Employment limitations of peripheral regions: The case of Gozo

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Policy Note

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Abstract

Employment in Gozo is characterised by disadvantages due to the island’s geographical and transportation constraints. It also benefits from advantages linked with its geography – in terms of physical and environmental endowment - as well as the abilities of its workers. This study attempts to measure these effects on employment data, both at regional and sectoral levels. A shift-share analysis is carried out using data from 2000 to 2019, estimating a deficit in regional employment numbers with respect to the whole of Malta of between 1271 and 1948 jobs, with a further shift-share regression indicating that employment in Gozo grew by 1.5% less than the national average. The performance of eleven sectors is assessed, with three sectors, (i) Professional, scientific and technical activities; administrative and support service activities, (ii) Real estate activities and (ii) Information and communication, appearing to have some innate advantages.

JEL Classification: R11, R15.

Keywords: Regional economics, Gozo, Malta, shift-share analysis, shift-share regression, employment
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Executive summary

In regional economic research, the development prospects of regions tend to determine public policy and funding. This study aims to inform policymakers and to suggest evidence-based and targeted policy responses, using regional employment data published by the National Statistics Office.

The two concepts of spatial concentration of an industry and the extent of regional specialisation are investigated. Location quotients are calculated for eleven industries showing the relative employment concentration of industries in Gozo, with respect to the country overall. Policymakers ought to look at the reasons why a few sectors in Gozo appear not to be able to match the employment concentrations found nationally – and whether this inability is structural, the result of existing employment policies, or simply a matter of choice. The distribution of employment in industries in Gozo is stable over time, implying there are no strong disparities between Gozitan and Maltese sectoral employment, and no excess concentration in employment in any industry in Gozo.

Using both classical and dynamic shift-share methods, it becomes apparent that employment in Gozo has fared worse than in Malta. The estimated ‘deficit’ in terms of number of jobs created stands at between 1948 and 1271 jobs between 2000 and 2019, respectively, for the classical and dynamic methods. A shift-share regression, which improves upon the methods discussed above, finds that between 2000 and 2019 employment in Gozo grew by 1.5% less than the national average growth rate. However, these findings should be assessed with caution due to methodological limitations. The analysis also identifies the sectors which appear to have some innate advantages. It is important to consider that an industry’s growth may require land take-up, affecting restricted land endowments, altering a region’s physical characteristics, as well as impacting the environment and communities. Impacts on a region’s social and physical character ought not to be overlooked. It could be argued that one of the unique strengths of Gozo is its rural character, which may be affected if it were to follow the same economic model as Malta.

To sum up, while Gozo appears to have missed out on several “winning industries” which performed more strongly in Malta, some industries in Gozo appear to have some innate advantages.
1. What can one say about regional employment distribution?

To assess regional employment scientifically and extract information relevant to policymakers, one must look at the two concepts of spatial concentration of an industry and the extent of regional specialisation. These are two crucial questions in regional policy analysis.

When discussing spatial or geographical concentration, one is referring to the concentration of an industry in one, or a few regions. In a country with a copper mining endowment, for example, companies operating in that sector will mainly be concentrated within the region having copper ore seams. Regional specialisation, on the other hand, looks at the above-average focus of a region on a certain industry.

This policy note will look at this issue in the context of Gozo as a region within the polity of Malta. In 2019, Gozo had 13,685 employees and accounted for around 5.2% of all employment on a national level. During the same year, average registered unemployment in Gozo stood at 157 individuals. Gross Domestic Product (GDP) per capita at market prices in Gozo stood at 65.1% of the national level in 2019, falling from the 70.8% measured in 2000. Gozo appears to have fallen behind the national counterpart. Comparing with the EU GDP per capita, Gozo rose from 40.9% of the EU per capita value in 2000, to 54.6% in 2019. Malta rose from 59.1% of the EU GDP per capita value in 2000, to 85.9% in 2019. Thus, while both regions made progress, Malta progressed faster towards the EU GDP per capita levels in market price terms. Trends in GDP per capita in Gozo are not linear over time, but fell at first, and then started to improve in more recent years. This may support the view that Gozo needs targeted aid to some sectors.

Over the years, researchers have looked at evidence for Gozo’s conditions in a number of studies, focusing on cultural, economic and employment areas. A number of studies have looked at the economic impacts of particular projects, however none appear to have attempted to measure the relative disadvantages in any sector.

A priori, one expects Gozo to have similar industrial and employment patterns as in Malta. Differences may be linked with the unavailability of direct access to key

2 Persons registering under Part I of the employment register.
infrastructural assets such as airports and deep-sea harbours. Even if there are differences, which may bring employment disadvantages in Gozo, these should not be too concerning in their nature: one must keep in mind that this analysis is looking at one region, in a small country, with a total population of around half a million.

A straight-forward way to look at regional concentrations follows from the so-called Location quotient (LQ). Using the simple tool, one can get a first impression of whether an industry is concentrated in a certain region. The numerical share of employment in a sector in Gozo is put in relation to Malta's share of total employment in that sector, such that:

\[ LQ_{ij} = \frac{E_{ij}/E_j}{E_i/E} \]

If the location quotient results in a value less than one, then the industry examined is represented below average in the region concerned. If, on the other hand, the measure takes on values greater than one, the sector is concentrated above average in this region. With a location quotient of exactly one, the concentration of the industry in the region corresponds to the average concentration in the superordinate comparison region, in this case Malta as a country. The Location quotients for eleven sectors are computed for Gozo, using 2019 employment data (see Table 1).

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4 Algebraic subject-of-the-formula manipulations of the Location quotient results in the so-called Hoover - Balassa Index. These correspond to one another and differ only in their presentation. Trade theory research refers mostly to the Balassa - Index, while in economic geography and regional economics the term 'Location quotient' is used.
Table 1
Location quotient

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<th>Industry</th>
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<tr>
<td>Agriculture, forestry, and fishing</td>
<td>3.5</td>
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<tr>
<td>Manufacturing</td>
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<td>Other industry</td>
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<tr>
<td>Construction</td>
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<tr>
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<td>0.7</td>
</tr>
<tr>
<td>Public administration and defence; compulsory social security;</td>
<td></td>
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<tr>
<td>education; human health and social work activities</td>
<td>1.3</td>
</tr>
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<td>Arts, entertainment, and recreation; repair of household goods and other</td>
<td>0.6</td>
</tr>
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</table>

Source: Author’s calculations.

A quick look at the Location quotients for the eleven industries shows the relative employment concentration of industries in Gozo, with respect to the country overall. In terms of results, Gozo appears to have relatively higher concentrations of employment in Construction, Real estate activities, Other industry, and Public administration than Malta. A particular outlier is the Agricultural sector, which appears to have a significant higher employment concentration in Gozo.

The Wholesale and retail trade sector, which has a very broad sectoral definition encompassing disparate sectors such as the tourist industry as well as repairs of motor vehicles, appears to correspond, on average, with the concentration found in the whole of Malta. Manufacturing in Gozo appears also to come close to the overall concentration, although with a value of 0.9 it is slightly below the national level. There are four other sectors which appear to employ less in Gozo when compared to the national concentration. These are the Financial and insurance activities, Information and communication, Arts, entertainment and recreation; repair of household goods and other services, and Professional, scientific and technical activities; administrative and support service activities.

This is a first indication of the relative concentrations of employment in Gozo. Policymakers ought to look at the reasons why certain sectors in Gozo appear not to
be able to match the employment concentrations found nationally – and whether this inability is structural, the result of existing employment policies, or simply a matter of choice.

**Krugman specialisation and concentration indices**

The Krugman specialisation index and the Krugman concentration index are computed for Gozo as a region within Malta. The two indices are measures of dissimilarity, that is, they emphasise the differences between the two regions examined. Krugman focuses on the specialisation index which is seen as a rough measure for showing regional differences in terms of specialisation (Krugman, 1991).\(^5\) The index has low data requirements, which is a strong advantage, and offers an initial overview of the specialisation of regions, or the concentration of industries.

The index can be described clearly with the following example, based on Malta and Gozo. For example, if the share of regional employment in the tourist industry in relation to total regional employment is very low in Malta and very high in Gozo, then the difference between these shares will be large. This will increase the value of the Krugman Index. The higher its value, the greater the difference between the regions examined. However, the index is influenced not just by one but by several industries. If, for example, the share of regional employment in the health sector in relation to total regional employment in Gozo and Malta is roughly the same, there will be a relatively small difference between these shares. This, in turn, contributes to a low value on the Krugman Index. Ultimately, the value of the index results from the summation of all the sectors being considered.

The Krugman specialisation index is obtained by summing all these absolute differences. The values for the Index are between zero and two. If the index is 0, this means that the two regions have the same branch structure. If the value is 2, no

\(^5\) The Specialisation index is computed as \(K_j = \sum_{i=1}^{11}|s_{ij}^* - \bar{s}_{il}^*|\), where \(s_{ij}^*\) is defined as \(E_{ij}/E_j\) using the same notation as the Location quotient above, and \(\bar{s}_{il}^*\) is defined as \(\frac{1}{J-1}\sum_{l=1}^{J} s_{il}^*\) with \(l \neq j\). The region \(j\) is ignored. Suppose region \(j\) is Gozo and one wants to compare the regional specialisation in some industries with the average specialisation in Malta. Accordingly, the absolute differences between the importance of the respective industry in Gozo and in the rest of Malta are calculated and added up across all eleven industries. The regional employment shares are \(s_{ij}^*\) or \(\bar{s}_{il}^*\).
industry will be represented in both regions, such that the industry structures of the two regions will have the maximum level of structural differences.

As seen in Chart 1 above, the Krugman specialisation index computed for Gozo is stable over time, within a range standing between 0.29 and 0.35. In 2019, $K_j$ takes the value 0.3144, which means that there is a limited argument regarding the specialisation between the two sub-regions.

This means that while in employment terms there are some industries with differences in employment as a percentage of the total, these are not enough to discern strong disparities between Gozitan and Maltese sectoral employment. While the Location quotients comparing Gozo to Malta indicate different concentrations, employment in Gozo is not particularly specialised when compared with Malta. This finding appears to be consistent over time. This indicates that sectoral employment shares, while developing over time, have not changed substantially enough to influence Gozo’s degree of specialisation.
By modifying the methodology of the specialisation index slightly, an index for the geographical concentration of an industry can also be calculated. This index differs by having the industry as the reference point. With the help of this measure, one can examine whether an industry is concentrated in a region compared to another (see Chart 2).

![Chart 2](image)

The values for the Concentration index show that there is very limited evidence for sectoral concentration between the two regions, with none of the computed concentration values exceeding 0.4. The findings again confirm that employment in Gozo has similar patterns to Malta, with some evidence that in Agriculture, forestry and fishing, Gozo has a higher concentration than Malta. This may be the result of various reasons, such as factor endowments or choice, and should not be seen to be a normative description on the desirability of the employment distribution.

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6 This consists in using \( s_{ij}^k \) instead of \( s_{ij} \), that is the employment share within the industry rather than across the region as was the case before. The Krugman concentration index is calculated as \( K_j = \sum_{l=1}^{J} |s_{ij}^k - S_{ij}^k| \). The two parts \( s_{ij}^k \) and \( S_{ij}^k \) are defined as \( s_{ij}^k = \frac{b_{ij}}{E_i} \) and \( S_{ij}^k = \frac{1}{I-1} \sum_{u \neq i} S_{ij}^k \) with \( u \neq i \).

Mathematically, this means that the sum runs from \( u \) to \( I \), where \( u \neq i \) holds. This means that all sectors are added up, except for the branch \( i \), for which the Krugman Concentration index is being calculated.
2. Can one quantify any Gozitan employment disadvantages over Malta?

In many cases, one cannot draw conclusions about the economic development of a region, from how a whole country has developed. While the dynamics of an area as a whole influence those of its regions, there are also region-specific factors which will make regional development deviate – sometimes very strongly – from that of its supra-regional path.

The specific industrial structure of a region may be crucial to determine its fortunes – either steering it toward economic growth or leading it down the path to stagnation or at worst, contraction. Therefore, if the developments within a region are determined by the dynamics of its industries, the prospects of these same industries will be of great importance.

Moreover, there are also specific regional peculiarities which can cause deviations from the growth path of the same industries with respect to the national unit. Even if, for example, the tourism industry is very dynamic and returns strong growth across Malta, it can be on the decline in Gozo. One possible reason for this divergence could be that the region is unattractive to workers, or that the companies in Gozo are unable to recruit enough qualified individuals as employees. A region-specific peculiarity in this case could also be an environment that is unattractive to workers – such as very long commute times. Likewise, the locational infrastructural endowment plays a role – for example, air infrastructure on Gozo is rather limited, meaning that the aviation industry in Gozo cannot be compared with the one in Malta – and that any change related to employment in such a sector in Gozo will have outsized effects at a disaggregated level.\(^7\)

In 2019, of the around 261,000 employees working in Malta, Gozo accounted for around 5.2% of total employment. Of these, 28.4% were employed in Public administration and defence; compulsory social security; education; human health and social work activities, and 27.3% in Wholesale and retail trade; repair of motor vehicles

\(^7\) This lack of critical mass means that very small absolute changes of employment in some industries may lead to strong changes in a region with low employment in that industry. In the literature, this is known as “shipbuilding in the Midlands”-problem, (Möller and Tassinopoulos 2000).
and motorcycles; transportation and storage; accommodation and food service activities.

To measure and analyse the regional developmental deviation from the overall spatial development, it makes sense to split the overall deviation in different components. This will enable the identification of the factors responsible for a comparatively positive or negative dynamic in the region being studied. Some examples of applications to regional economics and demand can be found in Rota, Bagliani and Feleting (2020), Otsuka (2016), and Elburz and Gezici (2012).

An ideal candidate as a simple technique to carry out such studies is a shift-share analysis. It is an empirical technique which is highly descriptive, easy to use and is applied in many studies to assess regional growth over time. This study will illustrate a shift-share analysis with respect to the Gozitan employment distribution, assess its results with respect to its criticisms and then estimate a simple shift-share regression.

The classical shift-share analysis

Shift-share analysis is a popular tool in regional economics for explaining different economic developments across regions. The development of a region is usually assessed against the development of an entire area. In this case, the regional development in Gozo will be assessed against Malta as an island, with Malta as a nation being the supra-regional unit of reference. In this way, shift-share analysis will allow us to measure regional deviation from the overall spatial development.

In this method, the observed actual change in employment within a sectoral branch of a region is compared to a fictitious change that would have occurred had the development of that sector in the region grown at the same rate as that of the wider reference area. For example, one would compute how much would the actual change in employment in Gozo be, had its employment in the construction industry grown at the same rate as that of Malta overall. This approach allows one to assess whether a region had any competitive advantage over other areas during the observation period. Regional deviations are usually attributed to either the regional industry structure, or to location-specific (regional) effects of a different kind.

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8 Regional development can deviate positively or negatively from that of the entire area.
There are several shift-share approaches which one can use. Starting from the “classic” shift-share model, based on the seminal work by Dunn (1960). In this simple approach, the change in employment over the study period is broken down into three factors, namely the economic, structural and location components, that is:

\[ e_{t+1} - e_t = n_{t,t+1} + m_{t,t+1} + c_{t,t+1} \]  
(Eq. 1)

Where \( e \) is employment in a region, and \( t \) and \( t+1 \) are the indices standing for the start and end time of the period being analysed. The left-hand side of Eq. 1 will equal the absolute change in employment in the region between the two time periods. The right-hand side of the equation shows how the change in employment arises from three factors, namely, national growth, \( n \), which will show the cyclical measure, \( m \) is the industry mix – and reflects the structural component, while competition \( (c) \) presents the location component. These three factors will all indicate the absolute changes in employment caused by the relevant factor between the two time periods.

![Chart 3: Employment development in Malta (MT) and in Gozo and Malta](image)

A main assumption in shift-share analysis is that the growth of the entire area, in our case Malta as a nation (which will be termed *Malta – MT*), has a significant influence on the development of employment growth in the individual regions. From Chart 3 above, it is very clear that employment developments within the regions follow the general trend of development in Malta – MT, with slight deviations (2000 = 100).
Results from the shift-share analysis

The methodology, equations and steps needed to compute the shift-share analysis are to be found in an Appendix to this study. The approach decomposes growth into three broad factors. This first component assumes that the region has developed like the reference area. That is, for example, that employment in Gozo has grown or fallen by the same factor as in Malta – MT as a whole. The second factor, termed the structural factor presents a differentiated view, as it considers the branch structures of the respective region and the comparison area. The central assumption within the structural component is that the sector in the region should develop at the same sector-specific growth rate as in the whole area. In other words, it is assumed that the structural employment change is reflected proportionally at the regional level.

The third component is the location factor. This reflects all the other influences which have an effect on regional employment development. It acts as a residual in this shift-share. It will act as indicator of the competitiveness of the region, because the location factor shows how the market shares of regions change with respect to one another. A positive location factor means that a region was able to gain market share compared to other regions. Increased regional competitiveness can be attributed to, for example, better infrastructural facilities, or having a pool of highly qualified workers. A drop in competitiveness will occur via factors such as the emigration of qualified workers, pollution in a region, or inadequate regional economic policies.

Using these methodologies, a shift-share analysis is computed focusing on the differences between Gozo and Malta, at first using the classical method which compares the situation in 2000, with that in 2019. Tables 2 and 3 show employment data in Malta – MT, split between the two regions of Gozo and Malta, over the eleven main sectors which are defined by the National Accounts.

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9 As a region with Malta separate from the overall country.
10 The sector divisions in the tables are Agriculture, forestry and fishing (1), Other industry (2), Manufacturing (3), Construction (4), Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities (5), Information and communication (6), Financial and insurance activities (7), Real estate activities (8), Professional, scientific and technical activities; administrative and support service activities (9), Public administration and defence; compulsory social security; education; human health and social work activities (10), and Arts, entertainment and recreation; repair of household goods and other services (11).
### Table 2
Employment in 2000

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### Table 3
Employment in 2019

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### Table 4
Expected employment in 2019 (without taking into account the sector structure)

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Tables 2 and 3 show how employment in the two sub-regions is distributed across the eleven sectors. Table 2 relates to the year 2000, while Table 3 to 2019. The respective row totals show the national total employment in the sector, while the column totals show total employment in the region. The summation of both these figures will be the total national employment for all the industries. The first step is to calculate the regional factor. It is assumed that employment in a particular region, will develop in all sectors with the national growth factor, which is shown in the right-hand side of Table 6. That is, this step assumes that all industries will grow with the same industry-independent national factor. This is carried out in Table 4. On the other hand, Table 5 shows the growth rate based on the sector structure growth factors seen in the left-hand side of Table 6.

Using this simple approach, it becomes apparent that in terms of employment Gozo developed at a relatively slower rate than Malta – MT, overall. Had it developed at the same rate as the national unit, employment in Gozo should have been 1948 higher. This estimate is based on a negative structural factor, with Gozo having an unfavourable regional branch structure (-1237). Finally, residual influences not directly attributable to regional structures again imply Gozo has an unfavourable location factor. This is a first and rough indication of the quantities at play in terms of the disadvantages built into Gozitan employment prospects.

One of the main disadvantages of the shift-share technique is the static nature of the analysis, which only compares 2019 to 2000. Only the differences between the start
and end point are considered – meaning that any changes which occurred in between are not included in the analysis. Factors such as a trend reversal – where employment increases by a lot in between the two years – would be excluded. To solve this problem, the same analysis is computed annually, following Barff and Knight (1988). This technique, termed dynamic shift-share computed all components annually, and then merges them. As seen in Chart 4 below, an annual regional factor decomposition shows how there were annual periods where employment in Gozo experienced positive growth factors, outperforming the rest of the country. These occurred in 2002, 2005, 2008, 2013, 2017 and 2018.

![Chart 4](image)

Summing these impacts together to compute a dynamic shift share leads to lower estimated negative factors for Gozo (see Chart 5). In the dynamic shift-share, the discrepancy between employment in Gozo had it been growing at the same rate as the whole of Malta, falls to 1271 jobs. Of these, 1020 (80.3%) can be attributed to structural factors within the productive sectors, and the rest to location factors. However, this decomposition must be taken with caution due to several methodological shortcomings.
Of course, some caveats are of order. Not only is the methodology approximate, but it is predicated on several simplifications. It does not consider issues such as binding population constraints in Gozo, and that these results may be inflated by the increase in population in Malta, which was fuelled by foreign workers. Moreover, the larger national unit itself may also experience binding population constraints. In this case, the national growth effect in employment growth was very strong, and it may be causing some distortions in these results. Finally, differences may also result from regional constraints relating to land use, and differences in the housing stock composition.
Moreover, the methodology uses deviations in sectoral shares in employment (after correcting for the cycle which is proxied by Malta’s trend employment) to capture structural and location factors. As an example, if the employment share in a fast-growing industry was low in Gozo around 2000, this methodology will interpret this as a structural factor (that is, an endowment factor). The difference between the actual and the sum of cyclical and structural factors are then interpreted as location factors.

Such an interpretation is usually more appropriate for a mature economy in the context of traditional sectors.\textsuperscript{11} Such a method may not necessarily be appropriate for a dynamic economy which has undergone strong structural breaks in the last two decades. More importantly, it may be the case that it is not easy to identify between location and structural factors in the Maltese context. The two may, in fact, be highly correlated. Indeed, it could very well be that the relatively low employment share of Gozo in “top performing industries” is the result of location issues: There is nothing structurally that would stop resources (which in a services sector are skilled individuals) from moving to Gozo had there not been issues with its location and its distance from infrastructure hubs like deep quay harbours or the airport.

\textsuperscript{11} For example, one could argue that the north of England underperformed the south due to its structural predisposition (including natural endowments) to heavy industry.
The first conclusion is that employment in Gozo does have a disadvantage with respect to the rest of the Maltese economy. It appears to be unable to grow at the same rate as Malta. While at first glance, most of this disadvantage is attributable to sectoral, rather than locational disadvantages, the decomposition may not be robust to the method being used.

Since employment in Gozo grew by 4529 between 2000 and 2019, this means one can further disaggregate the overall change as in Chart 6. Had employment in Gozo grown by the same proportion as in Malta, it would stand to be 1271 or 1948 higher than it actually was, depending on the methodology chosen. The results show how both location factors linked to infrastructure and region-specific sectoral limitations affect the employment distribution in Gozo. This is a first indication that sector specific aid schemes and targeted policies may continue to be important, irrespective of infrastructural decisions or other means to aid connectivity between the two islands. As an example, it is difficult to envisage the infrastructural development of aircraft or heavy ship-repair and servicing industries in Gozo, due to unavoidable geographical constraints.
Shift-share regression

While the dynamic shift-share is a better tool to assess changes compared to the “static” version, it still only considers employment changes over a yearly basis. The problem with the above approaches is that they are highly deterministic. One cannot infer causal effects, significance tests cannot be carried out on these estimates and the nature of the estimation methodology makes inference on the residual component problematic.

Instead of the classical approach, the shift-share regression model is used to assess whether there are significant changes in a particular industry's employment figures. In this study, the approach taken by Patterson (1991), expanded by Blien and Wolf (2002), Kowalewski (2011) and Blien et al. (2014) is followed. The approach uses a weighting methodology to estimate the regional industrial structure effect on employment. The approach is based on a single restricted regression, which is defined as

\[ \tilde{N}_{irt} = \alpha_i + \lambda_t + \kappa_r + \varepsilon_{irt} \]

where the regional employment growth \( \tilde{N}_{irt} \) in sector \( i \) is the dependent variable. The sectoral effect \( \alpha_i \), represents how employment for a specific industrial sector developed. A positive (negative) sign for the sectoral coefficient would mean that the sector developed better (worse) relative to the rest of the economy.

The time-period effects at a particular time \( t \) are controlled for by \( \lambda_t \), which will be annual dummy variables from 2001 to 2019. These will control for business cycle movements which affect sectoral employment developments in a specific year equally.

On the other hand, \( \kappa_r \) represents the location effect of region \( r \). This will allow for the direct inference on regional qualities – all those factors which affect employment development in all regional industrial sectors over the entire period in the same way. This would include elements like regional infrastructure, interconnectedness, or disadvantages of boundary regions.

Further details on this methodology may be found in an Appendix to this study.
The regression is rather difficult to estimate, and it involves a number of magnitude restrictions to construct, in line with Patterson (1991) and Kowalewski (2011).\textsuperscript{13}

\textbf{Table 8}  
Estimated regional effects on employment growth  

\begin{center}  
\begin{tabular}{l r}
  MT & 0.0152'''' \\
  GZ & -0.0152'''' \\
\end{tabular}  
\end{center}  

Significant at the 1% level. 

Source: Author’s calculations

\textbf{Table 9}  
Estimated sectoral performance in terms of employment growth  

\begin{center}  
\begin{tabular}{l r}
  Industry 1 & -0.0347'''' \\
  Industry 2 & -0.0303'''' \\
  Industry 3 & -0.0496 \\
  Industry 4 & -0.0135 \\
  Industry 5 & 0.0053 \\
  Industry 6 & 0.0076 \\
  Industry 7 & 0.0112'' \\
  Industry 8 & -0.0105 \\
  Industry 9 & 0.0616'''' \\
  Industry 10 & 0.0068 \\
  Industry 11 & 0.0461'''' \\
\end{tabular}  
\end{center}  

Significant at the 10% level,  
''Significant at the 5% level,  
''''Significant at the 1% level. 

Source: Author’s calculations

The results from the estimated shift-share regression indicate that Gozo does have a statistically significant disadvantage with respect to Malta, with employment growth being 1.5% below the national average (see Table 8). This difference is statistically significant. This is broadly consistent with the fact that while the level of employment in Malta rose by 72.1% in 2019 over 2000, employment in Gozo grew by 49.5% over the same period.

The same approach also gives insight on the industries’ performance with respect to the national average irrespective of their regional location (see Table 9). It appears

\textsuperscript{13} Details of the steps and restrictions for estimation, as well as a full tables with results, can be found in Appendix B.
that employment in Professional, scientific and technical activities; administrative and support service activities (Industry 9) and Arts, entertainment and recreation; repair of household goods and other services (Industry 11) outperformed growth in the national average by 6.1% and 4.6% respectively. These findings are statistically significant. Likewise, employment in Agriculture, forestry and fishing (Industry 1) and Non-manufacturing “Other industry” (Industry 2), grew by 3.5% and 3.0% less than national overall employment growth. There is not enough evidence to state confidently that the other industries performed better or worse than national overall employment growth: This means that these industries, on average, performed just as well in employment terms as the rest of the Maltese economy. Of course, one must recognise that employment growth in the whole of the Maltese economy rose by 70.7% in 2019 over the levels found in 2000. This is a particularly strong growth rate. One must frame these findings in the context of particularly strong employment growth rates seen in Malta.
3. How is sectoral employment in Gozo faring?

The same methodology discussed above can be used to look at sectoral trends. By disaggregating the regional factor into the structural and competition factor and assessing the actual outcome with the national growth effect (NGE), one is able to assess the performance of each productive sector in Gozo.

The NGE again shows the employment growth that would have happened if a sector in the regional economy were to grow at the same rate as the national economy. The structural factor will measure the amount of regional employment sector growth compared to the national employment growth. This measure is used to identify the sectors or industries in an economy which are growing at a fast or at a slow pace: A positive industrial mix effect in a particular regional employment sector shows that it is growing faster than the national economy.

Thus, for example, in Chart 7 above, the Professional, scientific, and technical activities (Industry 9) sector in Gozo is growing at a faster rate than in Malta in the dynamic shift-share analysis. If the industrial mix effect is negative, that sector is growing at a slower rate compared to the national economy. This is the case for six out of the eleven sectors analysed above, with manufacturing (Industry 3) showing the most negative structural factor contribution.
The location factor measures how a particular sector is growing in an area compared to growth of the same sector at the national level. A positive effect again means that the regional economy was more successful in attracting investment to a particular sector than the overall economy. One could argue that a positive competitive effect indicates the comparative advantage for a region in a particular sector. A positive regional share combined with a positive industrial mix effect show a potential competitive advantage in that sector. A negative competitive effect indicates that the regional economy is losing its share to other regions.

It is apparent that Gozo has a few industries that have factor advantages over employment in Malta. Starting from the competitive position effect, which looks at locational advantages, Gozo has seven sectors with a positive location factor. The three largest positive location factors are found in the Professional, scientific and technical sectors which supports 358 employees, Wholesale and retail (Industry 5) which supports 74 employees, and Agriculture (Industry 1) with a positive location factor over Malta which supports 90 employees.

Likewise, Gozo has five sectors with a positive structural factor, which is linked with the industrial sector’s structure. Of these, the largest three are Professional, scientific and technical activities which supports 527 jobs, Arts, entertainment and recreation; repair of household goods and other services (Industry 11), which supports 334 employees, and Real estate activities which supports 48 jobs.

It is also apparent that all sectors in Malta grew significantly in terms of employment, with all sectors returning positive NGE contributions. However, it is interesting to note that in four sectors, Gozo appears to have an edge over Malta as a whole, in terms of growth prospects. These are Arts, entertainment and recreation; repair of household goods and other services, which supports 5 more employees than it should do were it to grow at the NGE rates, Information and communication, (Industry 6), which supports 29 more employees, Real estate activities (Industry 8) which supports 51 more jobs, and Professional, scientific and technical activities; administrative and support service activities, which supports a staggering 885 more jobs than the NGE would suggest. This latter sector appears to be a innate driver of employment growth in Gozo which exceeds the NGE. While the Public administration (Industry 10) and Wholesale and retail sectors have contributed more jobs to Gozo, these also have a very strong NGE.
Finally, it is interesting to note that of these eleven sectors, only three have positive structural and location factor effects. These are Professional, scientific and technical activities; administrative and support service activities, Real estate activities and Information and communication. These three appear to be strong candidates for targeted economic policies, to continue to support the innate competitive advantages to these regional sectors.

The methodological issues identified in the previous section are to be reiterated and found again in this section – in some of the sectoral annual analysis carried out in the next sub-section, there are strong shifts from strong positives to strong negatives in the location factor from year to year. Theoretically, location effects should either be a drag or an asset in terms of economic development over a longer time span. Thus, it would be safer to interpret results in a structural versus location context with a lot of caution.

Looking at the share decomposition in Chart 7 above, this method is useful to show that Gozo missed out on some “winning industries” in Malta – such as, for example - manufacturing, but still had some successful industries of its own. Special care should be made not to infer structural issues from this analysis, particularly as the structural and location factors identified by this methodology are very correlated.

The next section will look at annual sectoral analysis of employment in Gozo across industries. One has to point out the limitations of using shift-share analysis for annual figures. The literature tends to focus on period averages, or on a “before and after” basis over extended periods of time. It is therefore very important not to read too much into annual results from this methodology – sudden shifts or changes in factors may not necessarily be representative of true industrial developments but may reflect the limitations highlighted above. The following are therefore only the intermediate calculations used to arrive to the final results in Chart 7 above.
Sectoral annual analysis

The analysis now turns to an assessment of these contributions over time, to check whether there are temporal shifts which have occurred in particular sectors. This is particularly important to assess how a sector is faring with respect to its recent past.

The Agricultural sector appears to return very stable employment changes, except for a shock between 2007 and 2008, and to a lesser extent in 2015 (see Chart 8). The shock in 2007/8 affected dramatically employment in this sector in Malta, which in this vintage of the dataset appears to have shrunk significantly while employment in Gozo, however, showed limited growth. This sectoral development significantly affects the estimates for the structural factor and the location factor between those two years. From 2016 onward, employment in this sector registers a recovery, with the total employment change aligning itself with the national growth effect by 2019.

Chart 8
Agriculture, forestry and fishing

The particular shock may be the result of the statistical compilation methods, and/or of structural shocks which affected the sector in this particular year. Moreover, one has to note that while in the older national accounts (NA) figures this regional data release is based upon there was a decrease in employment in agriculture, this is no longer the case in the latest set of employment data found in more recent vintages of NA. The nature of this shock may be dubious and may disappear from the data once the figures are updated with more recent data vintages.
The Manufacturing sector appears to witness a chronic negative structural factor, that is, the industrial mix effect shows negative structural effects on employment in Gozo in almost all years except for 2010 (see Chart 9). While in some years, employment growth has outperformed the national sectoral growth, this appears to occur rarely. The same is the case with the Other industry sector (see Chart 10).\(^{15}\)

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\(^{15}\) Developments in this sector, however, may be governed by changes which occurred in employment in a particular company operating in this sector.
The Construction sector in Gozo appears to have experienced almost cyclical shifts between the structural factor and location factor over time. The methodological issues identified in the previous section are made clear again in this section – the above chart.
shows the disaggregation of employment shares in location and structural factors, with the former shifting from strong positives to strong negatives from year to year. From a theoretical point of view, location effects should either be a drag or an asset in terms of economic development over a longer time span.

In 2019, however, all three components appear to be contributing positively to growth for the first time, with the construction sector in Gozo growing significantly in employment terms based on strong structural (IME) and location factors. This sector’s turnaround shows very clearly the disadvantages of assessing sectoral developments as changes between two end points, rather than in a dynamic way.

The Wholesale and retail trade sector, which includes tourism and other industries, has grown strongly in Gozo in terms of employment, but the bulk of the increase is also explained in national growth effects, rather than in regional specific trends. Nevertheless, this sector appears to be very important for Gozitan employment. A further analysis on why regional effects are at times estimated to be negative should be pursued to understand this sectoral trend. The sector appears to be unable to match the growth in employment seen in Malta. A reasonable hypothesis, if one were to attribute the differences to employment in tourism, would be underlying differences in the tourism industries in Malta and Gozo. The reliance on collective accommodation
and larger hotels in Malta may lead to higher employment growth rates than in Gozo, which relies on a less labour intensive tourism model, based on self-catering units or day trips.
In the Information and communication, and Financial and insurance activities sectors, the changes in employment are much lower than in the previous two sectors, with a lot of heterogeneity in terms of the different contributions over time. The Information and communication sector in Gozo outperformed that in Malta for the years between 2013 and 2015, and again in 2017 and 2018. Over recent years, strong employment growth was registered in Financial and insurance activities, with the sector outperforming the national growth rate from 2017 onward.

Real estate activities and Professional, scientific and technical activities; administrative and support service activities, were identified as two strong points of the Gozitan employment structure with respect to Malta. Of the two, the latter is the stronger in terms of contribution to employment, which experienced very strong growth from 2012 onward.

Of note, however, is the sharp deterioration in 2019 for Professional, scientific and technical activities; administrative and support service activities – with location effects dragging down overall employment for the first time since 2013.\(^\text{16}\) This sector is the only one to have a persistently positive structural factor contribution. A positive

\(^{16}\) As noted above, particular care should be made not to read too much into sudden shifts in either factor in particular years.
structural factor in a particular regional employment sector indicates that it is growing faster than the national economy. This may be a reflection of self-employment within this category amongst Gozo residents.

Public administration appears to follow very strongly the NGE, with particular deviations in a number of years. In structural factor terms, this decomposition shows that employment in the public sector in Gozo has grown at a slower pace than in the rest of the national economy for some years.
Finally, the Arts, entertainment and recreation, and repair of household goods and other services sector has strong support from the NGE, as well as the sectoral structural factor. At times, locational factors betray strongly negative effects. This component, which also includes employment in igaming, may be affected by the very positive growth seen in companies operating in this sector – but whose employees
tend to prefer to work in particular localities of Malta. One notes how, from 2016 onward, however, the total employment change in Gozo has exceeded that of the whole of the country. This means that the sub-components of this sector outgrew the performance of Malta overall. However, there is not enough information to check whether this growth effect came from a particular industry, such as igaming, or other more traditional components.
Appendix A – Shift-share methodology

The first step to compute a shift-share analysis is to measure the cyclical component. Following the definitions in Eq. 1 above, the **cyclical component** is calculated as:

\[ n_{t,t+1} = e_t \left( \frac{E_{t+1}}{E_t} - 1 \right) \]  
(Eq. A.1)

To ease its interpretation, this can be transformed as:

\[ n_{t,t+1} = e_t \frac{E_{t+1}}{E_t} - e_t \]  
(Eq. A.2)

As in Eq. 1 in the main text, \( e \) measures the employment in the region under consideration, while \( E \) corresponds to employment in the larger supra-regional unit. This first component assumes that the region has developed like the reference area. That is, for example, that employment in Gozo has grown or fallen by the same factor as in Malta – MT as a whole. Eq. A.2 considers regional employment at the starting point \( e_t \), multiplied by the growth factor\(^{17}\) of Malta overall \( \left( \frac{E_{t+1}}{E_t} \right) \), and deducted by the regional employment at the beginning \( (e_t) \). This means that the economic effect \( n_{t,t+1} \) will be the part of regional employment growth that is explained by the employment growth factor of the comparison area. Negative growth is also possible.

The **structural factor** presents a differentiated view, as it considers the branch structures of the respective region and the comparison area. The central assumption within the structural component is that the sector in the region should develop at the same sector-specific growth rate as in the whole area. In other words, it is assumed that the structural employment change is reflected proportionally at the regional level. For example, it assumes that the tourism industry in Gozo will grow at the same national growth rate of this industry. The structure factor is computed as \( m_{t,t+1} = \sum_{i=1}^{l} e_t^i \left( \frac{E_{t+1}^i}{E_t^i} - \frac{E_{t+1}}{E_t} \right) \), which is expanded to ease interpretation as:

\[ m_{t,t+1} = \sum_{i=1}^{l} e_t^i \frac{E_{t+1}^i}{E_t^i} - e_t \frac{E_{t+1}}{E_t} \]  
(Eq. A.3)

\(^{17}\) This analysis is based on *growth factors*, rather than growth rates. A growth factor, which may also be called a growth constant, corresponds to a growth rate plus one.
where the index \( i \) represents an industry. From Eq. A.3, it is clear that the structural factor shows the change in employment which is attributable to the region-specific industry structure. It can be mapped with the difference between the expected change in employment taking into account the regional mix of sectors, and the expected change in employment regardless of the regional sector structure. The first part of the right-hand side, \( \sum_{i=1}^{I} e_t^i \frac{E_{t+1}^i}{E_t^i} \), forms the regional employment in a sector \( e_t^i \), multiplied by the national growth factor of the respective industry, totalled across all industries. The other part then reflects how regional employment would change if it developed with the national (industry-independent) growth factor. The structural effect will therefore reflect that part of the change in employment which is due to the deviation of the regional sectoral structure, from that of the nation as a whole.

The third component is the location factor. This reflects all the other influences which have an effect on regional employment development. It acts as a residual in this shift-share. It will act as indicator of the competitiveness of the region, because the location factor shows how the market shares of regions change with respect to one another. A positive location factor means that a region was able to gain market share compared to other regions. Increased regional competitiveness can be attributed to, for example, better infrastructural facilities, or having a pool of highly qualified workers. A drop in competitiveness will occur via factors such as the emigration of qualified workers, pollution in a region, or inadequate regional economic policies.

Due to its nature as a residual, if the other components are calculated correctly, the results will be the same in both cases. To verify, one ought to still calculate this component separately as:

\[
c_{t,t+1} = \sum_{i=1}^{I} e_t^i \left( \frac{E_{t+1}^i}{e_t^i} - \frac{E_{t+1}^i}{E_t^i} \right) \quad \text{(Eq. A.4)}
\]

The location effect shows the change in employment in the observation period, which can be attributed to region-specific conditions. This effect will include that part of the change in employment that is induced by factors which cause the regional growth factors of specific sectors to be different from the respective national counterparts. A clear example for this would be the impact of regional infrastructural differences.
Appendix B – Shift-share regression method

Instead of the classical approach, Patterson (1991) uses the following model for his analysis, with the approach in this study closely following Kowalewski (2011) and Blien et al (2014):

\[ \hat{N}_{irt} = \alpha_i + \lambda_t + \kappa_r + \epsilon_{irt} \]

where:

\[ \hat{N}_{irt} = \frac{N_{ir(t+1)} - N_{irt}}{N_{irt}} \] is the regional employment growth in sector \( i \)

\( \alpha_i \) is the effect of the economic sector \( i \)

\( \lambda_t \) is the period effect at particular time \( t \)

\( \kappa_r \) is the location effect of region \( r \)

\( \epsilon_{irt} \) is the stochastic error term

As the estimation would usually be carried out using dummy variables, then the effect of a sector may only be measured against another which serves as references. To avoid having perfect collinearity, this implies the need to exclude one reference category. In turn, this would imply the need to re-calculate the effects as well as the significance levels, as the population mean is a more important measure of reference than any benchmark region. Patterson (1991) solves this by using identifying restrictions, in a restricted regression setting (Greene and Seaks, 1991). This study follows the further diversions in Blien et al. (2014) with respect to the restrictions and weighting structure. These are defined as:

\[ \sum_{r=1}^{R} \sum_{i=1}^{I} g_{ir} \kappa_r = 0 \]

\[ \sum_{r=1}^{R} \sum_{i=1}^{I} g_{ir} \alpha_r = 0 \]

The weighting solves issues relating to heteroscedasticity, where increases in the growth rates of small sectors are possible, leading to outliers. Moreover, the growth rate of the global parameters cannot be the mere aggregation of sub-units – to avoid heteroscedasticity, the whole equation must be multiplied by the square root of the employment weighting, such that:
\[ g_{ir} = \frac{N_{ir}}{\sqrt{\sum_i \sum_r N_{ir}}} \]

The estimation follows a weighted least squares approach, with the main equation becoming:

\[ g_{ir} \hat{N}_{irt} = g_{ir} \alpha_i + g_{ir} \lambda_t + g_{ir} \kappa_r + g_{ir} \epsilon_{irt} \]

The weights \( g_{ir} \) will be constant over time. This approach diverges from Patterson (1991) by using square roots as weights instead of linear ones, and both sides of the equation are now being weighted. The former is seen to lead to an approximation of global growth rates, while the latter follows the proper application of weighted least squares as seen in Möller and Tassinopoulos (2000).

This approach can be expanded to include other variables, such as the education levels in each regional sector, or the size proportion of firms operating in regional sectors. However, data limitations preclude the use of such a framework on Maltese data for now.

**Model fit**

The F-tests of the regression return a significant relationship between overall employment growth and the structural make-up. The region-specific factor is seen to significantly affect employment growth. As a constant is not included in the estimation due to the constraints imposed on the regression, the usual \( R^2 \) measure is not available. An unconstrained estimation which closely approaches the presented regression has an \( R^2 \) of 0.52.
Constrained linear regression

Number of obs  =  418

F( 30, 388) = 23.94
Prob > F = 0.0000
Root MSE = 0.0092

(1) cc1 + cc2 = 0
(2) ii1 + ii2 + ii3 + ii4 + ii5 + ii6 + ii7 + ii8 + ii9 + ii10 + ii11 = 0

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