[TES]

Trends in Employment Shifts over the years in Austria

Final project report

Submitted by

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Integrated Project: SDI Services Implementation

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Abstract

This study examines employment shifts in Austria from 2019 to 2023, utilizing data from AMS Statistics Austria and Austrian Open-Source data for state boundaries. This research integrates employment data with geospatial analysis by storing the dataset in a PostGIS geodatabase, enabling efficient spatial queries and analysis. Using ArcGIS Pro, the dataset is processed to explore employment changes across sectors, regions, and demographics groups, including gender and age.

The processed data published on the ArcGIS Enterprise Portal as web services, including WMS (Web Map Services), WFS (Web Feature Services), Image layer, and feature layer, ensuring accessibility for further analysis and visualization. Feature Layers are used to provide comprehensive data representation. A dynamics dashboard is developed to visualize the employment trends interactively, offering insights into regional and sectoral shifts in the labor market.

This study is conducted within the framework of **Spatial Data Infrastructure (SDI)**, promoting efficient data management, interoperability, and accessibility. The integration of geospatial and employment data supports data-driven decision-making, helping policymakers, businesses, and other stakeholders better understand employment trends. This study aims to enhance labor market planning and policy formulation through accessible, actionable insights based on spatial data analysis.

Keywords: Spatial Data Infrastructure (SDI), Employment,

1. Introduction

1.1 Background

Employment trends show how the job market is changing and help us understand the overall economy, workforce needs, and effects of government policies. Tracking these trends helps businesses, workers, and policymakers make better decisions about job opportunities, skills training, and economic planning. By studying employment patterns, governments can create policies to reduce unemployment, address skill shortages, and support job growth.

In Austria, the job market has changed a lot in recent years due to modern technology, shifts in population, and government policies. Automation and digital tools have replaced some traditional jobs but have also created new ones that require technical skills. At the same time, Austria's aging population has increased the demand for workers in healthcare and social services. Older workers may face challenges adapting to digital jobs, while younger workers need training in modern technologies. Gender differences are also noticeable, as more women are entering the workforce, especially in service industries, but gaps remain in leadership roles and technical fields.

Using **Spatial Data Infrastructure (SDI)** helps in understanding job market changes by organizing employment data in a structured way. **SDI** makes it easier to compare job trends across different regions, ensuring better decision making and planning. It helps governments and businesses see where jobs are growing and declining. So, they can plan policies and investments more effectively.

1.2 Aim and Objectives

Aim

The aim of this study is to analyze employment shifts in Austria from 2019 to 2023 using **Spatial Data Infrastructure (SDI)** principles to enhance data accessibility, interoperability, and visualization.

Objectives

- To examine employment changes across different sectors, age groups, and genders over the given period
- To store employment and geospatial data in a PostGIS geodatabase to ensure efficient spatial data management.
- To process the data using ArcGIS Pro and define metadata to ensure proper documentation.
- To publish the employment datasets as web services on the ArcGIS Enterprise Portal

- To develop an interactive dashboard that provides employment insights through maps, charts, and statistical summaries, supporting data-driven decision making.

2. Milestones and Work packages (WP)

2.1 Milestones:

For each work package (WP), distinct milestones have been established to monitor and ensure the completion of critical tasks. An overview of these project milestones is presented in Figure 2.1 and Table 1 below. Each milestone represents a key deliverable, enabling us to track progress, identify potential bottlenecks, and maintain alignment with the overall project objectives. This structured framework not only aids in managing individual work packages but also supports effective decision-making and resource allocation throughout the project lifecycle.

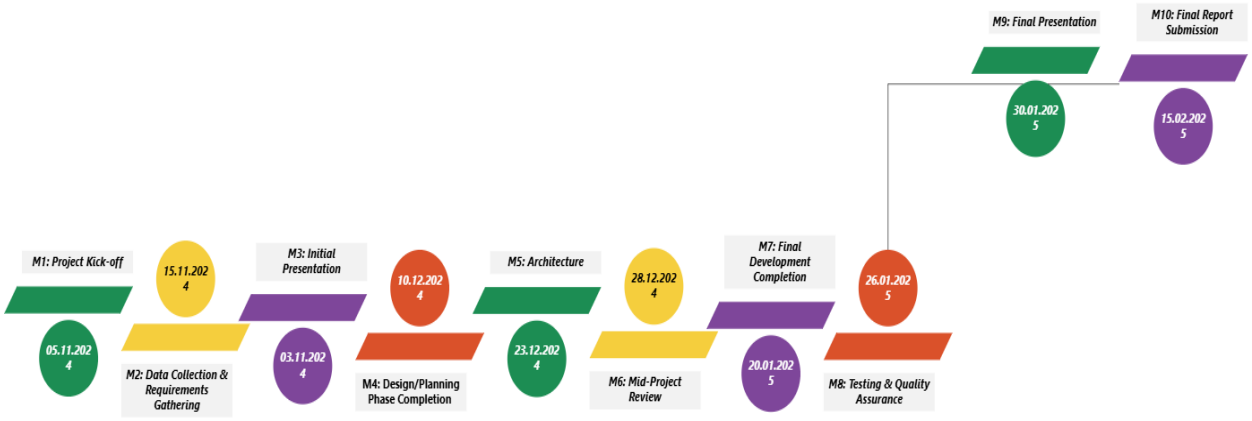

Fig 2.1: Milestone

	Name	Date Completion
M1: Project Kick-off	Official start of the project. Teams are introduced, objectives are set, and timelines are discussed	05.11.2024
M2: Data Collection and Requirement gathering	Gather employment, sectorial transition and demographic data and other requirements for the project.	15.11.2024
M3: Initial Presentation	Present the project scope, objectives, methodology, and initial findings to audience.	03.12.2024
M4: Design/Planning Phase Completion	Complete the design or planning phase, including high-level architecture, workflow, and strategic plans	10.12.2024
M5: Architecture	Begin work on the project deliverables (e.g., Geodatabase set up, Data Organization, Temporal analysis, and documentation).	23.12.2024
M6: Mid-Project Review	Review progress to date, address any blockers, and refine plans for the next phase.	28.12.2024
M7: Final Development Completion	Complete the dashboard development	20.01.2025
M8: Testing and Quality Assurance	conduct testing, validation, and quality assurance to ensure deliverables meet SDI project requirements.	26.01.2025
M9: Final Presentation	Deliver the final project presentation, displaying results, outcomes, and conclusions.	30.01.2025
M10: Final Report Submission	Submit the comprehensive final report documenting the entire project, including methods, findings, and outcomes.	15.02.2025

Table 1: Project Milestones

2.2 Work packages (WP)

The project has been organized into six distinct Work Packages (WPs), as illustrated in the diagram below. Each WP has been carefully defined to encompass a specific set of activities essential for the project's success. These work packages cover critical areas including project management, data acquisition and preparation, system architecture, analytical processing, visualization and user interface development, and the final documentation phase.

A detailed breakdown of the individual subtasks associated with each WP is provided in Figure 2.2. This comprehensive structure not only ensures that every key task is systematically monitored but also facilitates clear coordination and effective resource allocation throughout the project lifecycle. The well-defined interdependencies among the tasks enable proactive management of potential bottlenecks, thereby supporting the timely delivery of project objectives.

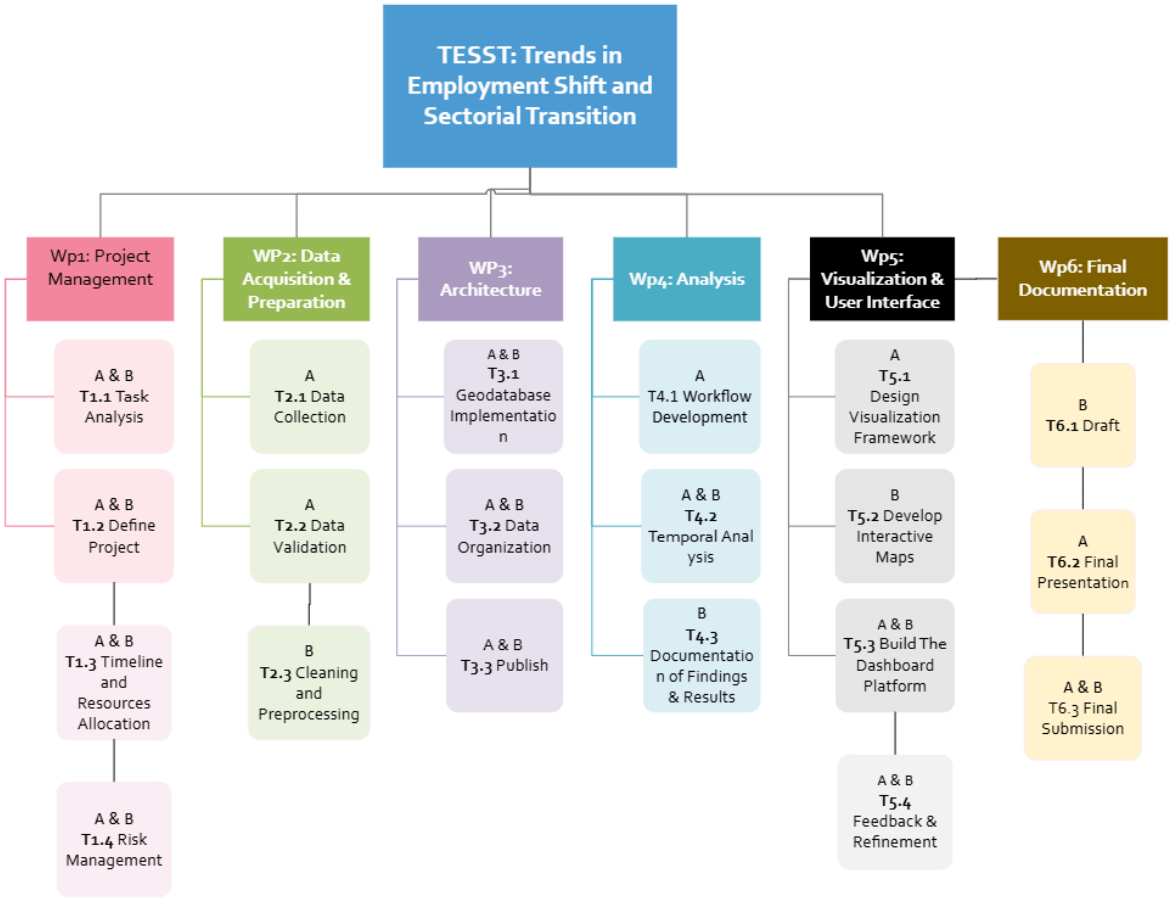

Fig 2.2: Work Packages and Task Allocation

3. Methods

3.1 SDI Architecture

This study is conducted within the framework of **Spatial Data Infrastructure (SDI)** shown in figure 3.1. which ensures efficient management and interoperability of spatial data. **SDI** is a framework that promotes the collection, sharing, and accessibility of geospatial data across organization and districts. It ensures that the employment data is:

- **Interoperable:** This geospatial data can be used with other datasets (e.g., demographic, economic data) from various sources.
- **Accessible:** The data can be easily accessed by authorized users through the ArcGIS Enterprise Portal, improving accessibility for both the public and private sectors.
- **Efficiently managed:** The PostGIS database and web services ensure that the data is well-structured, reducing redundancy and enhancing the performance of queries and data processing

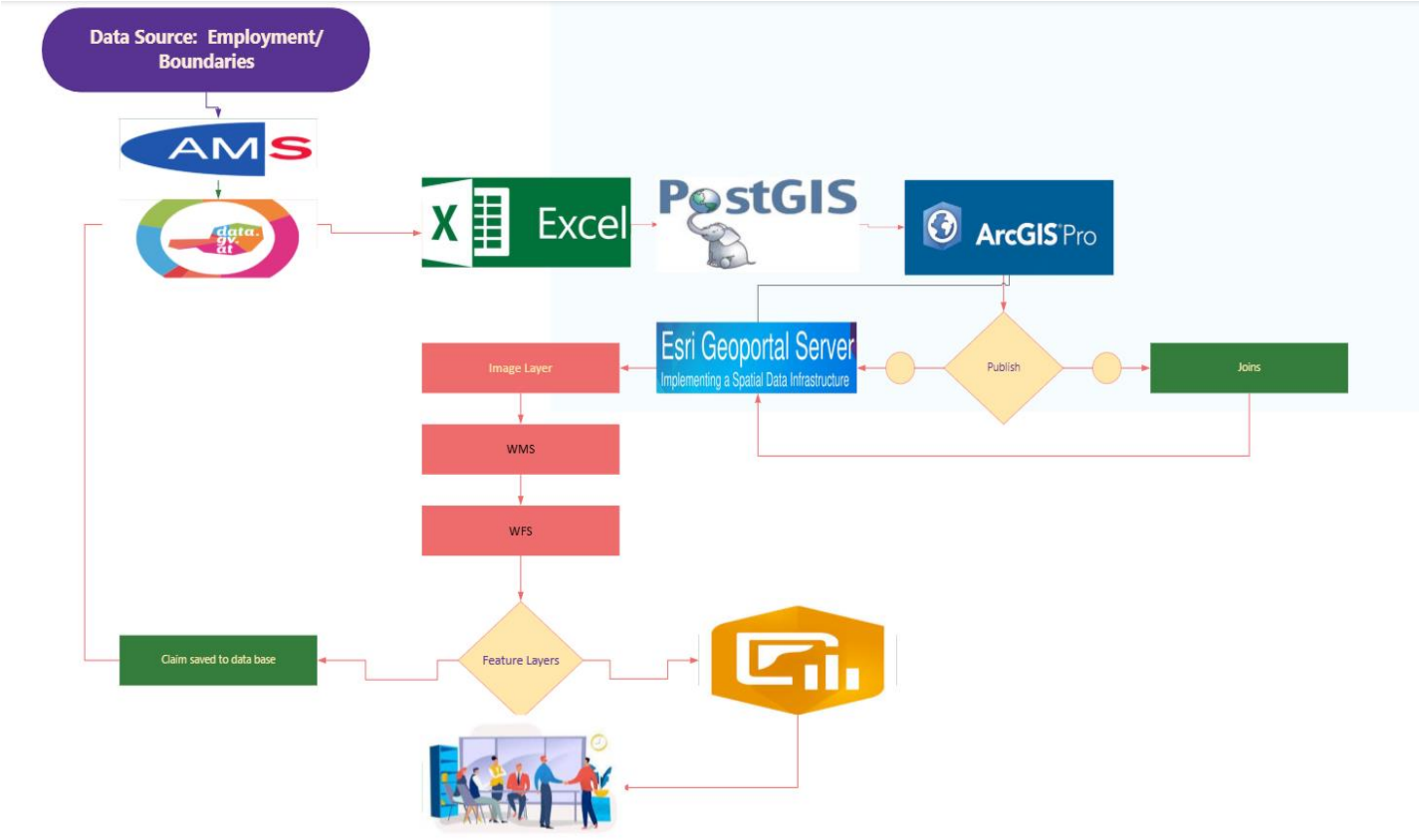

Fig 3.1: SDI Architecture

3.2 Data Collection

- Employment Data: Acquired from AMS Statistics Austria, covering employment distribution across Austria.
- State Boundaries: Downloaded from Data.gv.at, providing geospatial boundaries for accurate mapping.

3.3 Data Storage and Processing

Employment data was structured and stored in PostGIS geodatabase, ensuring spatial compatibility, efficient querying, and integration within **SDI** framework. The dataset underwent cleaning and preprocessing to remove inconsistencies, standardize formats, and enhance data accuracy. SQL queries were used to filter, aggregate, and transform data for better usability. Spatial joins were performed in ArcGIS Pro, linking employment statistics with regional boundaries to enable geospatial analysis. This integration allowed for seamless visualization, querying, and spatial interpretation, ensuring the dataset could support decision-making, trend analysis, and interactive mapping in the final dashboard and web services.

3.4 Metadata

Employment data has been processed and structured using metadata standards compliant with ISO 19115, ensuring high-quality and standardized geospatial data documentation. This standard allows for enhanced data integration, consistency, and accuracy when analyzing employment trends at different geographic levels. The structured metadata supports effective data sharing and comparison across regions, contributing to a comprehensive understanding of Austria's labor market dynamics.

3.5 Data Publishing

The processed dataset was published on ArcGIS Enterprise Portal as interactive web services within **SDI** framework:

- **WMS:** To enable visual representation of employment shifts
- **WFS:** Allowing users to query and analyze employment trends spatially.
- **Feature Layer**: Supporting advanced spatial queries and data visualization.
- **Image Layer:** Representing rasterized employment changes over time.
- **OGC Coverage:** Ensuring standardized geographical data dissemination

3.6 Dashboard Development

An interactive dashboard was developed using ArcGIS Dashboard within and **SDI**-based framework to enhance the analysis and visualization of employment trends in Austria. The dashboard provides real-time insights into workforce distribution and sectoral shifts.

Key features include:

- **Maps:** Displaying employment distribution across Austria with spatial layers for better geographic analysis.
- **Charts:** Visualizing employment trends by sector, age group, gender, and region for comparative analysis.
- **Slider:** Allowing users to track employment changes over time, making trend analysis more dynamic.
- **Sidebar:** Providing a concise summary of the dashboard's purpose and guiding users on data interpretation.

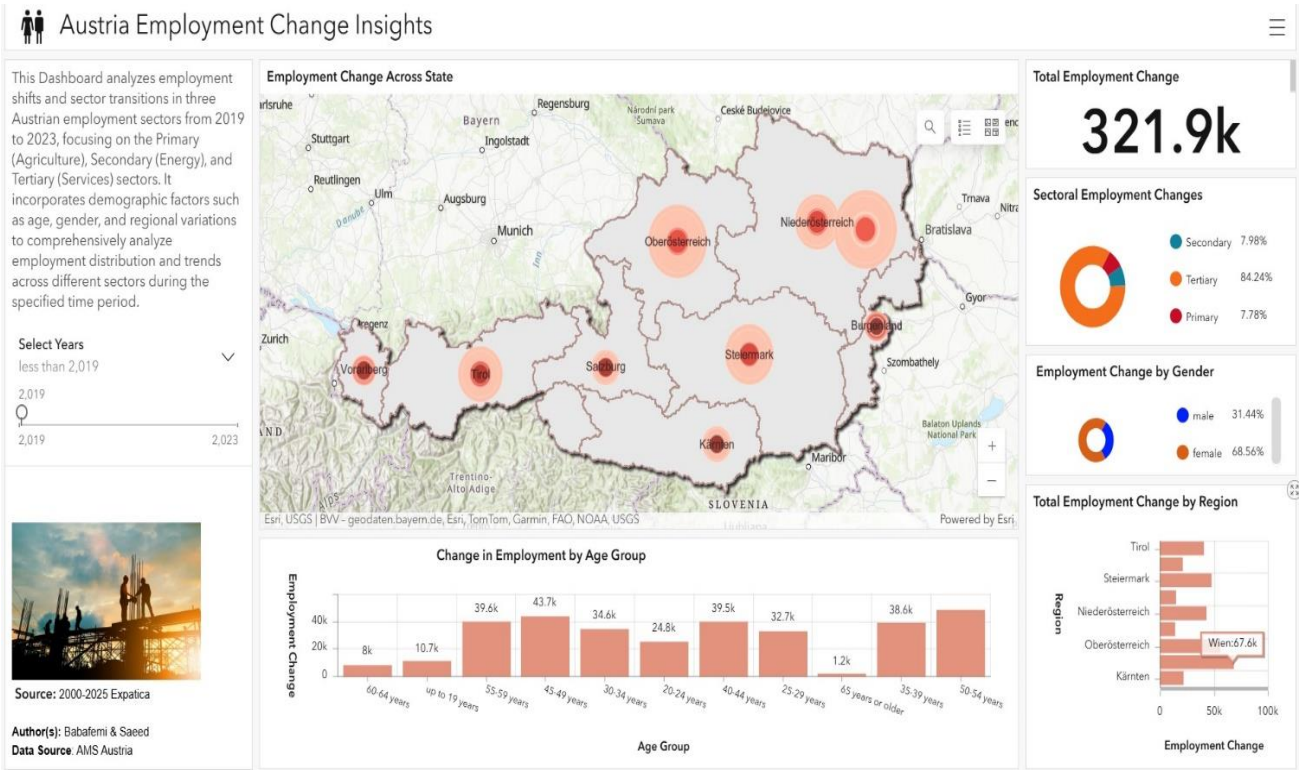

Fig 3.1: Austria Employment Change Dashboard

4. Results

4.1 Employment Trends by Sector

Employment shifts across Austria's sectors show a strong trend toward service-based jobs. The tertiary sector saw the highest growth, adding 84.24%, driven by expansion in IT, healthcare, and finance. The secondary sector experienced moderate growth with 7.98%, boosted by infrastructure projects and local manufacturing but limited by automation. The primary sector saw minimal change with 7.78%, as mechanization reduced labor demand. These trends indicate Austria's transition to a service-oriented economy, with declining reliance on traditional industries. Understanding these shifts is crucial for workforce planning, ensuring sustainable employment, and adapting to evolving economic demands.

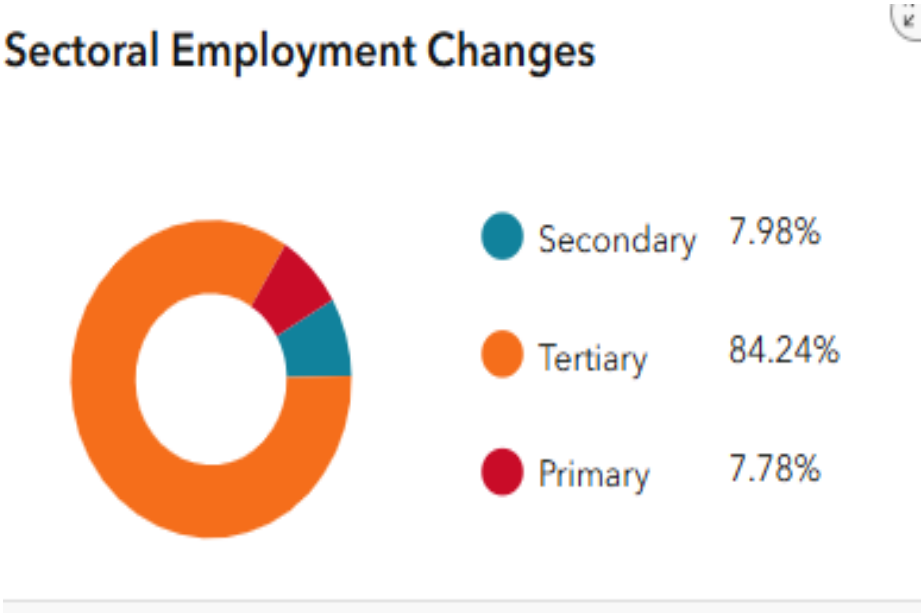

Fig 4.1: chart showing the sectoral employment shift

4.2 Employment Trends by Gender

Employment growth in Austria saw a significant rise in female workforce participation, with 68.56% new jobs for women compared to 31.44% for men. This shift reflects policy-driven initiatives, such as gender equality programs, parental leave reforms, and workforce flexibility. Expansion in healthcare, education, and service industries, where women are more represented, contributed to the trend. Additionally, remote work opportunities post-pandemic enabled more women to join the labor market. These factors indicate a growing emphasis on gender inclusion, fostering a more balanced workforce and reflecting ongoing social and economic transformation.

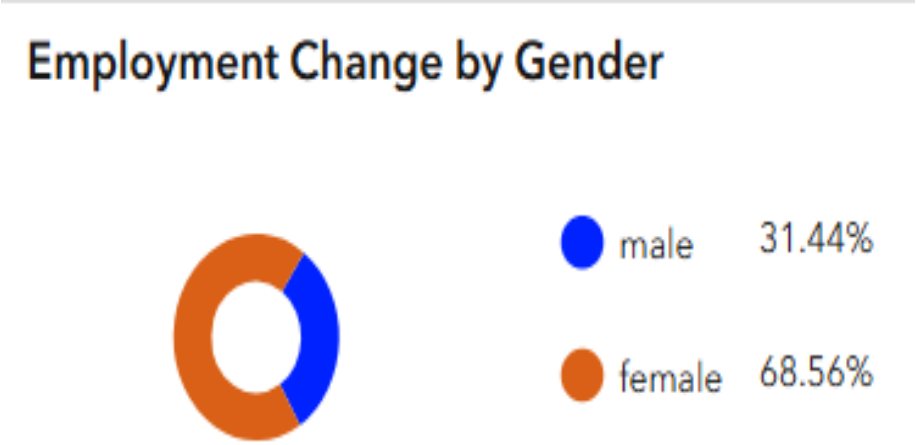

Fig 4.2: chart showing employment shift by gender

4.3 Employment Trends by Region

Employment growth varied significantly across Austrian states, with Oberösterreich, Wien, and Steiermark experiencing the highest job increases. These regions benefit from strong industrial bases, service sector expansion, and urban-driven economic activities, attracting businesses and workers. In contrast, Kärnten and Burgenland saw the lowest employment growth, highlighting economic disparities due to limited industrial presence, slower business expansion, and lower population density. Differences in infrastructure, investment levels, and government policies contribute to these regional variations. Understanding these trends helps policymakers address economic imbalances and develop targeted strategies to stimulate job creation in lagging regions while sustaining growth in thriving areas.

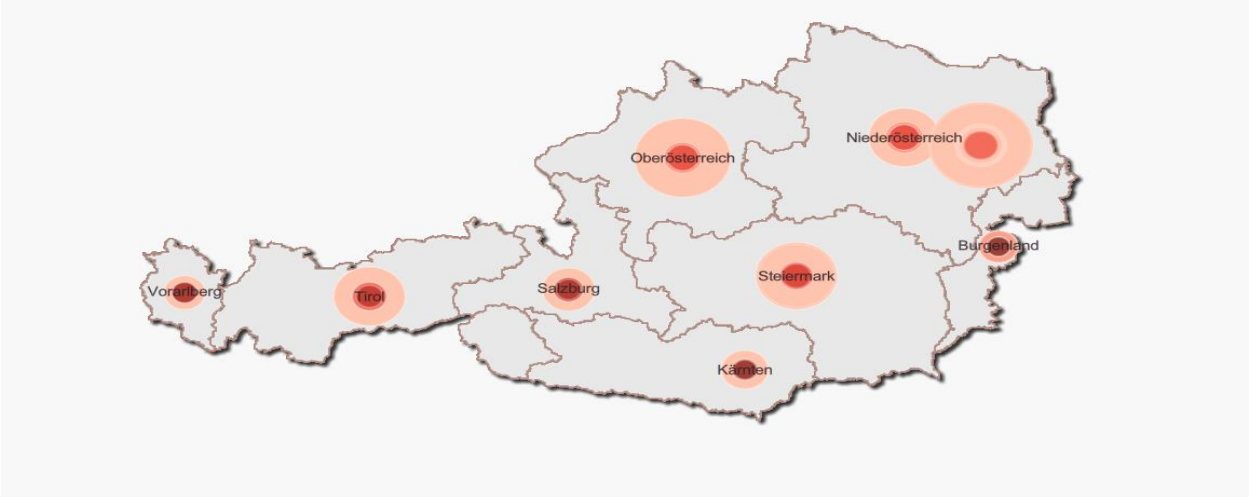

Fig 4.3: Map showing across region

4.4 Employment Trends by Age Group

Employment growth varied across age groups, with the 50-54 years category experiencing the highest increase (48.5k jobs). This trend is likely driven by policy incentives encouraging the retention of experienced workers, such as extended retirement age, skill retention programs, and workforce flexibility for older employees. In contrast, the 65+ age group saw minimal changes (1.2k jobs), reflecting natural retirement patterns and reduced labor force participation. Younger age groups showed moderate employment gains, influenced by education-to-work transition and evolving job market demands. These trends highlight the importance of targeted policies to support workforce participation across all age categories.

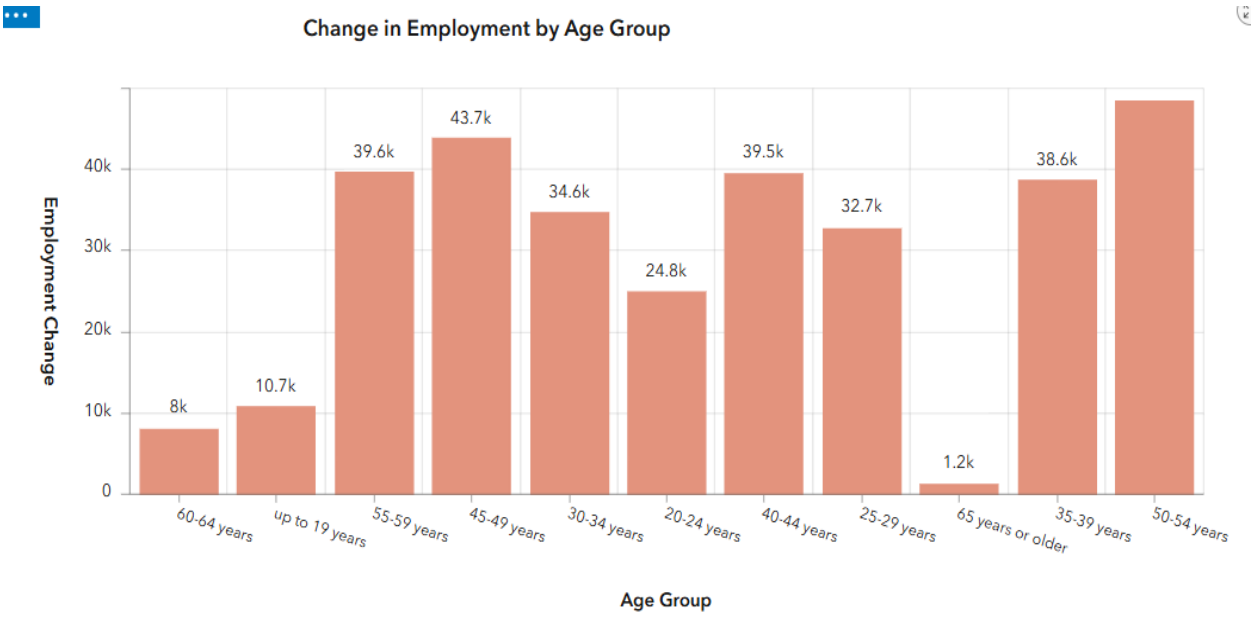

Fig 4.1: chart showing employment shift by age group

5. Discussion

Sectoral Shifts: Austria's job market is shifting towards service industries such as healthcare, education. This means fewer jobs in manufacturing and farming, while more opportunities are opening in areas like finance, IT, and tourism. This change is driven by modern technology, a growing demand for skilled workers, and Austria's changing economy. As the service sector grows, workers need new skills, especially in digital technology and customer services.

Gender Disparities: More women are joining the workforce which suggests changes in workplace policies and society. Supports for working mothers, improved childcare options, and efforts to promote gender equality have helped increase female employment. More women are now working in fields that were once dominated by men, such as technology and management.

However, challenges like the pay gap and fewer women in leadership roles still need to be addressed.

Regional Variations: Job opportunities vary across various parts of Austria. Cities like Vienna and Salzburg have more jobs in tertiary sectors, while rural areas rely more on primary and secondary sectors. These differences show that some areas are growing faster than others. To help balance this, Austria needs better training programs and investments in smaller twons to create more job opportunities.

SDI and Geospatial Benefits: Using Spatial Data Infrastructure (SDI) helps in analyzing job trends. SDI makes employment data easier to access, compare and visualize, so decision-makers can better understand where jobs are increasing or decreasing. Maps and data tools help businesses and the government plan for future jobs, growth, ensuring people have better access to opportunities no matter where they live.

6. Conclusion

This study successfully integrates employment data with geospatial information with a Spatial Data Infrastructure (SDI) framework to analyze employment trends across Austria. By leveraging advanced geospatial tools, it provides a comprehensive approach to understanding labor market dynamics at different regional levels. The methodology highlights the effectiveness of PostGIS and ArcGIS Enterprise in managing, analyzing, and visualizing employment data, ensuring accurate representation of job shifts over time.

A key outcome of this research is an interactive dashboard, which serves as a valuable tool for policymakers, businesses, and researchers. By offering real-time visualizations of employment trends, the dashboard supports data-driven decision-making, helping stakeholders design targeted employment policies, investment strategies, and workforce development programs.

Future research can enhance this study by incorporating predictive analytics, Al-driven insights, and real-time data updates. These advancements would improve forecasting accuracy, allowing for proactive labor market interventions and better responses to ongoing economic and technological changes.

References

AMS Statistics Austria (2019-2023). Employment Data

Data.gv.at Austria State Boundaries