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Foreign Trade in the Austrian Regions

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This policy brief introduces a method to estimate foreign trade of the nine Austrian NUTS-2 regions. The basic idea of the method is to disaggregate national foreign trade data to the regional level using national input-output, regional employment and other supplemental data. This allows for the estimation of foreign trade of the Austrian regions for the years 1999 to 2009. The results indicate highly differentiated patterns of trade competitiveness across the Austrian regions. While Upper Austria and Vorarlberg perform well on European and global markets, other regions, foremost Burgenland, are in a much more difficult position. The regions' reactions to the 2009 economic crisis were equally differentiated. Although the decline of foreign trade led to an employment loss in all Austrian regions, Vorarlberg and Tyrol proved to be much more resilient than others.

1. Introduction

Foreign trade of countries and even more so of a country's regions is a key element for economic development and growth. It is an important variable in explaining a region's past, current and future development path. Given this, it is important to analyse integration processes, notably within the EU or in smaller, locally confined areas like CENTROPE, to highlight the competitiveness of regions and thus derive conclusions for policy makers with regard to measures to improve a region's economic situation and the situation of the people living in that region.

The only difficulty is that available data on foreign trade by Austrian regions are limited and those that are available are subject to a number of problems. In principle, data on foreign trade by regions are made available by Statistics Austria through a special compilation. However the way data on foreign trade have been collected to date, namely at the location where the Austrian company pays its taxes rather than where actual production takes place, resulted in a non-negligible bias to the data due to the presence of headquarters, central storage locations of companies and enterprises that have their own distribution companies that operate independently of the enterprises' production companies. For that reason Statistics Austria has stopped distributing data on regional foreign trade and is currently working on a new data collection scheme to improve the quality of the data.

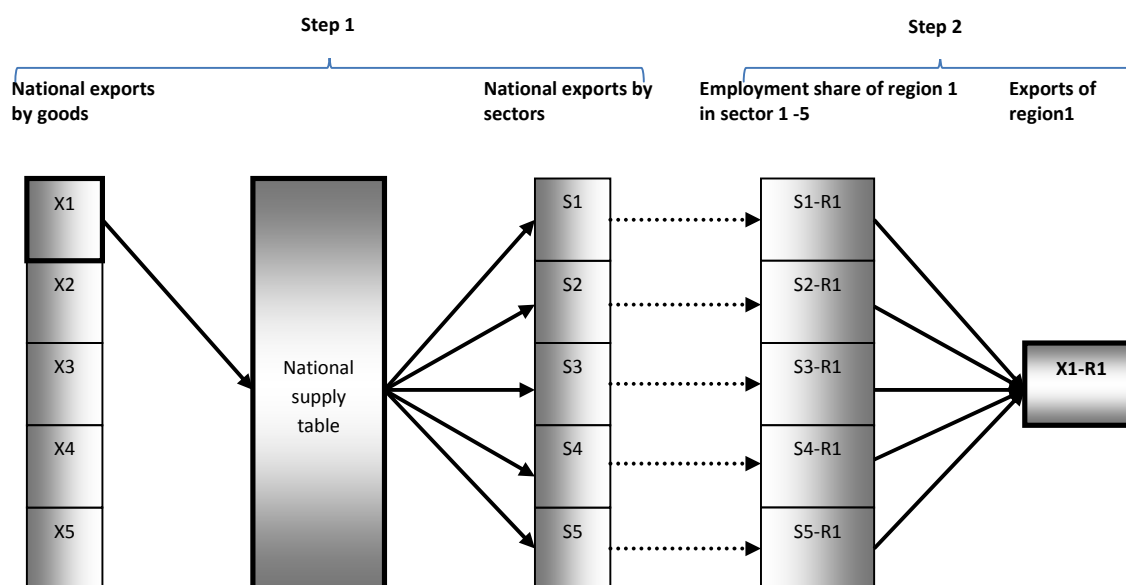
Attempts to correct the data from Statistics Austria have been made by Joanneum Research (see Kurzmann et. al. 2008, and Kurzmann and Gstinig, 2010)

using additional data from the "Konjunkturerhebung" to correct for the biases. It seems that these attempts were able to solve some of the existing problems, but lead to further problems, one example being that data from the Konjunkturerhebung, which are at the industry level, had to be adjusted to trade data, which are at the product level. Additionally, the Konjunkturerhebung only covers firms with more than 20 employees and there are also confidentiality issues, so that it was only possible to estimate regional exports and not imports.

So overall, there is a lack of publicly available data on regional foreign trade. This impedes academic research in this field and does not allow for the linking of scientific expertise with evidence-based economic policy making. This policy brief summarizes the findings of a recent study that used an alternative method to estimate regional trade for the Austrian Bundesländer¹.

¹ Römisch, R. (2012), Foreign Trade and FDI in the Austrian Regions – A new methodology to estimate regional trade and an analysis of the crisis effects, Study for the BMWFJ

Figure 1: Allocation of national exports to the regions



2. Method

The following paragraphs provide a short non-technical summary of the methodology to give an intuition of how the foreign trade data for the Austrian regions are estimated. In a nutshell, the estimates are derived through: a) allocating national data on foreign trade via input-output tables to the sectors of production, and b) by using regional data on employment and other regional data to disaggregate national trade data to the level of individual Austrian regions.

In more detail, the estimation of regional exports involves two steps. These are illustrated in Figure 1.² In the first step, national exports as recorded in the trade statistics are allocated to the sectors of production using Austria's supply matrix. This transforms the original product-level exports to exports by industries. In the second step, the exports by industries are regionalised using employment data by sectors and regions, also taking into account differences in regional productivities. This results in exports split up by goods and regions.

To estimate regional imports (illustrated in Figure 2), national imports are first split into imports of intermediate goods and imports of final goods (for consumption and investment). This is done using the input-output (I/O) import matrix that differentiates between intermediate inputs and final goods imports.

As far as regional imports of intermediate goods are concerned the estimation is similar to the export method, except that the method uses Austria's use table instead of its supply table as the basis for the es-

timisation. Final consumption imports by regions are estimated using the regions' disposable income of households and investment expenditures. Total imports of the regions are then calculated by adding up final consumption and intermediate consumption imports.

The data base for the estimation consists of foreign trade data from the COMEXT database (2-digit NACE rev. 1.1.), Austrian I/O matrices from the WIOD project³, detailed LFS regional employment data (2-digit NACE rev. 1.1.) and regional data on productivity, disposable income and investment expenditures (all from Eurostat).

The estimation of regional exports and imports rests on a number of restrictive assumptions. As far as exports are concerned it is firstly assumed that the structure of total production, i.e. production for domestic use and exports, is identical to the production of exports. Secondly, by using employment data to regionalise national foreign trade by industries it has to be assumed that the level of employment is proportional to the level of production. However, this is corrected for differences in productivity in each sector across the regions. Thirdly it is assumed that across regions industries produce the same product mix, whereby the individual products are either identical or close substitutes.

As far as imports are concerned it is firstly assumed that all regions have identical consumer preferences concerning final consumption imports. Secondly, the composition of investment is assumed to be identical across regions. Thirdly, firms in different regions are assumed to use the same production technology regarding the composition of intermediate imports. For both exports and imports trade costs and factors such as distance are disregarded.

² The example in figure one is for one good and one region only.

³ World Input-Output Database, <http://www.wiod.org/>

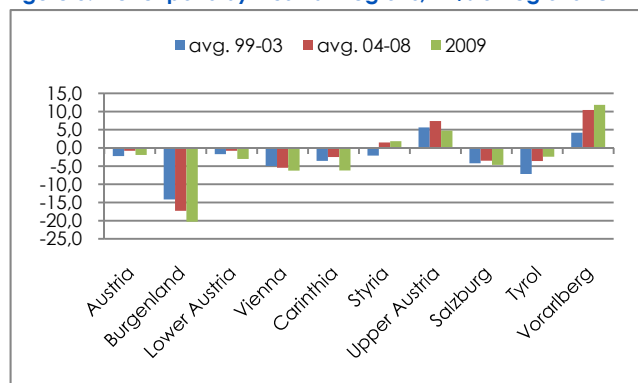
Without more detailed data there is little that can be done to relax these assumptions, so that the estimates should be considered to be highly indicative but certainly not 100% accurately reflecting real trade flows. Hence there are a number of issues left for future research to improve and expand the methodology and to increase the reliability of the results.

3. Results

Based on this methodology foreign trade of the nine Austrian regions was estimated for the period 1999–2009. Overall the importance of foreign trade tends to differ greatly across Austrian regions, with Lower Austria, Upper Austria, Styria and Vorarlberg having import and export shares of around 45% to 50% of GDP on average; Burgenland has an even higher import share (57%), though its export share was only 40% in the years 2004–2008. By contrast, Vienna's export and import shares in GDP were just 22 and 28% in the same period, respectively. Foreign trade expanded significantly from 1999 to 2008 in all Austrian regions. On average imports as a share of GDP expanded from 36.9% to 41.4%, with the largest increase observed for Burgenland (from 49.7% to 56.8%) and the smallest for Vienna (from 26.2% to 27.6%). In the same period exports increased on average by 6 percentage points. The increase was lowest in Vienna (from 21.2% to 22.1%) and highest in Styria and Vorarlberg, with the export ratio increasing from 40.8% to 50.1% in Styria and from 44.3% to 56.9% in Vorarlberg. When the crisis hit in 2009 both the export and import ratios declined, falling by 6.2 and 5 percentage points respectively.

At the same time, competitiveness in foreign trade is unequal across regions. In fact, before the crisis, only three regions (Upper Austria, Vorarlberg and Styria) had a net trade surplus, with that in the latter being very low. All other regions had a trade deficit, which was by far most pronounced in Burgenland at around 17% of the region's GDP on average over the period 2004–2008 (see Figure 3).

Figure 3: Net exports by Austrian regions, in % of regions' GDP



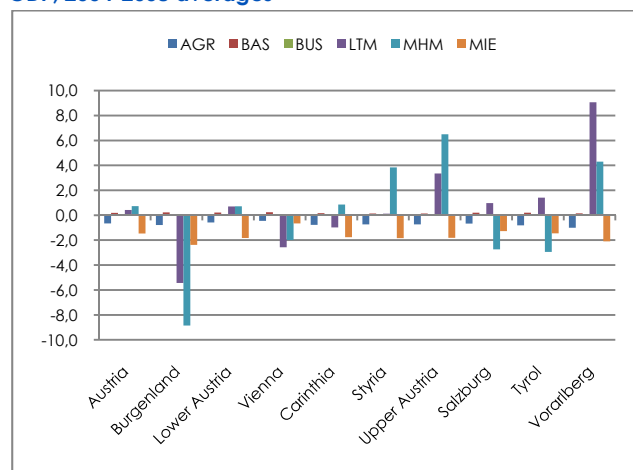
Source: Own calculations

From a sectoral point of view, manufacturing trade by far dominates trade in other goods and services. This may be explained in part by the data, which cover mainly manufacturing trade and excludes tourism for

example, which for many regions is an important source of income coming from abroad. Still, some Austrian regions show a distinct pattern of industrial and trade specialization, with the Eastern regions being stronger in exports of medium and high tech industrial goods, and Tyrol and Vorarlberg being stronger in low-tech industrial goods.

Interestingly, though only three Austrian regions have a net surplus in total foreign trade there is more differentiation if net exports by individual sectors are analysed (see Figure 4). In the case of manufacturing for example, we observe that in addition to Upper Austria, Vorarlberg and Styria, which have a trade surplus in low-tech or high-tech trade (or both), trade surpluses are also found in Lower Austria (in both low- and high-tech manufacturing), Carinthia (high-tech), Tyrol (low-tech) and Salzburg (low-tech). In contrast, all Austrian regions are net importers of energy and agriculture. Net exports in basic services tend to be positive, while net exports of business services are negative across all regions. However the size of the trade balance for basic and business services trade is very small in all Austrian regions.

Figure 4: Net exports by regions and sectors, in % of regions' GDP, 2004–2008 averages⁴

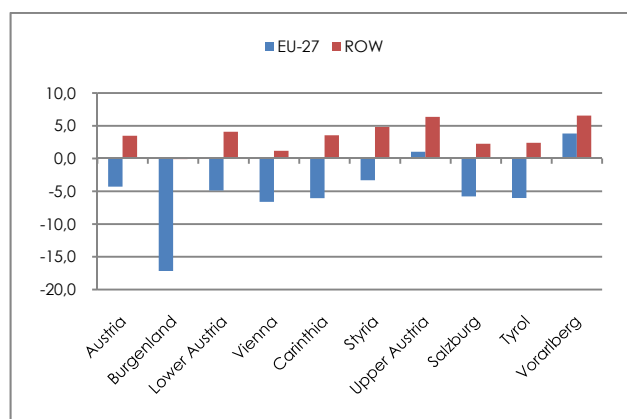


Source: Own calculations

For all Austrian regions the main trading partner is the EU27. Imports from the EU27 are four times larger than imports from the Rest of the world (RoW), while exports are three times larger. Despite this, in the period 2004–2008 most Austrian regions had a trade deficit vis-à-vis the EU27, the exceptions being Upper Austria and Vorarlberg. In contrast, all Austrian regions have a trade surplus with the RoW, the exception being Burgenland where a small deficit of around 0.1% of GDP from 2004–2008 existed.

⁴ Abbreviations: AGR: Agricultural goods; BAS: Basic services; BUS: Business services; LTM: Low technology intensive manufacturing industries, MHM: medium and high technology intensive manufacturing industries, MIE: mining and energy. A detailed description is given in the Annex.

Figure 5: Regions' net exports vis-à-vis the EU 27 and RoW, in % of regions' GDP, 2004-2008 averages



Source: Own calculations

3.1 Crisis effects

In 2009 during the economic crisis both imports and exports declined strongly, especially in Burgenland, Lower Austria, Carinthia, and Upper Austria. The ratio of imports to GDP in Austria declined by around 5 percentage points with the export ratio falling by 6 percentage points (see Table 1). Across the Austrian regions however there was a strong degree of heterogeneity. Imports declined especially strongly in Burgenland, but also in Lower Austria, Carinthia, and Upper Austria, i.e. all regions with some strength in medium/high tech manufacturing, while they declined least in Vienna. As far as the export ratio is concerned a decline of more than 11 percentage points was observed in the case of Burgenland, with declines of between 8 and 10 percentage points observed in Carinthia, and Lower and Upper Austria. The export ratio declined to a lesser extent in Tyrol and Vorarlberg however, i.e. by around 3 percentage points.

As a consequence the net trade effects of the crisis were also highly heterogeneous across regions. The trade deficits increased most strongly in Carinthia and Burgenland, while Tyrol, Vorarlberg and to a lesser extent Styria actually saw an improvement in their trade balance as imports declined by more than exports.

Table 1: Changes in imports, exports and net trade, average 2004-2008 and 2009, in % of GDP

| | Imports | Exports | Net trade |
|----------------------|---------|---------|-----------|
| Austria | -5.0 | -6.2 | -1.2 |
| Burgenland | -8.6 | -11.6 | -3.0 |
| Lower Austria | -6.1 | -8.4 | -2.2 |
| Vienna | -3.9 | -4.7 | -0.8 |
| Carinthia | -6.1 | -9.8 | -3.7 |
| Styria | -5.0 | -4.6 | 0.3 |
| Upper Austria | -6.0 | -8.6 | -2.7 |
| Salzburg | -4.0 | -5.2 | -1.1 |
| Tyrol | -4.2 | -3.0 | 1.2 |
| Vorarlberg | -4.8 | -3.4 | 1.4 |

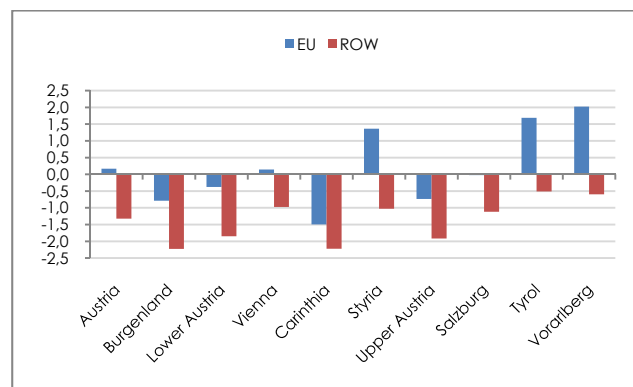
Source: Own calculations

From a sectoral perspective, the contributions of high-tech manufacturing trade to the overall trade balance show a differentiated pattern. In most regions its contribution declined – most strongly in Lower Austria, which recorded a decline of around 1.8 percentage points of GDP. In some regions net exports of high tech manufacturing goods increased however, notably in Tyrol and Vorarlberg and to a lesser extent in Styria. Across all regions, positive effects on the trade balance during the crisis came from trade in energy products, a result of imports declining more strongly than exports.

Looking at the 2009 trade developments in the Austrian regions vis-à-vis the EU27 and the RoW reveals that both imports as well as exports declined in all Austrian regions, with the exception of imports from the RoW to Tyrol and Vorarlberg. The difference between EU27 and RoW trade was that the fluctuations in trade tended to be much higher for trade with the EU27, with both the export and import ratios tending to decline by around 5 percentage points on average across the regions. In contrast imports from the RoW declined by less (i.e. 0.1 percentage points of GDP) than exports (i.e. 1.4 percentage points of GDP).

Interestingly enough, the net trade effects of the crisis for the Austrian regions does not depend on the size of the reduction in imports and exports (see Figure 6). Thus, in all Austrian regions the trade balance worsened to a greater extent with regard to trade with the RoW in 2009. On average the trade balance decreased by around 1.3 percent of GDP, with the declines being strongest in Burgenland, Lower and Upper Austria, and Carinthia (around 1.8 to 2 percent of GDP). In contrast the negative trade balance effects were less with respect to trade with the EU-27 (with the declines being relatively strong in Carinthia and Burgenland), with improvements in the trade balance being observed in some regions (i.e. Styria, Tyrol, Vorarlberg and Vienna).

Figure 6: Net trade vis-à-vis the EU-27 and RoW 2009, in % of GDP



Source: Own calculations

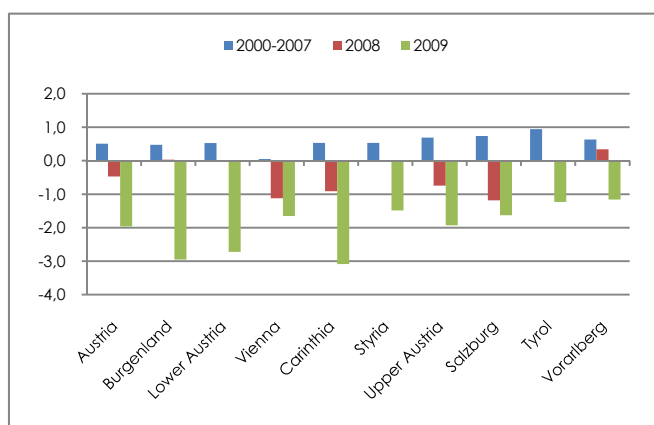
3.1.1 Employment effects

Apart from estimating crisis related effects on foreign trade flows in terms of GDP, it is also possible to esti-

mate the labour content of trade and thus to give an indication of the foreign trade related employment effects of the economic crisis in 2009.⁵ As far as employment effects are concerned, they take into account both direct and indirect effects. Direct employment effects are the result of the reduction of exports of the individual industries in the regions, and thus show how the decline in export production translates into a decline in employment in the respective industry. Indirect effects measure the employment effects that arise through the reduction in intermediate demand due to the decline in exports. That is, the reduction of export demand in one industry spills over to other industries as the demand for intermediate inputs tends to decline *pari passu* with the decline in exports. It should be noted that as far as the employment effects are concerned only the effects arising from a reduction or increase in exports of the Austrian regions are considered (i.e. the effects of changes in imports are not considered).

The estimation of foreign trade related employment effects shows that the expansion of exports in the period 2000-2007 had positive effects on total employment in the regions. On average trade related employment tended to grow by 0.5% per year in the Austrian regions, with growth being lowest in Vienna (i.e. almost zero) and highest in Tyrol (close to 1%). In 2008 the positive effects on total employment either vanished or turned negative across the Austrian regions. In 2009 the crisis hit the Austrian regions fully in terms of employment. Thus, the large reduction in the regions' exports led to significant trade induced losses in total employment, losses which ranged from around 1.2% in Tyrol and Vorarlberg to around 3% in Burgenland and Carinthia. In contrast to 2008, all major trading sectors suffered from export declines and hence direct employment losses in 2009.

Figure 7: Growth of employment effect of exporting in % of total regional employment (of previous year)



Source: Own calculations

⁵ Details on the methodology are given in the study.

4. Conclusions

The aim of the study from which this policy brief emerged was to expand the data we have at our disposal to analyse regional economic activities. Having this in mind and also considering that the analysis was based on estimates from a model with a number of restrictive assumptions the results have to be interpreted with some caution. Still, at first glance, the results seem to be plausible and highly indicative of the foreign trade performance of the Austrian regions. The data show that the competitiveness of the Austrian regions in foreign trade is highly heterogeneous, with some regions being highly competitive (e.g. Upper Austria and Vorarlberg) and others being much less competitive (e.g. Burgenland and Carinthia). The data also show that the crisis effects, i.e. the reduction of foreign trade because of the global economic downturn in 2009, had different impacts on the regions. Some regions (i.e. Vorarlberg and Tyrol) proved to be much more resilient than others, even though all regions lost employment.

A number of interesting issues and questions arise that may be followed up in further research. For example, one issue is the inherent differences in trade competitiveness across Austrian regions and how to improve the trade-competitiveness of the weaker regions. Since, in part, the poor performance in foreign trade is due to the industrial structure of the regions (e.g. in Burgenland), it would be interesting to analyse whether these structures can be improved and how this could be done. Attracting foreign firms would be one way, fostering start-ups of domestic enterprises another. The data show that the attractiveness for firms and hence for FDI is quite low in certain Austrian regions however, so that it may be necessary to improve the business environment in the respective regions first. In this respect EU Regional Policy might also be analysed, and in particular whether in its current form it is delivering and whether it really generates new investment or new firms, or whether existing firms make use of the funds to finance investment they would have undertaken anyway.

Another point of departure for further analysis is the variation in net-export performance of most Austrian regions vis-à-vis the EU27 and the RoW. With the exception of the strong export regions, Austrian regions tend to have a trade deficit in trade with the EU27 but a surplus in trade with the RoW. This may arise because the goods produced are not marketable in EU markets (e.g. because of low technology content), or due to insufficient marketing efforts for example. Part of the problem may also be related to the small average size of Austrian companies as it is usually assumed that larger firms find it easier to export, as they can devote resources to explore foreign markets. Equally, larger firms find it easier to engage in R&D and thus raise the technological standards of their goods, as well as having advantages in financing, etc. At the same time, the example of the Veneto region in Italy shows that regions dominated by small and medium

enterprises can be successful on foreign markets, if firms learn to co-operate, if there is a suitable institutional and economic environment (e.g. through the presence of business services) and if the firms are able to remain flexible while still producing high quality products (see Applica et al. 2012).

A further point of interest could be the extent to which Austrian regions benefit from engagement in foreign trade by other regions. Here it might be asked whether the success of Upper Austria or Vorarlberg generates spillovers to other regions (e.g. through intermediate inputs, production networks, cluster effects etc.), or whether competition between the Austrian regions does not allow for this. The example of Finish regions shows that cluster effects need not be confined to small local areas (see Applica et al. 2012). Rather they can also occur over a wider geographic distance, given that the necessary infrastructure is available allowing firms to benefit from the comparative advantages of other firms even if they are far away. This would be especially interesting in the case of the Vienna region, where Vienna obviously has quite distinct advantages in the services sectors, education and R&D, while Lower Austria and Burgenland have the capacity to host those manufacturing industries that rely on the advantages of Vienna but do not want to locate there (for reasons of space or cost) directly.

5. Annex - Definition of sector

Table 2: Definition of sector of economic activity, according to NACE rev.1.1 2digit industries

| Agriculture | |
|--|--|
| NACE-01 | products of agriculture, hunting and related services |
| NACE-02 | products of forestry, logging and related services |
| NACE-05 | fish and other fishing products, services incidental to fishing |
| Mining & Energy | |
| NACE-10 | coal and lignite; peat |
| NACE-11 | crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying |
| NACE-12 | uranium and thorium ores |
| NACE-13 | metal ores |
| NACE-14 | other mining and quarrying products |
| NACE-40 | electrical energy, gas, steam and hot water |
| Medium and high technology intensive manufacturing | |
| NACE-24 | chemicals, chemical products and man-made fibres |
| NACE-29 | machinery and equipment n.e.c. |
| NACE-30 | office machinery and computers |
| NACE-31 | electrical machinery and apparatus n.e.c. |
| NACE-32 | radio, television and communication equipment and apparatus |
| NACE-33 | medical, precision and optical instruments, watches and clocks |
| NACE-34 | motor vehicles, trailers and semi-trailers |
| NACE-35 | other transport equipment |

| Low technology intensive manufacturing | |
|--|---|
| NACE-15 | food products and beverages |
| NACE-16 | tobacco products |
| NACE-17 | textiles |
| NACE-18 | wearing apparel; furs |
| NACE-19 | leather and leather products |
| NACE-20 | wood and products of wood and cork (except furniture), articles of straw and plaiting materials |
| NACE-21 | pulp, paper and paper products |
| NACE-22 | printed matter and recorded media |
| NACE-23 | coke, refined petroleum products and nuclear fuel |
| NACE-25 | rubber and plastic products |
| NACE-26 | other non-metallic mineral products |
| NACE-27 | basic metals |
| NACE-28 | fabricated metal products, except machinery and equipment |
| NACE-36 | furniture; other manufactured goods n.e.c. |
| Business Services | |
| NACE-72 | computer and related services |
| NACE-74 | other business services |
| Basic Services | |
| NACE-90 | sewage and refuse disposal services, sanitation and similar services |
| NACE-92 | recreational, cultural and sporting services |
| NACE-93 | other services |

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