reg. deviation from national		Sector structure component		Regional component		Localisation economies component	
	Aver.	Abs.	Aver.	Abs.	Aver.	Abs.	Aver.	Abs.
Growth of lab. productivity*	-0.18	0.36	-0.13	0.20	-0.05	0.33	0.00	0.27
Growth of value added	-0.35	0.81	-0.24	0.37	+0.12	0.63	-0.24	0.36
Growth of labour volume	-0.17	0.60	-0.10	0.24	+0.16	0.52	-0.23	0.28

* At the level of the individual decompositions, per region, per year, this row equals the value added row minus the labour volume row.

Figure 1 – Regional labour productivity, level 1990, %-deviation from national

Legend

■ (dark red)	13.00 - 48.70
■ (orange)	7.00 - 13.00
■ (light orange)	2.00 - 7.00
■ (grey)	-2.00 - 2.00
■ (light blue)	-2.00 - -6.00
■ (blue)	-6.00 - -10.00
■ (dark blue)	-10.00 - -12.44

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Figure 2 – Regional labour productivity, level 2001, %-deviation from national
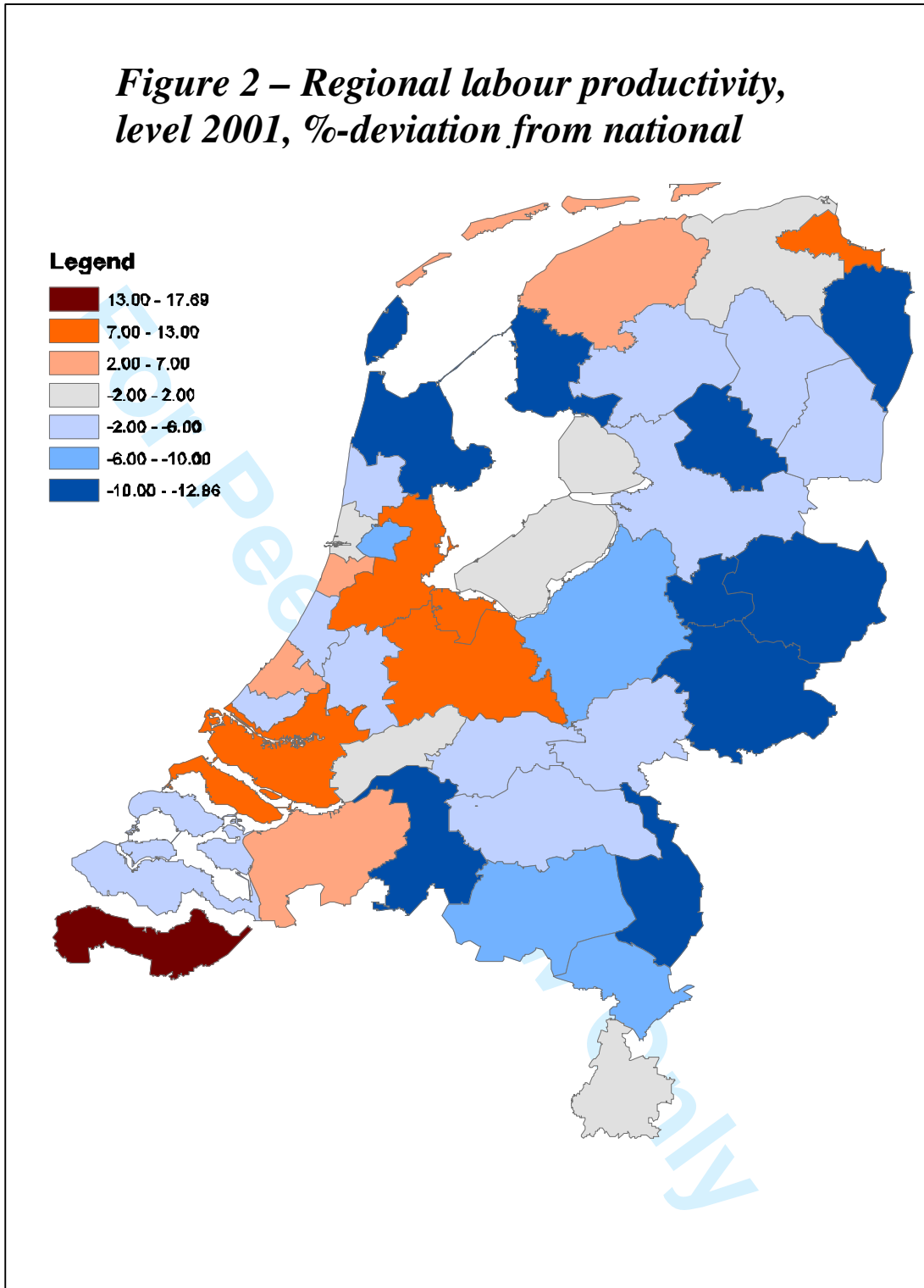
Figure 3 – Regional labour productivity, growth 1990-2001, %-deviation from national
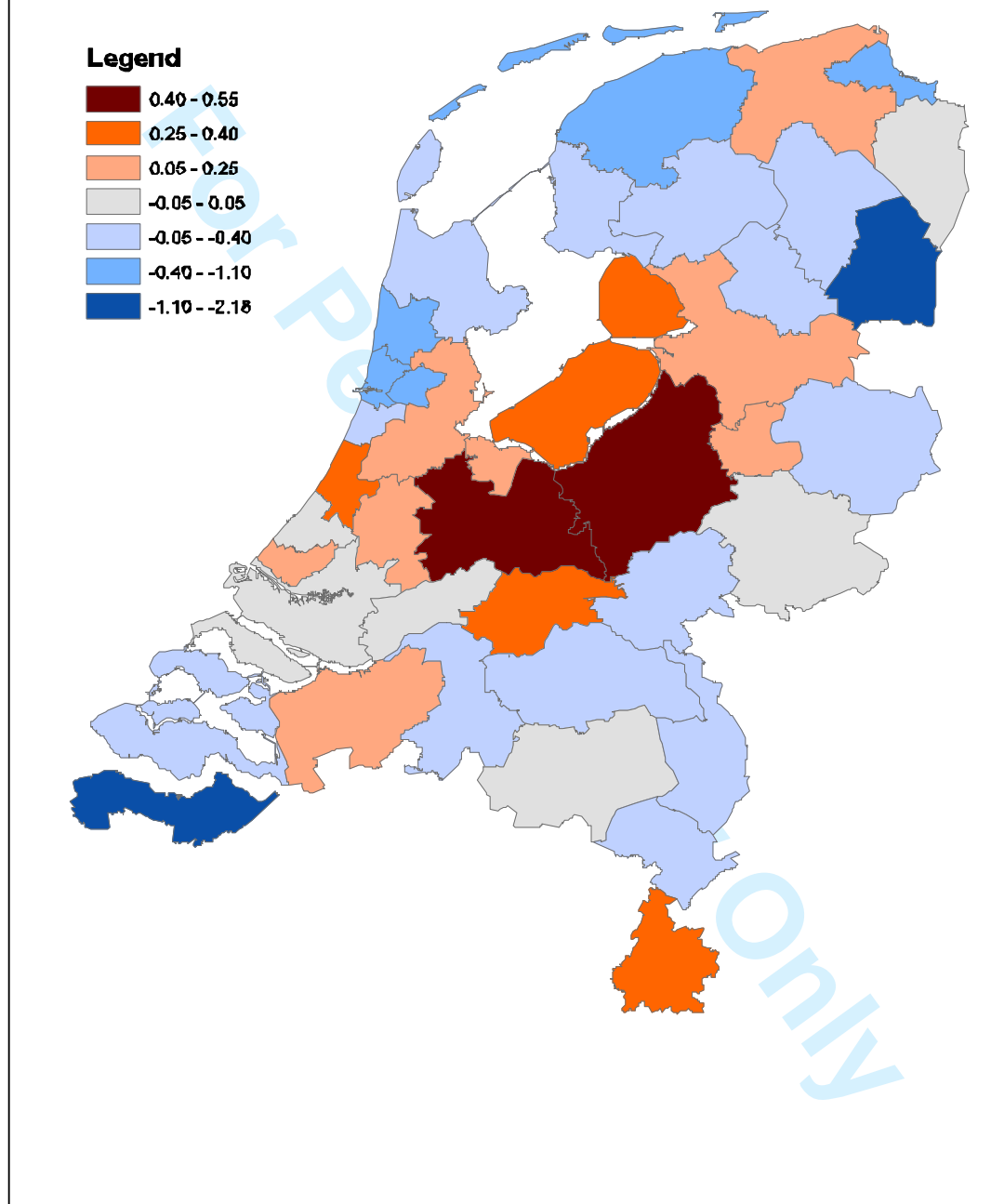
Legend

■	0.40 - 0.55
■	0.25 - 0.40
■	0.05 - 0.25
■	-0.05 - 0.05
■	-0.05 - -0.40
■	-0.40 - -1.10
■	-1.10 - -2.18

Figure 4 – Regional gross value added, growth 1990-2001,%- deviation from national

Legend
2.00 - 2.53
1.00 - 2.00
0.30 - 1.00
-0.30 - 0.30
-0.29 - -1.00
-1.00 - -2.00
-2.00 - -2.94
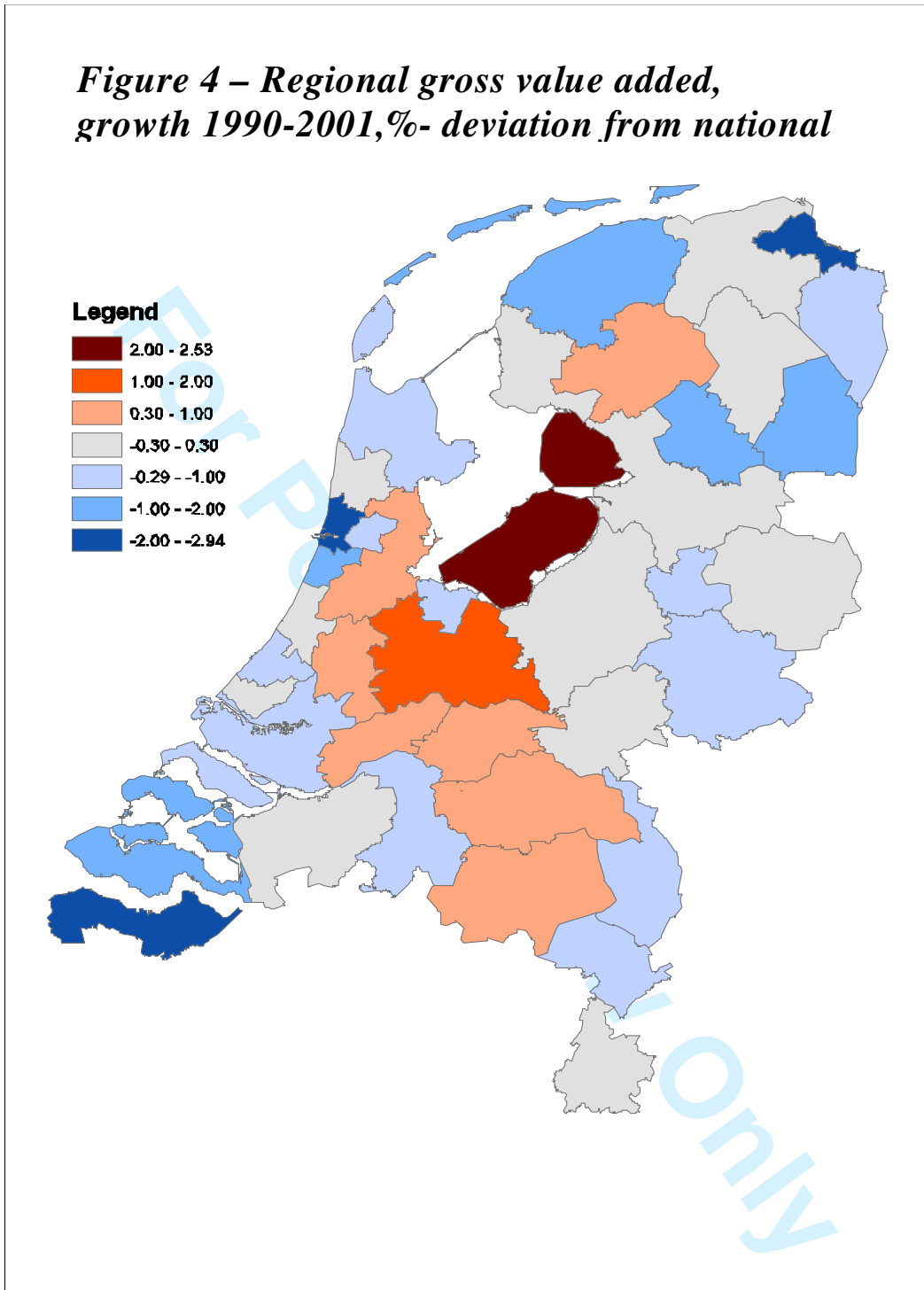
Figure 5 –Sector structure component, in %-deviation from nationalproductivity level
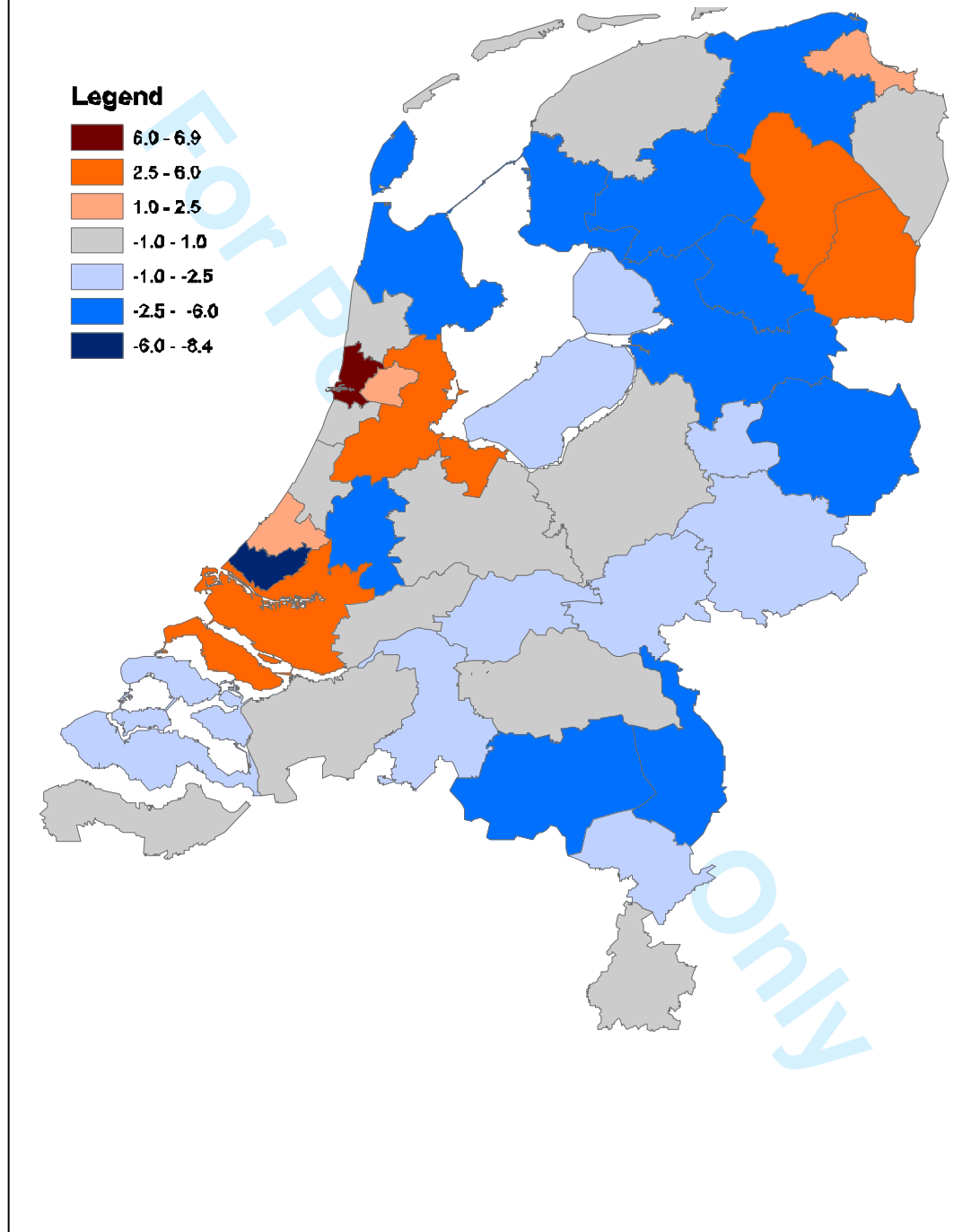
Legend

- ■ 6.0 - 6.9
- ■ 2.5 - 6.0
- ■ 1.0 - 2.5
- ■ -1.0 - 1.0
- ■ -1.0 - -2.5
- ■ -2.5 - -6.0
- ■ -6.0 - -8.4

Figure 6 – Localization economies component, in %-deviation from national productivity level
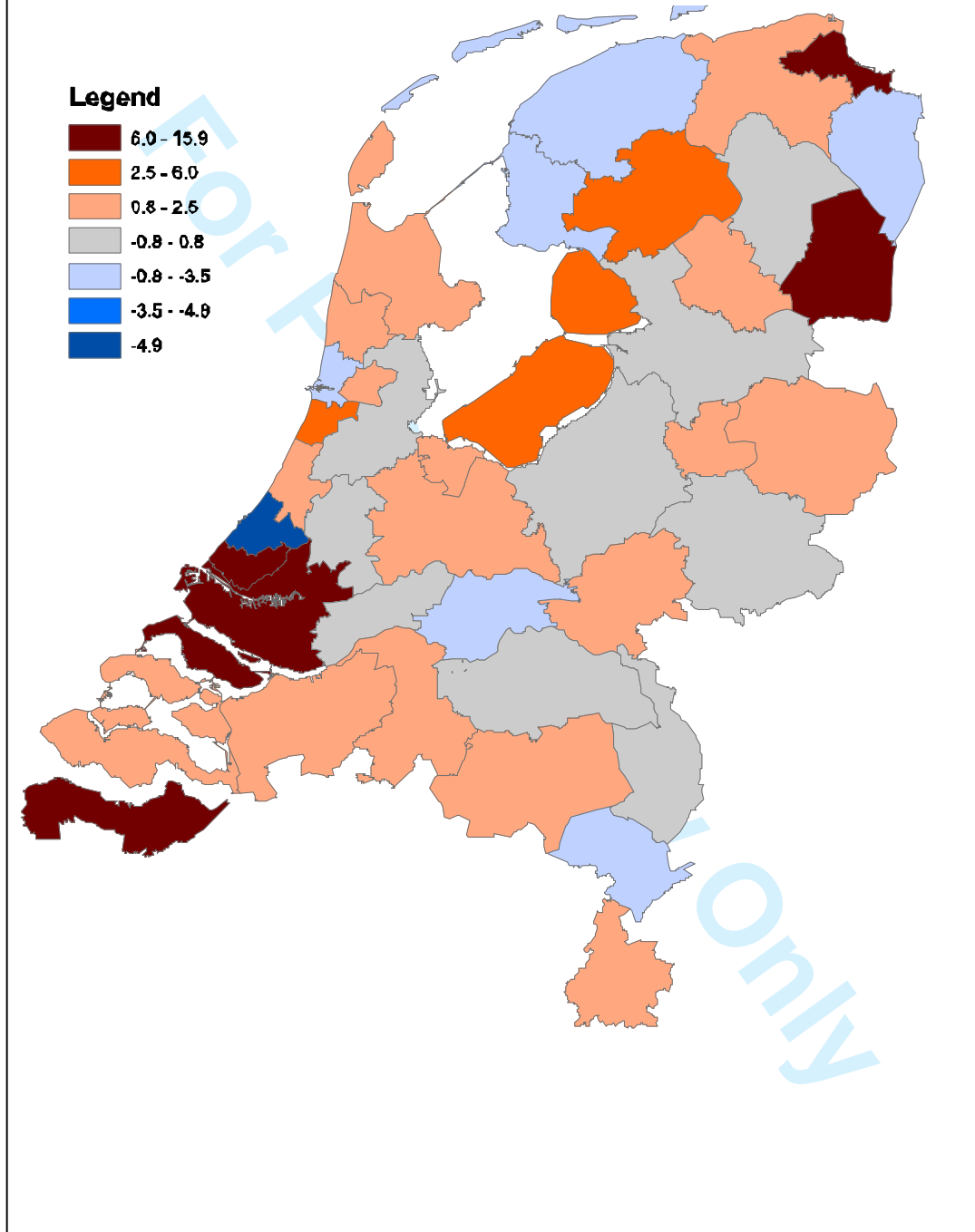
Legend

■	6.0 – 15.9
■	2.5 – 6.0
■	0.8 – 2.5
■	-0.8 – 0.8
■	-0.8 – -3.5
■	-3.5 – -4.9
■	-4.9

Figure 7 – Sector structure component, in %-deviation from national productivity growth

Legend

■	0.35 - 0.40
■	0.25 - 0.35
■	0.10 - 0.25
■	-0.10 - 0.10
■	-0.10 - -0.25
■	-0.25 - -0.40
■	-0.40 - -0.90

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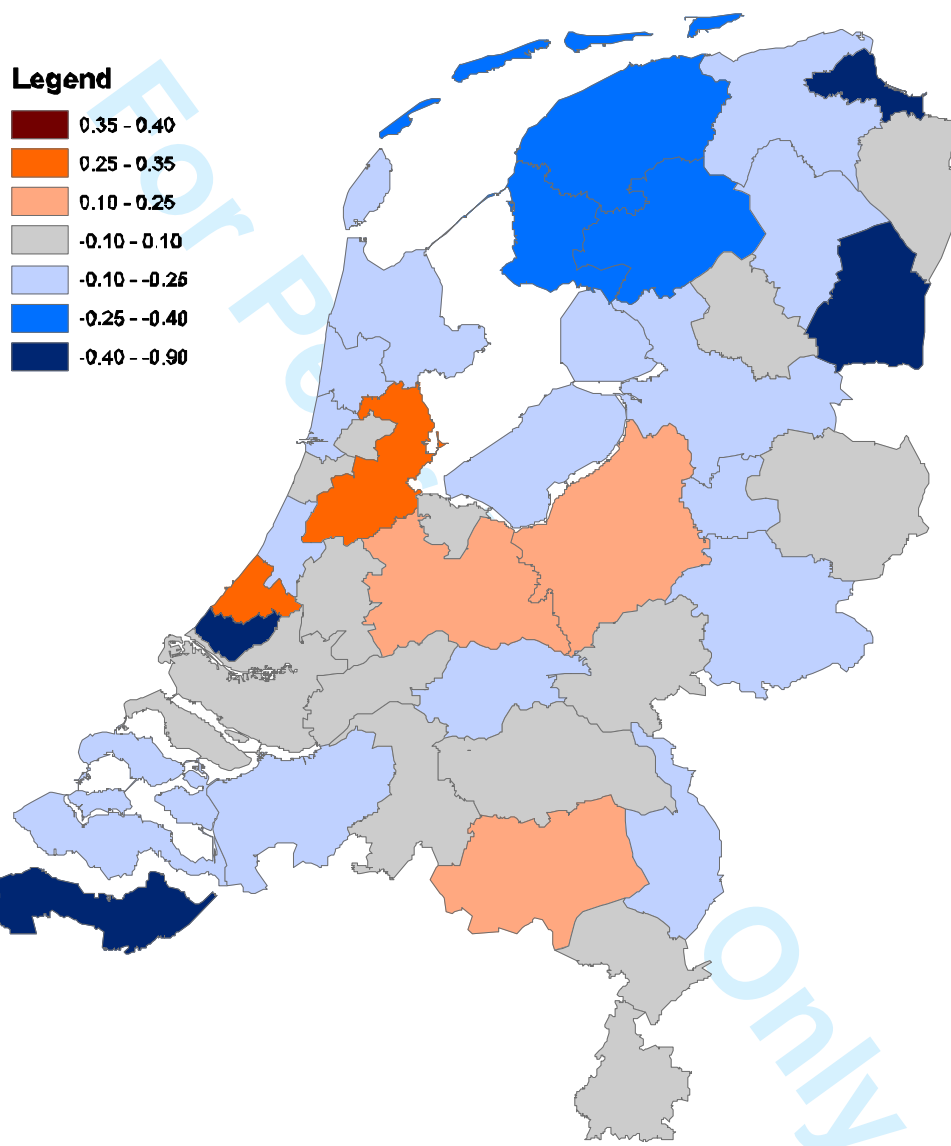
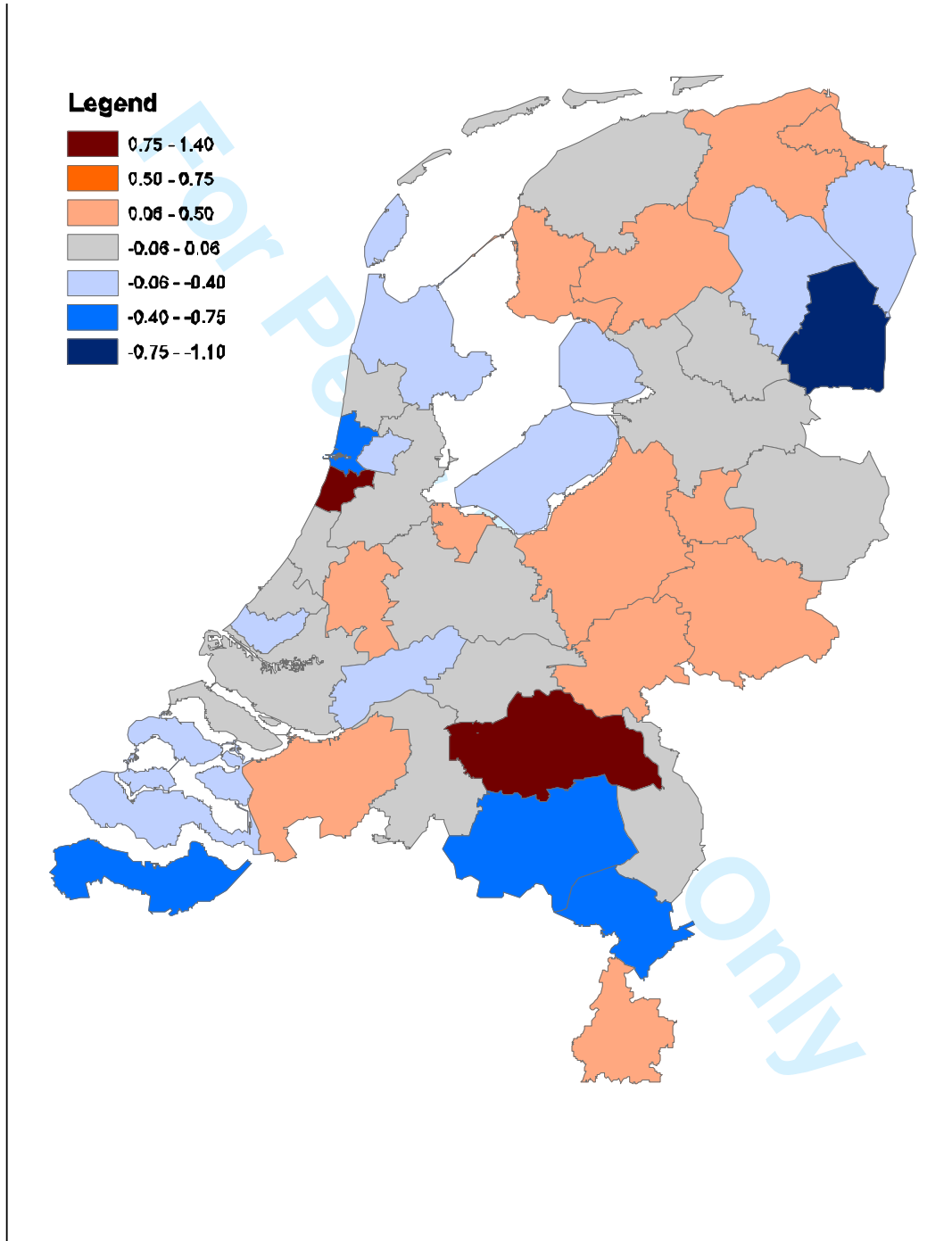*Figure 8 – Localization economies component, in %-deviation from national productivity growth*