Nederlands

PBL Netherlands Environmental Assessment Agency

TOWARDS AN INTEGRATED REGIONAL DEVELOPMENT STRATEGY OF ANDALUCÍA

THE STATE OF THE REGIONAL ECONOMY OF ANDALUCÍA

COLOFON

ANDALUCÍA: AN INTEGRATED REGIONAL ECONOMIC DEVELOPMENT STRATEGY

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Den Haag, 2017

PBL-Website generated report: Andalucía 2018-09-18

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1 Introduction: Regional economic policy perspectives for Andalucía

Economic growth can occur due to regional factors that raise productivity and a region's competitive position, or it can be due to external factors such as a surge in demand from other fast growing regions. The opposite is also true: a region may implement excellent regional policies and outperform relative to many other regions while having an overall negative growth rate caused by a collapse in demand from other regions. The economic crisis in Europe that started with the banking crisis in 2008 and continued far into 2014 is an illustration of such a negative interregional demand spillover onto regional economic growth. We therefore have to distinguish between regional growth that is the result of a change in structural factors strengthening a region's competitiveness and increasing its productivity, and growth due to changes in demand in other parts of the world.

Regional economic policy is targeted at raising the competitiveness of a region and is central in a regional economic policy strategy and a region's long-term growth perspective. In this report, we discuss these regional economic policy perspectives in the context of the situation in Andalucía in Spain. We introduce a new policy concept in which three types of regional economic policy are combined: industrial, innovation and competitiveness policies. We use this policy concept to discuss the different regional economic policy options for Andalucía.

The report does not give a readymade regional economic development strategy, but rather offers building blocks for a regional investment strategy by sketching the different policy options and identifying the important stakeholders needed to develop such a strategy. This report is also a guide to how the information needed for an integrated regional development strategy can be derived from the website 'A regional development strategy. Winners and losers in regional competition', in order to identify more policy options and to develop this region's economic development strategy.

The information on the website 'Winners and losers in regional competition' gives an indication to policymakers of the effectiveness of different policy options given the present state of the regional economy and its recent growth performance. The website thereby gives the detailed information needed for a regional economic development strategy. For example, a benchmark can be conducted using information regarding which firms from what regions have outperformed the firms in the region within a certain economic sector. On the website this can also be visualised on a map. This gives policymakers the possibility to identify the regions that have 'won' or 'lost' in economic competition. Combining the information of the website with detailed information available in the region itself gives regional policymakers the possibility to build an evidence-based economic policy strategy.

The report is structured as follows: first, we evaluate the performance of the various economic sectors in the region and discuss options for regional policies. Based on an analysis of the current situation, we highlight the relevant policy domains that should be involved in a regional development strategy (*governance*). Next, we focus on specific policy instruments within these policy domains that can strengthen the competitiveness of the region; for example, investments in infrastructure or education. In the discussion of the policy instruments, we consider how policymakers could focus on either strengthening well performing sectors or on helping poorly performing sectors. In the regional economic policy perspectives, we integrate industrial, innovation and competitiveness policies into one regional economic policy concept.

In region Andalucía in Spain, we see clear differences in the performance of the various economic sectors. Sector Private services is a gaining sector: a driving force within the regional economy, active in growing sales markets where it is also gaining market share. Sector Chemicals is a promising potential that is gaining market share but is active in relatively declining sales markets. Sector Construction is situated in a favourable economic environment but is losing market share and therefore faces an uncertain future; thus even though this sector is growing, it is underperforming relative to firms from other regions. We can therefore make a distinction between good and bad growth for different sectors depending on their relative performance (see Thissen et al. 2016). Finally, the economic perspectives of the sector Hightech are strongly negative; it is an evident loser from the perspective of both market share and the geographical sales market.

The information provided through the evaluation of sectoral performance provides guidelines for regional industrial, innovation and competitiveness policies. We focus on polices supporting potential future winners as well as cornerstone sectors in the region that are under threat. Supporting the strong and well performing sectors in a region is obviously also a policy option; however, this is not discussed in the report.

We illustrate the usefulness of the regional economic policy concept presented in this report using two examples of sectors within the most interesting groups: 1) a potential winner that is gaining market share, and therefore a promising growth sector for the future; and 2) a masked loser, which is losing market share despite experiencing growth due to increased demand in its specific geographical sales markets. Several sectors are not covered in the example because they are small in size in most regions (such as the furniture industry) or because they are of limited interest for regional economic policy (such as public services). For region Andalucía, we choose the potential winner Chemicals and the masked loser Construction.

2 The policy concept

Regional economic policies are necessarily region- and sector-specific. This statement is supported by recent scientific literature in regional economics as well as by regional economic policy reports from PBL, the EU Commission and international research bodies such as the OECD. However, by definition ex-post evidence for cross-regional differences in policy impact is easier to identify than the ex-ante impact for region- and sector-specific policy options. In this report, we focus on the analysis of region-specific policy options for supporting competitiveness based on ex-post region-specific performance. These policy options are therefore evidence-based.

The discussion of region- and sector-specific policy options for region Andalucía within our new policy concept is the main topic of this report. The analysis of policy perspectives reflects the current regional economic policy context of the regional economy as a base. This region-specific context is defined by (inter-)national sector-specific trade networks as well as knowledge and investment networks operating in an institutional environment of public sector institutions and (region-specific) regulation and behaviour. This policy concept used here is an extended version of the Triangularised Triple Helix model (Farinha & Ferreira 2012).

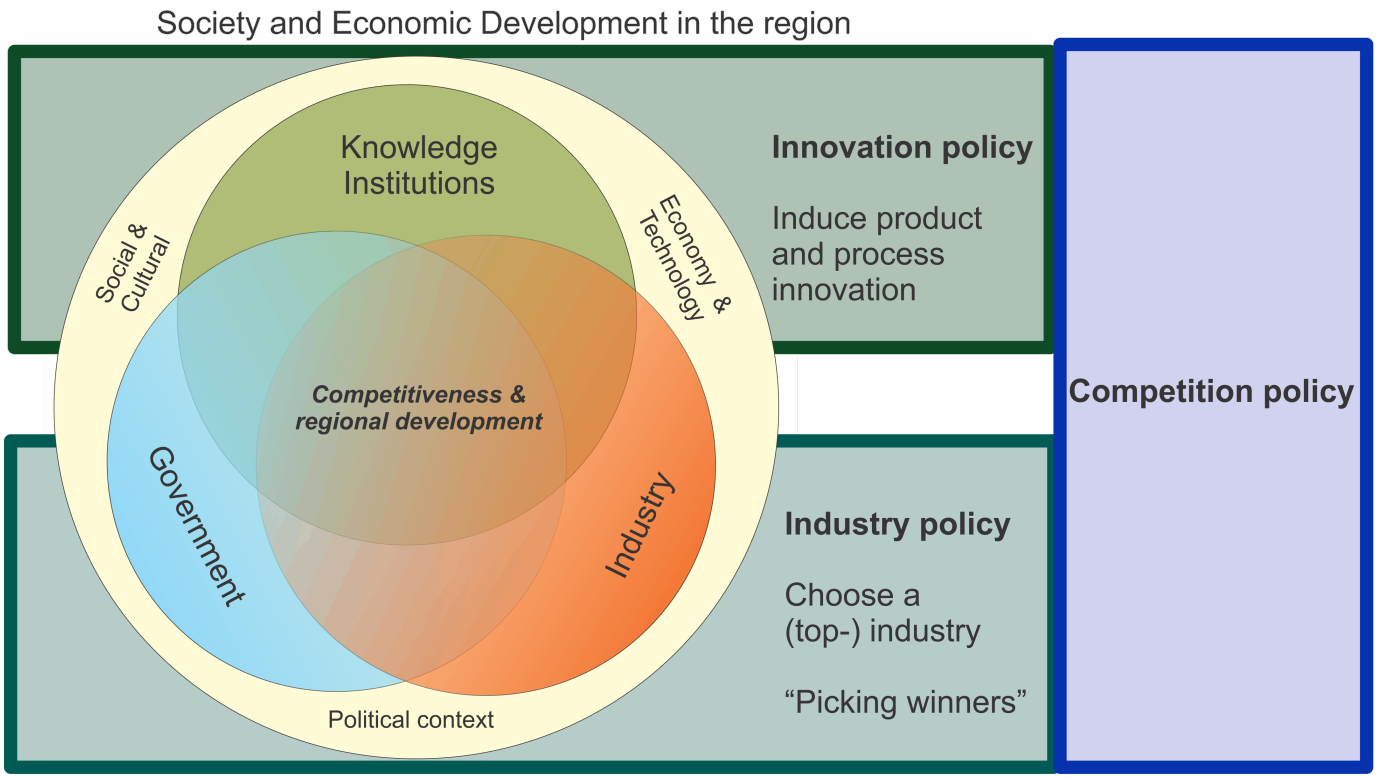


Figure 1: Competitiveness, innovation and sector policy within the Triangularised Triple Helix model

The extended version of the Triangularised Triple Helix model is depicted in Figure 1. According to this model, policies impact regional competitiveness, as agents within the socio-cultural, socio-economic and political environment respond to incentives created by policy. Within this complex environment there is a number of factors that, to a greater or lesser degree, affect the competitiveness of firms in the region. Due to this complexity – with mutual dependencies between agents – the shaping of targeted and efficient policies requires the involvement of all relevant parties. The importance of different agents differs somewhat between policy domains. Within industrial policy (which industries within the region need stimulus), the most important role is played by the public and industry sectors, while knowledge bodies are more influential in shaping innovation policies (how should the region promote changes). Competitiveness policy brings industrial and innovation policy together, as specific regional policies and investments are targeted to strengthen the regional economy and thereby its competitiveness. The starting point for such a regional development strategy is the present state of the regional economy, its strengths and weaknesses, and its past performance. The potential regional factors that were important for past regional growth determine which regional policies are most promising and which regional institutions and policymakers should be involved in developing a successful regional development strategy. Moreover, the present position and the position over time of the firm in the sector business cycle can help to formulate innovation policies that may aid a specific industry to improve its competitiveness and performance.

3 An evaluation of the economic performance of Andalucía

Prior to the policy discussion, here we give an overview of the economic performance of region Andalucía; after all, the strengths and weaknesses of the regional economy should be the starting point of evidence-based regional policies. As such, we first present the growth of the regional economy over the period 2010

– 2014 and we compare it to the overall growth in Europe. This allows us to evaluate the economic performance of a sector in region Andalucía.

The overall growth of the regional economy in Andalucía in the period 2010 – 2014 amounted to -1.39 %. This is illustrated in the bar chart in Figure 2 by the black line. The bar chart distinguishes three patterns of regional economic growth in Europe: weak regions with negative growth (shaded), average performers experiencing positive growth below the European average (pink), and strong regions with a growth above the European average. Andalucía had a **negative** growth that is **weaker** than the European average. As such, Andalucía belongs to the **weaker regions**.

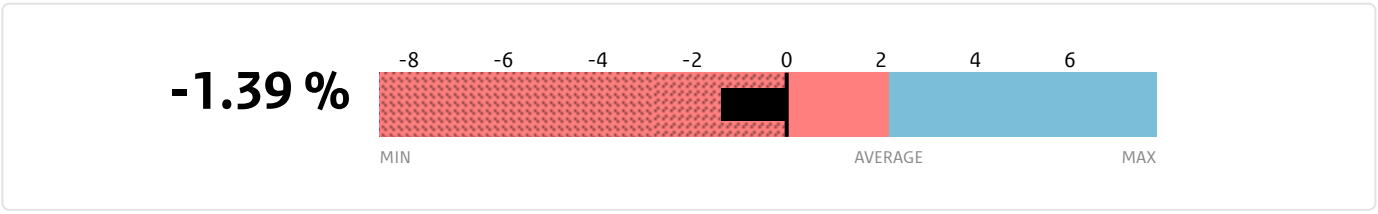


Figure 2: The economic performance of Andalucía

What are the driving factors of the economic performance of Andalucía? And to what extent can the performance be attributed to regional policies in Andalucía or to external factors? Not all growth can be explained by regional policies in Andalucía. After all, the economy of region Andalucía is strongly influenced by external factors such as the economic crisis in 2008 and its aftermath. The determining factors of the economic performance of a region may well lie primarily outside the range of influence of the region.

Economic growth means producing and selling more and/or better products and services. This results in increased added value (GDP growth). Growth can be a result of increased demand for products from other regions (sales market growth), or of increased competitiveness (market share growth) which is associated with the rising productivity of firms in region Andalucía. The external demand for products and services, or demand-led growth, is primarily determined by factors outside the influence of the region itself. However, increased market share, or competitiveness gains, can partly be explained by regional economic policies.

The decomposition of growth into a structural (1) and a demand-led (2) component allows us to investigate the extent to which regional economic performance is determined by competitiveness gains (1), whereby firms from the region have increased their market share, or by external factors on the world market (2), leading to the expansion or decline of sales markets. It also gives a guideline for policy: which sectors in the region can be strengthened by improving competitiveness and which sectors can be strengthened by exploring new sales markets? An analysis of the characteristics of other regions that performed better or worse helps us to understand the distinguishing drivers of the economic performance of these regions. This information can be used to support regional productivity and to further strengthen regional competitiveness.

How are demand-led and structural growth determined?

Figure 3 illustrates the concept of demand-led and structural growth within the concept of regional revealed competition (Thissen et al. 2013) that distinguishes between production and market (consumption) regions. In this figure, region i exports goods and services to region j. The market j is represented by the grey circle and the market share of i in market j is represented by the light blue area. Growth of market j entails an increase in income, consumption expenditure and demand for products: market expansion that is depicted by the dark grey donut around the light grey circle. As such, the total of market j after growth consists of the entire circle (light plus dark grey). Consequently, due to the growth in demand, exports from region i to region j increase, as depicted by the dark blue area. This is demand-led growth. If region i additionally manages to strengthen its competitive position, it gets a larger part of the market. The gaining of a larger market share in j is represented by the red triangle in Figure 3. This red triangle therefore represents structural growth. Both demand-led and structural growth can differ by market and sector, and both can be positive or negative.

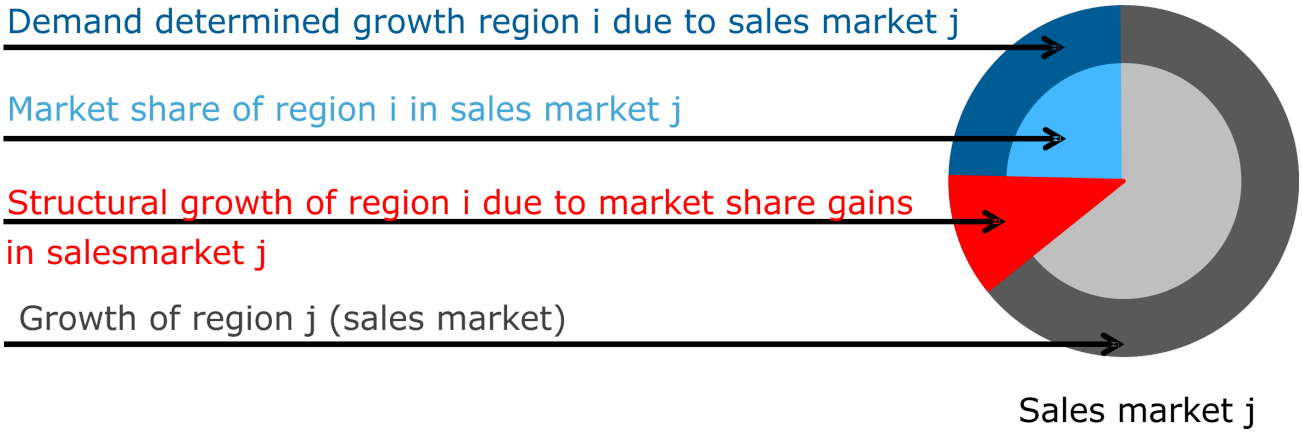
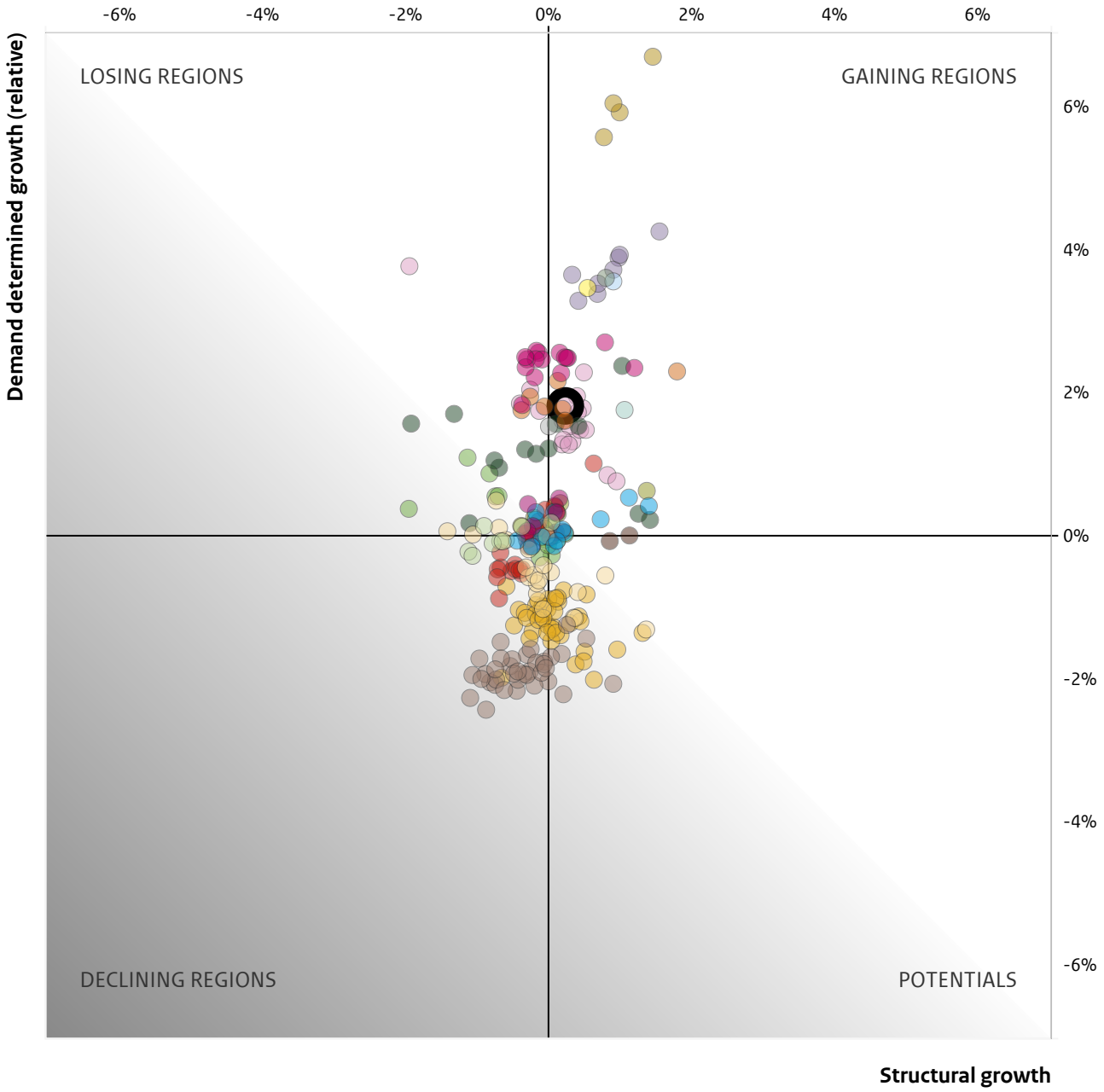


Figure 3: Demand-led and structural growth

In order to gain an overview of the performance of an entire sector in Andalucía, we add up the demand-led and structural growth across all of its 265 market regions and the rest of the world. In this analysis, by covering all markets across the world, we investigate whether growth is the result of demand-led or structural factors.

3.1 Winners and losers

On the basis of the decomposition into demand-led and structural growth, we can divide the economic performance of regions into four categories. This can be illustrated by means of a dynamic Boston diagram, as shown in Figure 4. In a dynamic Boston diagram, the horizontal axis represents the structural growth of the region while the vertical axis represents the demand-led growth of the region. As such, the horizontal axis represents the strength of the competitive position of the region: movements along the axis are gains or losses in market share. At the same time, the vertical axis illustrates whether the region is focusing on the right export markets: movements along the axis show whether demand-led growth is higher or lower than the European average.



Degree of negative growth

MORE LESS

X axis: GROWTH IN GDP BECAUSE OF COMPETITIVENESS (MARKET SHARE GAINS IN PERCENTAGES)
Y axis: GROWTH IN GDP BECASUE OF DEMAND FROM OTHER REGIONS (GROWTH IN PERCENTAGES RELATIVE TO THE EUROPEAN AVERAGE)

Figure 4: The economic performance of Andalucía

The decomposition into structural growth, potentially influenced by regional policies, and demand-led growth, largely determined by external factors, allows us to place Andalucía in one of the four possible quadrants of the dynamic Boston diagram. These quadrants are shown in Figure 5.

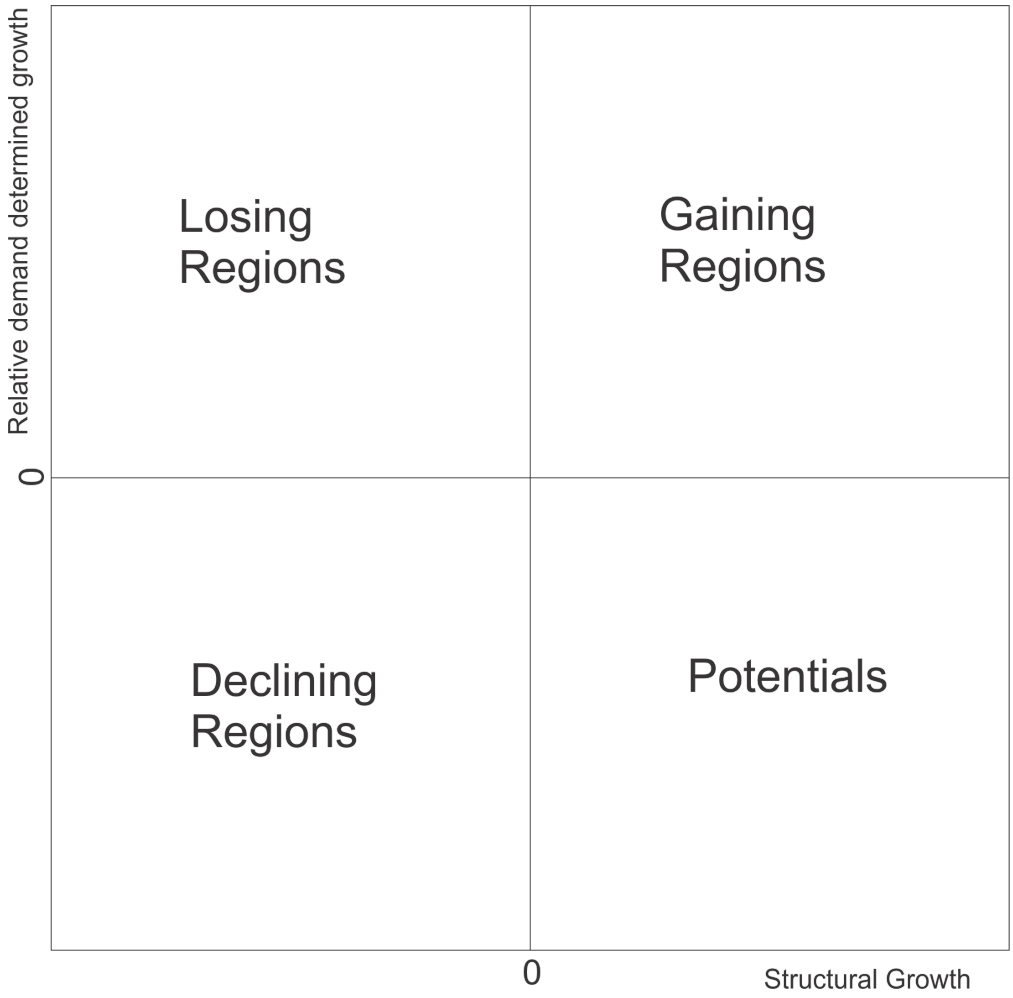


Figure 5: Evaluation of economic performance

Figure 5 shows the four categories of regional economic performance: potentials, gaining regions, losing regions, and declining regions. Our analysis reveals that region Andalucía falls in the category of Succesvolle winnaars. What does this mean for the economic performance of the region?

Potentials are located in the south-eastern quadrant of the dynamic Boston diagram. These regions have a strong competitive position (structural growth). However, they are faced by sectors experiencing declining sales markets (less than average demand-led growth). These regions are therefore performing sub-optimally, and growth could be increased by exploring new sales markets. Since many successful startups also start in sales markets that coincide with or are in the neighbourhood of production regions, this category is often found in this quadrant.

Gaining regions are located in the north-eastern quadrant of the dynamic Boston diagram. These regions are characterised by high structural growth and higher-than-average demand-led growth. Gains in market share where the region is active as well as activity in growing sales markets result in high overall growth.

Losing regions are located in the north-western quadrant of the dynamic Boston diagram. These regions experience a deteriorating competitive position, but the decline is masked. The production structure of these regions is dominated by sectors that are active in strongly growing sales markets (demand-led growth), but which are also losing market shares (negative structural growth). This is not sustainable in the long-run and the region finds itself in a challenging position: restructuring the economy is necessary but it appears less urgent due to the growth in sales markets.

Declining regions are located in the south-western quadrant of the dynamic Boston diagram. These regions have a weak competitive position. Their economic structure is dominated by sectors that are experiencing shrinking market shares (negative structural growth) in declining sales markets (lower-than-average or negative demand-led growth). This leads to low or even negative overall growth. Only a fundamental restructuring of the economy can reverse the process of economic marginalisation among the category of declining regions.

Gaining regions: Firms in Andalucía are performing well and represent a driving force within the regional economy. These firms are competitive and are active in growing sales markets.

3.2 The economic performance of the region in detail

How informative is the average growth rate of a region? The information contained in the average growth rate is only limited because the production of the economy in a region consists of a mix of firms that differ in terms of economic performance and are active in different sales markets. As a result, positive and negative growth rate cancel each other out and obscure the economic processes that drive the performance of the region. In order to better understand the economic performance of the region, it is therefore important to delve into the details of sector-specific performance. Here, sectors represent an aggregation of similar firms. In our analysis, we choose the lowest level of aggregation that still allows us to produce reliable results. This should be taken into account when interpreting the results: in order to find specific firms, policymakers would need to carry out further research. The sector-specific results allow us to identify weak and strong points of the regional economy of Andalucía. The information about the strengths and weaknesses of the different sectors in the economy together form the basis of a successful regional policy strategy.

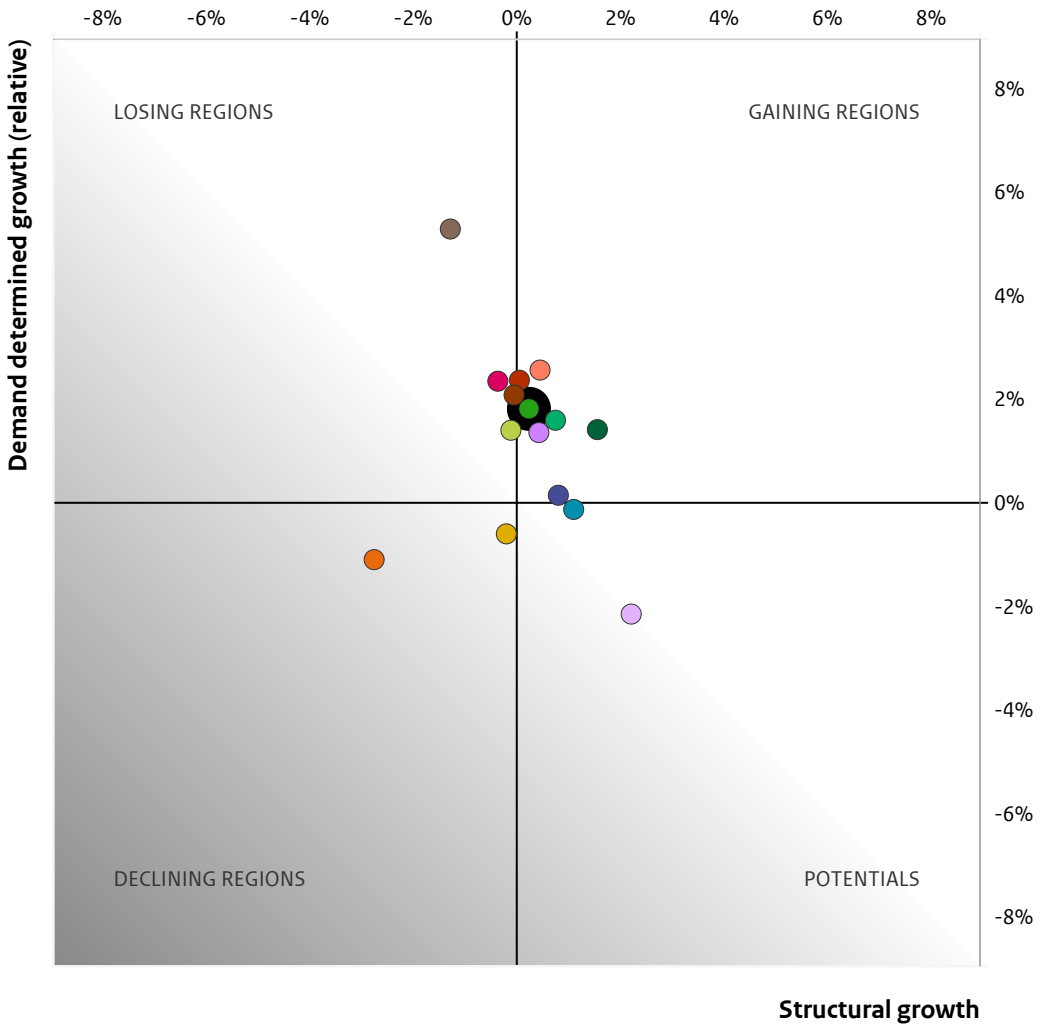


Figure 6: The economic performance of sectors in Andalucía

In Figure 6, the economic performance of Andalucía is differentiated according to the underlying performance of the different sectors. This figure is constructed in the same way as Figure 5. However, in Figure 6 the comparison is not regarding the overall region, but rather focuses on the sectoral level within the region: how are the sectors performing relative to competitors from other regions. The total production of Andalucía is located at exactly the same co-ordinates as in Figure 5. It is clear to see in the figure that sector Technologische Industrie is the worst performing sector, while sector Bouw is performing the best. These two sectors are located furthest towards the south-western and north-eastern corners of the figure respectively. In addition, we can also identify successful winners as well as masked losers using the classification presented in Figure 5.

3.3 From evaluation to policy

The evaluation of the economic performance of the sectors in Andalucía forms the basis for a regional economic development strategy. In the next section, we work out such a regional economic development strategy in line with the policy concept presented above, and using Andalucía as an example. In order to do this we have to make choices, such as the type of sectors that the policy will focus on. In particular, we choose policies aimed at supporting the potentials of the future and the losing sectors under threat from their competitors. It is of course possible to choose alternative strategies (for example, to further strengthen successful winners), which would likely lead to other policy choices. A policymaker can develop such an alternative strategy using the material provided on the PBL Netherlands Environmental Assessment Agency website 'A regional economic development strategy for European regions'.

4 Region- and sector-specific evidence-based policy

To what extent does policy influence regional economic development? This question has frequently been discussed in the literature. One of the main overall conclusions is that the influence of policy is limited and mostly region- and sector-specific. The importance of context means that it is difficult to find a general answer to the question. However, it is fairly straightforward to estimate the maximum potential effect of policy on regional economic development.

Thissen et al. (2016b) conclude that the maximum effect is limited. Only about 30 percent of regional growth can be explained by factors in the region (structural growth). This means that regional growth is primarily determined by external factors (demand-led growth). These external factors, including regional policies in other regions, affect the growth in sales markets, leading to higher or lower demand for products. Change in the demand for goods and services is the main determinant of sectoral growth, irrespective of policy stimulus.

Clearly, there are cross-sectoral differences here. In certain sectors, competition is intense, leading to substantial dynamics. In other sectors, such as the service sectors, there is much less competition and growth is almost entirely determined by the local demand for services. In our analysis, we have investigated the relative importance of structural and demand-led growth (Table 1). Table 1 shows the sector-level cross-European average value of the relative importance of the two components of growth. Structural growth is more important in traditional industrial and agricultural sectors (indicated in red), where

competition between firms from different regions can be fierce, than it is in service sectors (indicated in blue), where there is less competition. Trade in services is primarily local and, as argued in Thissen et al. (2016c), the European market for services is less integrated than the industrial and agricultural markets.

	Structural growth(% total growth)	Demand-determined growth(% total growth)
Total production	70%	30%
Agriculture	39%	61%
Food	29%	71%
Materials	40%	60%
Technological industry	41%	59%
Chemicals	39%	61%
Energy	56%	44%
Financial services	70%	30%
Business services	62%	38%
Mining	65%	35%
Textiles and paper	67%	33%
Other industry	46%	54%
Construction	46%	54%
Private services	43%	57%
Public services	72%	28%

Table 1: The relative importance of structural and demand-led growth

The effect of investments in specific regional characteristics, such as accessibility and education capacity, does not only depend on the sectoral structure of a region, but also on whether firms in the region are able to sufficiently increase their competitiveness and are willing to take initiatives themselves (Thissen et al. 2016a). For this reason, policies aimed at supporting existing structures within the regional economy tend to be more successful than policies aimed at creating a new regional economy. After all, it is difficult to build an entire regional economic structure from scratch. This insight is supported by a voluminous literature that voices criticism over the creation of new regional ‘valleys’.

4.1 General guidelines for regional economic policy

Regional policy has only a limited impact on the development of a regional economy. In addition, the effects of regional economic policies are highly dependent on the region-specific context. Consequently, a successful strategy in one region cannot simply be ‘copy-pasted’ to another region under the expectation of similar effects. Regional economic policies of a supportive and facilitating character are more likely to be successful if they are tailored to the regional economy. In practice, this means solving bottlenecks and investing in regional factors such as knowledge infrastructure, matching the needs of firms active in the region. A sign of a successful policy is increased investments from the firms in the region, which will ultimately lead to higher economic growth. The development of industry- and region-specific policies is the theme of the rest of this section.

4.2 Industrial policy for Andalucía

Industrial policy is commonly associated with 'picking winners'. Here, analyses focus on firms clustered into a sector under the assumption that these firms face the same economic problems and opportunities. Policies are mainly implemented to support the sectors making the largest contribution to the economy. At first sight, policymakers may then choose the fastest growing sectors. Sectoral growth in the period 2000 – 2010 in Andalucía is presented in Table 2. The first column of Table 2 shows the economic potential of each sector. This is sectoral growth, independent of the size of the sector. The second column shows the economic strength of the sector. This is the sector's share of the economic growth of the region. As such, the second column captures both the growth and size of each sector.

Sector	Potential	Economic importance	Economic strength
Financial services	61.22	6,666.84	4,081.56
Construction	18.42	11,531.89	2,124.32
Private services	16.41	36,405.55	5,975.58
Hightech	11.52	2,731.66	314.57
Other industry	1.57	1,153.89	18.13
Chemicals	-0.51	280.76	-1.43
Food	-0.79	3,853.32	-30.63
Forestry and Mining	-0.92	492.32	-4.50
Government services	-2.95	29,800.18	-877.71
Textile, clothing and paper industry	-3.00	2,623.96	-78.71
Energy	-5.08	3,829.99	-194.72
Materials	-5.44	3,079.34	-167.44
Agriculture	-8.47	5,822.36	-493.32
Business services	-10.01	11,054.26	-1,106.96

Table 2: The economic potential and strength of the sectors in Andalucía

The second column of Table 2 clearly shows that Financial services was the fastest growing service sector of Andalucía over the period 2000 – 2010, while Construction was the fastest growing industrial sector. Due to their high growth rates, these are sectors with a high economic potential. Industrial policies could be employed to further develop these sectors, leading to even higher economic growth in the future. A policymaker could choose either the service sector or the industrial sector, bearing in mind that the industrial sector is more responsive to policy than the service sector. As argued above, structural growth is higher in industrial sectors.

Aside from the type of sector, its size is also relevant. A small sector with high economic growth clearly has much potential, but its contribution to the regional economy remains limited. In addition, a small industry in the starting phase achieves high growth with more ease than a large established industry. High growth may not persist for a long time, however. Consequently, growth numbers for a single year are less reliable indicators than trends in growth over a period of time. An analysis of regional economic growth therefore needs to capture sectoral composition, the relative size of the sectors and long-term trends.

In the second column of Table 2, the economic importance of a sector is represented by the gross domestic product (GDP), and in the third column economic strength is represented by the sector's share of regional growth in the period 2000 – 2010. By looking at the share in growth, we implicitly weight the sector's growth by its size. This weighting allows industrial policies to focus on sectors that are growing fast while avoiding those that are tiny in size. In Andalucía, the largest contributors to growth are the service sector Private services and the industrial sector Construction. This industrial sector is therefore a potentially good target for industrial policies, unless the share of Private services in growth is much higher. If the share of the latter is much higher than the share of Construction, it might be better to develop industrial policies supporting the service sector.

4.3 Innovation policy for Andalucía

Innovation policy examines the dynamic development of the different sectors of the economy. The goal of innovation policy is to support the growth potential of a sector through product or process innovation. In contrast with industrial policy, the size of a sector does not matter for innovation policy: these policies can be implemented over the entire life cycle of a sector. As such, innovation policy is an answer to the critique of static industrial policies that is frequently mentioned in the literature, namely the impossibility of 'picking winners' of the future. High growth in the past is no guarantee for high growth in the future. Prior to the discussion of innovation policy, it is necessary to explain the different stages of the life cycle of a sector in a region; these stages are the basis of innovation policy.

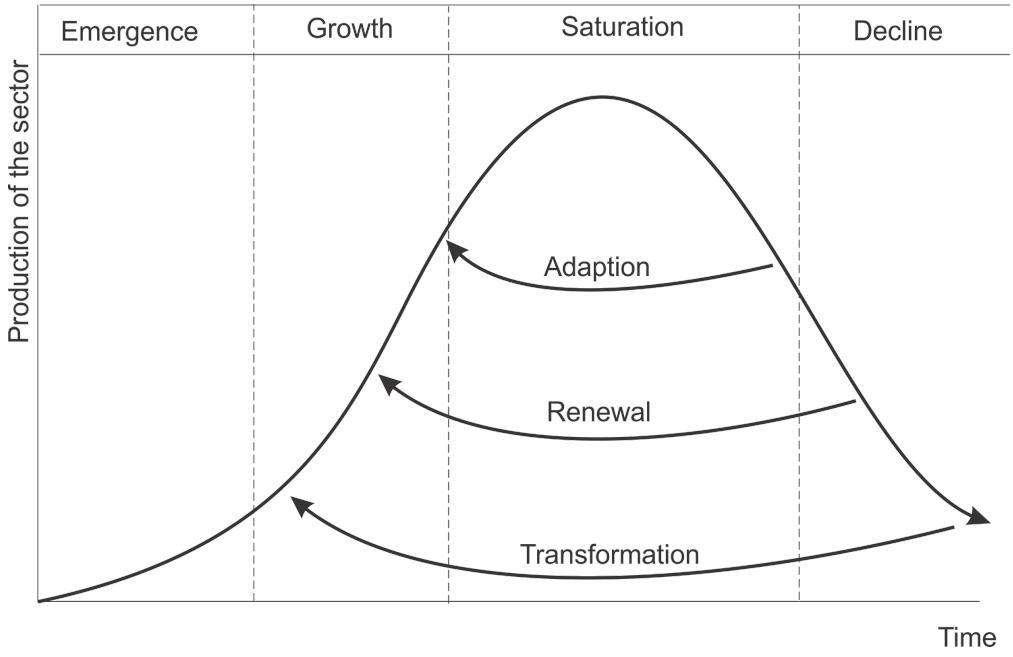


Figure 7: The life cycle of sectors

Figure 7 illustrates the life cycle of a sector (based on Menzel & Fornahl 2010; Porter 1980). In the first stage of the life cycle, a sector introduces new products. New sales markets are explored and market share is won from existing sectors whose products sell less due to the introduction of the new products. Examples here are the substitution of mobile phones with smart phones and textile napkins with paper napkins. The growth within this stage persists until the market is saturated with the new product. All potential sales markets have been explored and the majority of potential clients who can afford the new product have already bought it. Market saturation is followed by increased competition. A steady flow of new

competitors enters the market, introducing variants of the product. These new producers can spend less on innovation and may even come from regions with lower labour costs. They are therefore highly competitive. The original producers will experience a drop in sales and they have to adapt to the changed situation on the market. In order to ensure that their product remains competitive with the cheaper variants of the entrants, production costs have to be cut. These producers thus aim to produce at less cost in order to remain competitive. However, over time it becomes increasingly difficult to realise these efficiency gains and decline sets in. At this stage, a producer is forced to invest in renewal. One option is to introduce a product of substantially superior quality relative to the old product, such that competition can be won on quality rather than on price. In the smart phone example, this could be investing in innovation to introduce a smart phone with additional functionalities to the market. Through adaptation and renewal, a sector in a region can continuously return to the growth stage of the life cycle and in this way sustain its growth. If the strategy of adaptation and renewal fails for a sector in a region, the firms within the sector will experience decreasing profit and low growth in a declining market. Ultimately, the only remedies in such a case are disruptive innovations or the exploration of new sales markets. The best example here is Nokia, which left the mobile phone market to focus entirely on software development in order to return to economic growth.

Our classification of economic performers into promising winners, successful winners, masked losers and evident losers matches almost perfectly with the life cycle model of sectors. Thus with our classification we have developed a methodology to identify the stage of the life cycle within which a particular sector is located. This provides useful guidelines for innovation policy.

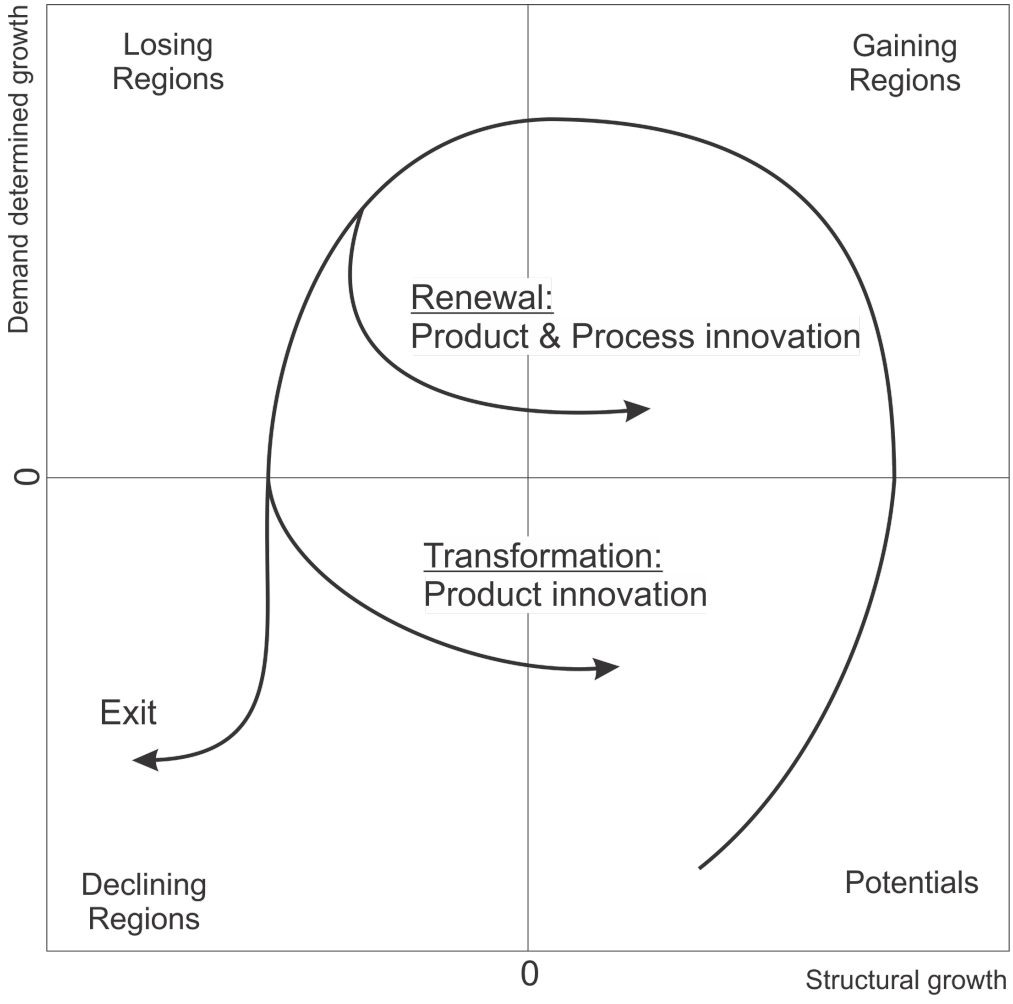


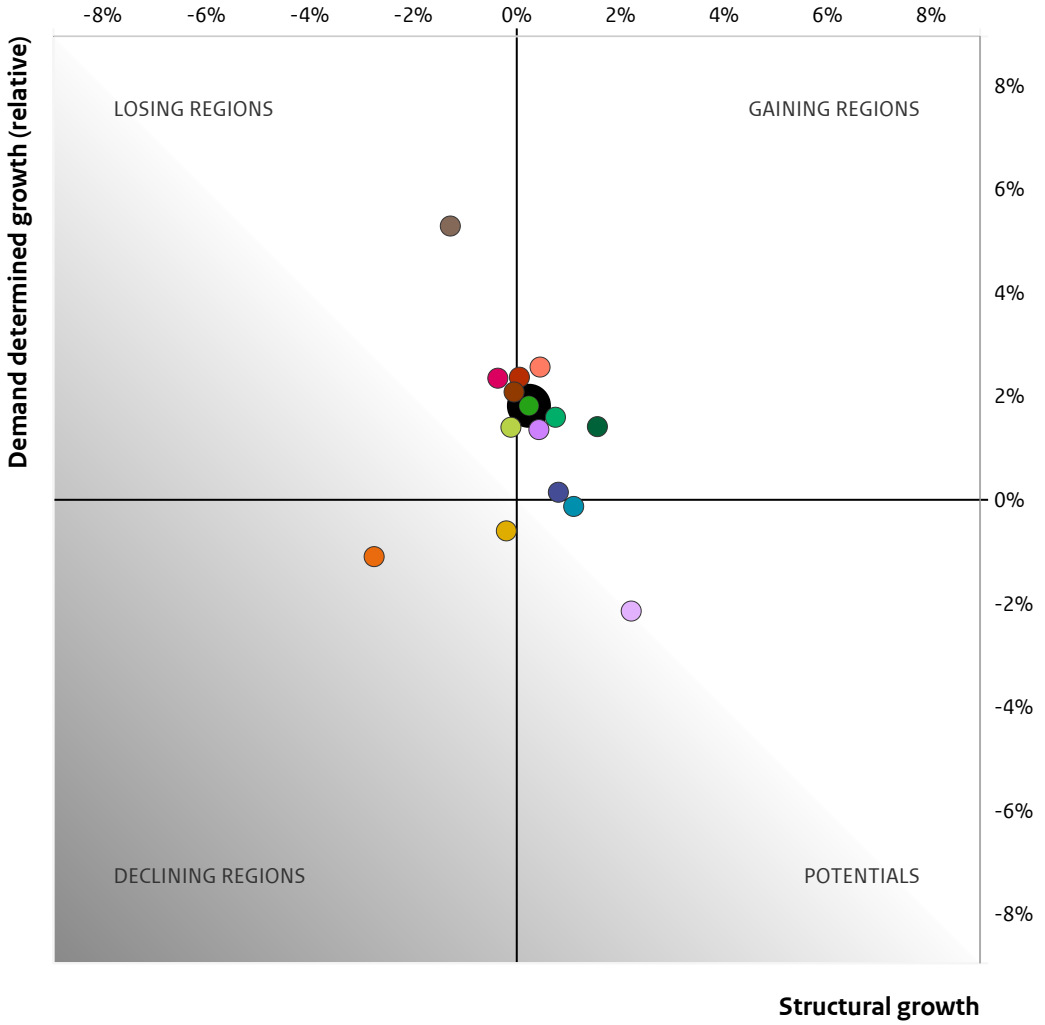
Figure 8: The regional economic performance and life cycle of a sector

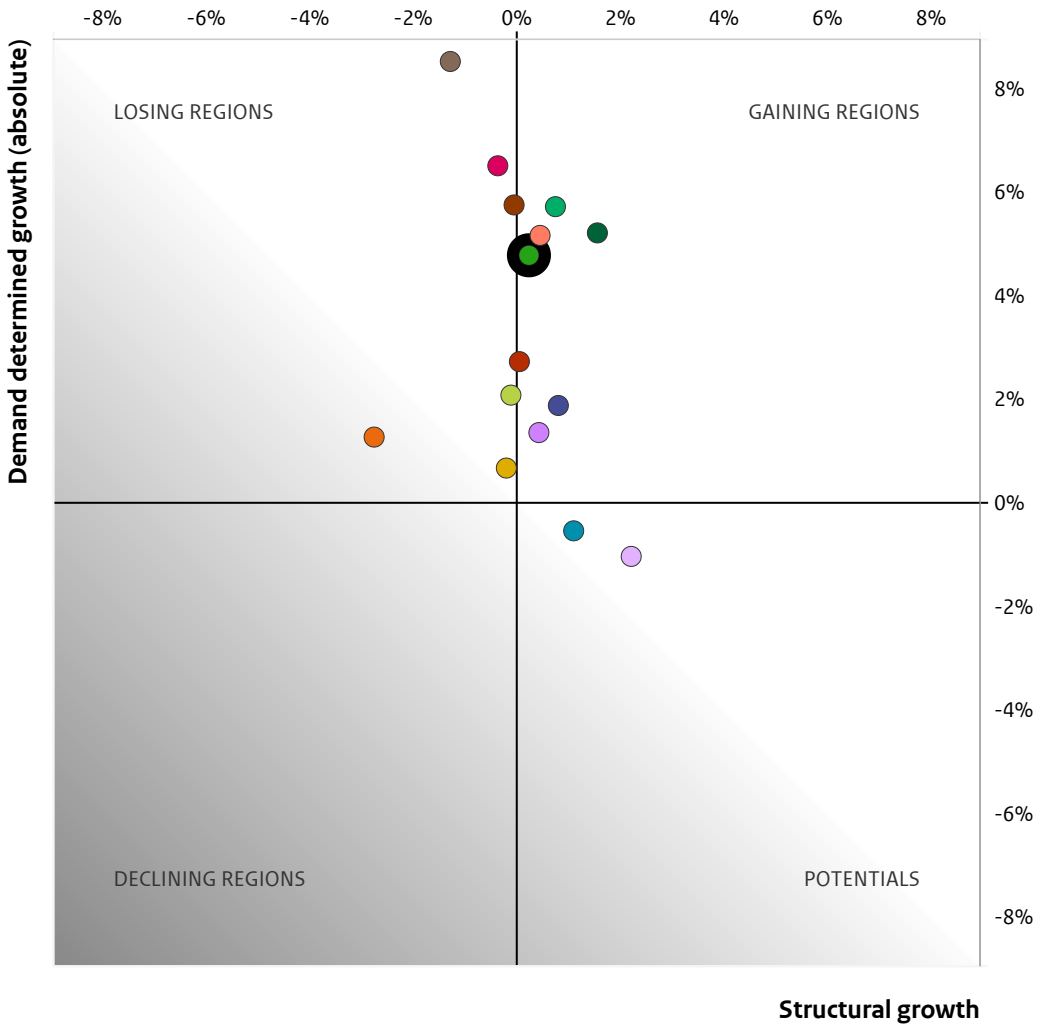
Figure 8 shows the relationship between the economic performance of a sector and its position in the life cycle. Potential winners are typically firms in the introduction stage of the life cycle. These firms are usually located in the region where they happened to be started and they primarily grow by gaining market share (structural growth) rather than by expanding sales markets. If competition becomes fiercer due to new entrants, firms could realise limited growth through expanding sales markets, but in reality they are losing market share. They are therefore masked losers and need to take action in order to avoid becoming evident losers. A first option is the reduction of costs through product and process innovation, which could transfer the firm to the group of successful winners. If this strategy does not work, the sector is in danger of marginalisation: in the figure, this is illustrated by a movement towards the south-western corner where the market share slowly approaches zero and the sector 'disappears'. In this case, fundamental product innovation is the only viable option that can help the sector return to the group of winners.

It is important to note that our analysis does not account for the fact that a sector also consists of a number of diverse firms. Aggregation into sectors implies that the largest and highest earning firms are most representative of a sector. However, for the practical implementation of regional innovation policies, it is important to get an overview of firms within the sector and to identify potentially suitable candidates for specific policies. In addition, the gathering of information on firms within a problematic sector can have the added benefit of finding firms in an early stage of the life cycle which, with the appropriate support, could become the growth engines of the sector.

The economic performance a sector and its position in the life cycle, as described above, provide guidelines for innovation policy. Innovation policy does not take the size of a sector into account; it is only based on the economic performance of the sector. In terms of policy options, it is effective to support potential winners in the exploration of new markets, while successful winners likely do not need policy support. Losing regions need to be careful not to lose in the competition due to high costs, while evident losers should focus on fundamental renewal. Innovation policies should be employed to support product and process innovation at the correct stages of the life cycle, or alternatively to seek potential winners among the firms within a losing sector.

Figure 6 showed the economic performance of the sectors of Andalucía. In Figure 9, performance is related to the economic performance of the same sectors in other regions. The figure also shows the classification (one out of four) of each sector in Andalucía. Identifying the future engines of growth requires information about the sectoral growth of sales markets in other regions, not only about the domestic sales market. After all, market share gains in a growing sector have a larger impact on economic performance than gains in a declining sector. The vertical axis of the diagram in the upper part of Figure 9 represents nominal demand-led growth. The horizontal axis in both of the diagrams in Figure 9 represents the growth in market share (structural growth).


-8%
-6%
-4%
-2%
0%
2%
4%
6%
8%
LOSING REGIONS
GAINING REGIONS
DECLINING REGIONS
POTENTIALS
Demand determined growth (relative)
Structural growth



- Total Production
- Agriculture
- Food
- Materials
- Hightech
- Chemicals
- Energy
- Financial services
- Business services
- Forestry and Mining
- Textile, clothing and paper industry
- Other industry
- Construction
- Private services
- Government services

Degree of negative growth

MORE LESS

X axis: GROWTH IN GDP DUE TO COMPETITIVENESS (MARKET SHARE GAINS IN PERCENTAGES)
Y axis above: RELATIVE GROWTH IN GDP BECAUSE OF DEMAND FROM OTHER REGIONS (GROWTH IN PERCENTAGES RELATIVE TO THE EUROPEAN AVERAGE)
Y axis below: ABSOLUTE GROWTH IN GDP BECAUSE OF DEMAND FROM OTHER REGIONS (GROWTH IN PERCENTAGES)

Figure 9: Economic performance and growth of the sectors in Andalucía

The diagram in the lower part of Figure 9 helps policymakers to identify the most interesting sectors. These are likely fast growing sectors. Subsequently, the diagram in the upper part of the figure helps to identify a suitable type of innovation policy for these sectors. In other words, the diagram in the lower part of the figure helps to identify innovation policies that can assist the sectors in the upper part of the figure to reach even higher levels of growth.

4.4 Competitiveness policy for Andalucía

The goals of competitiveness policy are to further strengthen the competitiveness of sectors and to increase productivity among firms in the region. Just as with innovation policies, competitiveness policies can be implemented irrespective of a sector's size or economic importance. Competitiveness policy is thus not based on 'picking winners' but rather on strengthening the competitive edge of the firms in the region. At first sight, competitiveness policy has more in common with innovation policy than with industrial policy. However, competitiveness policy also includes a number of elements from industrial policy; for example, it also involves a search for underlying factors that could strengthen the competitiveness of the region. In this way, competitiveness policy ensures synergy between traditional industrial policy and innovation policy.

In contrast with the static industrial policy, competitiveness policy does not follow the strategy of 'picking winners'; rather, it aims to strengthen the competitiveness of all sectors, taking into account the region-specific context that each sector operates in. This strategy of targeting firms with a strong competitive position has, particularly in the context of international competition, been largely successful. It actually appears to be the case that low productivity firms primarily focus on domestic markets, average productivity firms are active in domestic as well as in international markets, while the firms with the highest productivity even have establishments abroad (see, e.g., Grossman & Helpman 2004; Bernard & Jensen 1999).

In this report, we focus the attention on supporting the leaders of the future (potential winners) and laggards under threat (masked losers) of the regional economy. The focus on the potential winners and the masked losers from the dynamic Boston diagram does justice to the dynamics of the regional economy over time. Competitiveness policy aims to give a further boost to these dynamics. As such, we see innovation policy as complementary to industrial policy, and they are both integrated in the competitiveness policy described here.

Analysis of competitiveness policy

Our analysis of competitiveness policy comprises more than one hundred factors. These factors are derived from the most recent numbers for all European regions included in our analysis. Several of these factors are based on the unique PBL database of regional trade, production and consumption. In addition, some factors are retrieved from Eurostat and others from Espon. Most of the factors are related to the structure of the economy. A list of all the factors as well as an explanation of their role in the regional economy can be found in the Appendix. We also allocate these factors to eleven different policy domains.

After identifying which sectors from which regions are gaining (or losing) market share, we investigate the characteristics of these winners (and losers) and discuss whether differences in characteristics can explain the performance of a sector in a specific region. In the case where there are more winners than losers, we obtain information by analysing the winners; if the contrary is the case, we gain information by analysing the losers. The statistical reason for looking at these different groups depending on the number of winners or losers is the following: if all other regions are winning from a specific region, we will not find any significant characteristics among these winners. Likewise, if all other regions are losing from this region, we will not find any significant characteristics among the losers (if a sector in a region wins from all other sectors, an investigation of the overlapping characteristics of the losers does not add value to the analysis). If a region both wins and loses from an equal number of regions, it might be relevant to look at both the winners and losers. We have therefore included this possibility in the interactive part of the website. Whether you look at the winners or the losers also determines whether a characteristic of this group is relevant: if we look at regions that win (or lose), the only relevant characteristics are those that are weaker (or stronger) within the losing (or winning) regions. Making policy based on this information involves one additional policy step that we cannot make on the basis of the presented analyses: should one invest in strong characteristics of a region to strengthen the competitiveness of a sector in a region, or try to improve the weak characteristic to improve the competitiveness of this sector in the region?

Governance: The relevant policy domains within competitiveness policy

In the analyses, we identify the policy domains with the strongest contribution to competitiveness policy. Agents and policymakers that are active within these policy domains should ideally be involved in the shaping of competitiveness policy. Policy domains related to characteristics that are found to be significant for competitiveness policies are the most relevant. Policy domains related to characteristics that are not significant for the economic performance of competitors appear to be of limited importance for relevance for regional competitiveness policy. In terms of methodology, we make a selection of policy domains based on the characteristics in a region that are significantly different from those in other regions. In line with the law of diminishing returns, investments in characteristics with the largest interregional gap should bring the largest returns. If a region scores similarly to other regions on a certain characteristic, large investments here will not make much of a difference. The significance of a characteristic is determined by a t-test using a 95 percent level of significance.

Policy: Which regional characteristics can be influenced in order to strengthen the competitive position of the region

Our analysis reveals in every policy domain the factors that could potentially be improved in order to strengthen competitive position. However, we only analyse the significance of the regional characteristics; we do not investigate whether investing in these characteristics would lead to an

impact on regional economic growth. Such a quantitative analysis of the impact of the characteristics of growth has the disadvantage of placing severe restrictions on the number of characteristics that can be included. The ensuing simplification of reality makes the analysis less policy relevant and we have therefore chosen not to do it. See Thissen et al. (2016a) for such an analysis of the impacts on growth due to changes in aggregated regional indicators.

As an illustration, we choose two sectors belonging to the two most interesting groups: namely the potential winner with the highest level of structural growth – in other words, a possible growth sector for the future – and the masked loser with the largest loss in market share (lowest structural growth), which may not yet realise the gravity of the situation. If there are no losing regions in the sector analysis, we choose the declining region with the poorest performance. In the example, we have chosen the winning sector Chemicals and the losing sector Construction in Andalucía. Through this example, it should not be too difficult to carry out the analysis for other sectors.

4.4.1 Governance: Which policy domains should be involved

Prior to the development of regional policy strategy, a region needs to identify the relevant policy domains in order to involve the right policymakers. Obviously, if accessibility is important for the competitive position of a sector, it is necessary to involve policymakers who are responsible for accessibility and infrastructure. We have analysed the most important regional characteristics for Chemicals and Construction. In Figure 10, under the header of policy factors (those that can be influenced by policy), these characteristics are allocated to policy domains for the sectors Chemicals (to the left) and Construction (to the right).

Sector: Chemicals

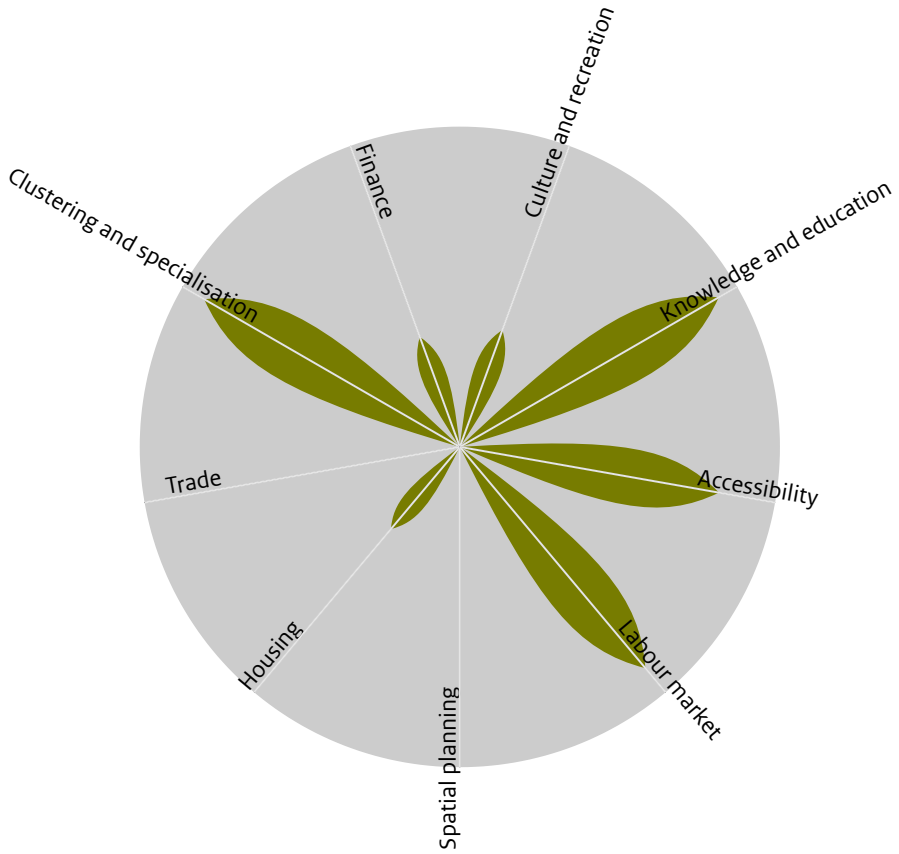


Figure 10: The important policy domains for the sectors Chemicals (to the left) and Construction (to the right)

It is not the case that the same regional characteristics are important across all regions. This is because the different sectors are not necessarily active in the same geographical markets, meaning that they compete with sectors from dissimilar regions. Consequently, our results may show that a characteristic of a particular region is highly important for one sector and irrelevant for others. The regional implementation of a sector policy strategy should therefore not necessarily involve the same policymakers in the development of all sub-elements of the strategy.

4.4.2 Policy: Which policy factors are important

Important policy domains are identified based on the significant underlying regional characteristics, i.e. the policy factors. Policy instruments that can influence these characteristics are good candidates for the regional competitiveness policy. These significant policy factors per policy domain are shown as green leaves in Figures 13 and 14. A larger leaf indicates a larger difference in score on a particular characteristic, which again implies a larger potential impact of policy. Several ‘soft’ policy factors within the policy domains of health, environment and nature, governance and stability, and poverty are not easily related to specific factors. Therefore we have chosen to include policy factors under these policy domains under the general economic development of the region.

Housing

BELOW AVERAGE

ABOVE AVERAGE

Quality of housing

Living surroundings

Affordability of housing

Clustering and specialisation

BELOW AVERAGE

ABOVE AVERAGE

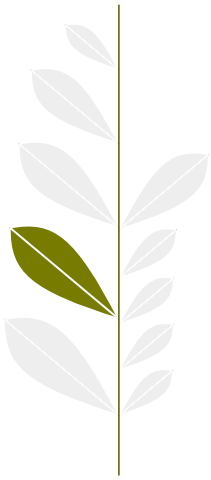
Change in degree of clustering

Clustering within the region of sector Chemical Industry

Degree of clustering

Degree of specialisation in Chemical Industry

Clustering within the sector Chemical Industry



Degree of specialisation

Change in clustering within the region of sector Chemical Industry

Change in degree of specialisation in Chemical Industry

Change in clustering within the sector Chemical Industry

Change in degree of specialisation

Finance

BELOW AVERAGE

ABOVE AVERAGE

Banks

Total taxation rate

Income taxation rate

Culture and recreation

BELOW AVERAGE

ABOVE AVERAGE

Recreational possibilities

Culture and restaurants

Figure 11: Policy factors, by policy domain, that are important for the competitive position of Chemicals in Andalucía

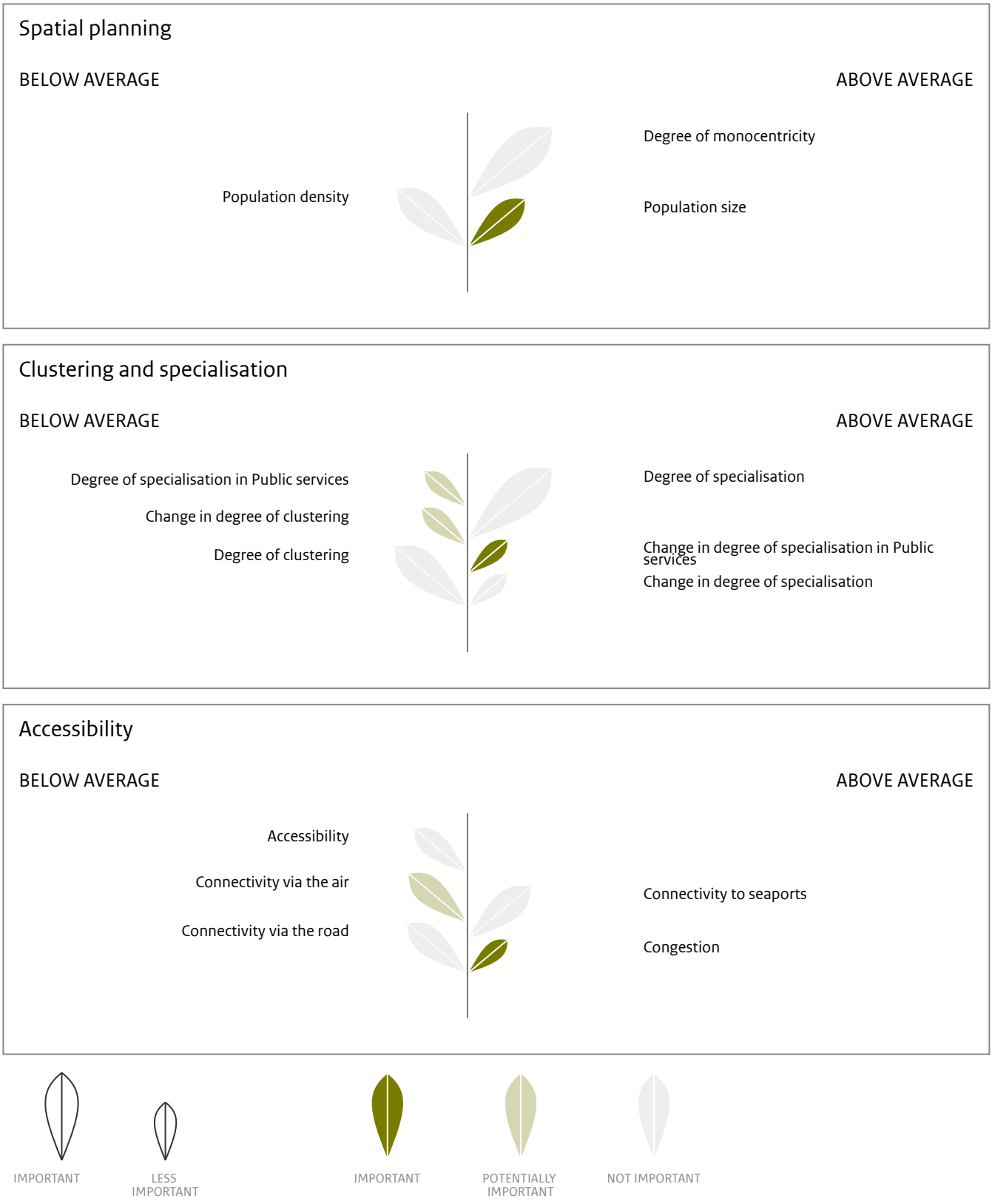


Figure 12: Policy factors, by policy domain, that are important for the competitive position of Construction in Andalucía

There are also some policy factors that are significant but not economically relevant. This is most easily illustrated through an example: let us say that for a particular sector in a region, we wish to learn from the other regions that have won from this particular region. That is, we want to investigate the significant characteristics of the group of winners within the sector for this specific region. Characteristics that are stronger among the group of losers cannot possibly explain the performance of the winners. Ergo these latter characteristics are not economically relevant.

4.4.3 Some comments on the policy domains and policy factors

The aim of this publication is to develop a policy concept where three forms of economic policy are integrated (industrial, innovation and competitiveness policy), which can provide guidelines for regional economic policy strategy. It is therefore important to repeat that we analyse the performance of the regional economy in the recent past, the results of which we use as a basis for evidence-based policies. As such, it is not the case that investments in all important policy factors found in our analysis necessarily lead to an improvement in the competitive position of all firms in a region, since future developments may not be perfectly estimated based on past evidence.

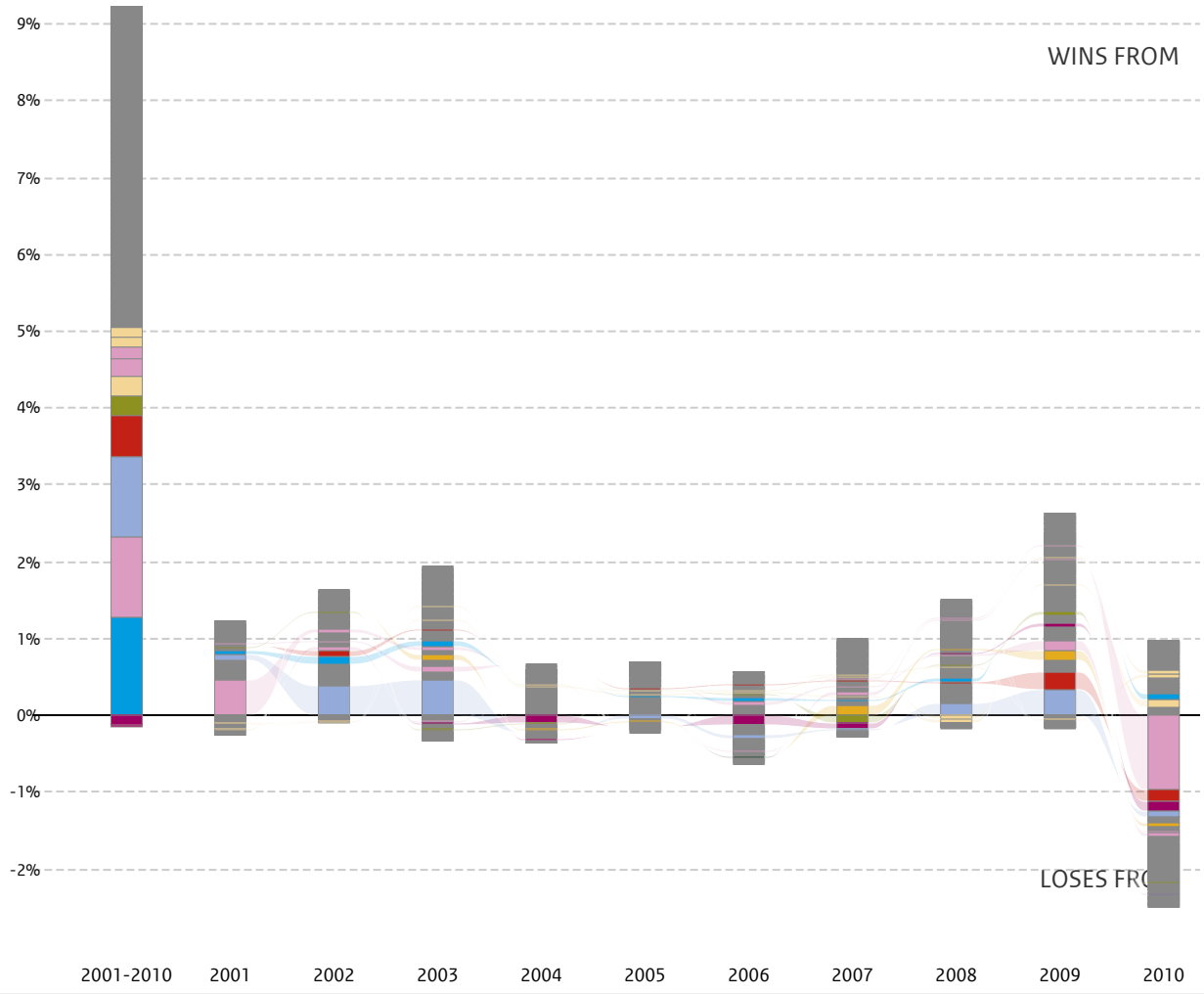
We also want to emphasise that the analysis presented here does not provide a readymade investment strategy. The primary reason for this is that the analysis, as is the case with all analyses, has certain limitations. From our analysis, it is possible to conclude **which** characteristics are important among a group of well performing regions and, consequently, what other regions could learn from this. However, we cannot estimate **the extent** to which these characteristics contribute to regional growth. In addition, our analysis captures only one side of the story: a region that performs better than other regions cannot learn from the characteristics of regions performing better than itself, only from the characteristics of regions performing worse. This means that we might neglect the influence of certain important characteristics. If the number of regions winning is the same as the number of regions losing from a certain region, it can be relevant for this region to look at both reference groups.

Despite the limitations, our analysis presents a number of opportunities. The analysis provides clear guidelines for policies aimed at improving the competitive position of a region. As such, it is a good starting point for a policy discussion involving the right policymakers. It also identifies the characteristics that **do not** contribute to the economic performance of other regions. Policy factors that are not significant cannot have contributed to economic growth.

The analysis also provides the necessary material for an investigation of other potentially important policy factors. In this way, we can identify, for each sector in each region, regions that have performed better. This is also shown in a map. This gives the policymaker the opportunity to investigate what these regions have done better without the need to collect data from all European regions. The latter is just a precondition for the systematic analysis of all sectors of all European regions presented here.

4.4.4 Winners and losers over time

The analysis presented here shows growth over a long period of time: 2000 – 2010. In addition, we indicate whether the growth has continued more recently. Here we make use of the most recent data; regional economic data always becomes available with some delay. There is of course the question of whether this is important.



In 2001-2010 Andalucía

Wins from:

1. Rest of the World: **1.27%**
2. País Vasco: **1.06%**
3. United States: **1.04%**
4. Île de France: **0.54%**
5. Japan: **0.26%**
6. Piemonte: **0.25%**
7. Extremadura: **0.21%**
8. Comunidad Valenciana: **0.15%**
9. Campania: **0.14%**
10. Sicilia: **0.14%**

Loses from:

1. China: **-0.12%**
2. Attiki: **-0.01%**
3. Russia: **-0.00%**
4. Mazowieckie: **-0.00%**
5. Praha: **-0.00%**
6. Groningen: **-0.00%**
7. Noord-Brabant: **-0.00%**
8. Romania: **-0.00%**
9. Dytiki Makedonia: **-0.00%**
10. Ionia Nisia: **-0.00%**

Figure 13: Winners and losers from Construction in Andalucía over time

Figure 13 shows, for the sector Construction in Andalucía, the regions against which it has lost or gained market share. The bar to the left in the diagram shows the top 10 losers and winners from this sector in this region over the whole time period. The subsequent bars indicate winners and losers for each year. We easily observe a large variation over time. The reason for this is that different European regions are often in different phases of the macroeconomic business cycle. In addition, the yearly data for small regions is strongly affected by the incidental growth of single firms. This means that a specific region can outperform another region within a single year, even though the latter performs better over the long run. Therefore an analysis of a single year has only very limited value. This point is obviously acknowledged in the literature: an analysis of the impact of policy factors on economic growth, as presented in this report, is only sensible for the long run; little can be said about growth within one year.

5 Supplements and data

This report for Andalucía is based on big data on trade between 246 European regions, covering 14 sectors, 59 products and 11 years (2000 – 2010), as well as the most recent data on economic growth for the period 2000 – 2014. Trade data is based on Thissen et al. (2017 forthcoming). The regional trade data are consistent with the World Input-Output Database (Dietzenbacher et al. 2013) and were developed under the European FP7 project *Smartspec*. The most recent data on economic growth have been retrieved from Eurostat. The policy factors are based on the data set mentioned above and are supplemented with regional key figures from Eurostat and Espon (see Table 3).

5.1 Data

The data used in this report is made available in the format of a so-called Multiregional Input-Output table. This table was created under the European FP7 project *Smartspec*. A Multiregional Input-Output table not only contains information about the added value per sector (GDP) but also information about mutual exchanges of goods and services (trade) between the sectors. Due to technical reasons related to the construction of Input-Output tables, as defined by Eurostat rules, the sectoral aggregation used in the table differs somewhat from that used for the website. The underlying data used for the website is available from the authors upon request.

A thorough description of the construction of the data set can be found in:

Thissen M, B. Los & M. Lankhuizen (2017 forthcoming), 'Construction of a Time Series of Fine-Grained detailed Nuts2 Regional Input-Output Tables for the EU embedded in a Global System of Country Tables', mimeo, PBL Netherlands Environmental Assessment Agency.

5.2 Significance of policy domains and factors

A key advantage of the analysis in this report is that it provides a description of available economic data without resorting to the introduction of assumptions about behaviour or the construction of complicated economic models. Only in the discussion of important policy domains and underlying factors in section 4.3 do we carry out a statistical analysis. Here we carry out a so-called one-sided student's t-test, which is used to determine whether an underlying factor is a significant characteristic of the group of winning or losing regions under investigation.

The student's t-test is the standard method used to analyse significant differences between two groups. Here it is important that the underlying factors used for the comparison of groups of regions is normally distributed. In order to ensure this, the following factors are transformed using the formula Ln(1+x): population size, population density, patents, income tax rate, hospital beds, and number of registered crimes by the police. For congestion, we take the inverse, while energy security is squared. P-values are used

to determine the significance of a factor using a 95 percent level of significance. In other words, the test allows us to determine, with 95 percent probability, that a significant characteristic is actually a specific characteristic of the group of regions in question. It is important to note that the use of a 99 percent significance level had little impact on our results. We have chosen to use a 95 percent significance level as this is standard in the literature.

The importance of policy domains is based on the significance level of the underlying factors. The existence of a significant underlying factor implies that the policy domain is relevant for the competitiveness policy of the region. The degree of importance of a policy domain is determined by the law of decreasing returns: the larger the difference in the score between a region and the reference group of winners and losers, the larger the potential impact on the score and the higher the importance of the policy domain.

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6 Appendix: Policy domains and regional characteristics

In Table 3, we present the policy fields (column 1), the regional characteristics (column 2), whether these characteristics are sector-specific (column 3), and their source (column 4). The Eurostat and Espon characteristics have been corrected where necessary; the characteristics developed by PBL are based on the trade database developed in the European FP7 project Smartspec.

Policy field	Characteristic	Sector-specific	Source
Interior and Kingdom Relations	Population size	No	Eurostat
	Population density	No	Eurostat
	Degree of monocentrism	No	Eurostat/PBL
Housing	Housing affordability	No	Eurostat/PBL
	Housing quality	No	Eurostat/PBL
	Surroundings (quality)	No	Eurostat/PBL
Foreign Affairs	Openness of the region	Yes	PBL
	Change in openness of the region	Yes	PBL
	International openness of the region	Yes	PBL
	Change in international openness of the region	Yes	PBL
Economic Affairs	Clustering of the region	No	PBL
	Clustering of a sector (production column)	Yes	PBL
	Clustering of the sector (within the sector)	Yes	PBL
	Change in clustering of the region	No	PBL
	Change in clustering of a sector (production column)	Yes	PBL
	Change in clustering of the sector (within the sector)	Yes	PBL
	Specialisation of the region	No	PBL
	Specialisation of the region in a sector	Yes	PBL
	Change in specialisation of the region	No	PBL
	Change in specialisation of the region in a sector	Yes	PBL
Finance	Banks	No	Eurostat
	Income tax rate	No	Eurostat
	Total tax rate	No	Eurostat
Nature	Environmental quality	No	Eurostat/PBL
	Climate	No	Eurostat/PBL
	Nature	No	Eurostat/PBL
Environment	Culture and restaurants	No	Eurostat/PBL
	Recreational possibilities	No	Eurostat/PBL
Education, Culture and Science	Percentage higher educated	No	Eurostat
	Percentage public R&D	No	Eurostat
	Percentage private R&D	No	Eurostat
	Patents	No	Eurostat
	Education quality	No	Eurostat
	Educational possibilities	No	Eurostat
	Internet	No	Eurostat
Infrastructure	Connectivity road	No	Espon

Policy field	Characteristic	Sector-specific	Source
	Connectivity air	No	Espon
	Connectivity seaports	No	Espon
	Congestion	No	Espon
	Infrastructure	No	Espon
Security and Justice	Governance (effectiveness)	No	Eurostat
	Political stability	No	Eurostat
	Safety	No	Eurostat
	Personal freedom	No	Eurostat
	Social cohesion	No	Eurostat
	Energy security	No	Eurostat
	Natural disasters	No	Eurostat
	Robberies (registered by police)	No	Eurostat
Health, Welfare and Sport	**Health, Welfare and Sport**	No	Eurostat
	Food safety	No	Eurostat
	Life expectancy	No	Eurostat
	Hospital beds	No	Eurostat
Social Affairs and Employment	Jobs	No	Eurostat
	Participation rate labour (15-64 years)	No	Eurostat
General Affairs	Cost of living	No	Eurostat
	Risk of poverty	No	Eurostat

Table 3: Policy factors by policy domains