

## KEY FINDINGS BRIEF

# OREGON ECONOMIC & DEMOGRAPHIC REGIONS WHITE PAPER

OREGON DEPARTMENT OF TRANSPORTATION | JULY 2020

## 1 BRINGING A REGIONAL PERSPECTIVE TO OREGON'S TRANSPORTATION PLANNING

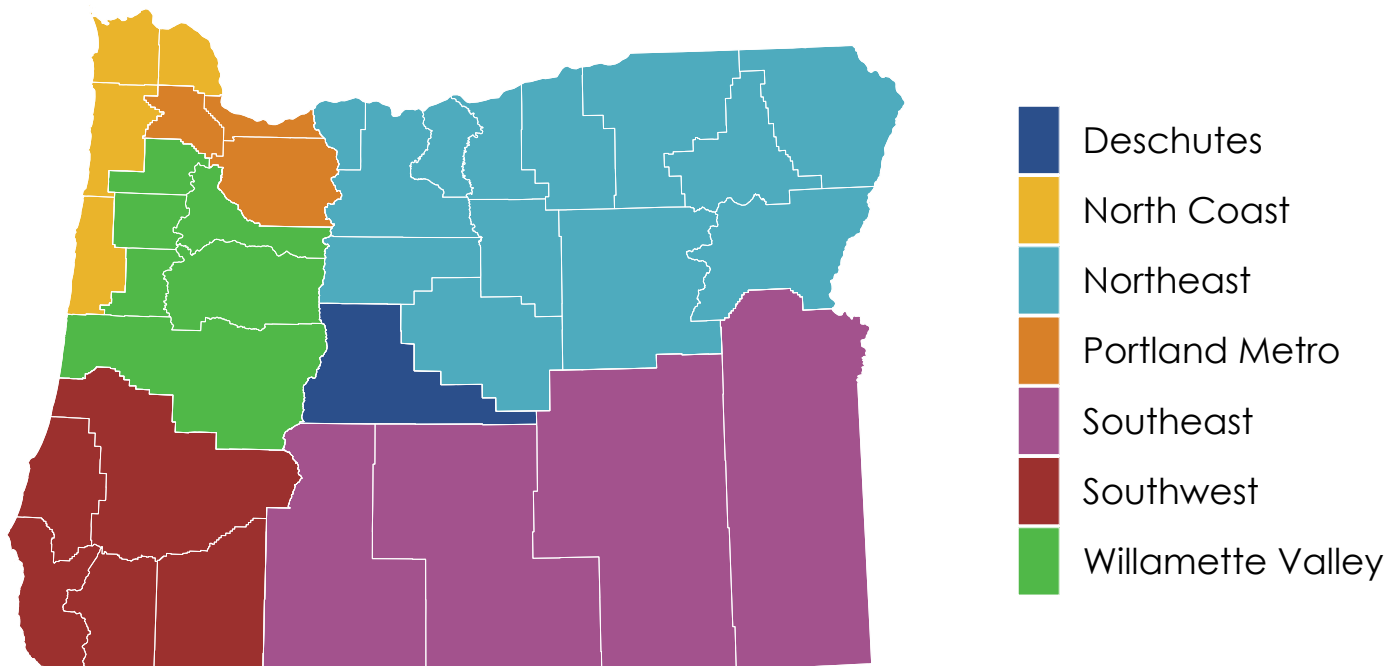
- How do demographics and economic regions influence transportation system use and needs in Oregon?
- What has influenced transportation demand in the past? What will influence it in the future?

Oregon is revising its Transportation and Highway plans (OTP/OHP), which are intended to guide the state's future transportation investments. The findings of this white paper are intended to answer the following questions:

1. Informing how statewide transportation plans, policies, and strategies may reflect or impact regional economic/demographic contexts.
2. Recommending potential study regions for specific policy consideration.
3. Identifying potential themes and scenarios to consider during the updates to the 2006 OTP and 1999 OHP.

### Recommended Study Regions

Source: EcoNorthwest



## 2 | EMPHASIZING REGIONAL INDICATORS OF TRANSPORTATION DEMAND IN OREGON

### Structural drivers

- It is critical for the OTP/OHP process to identify the relationship between transportation demand and economic growth

Transportation demand is related to the growth of a region's economy, but the relationship is complex. Investments in transportation infrastructure inform understanding of economic productivity.

Our recommendation is that the appropriate framework for the OTP/OHP is to assume transportation demand (i.e., vehicles miles traveled) and economic growth are interrelated. Policy objectives can be nuanced: for example attempting to reduce transportation demand while benefiting a region's economy.

#### Oregon VMT and GDP growth, 2000 to 2018

Source: Federal Highway Administration, Bureau of Economic Analysis



### Population and labor force changes

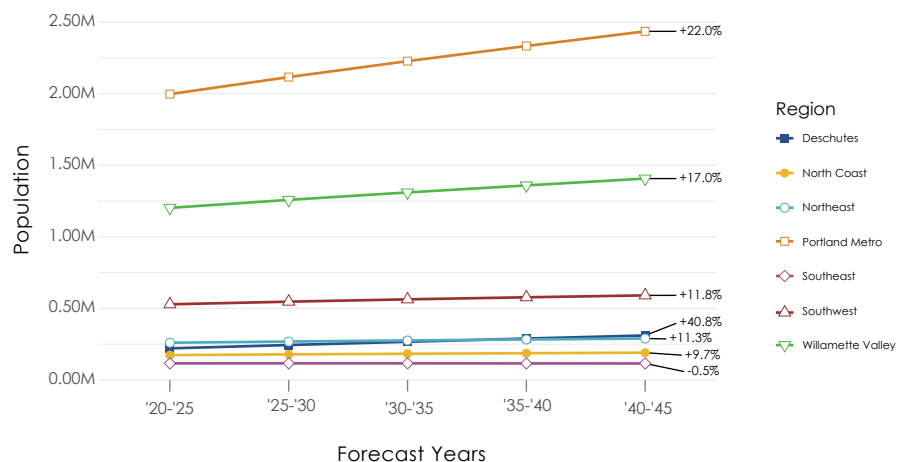
- Population growth, an aging population, and urbanization are important factors relevant to OTP/OHP planning and scenario development.

Several key findings are relevant to the upcoming OTP/OHP process:

- The population has grown by 24% since 2000. ~8% additional growth is expected by 2030.
- The population statewide is aging. This is particularly important in rural communities as they become more reliant on an efficient transportation network to access lifeline services.
- As congestion rises with urbanization and the increasing remoteness of affordable housing, network reliability suffers.

#### Forecasted population growth by region 2020 to 2045

Source: Portland State University, Population Research Center.



## Changes in Oregon's industrial composition

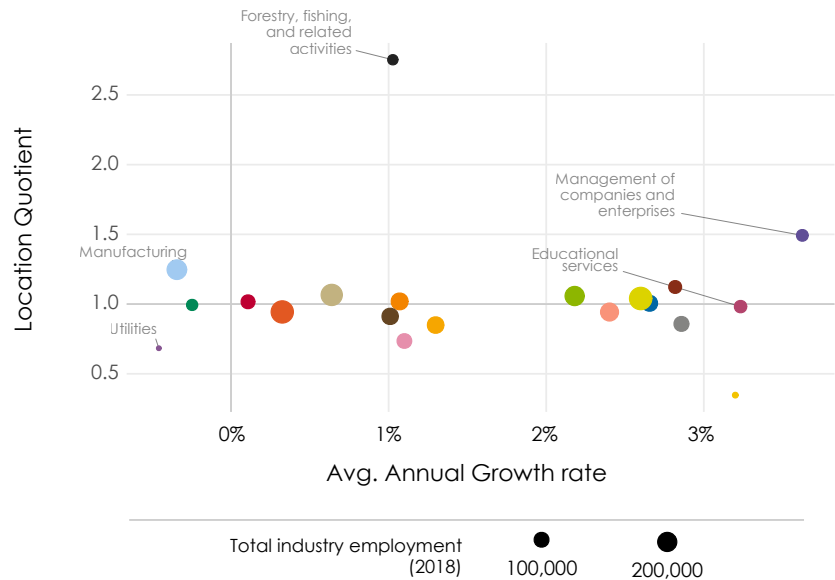
- Industrial composition affects how a region's economy responds to negative shocks or downward swings in the business cycle
- Industry mix impacts regional transportation demand

Several trends in industrial mix are relevant for the OTP/OHP:

1. Oregon's economy is becoming more diversified, growing more rapidly in services and technology.
2. Rural regions face challenges with changing economic conditions while diversifying economies in the Portland Metro and Central Oregon regions helps them withstand economic shocks.
3. The economic shock from COVID-19 reveals growing disparities in our regional economies. Oregon's economy is volatile, outperforming in periods of growth, but suffering more in periods of contraction.

### Industry Concentration and Growth in Oregon, 2010–2018

Source: U.S. Bureau of Economic Analysis



Note: Location Quotient indicates how concentrated an industry is in Oregon compared to the national average. LQ's over 1 indicate more concentration in that industry than the national average.

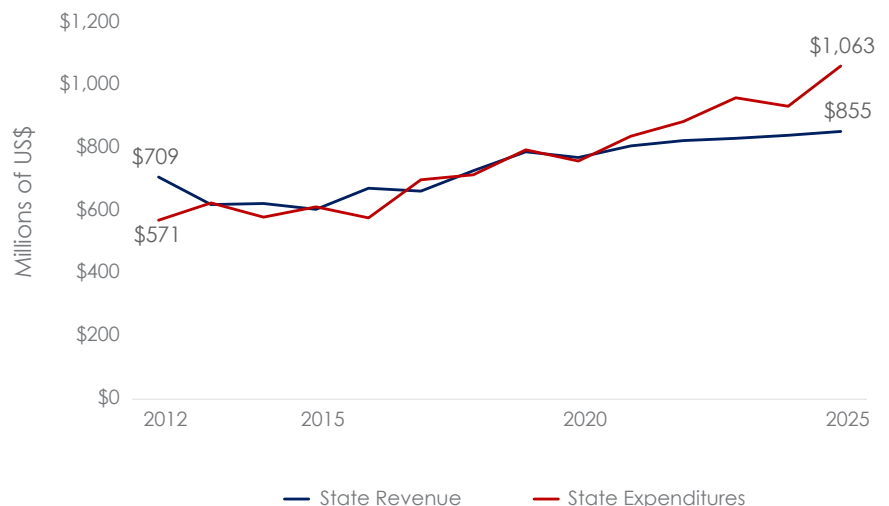
## Aligning changing demand with transportation financing

- Oregon should consider new approaches to evaluate statewide and regional transportation demand while balancing costs and revenues to maintain existing public assets

1. Increasingly, existing tax revenue instruments will be inadequate for financing Oregon's transportation infrastructure.
2. We recommend that Oregon consider new approaches for evaluating statewide and regional transportation demand to prioritize investments.
3. Alternative financing mechanisms that serve multiple goals of efficiently raising revenues while moderating demand should be an important consideration for sustainability.

### Forecast of State Highway Fund Balance (May 2020)

Source: Oregon Department of Transportation





## Important themes to consider in scenario planning

External factors affect the drivers of transportation demand and supply. The following themes can be used to guide the process of exploring choices.

**Land use and density.** Changes in land use affect where people live and how they travel.

**Changing nature of freight.** Changes in purchasing modes and innovations in distribution systems are driving new services that rely heavily on the transportation network.

**Structural economic changes.** Changes in Oregon's industrial composition will impact the types of investments that will need to be made to support future economic growth.

**Economic Resilience.** Investing in resilient infrastructure will help the state's economy recover more rapidly after a major event, such as a Cascadia Subduction Zone earthquake.

## 3 | IMPLICATIONS FOR OTP/OHP

### Transportation planning through a regional perspective

- Demographic and economic factors vary by region, resulting in different policy implications for long-term transportation planning.
- The State of Oregon should consider including a data-driven approach to incorporate regional analysis in the OTP/OHP process.
- Our recommendation is to use combined Public Use Microdata regions as a guide to aggregate regions to ensure reproducibility and harmony across all metrics used in the OTP/OHP process.

### Drivers of transportation demand in Oregon

- Understanding the distribution of population growth is key to identifying the demographic changes that lead to effective regional policies and infrastructure investment.
- All regions in Oregon are facing diverse transportation challenges. The increasing demands on urban infrastructure, along with health and safety concerns for rural residents should be considered as part of the OTP/OHP process.

- The changing mix of industries around the state will also affect the type of transportation investment that will be needed. The OTP/OHP should account for these regional changes to understand how to build scenarios that can help prioritize investments.

### Economic factors impacting the supply side

- Total lane miles have remained flat for the state's facilities, while population growth and environmental changes have placed increasing stresses on the state's aging roads and bridges.
- Changing system user needs will impact the efficacy of existing revenue instruments and will not be to be enough to maintain enough investment in the state's transportation infrastructure in the future.
- With declining revenues and increasing demand, increasing costs, and aging infrastructure, the OTP/OHP process should emphasize strategies that guide prioritization of transportation investments and demonstrate which investments result in the largest public benefits.



OREGON DEPARTMENT OF TRANSPORTATION

# OREGON ECONOMIC & DEMOGRAPHIC REGIONS WHITE PAPER

JULY 2020





OREGON DEPARTMENT OF TRANSPORTATION

# Oregon Economic & Demographic Regions White Paper

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July 2020

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## EXECUTIVE SUMMARY

This white paper combines the demographic and economic regions evaluation of how these two key factors have and will continue to influence the transportation system use and needs within the State of Oregon. The purposes of this white paper are to define historical and projected drivers that affect demand for transportation in Oregon and Evaluate relative strengths and weaknesses of utilizing future regional versus statewide specific policies.

The results of this white paper are intended to be use for:

1. **Informing how statewide transportation plans**, policies, and strategies may reflect or impact regional economic and demographic contexts;
2. **Recommending potential study regions** for specific policy consideration; and,
3. **Identifying potential themes and scenarios** to be consider during the updates to the 2006 Oregon Transportation Plan (OTP) and 1999 Oregon Highway Plans (OHP).

The white paper includes a summary brochure, executive summary, a main report, and a technical appendix. The summary brochure is intended to inform advisory committee members for the OTP/OHP update of the key findings related to demographic and economic trends and drivers. The executive summary and report provide a deeper understanding of the subjects, and the technical appendix provides a detailed compendium of the information used to support the findings of the white paper.

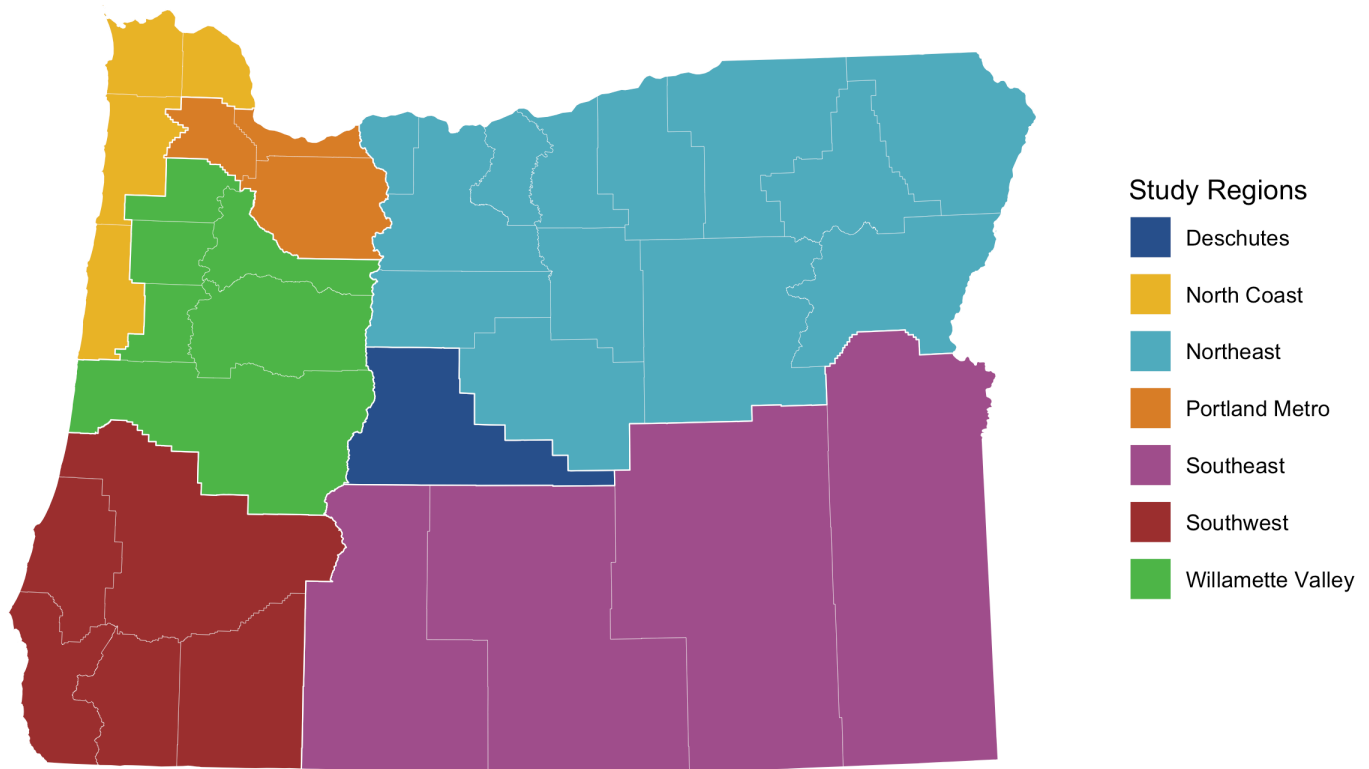
### Bringing a regional perspective to Oregon's transportation planning

Oregon is revising its Transportation and Highway plans (OTP/OHP), which are intended to guide the state's future transportation investments. Based on several factors explored during this study, this paper recommends considering a regional approach in the OTP/OHP for the following reasons:

- **Oregon's transportation infrastructure is foundational.** Regional economic health and individual quality of life depend on its function. Oregon's state-owned transportation system connects almost every community in the state. Each of the state's regions have unique challenges based on their population, geography, access, and existing infrastructure.
- **Investment decisions must be made intentionally.** An explicit understanding of the interactivity of the system with other key systems that support societal well-being increase system efficiency. Efficient transportation networks reduce costs to move labor, goods, and services through the network.

## Recommended Study Regions

Source: ECONorthwest



- **Transportation systems are key to local economic development.** Improvements should take into consideration changes in demographic and economic activity in a region that will influence the demand for, and the type of investments needed. Additionally, regional and local planning allows for coordination between public agencies to ensure that unique transport and accessibility needs are accounted for in the planning process.

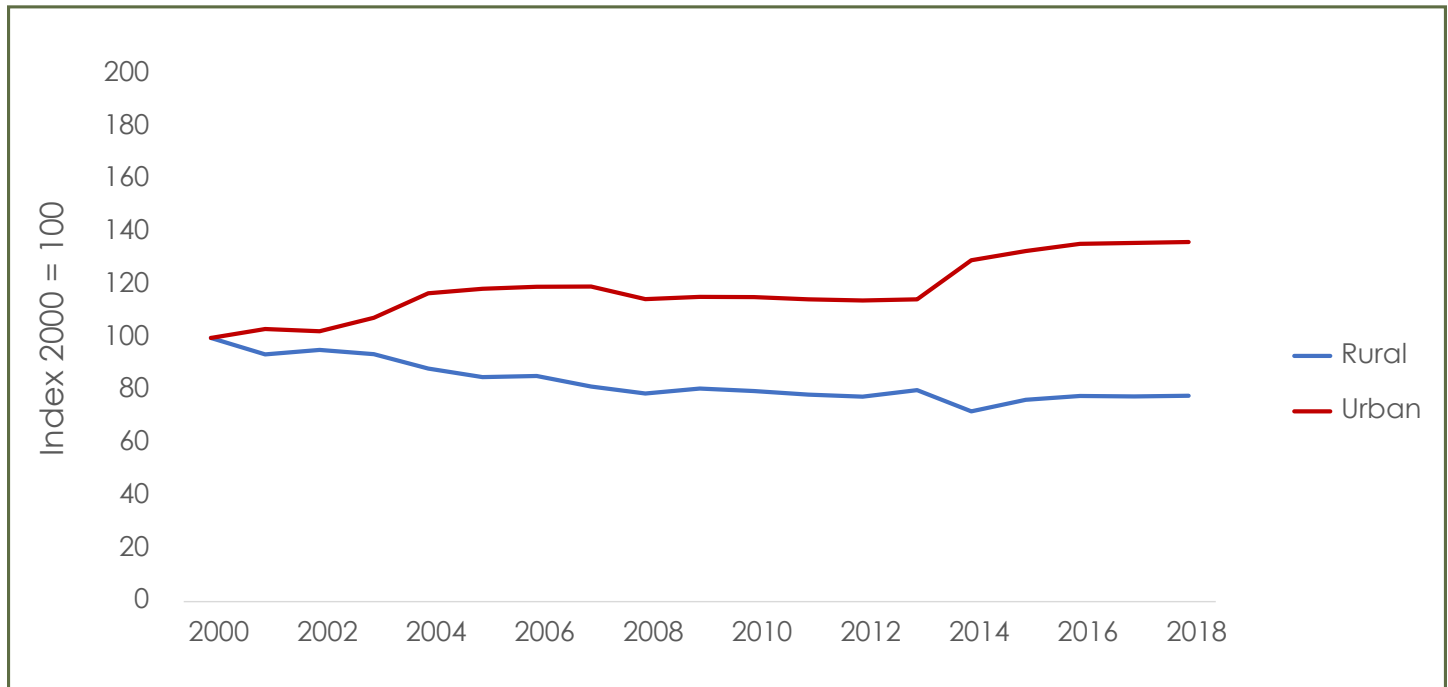


# EMPHASIZING REGIONAL INDICATORS OF TRANSPORTATION DEMAND IN OREGON

## Structural drivers

### Oregon VMT and GDP growth, 2000 to 2018

Source: Federal Highway Administration, Bureau of Economic Analysis



Transportation demand is integrally related to the growth of the regional economy. Investments in transportation infrastructure are an important input to understand the productivity of a region's economy. However, the relationship between transportation demand and growth in economic activity is complex, and as a result, there is not consensus around the strength or directionality of the relationship. There are four thoughts about the relationship of transportation demand and the economy:

- Changes in transportation demand "cause" changes to economic activity
- Changes in economic activity "cause" changes to transportation demand

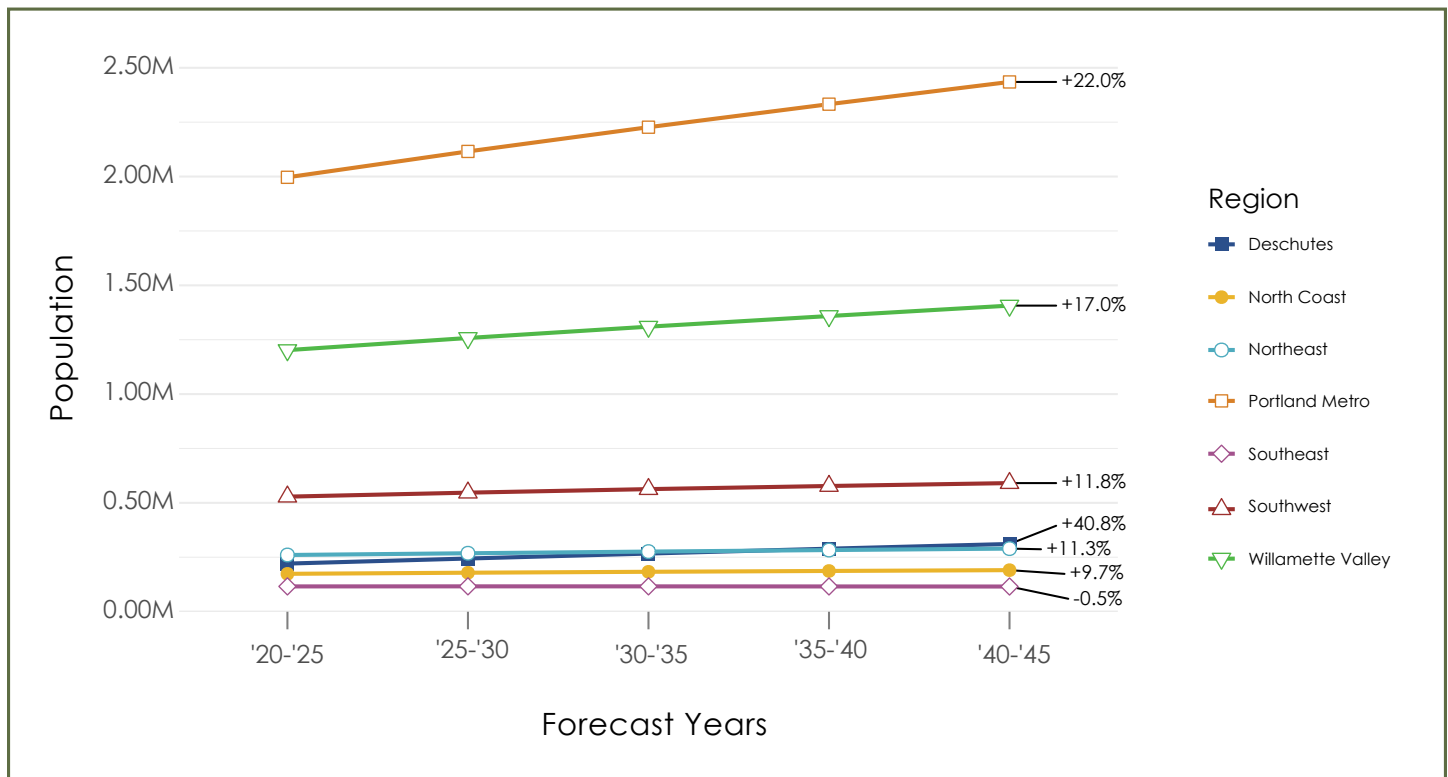
- The relationship between transportation demand and economic activity is bidirectional
- There is no direct relationship

Based on the existing literature and our professional experience, we believe the appropriate framework the OTP/OHP is to assume the relationship is bidirectional. That is, transportation demand and economic growth are interrelated. Policies can be nuanced in objectives, for example attempting to meet the goals of reducing transportation demand while benefitting the regional economy.

## Population and labor force changes

### Forecasted population growth by region 2020 to 2045

Source: Portland State University, Population Research Center.



Though there are many important components of demography, this white paper focuses on several key indicators that closely align to regional transportation demand. Population growth, an aging population, and urbanization are the three factors this white paper considered to be most relevant to OTP/OHP planning and scenario development. During this study, we determined that there are several key findings relevant to the upcoming OTP/OHP process:

- Oregon's population has grown rapidly. Since 2000, Oregon's population has increased rapidly, growing by 24 percent (around 815,000). Almost all that growth has been clustered in regions along the I-5 corridor. The State of Oregon projects that another 341,000 individuals (~8 percent) living in the state by 2029, with most of that growth occurring due to in-migration.
- An aging population has implications for regional labor force and mobility needs. Outmigration has left many rural areas

of the state with an aging population and slower expected growth in the labor force. This segment of the population will be more reliant on an efficient transportation network to access lifeline services. Additionally, slower growth in the labor force can result in lower income growth and fewer businesses, which contribute to outmigration.

- Urbanization has both benefits and costs for Oregon. Increasing commuting patterns suggest that people are moving to the Portland Metro to take advantage of economic opportunities. The concentration of traffic in the region is increasing congestion levels on the existing infrastructure and decreasing reliability of the network. Additionally, rapid population increases are exacerbating housing affordability issues in the state, which affect congestion as people are forced to commute further from affordable locations.

## Changes in Oregon's industrial composition

### Industry Concentration and Growth in Oregon, 2010–2018

Source: U.S. Bureau of Economic Analysis



Industry composition is important to understanding how regional economies are changing over time. From a broader lens, change in industrial composition affect how a region's economy will respond to negative shocks or downward swings in the business cycle. Understanding industry mix is also important within the context of OTP/OHP because it will impact the demand for transportation compared to the current system demand statewide. This study found several trends that are relevant for the OTP/OHP:

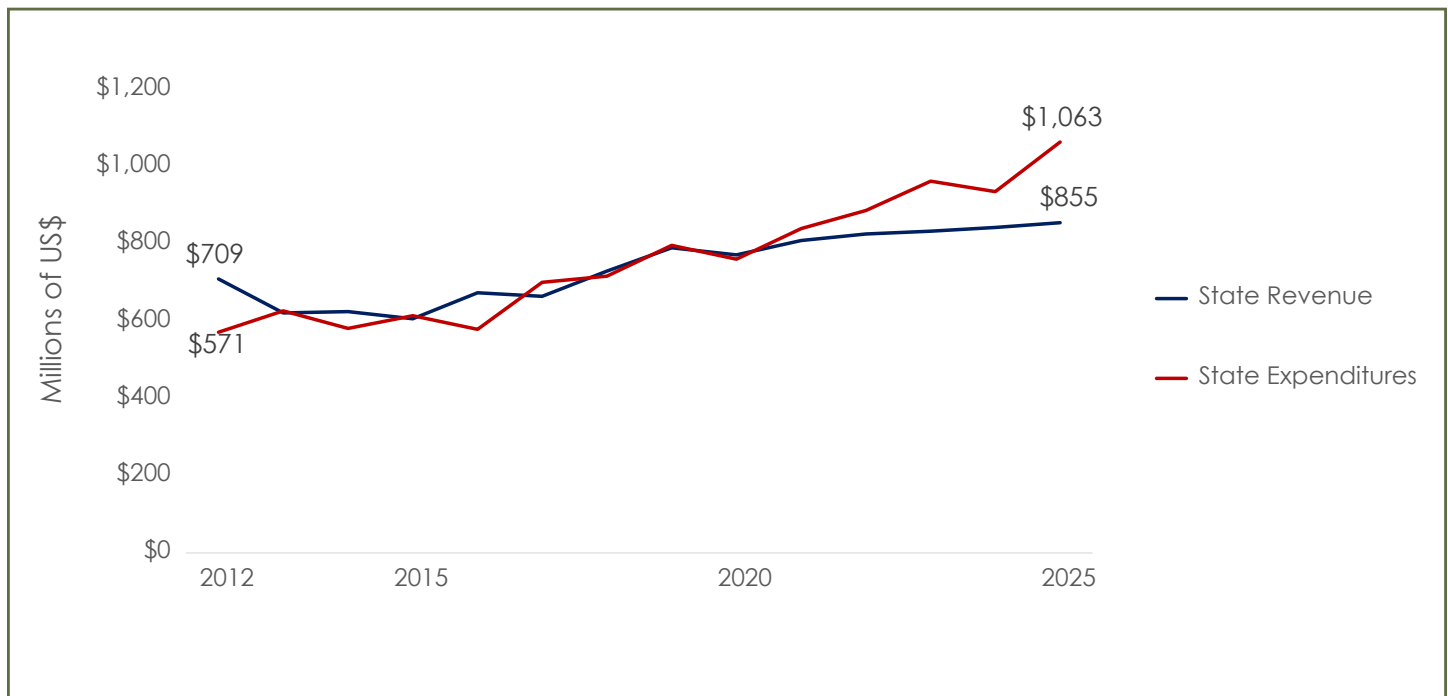
- Oregon is shifting toward a service-based economy. Oregon's economy has traditionally been reliant on trade-dependent industries including natural resources and manufacturing, which led to wider swings in employment during recessionary and expansionary periods. More recently, Oregon has seen increasing specialization in professional services and technology.
- Oregon's economy is also becoming more diverse. While rural regions of the state face ongoing and future challenges with changing economic conditions that impact the local labor force, the Portland Metro and Central Oregon are becoming increasingly diverse. Industrial diversity is important because it helps a region's economy withstand economic shocks.
- Despite these changes, some of Oregon's economic regions face headwinds. The economic shock from the COVID-19 pandemic demonstrates that there are growing the disparities in Oregon's regional economies. Many benefits of economic diversification have accrued to the Portland Metro. Regions around the state that are dependent on natural resources and tourism as primary industries are expected to experience much slower recoveries.



## Aligning changing demand with transportation financing

### Forecast of State Highway Fund Balance (May 2020)

Source: Oregon Department of Transportation



Existing tax revenue instruments will be increasingly inadequate for financing Oregon's transportation infrastructure in the future. As part of the OTP/OHP, we recommend that Oregon consider new approaches for evaluating statewide and region transportation demand while balancing costs and revenues to maintain and enhance existing public assets. Additionally, developing alternative financing mechanisms that serve multiple goals of efficiently raising revenues while moderating demand should be an important consideration for developing a sustainable transportation system.

## Bringing these indicators together for scenario planning

To help decision-makers understand their choices about policies and investment choices for operating and maintaining the transportation system, it will be critical to understand how exogenous (and uncertain)

forces will affect the drivers of transportation demand and supply. While the following four themes don't provide specific answers, they enforce discipline in the process of exploring choices, so that policies can be as thoughtful and comprehensive as possible.

- Land use and density. Changes in how land is used and where people live will affect the way people choose to travel
- Changing nature of freight. Changes in purchasing modes are driving new services that rely heavily on the transportation network.
- Structural economic changes. Emerging industries and decline of traditional industries in Oregon will impact the types of investments that will need to be made to support future economic growth.
- Economic Resilience. Investing in transportation infrastructure that is resilient to natural disasters and climate change will help the state's economy recover more rapidly after a major event such as a Cascadia Subduction Zone earthquake.

## Implications for OTP/OHP

Based on the findings developed through this white paper, the following implications are recommended for consideration during the OTP/OHP update:

### Transportation planning through a regional perspective

- Many of Oregon's demographic and economic changes have been regional and have policy implications for long-term transportation planning
- The State of Oregon should consider including a data-driven approach to incorporate regional analysis in the OTP/OHP process
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## Drivers of transportation demand in Oregon

- Understanding the distribution of population growth is key to identifying the demographic changes that lead to effective regional policies and infrastructure investment
- All regions in Oregon are facing diverse transportation challenges. The increasing demands on urban infrastructure, along with health and safety concerns for rural residents should be considered as part of the OTP/OHP process.
- The changing mix of industries growing and declining around the state will also affect the type of transportation investment that will be needed. The OTP/OHP should account for these regional changes to understand how to build scenarios that can help prioritize investments.

## Economic factors impacting the supply side

- Total lane miles have remained flat for the state's facilities, while population growth and environmental changes have placed increasing stresses on the state's aging roads and bridges.
- Changing consumer preferences will impact the efficacy of existing revenue instruments and will not be to be enough to maintain enough investment in the state's transportation infrastructure in the future.
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## INTRODUCTION

This white paper combines the demographic and economic regions evaluation of how these two key factors have and will continue to influence the transportation system use and needs within the State of Oregon. The purposes of this white paper are to define historical and projected drivers that affect demand for transportation in Oregon and Evaluate relative strengths and weaknesses of utilizing future regional versus statewide specific policies.

The results of this white paper are intended to be use for:

1. **Evaluate relative strengths and weaknesses** of utilizing a regional-focus to compare statewide-specific policies.
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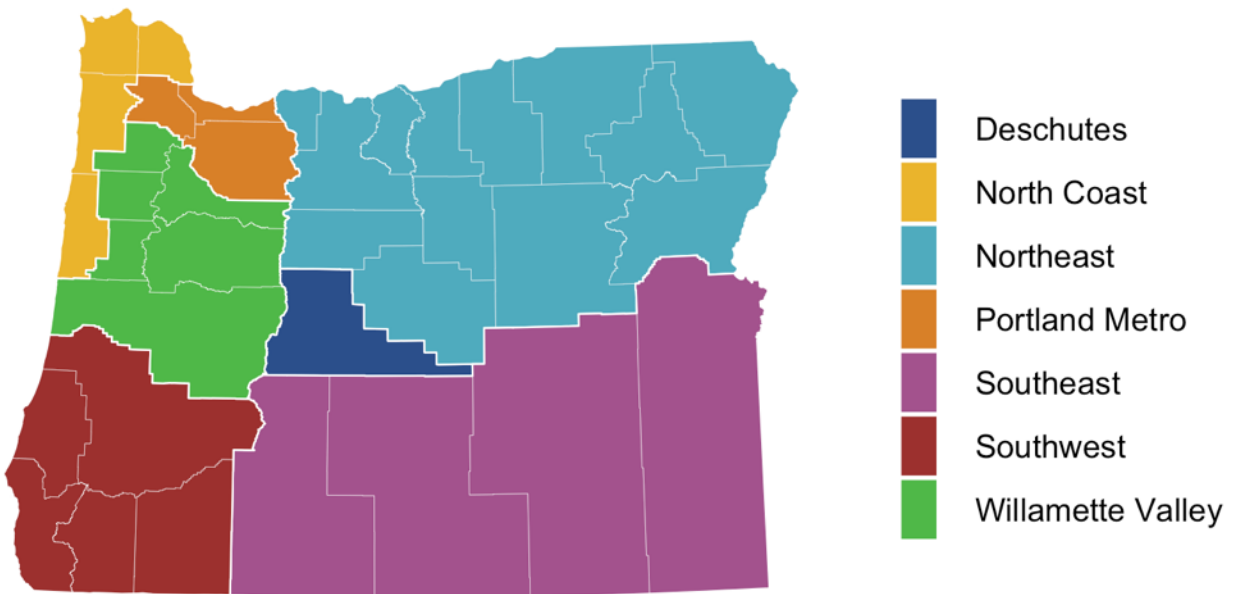
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- **Oregon's transportation infrastructure is foundational.** Regional economic health and individual quality of life depend on its function. Oregon's state-owned transportation system connects almost every community in the state. Each of the state's regions have unique challenges based on their population, geography, access, and existing infrastructure.
- **Investment decisions must be made intentionally.** An explicit understanding of the interactivity of the system with other key systems that support societal well-being increase system efficiency. Efficient transportation networks reduce costs to move labor, goods, and services through the network.
- **Transportation systems are key to local economic development.** Improvements should take into consideration changes in demographic and economic activity in a region that will influence the demand for, and the type of investments needed. Additionally, regional and local planning allows for coordination between public agencies to ensure that unique transport and accessibility needs are accounted for in the planning process.

## EMPHASIZING REGIONAL INDICATORS OF TRANSPORTATION DEMAND IN OREGON

### Structural drivers

#### **Oregon Vehicle miles traveled (VMT) and Gross domestic product (GDP) growth, 2000 to 2018**

Source: Federal Highway Administration, Bureau of Economic Analysis



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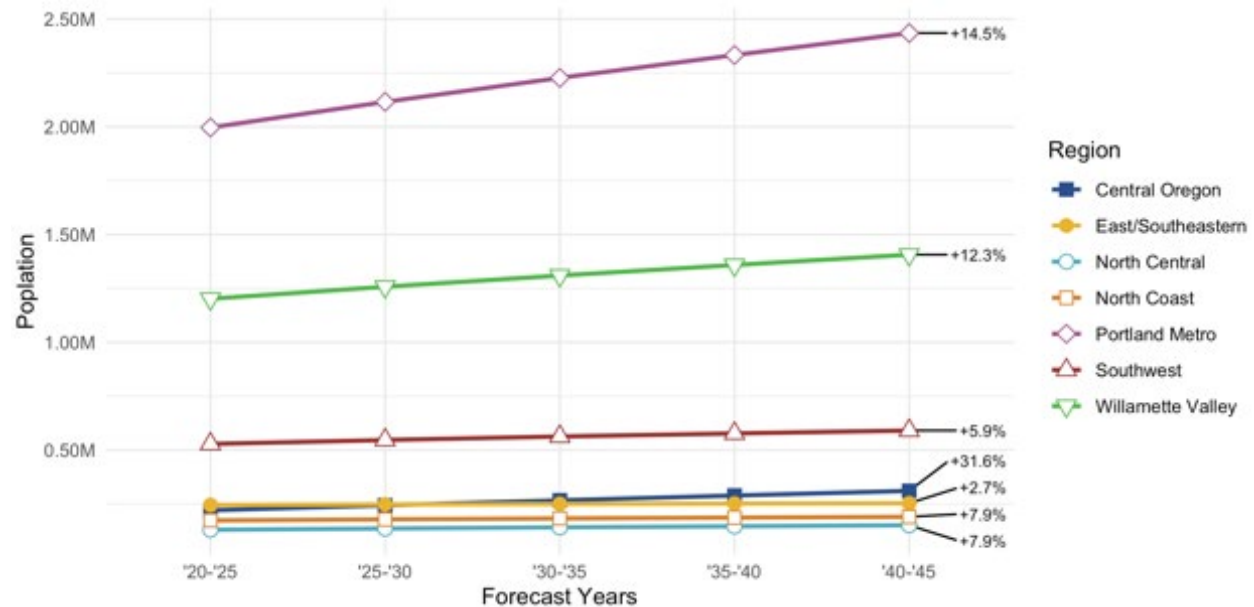
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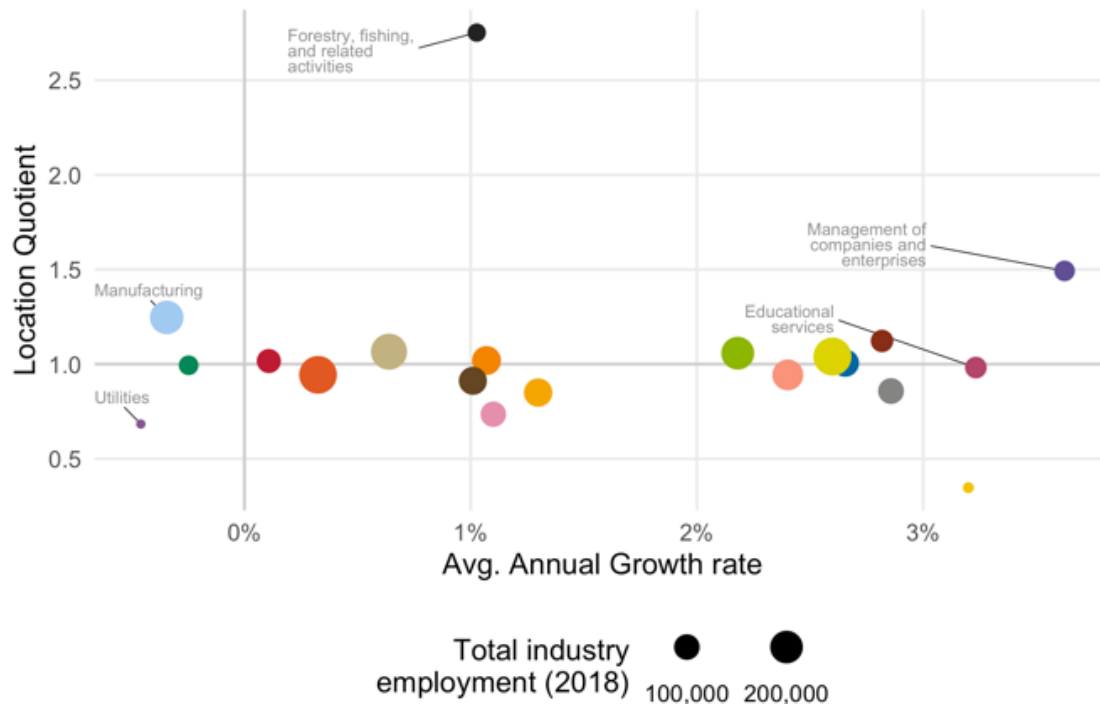
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<sup>1</sup> Oregon's short-term population forecast through 2029.  
<https://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx>

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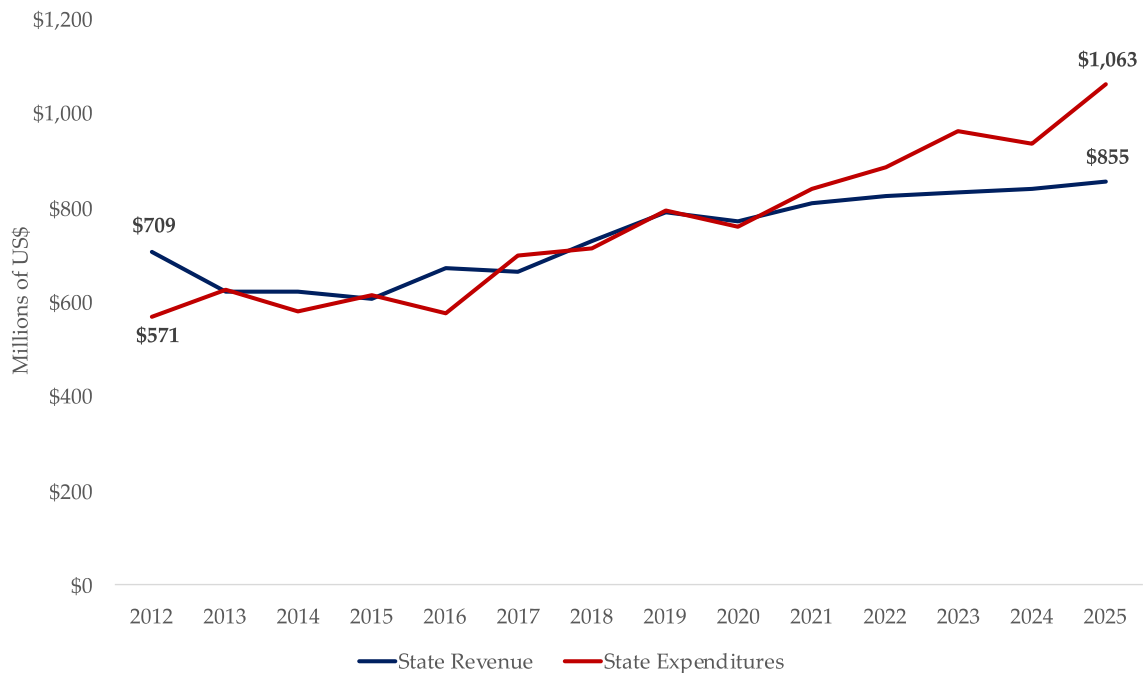
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### Implications for OTP/OHP

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#### Transportation planning through a regional perspective

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- The State of Oregon should consider including a data-driven approach to incorporate regional analysis in the OTP/OHP process
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- The changing mix of industries growing and declining around the state will also affect the type of transportation investment that will be needed. The OTP/OHP should account for these regional changes to understand how to build scenarios that can help prioritize investments.

#### Economic factors impacting the supply side

- Total lane miles have remained flat for the state's facilities, while population growth and environmental changes have placed increasing stresses on the state's aging roads and bridges.
- Changing system user needs will impact the efficacy of existing revenue instruments and will not be to be enough to maintain enough investment in the state's transportation infrastructure in the future.
- With declining revenues and increasing demand, increasing costs, and an aging infrastructure, the OTP/OHP process should emphasize strategies that guide prioritization of transportation investments and demonstrate which investments result in the largest public benefits.

## CHAPTER 1. TRANSPORTATION PLANNING THROUGH A REGIONAL PERSPECTIVE

Oregon is preparing to review and update its long-range Transportation and Highway plans, which serve as a guide for establishing priorities for transportation investments. Since the last update in 2007, Oregon has experienced two major recessions that had a transformative effect on the state's economy, moving further away from traditional industries in extraction, toward an economy based in services. During that time, the state has seen a rapid growth in population that has put pressures on much of the state's existing infrastructure from housing to highways. This white paper is intended to serve as a supporting document for the Transportation and Highway Plans by describing recent demographic and economic trends affecting demand for the state's highway infrastructure, along with anticipated challenges for financing the operations and maintenance of that infrastructure.

Oregon's transportation infrastructure is foundational. Regional economic health and individual quality of life depend on its function. Assessing investments in transportation systems in this context is inherently challenging. Benefits of investments accrue over time, and for many improvements, over the long term. And, over the long-term, the drivers of transportation demand will change in ways that may have little to do with the transportation system itself.

Nonetheless, investment decisions must be made intentionally, with an explicit understanding of the interactivity of the system with other key systems that support societal well-being, and with a goal of increasing system efficiency. Efficient transportation networks reduce costs across many economic sectors by minimizing the time needed to move labor, goods, and services through the network. To optimize investments over a planning horizon, scenarios are a helpful planning tool to understand and quantify the tradeoffs (benefits and costs) of different policies and investments and inform decisions about which investments best increase efficiency of the overall system.

This chapter explores the feasibility and effectiveness of taking a regional approach when planning for transportation needs, given the complexity of this system interactivity. ODOT currently has several administrative and advisory regions to provide support for local and regional issues related to the state transportation system. Previously, Oregon's Highway and Transportation Plans (OTP & OHP) provided guidance for regional transportation plans but did not explicitly analyze regional changes in transportation demand. Would an evaluation at the regional level improve planning outcomes?

Although the benefits and costs of transportation investments are often thought of in aggregate, there are plenty of reasons to explore transportation policy at the regional levels. Benefits and costs accrue differently in different regions, based on local economic, demographic, and other system variables. And, because transportation systems are key to economic development, transportation improvements should take into consideration changes in demographic and economic activity in a region that will

influence the demand for, and the type of investments needed. Additionally, regional and local planning allows for coordination between public agencies to ensure that unique transport and accessibility needs are accounted for in the planning process.

This chapter outlines the rationale for considering the OTP and OHP through a regional lens to improve the decision-making and scenario planning that will inform regional and local transportation plans, better account for benefits and costs, and better inform decisions about improving system efficiency.

## Transportation policy analysis - state vs. region and local

Oregon's state-owned transportation system connects almost every community in the state. Ensuring that this large multimodal system supports the state's diverse transportation needs is complex. Each of the state's regions have unique challenges based on their population, geography, access, and existing infrastructure. Maintaining a robust multimodal system that intersects with the distinct challenges across Oregon's communities requires a thoughtful approach to allocating the state's scarce resources.

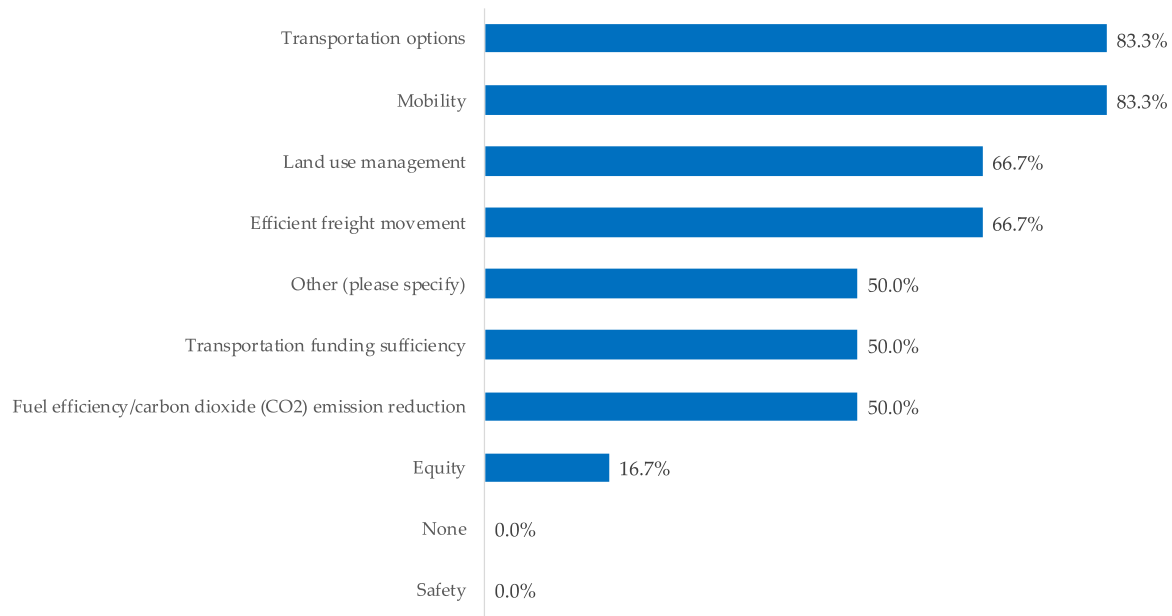
Outside of Oregon's borders, this approach to transportation planning has seen an increase in interest with an increasing number of Regional Transportation Organizations that help support statewide planning processes for non-metropolitan areas. Within Oregon, there has also been more interest in formalizing the inclusion of regional approach coordination for the statewide transportation and highway planning process, part of which is the impetus for this white paper. The size of the state's transportation network combined with the diversity of the state's communities makes selecting which policies to evaluate at a regional or local level challenging.

Initial exploration by ODOT staff suggests that there is some agreement about which policies could be effectively explored through a regional lens and incorporated into the statewide transportation and highway planning process. As part of this project, ODOT staff were surveyed to see which policies they believe are most appropriate to consider at the regional level. Results indicate that transportation options (e.g. tolling), mobility, and land-use decisions all benefit from consideration of regional and local needs to help inform statewide decisions around future planning.



**Figure 1. Responses to which policy topics are most likely to be regionally based**

Source: Oregon Department of Transportation, results of survey of ODOT staff, 2020



The results of the survey help us understand the types of policies that may be effectively explored at a regional level, but they do not provide any specific guidance on how to construct regions within Oregon. There are political, economic, and analytic reasons answering this question is challenging. For the purposes of this white paper, we allow the availability and limitations of existing data to inform and narrow the possible regions. This ultimately allowed for discussions about whether and how a regional approach to transportation planning could be analytically incorporated in the state's transportation and highway planning process. In the following section, we describe our process for evaluating the rationale and approach for developing study regions.

### Preferred approach for developing study regions

As a first step, we developed a set of study regions, to explore how regional data could be organized and used to influence transportation planning. Although there was no formal framework established for this evaluation, we used several metrics to guide our thinking about whether and how to incorporate regional and local trends into this analysis. These also guided our approach to developing regions:

- First, and arguably most important, evaluating the demographic and economic data used to understand changes in transportation demand to determine if trends can be differentiated from historical data and if projections differ going forward. The characteristics of households and businesses in a region that lead to expected changes in transportation demand should have enough variation across regions to determine the need for regional policies.

- Second, the metrics used to measure regional characteristics need to align across any proposed study regions. This ensures that any demographic or economic characteristics used to compare existing or future demand for transportation are comparable across regions.
- Third, data need to be publicly available. Although this can limit the scale and quality of data used for the analysis, it ensures transparency and reproducibility as part of the public process, and ultimately for use in future projects such as OTP/OHP.

### **Using Public Use Microdata Sample (PUMS) for study regions**

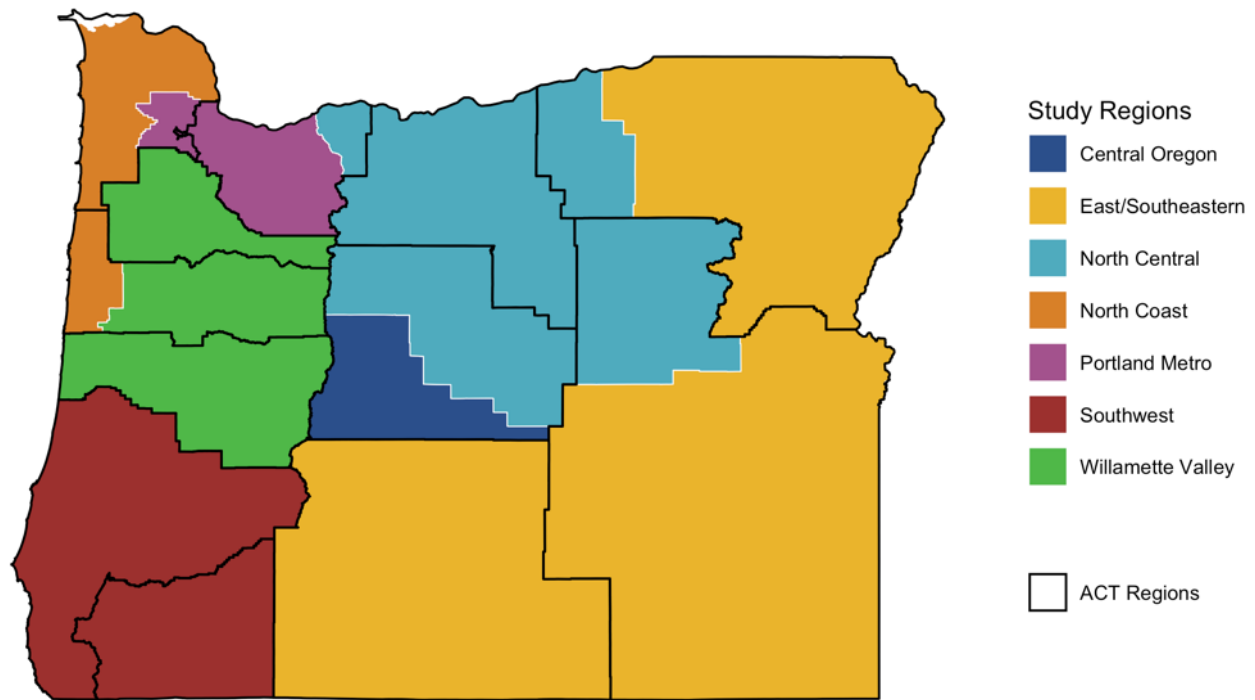
After evaluating the conditions described above, we determined that U.S. Census boundaries would be most effective for developing regions to study demographic and economic characteristics. For this analysis, we relied on the 1-year (2010 through 2018) U.S. Census American Community Survey (ACS) microdata called Public Use Microdata Sample (PUMS) to calculate household and population data. The PUMS microdata is an ideal dataset for this analysis because it allows us to calculate detailed population-level and household-level estimates across regions and over time.

The most specific geography available with PUMS data is a PUMA, or Public Use Microdata Area. These regions are realigned based on population growth to correspond with the Decennial Census. For the most recent Decennial Census, the U.S. Census generally defines these regions as having a population of roughly 100,000 individuals. In high population regions, PUMAs closely correspond with counties. Smaller regions are slightly more difficult to work with because a rural PUMA may include several counties, or parts of multiple counties.

As of the 2010 Census, Oregon has 31 PUMAs; the analysis was limited to stand-alone or combined PUMA geographies. Many of the geographically larger PUMAs are concentrated in smaller population centers that share the same transportation infrastructure. For this analysis we considered multiple regional configurations, ultimately selecting to aggregate PUMAs to seven regions, which broadly align with Oregon's economic areas as defined by the Governor's Regional Solutions. Although this approach has some limitations, it allowed us to aggregate demographic and economic data from various datasets to the same regions. The result is a set of data that allow us to identify trends in key indicators that are important to transportation planning.

**Figure 2. Study regions with ODOT Area Commissions on Transportation (ACT) regions**

Source: U.S. Census and Oregon Department of Transportation



The regions selected for this analysis are broader than ODOT's Area Commissions on Transportation (ACT) regions, which are used to advise the state on regional and local transportation issues. Although they do not align, our proposed study regions do overlap with many ACT regions, which allow ODOT to incorporate information obtained from those advisory groups into the broader analysis on regional economic and demographic trends. The benefit of this approach is integrating qualitative and quantitative information to better evaluate current and future transportation needs around the state.

### Using PUMAs to understand regional commute patterns

A key aspect of regional transportation planning is understanding how the existing transportation network is being used. Although there are several tools to do this, one key measure is to examine regional commuting patterns. These commute trips are important because they have a direct relationship to the regional economy and where households tend to locate relative to their place of employment. Population decentralization beginning in the mid-20<sup>th</sup> century led to an increasing reliance on the transportation network and impact the types of investments needed to support the highway system.

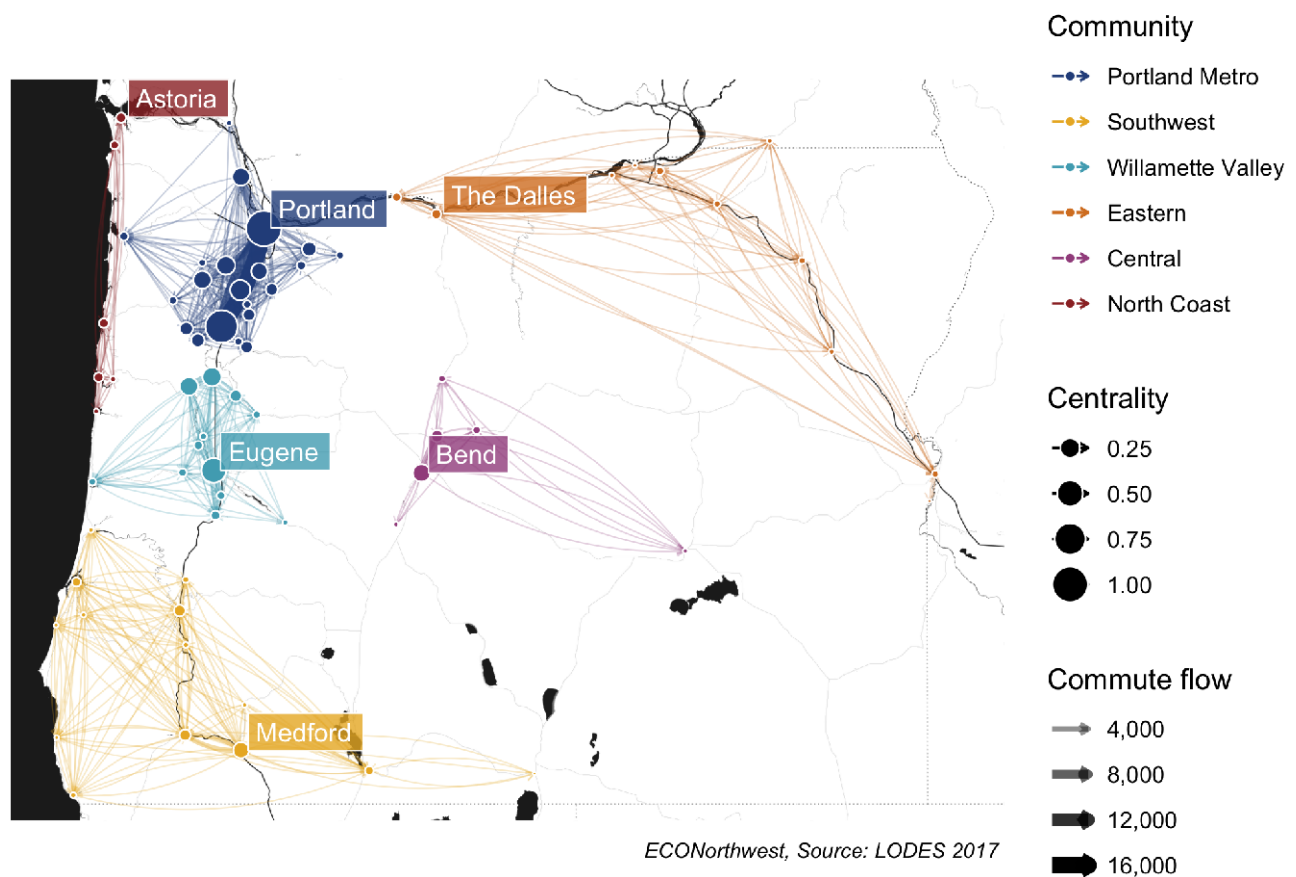
As a result, commute patterns can provide important context for policies directly related to transportation planning, such as mobility, mode use and congestion. However, understanding how these policies broadly intersect with population centers helps inform a broader set of policy decisions around land-use, housing, and natural

resource management. When viewed holistically, these relationships help decision-makers the ability to prioritize investments between and within regions that can yield the most benefits for citizens.

As part of this analysis, we used Longitudinal Employer-Household Dynamics (LEHD) data from the U.S. Census data to identify patterns in commuting and how they have changed since 2002 within each of the study regions developed for this white paper. The maps below display identified intraregional patterns based on analysis of the LEHD data in 2017 and the charts show the largest changes in commuting patterns over a 15-year period. These clusters show the interrelatedness of communities in population centers based on commuting ties and help provide context for understanding how commute distances and job density intersect.

**Figure 3. Regional Commute Patterns – 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2017.

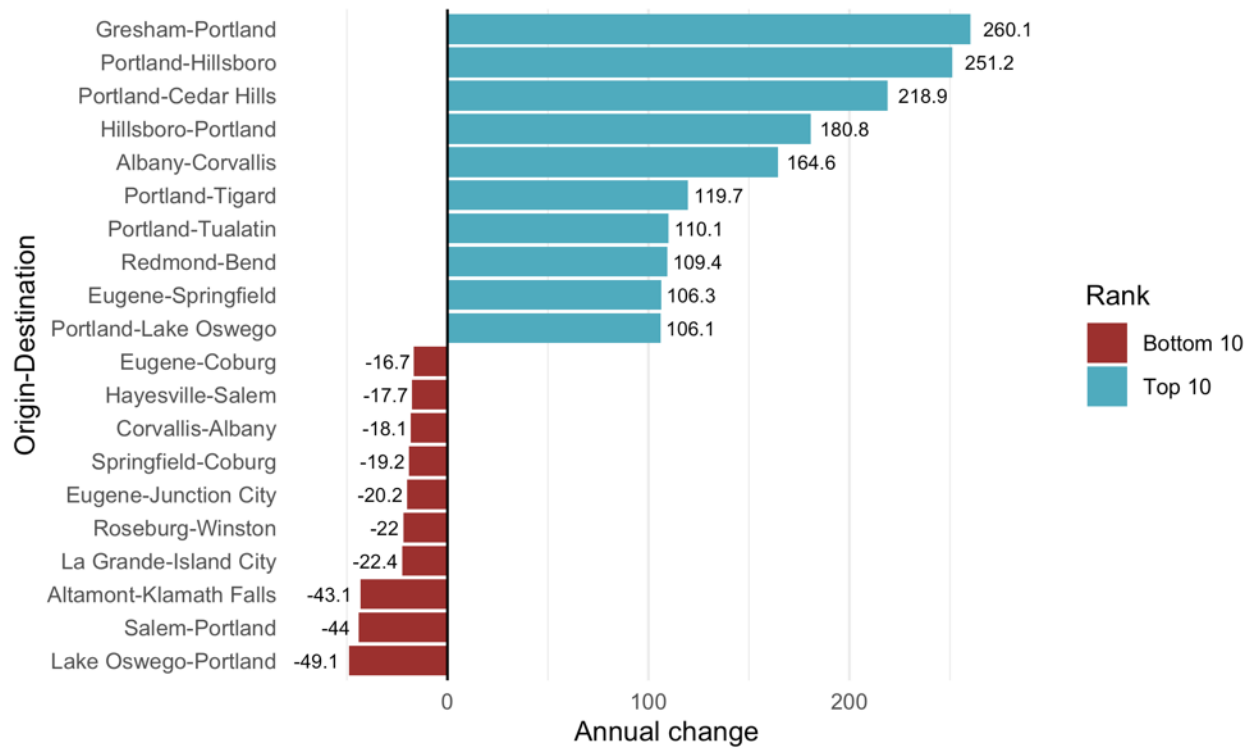


**Notes:**  
**Community:** The grouping of nodes that display a statistically significant relationship with each other based on the volume of flow between them. This map does not show commutes between separate communities.  
**Centrality:** The degree to which a node serves as a major hub to other nodes within the network. Higher values denote more connections, and the node with the highest centrality within its community is labelled.



**Figure 4. Annual Average Change in Commute Flows in Oregon 2002 to 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2017.



In the following chapter, we explore changes in demographic and economic changes in Oregon that affect the commuting patterns displayed above, along with other drivers of demand for the transportation network. Because of data availability, many of those characteristics are examined through the lens of household and employment information. However, understanding the transportation industry itself is an important component of transportation planning, we include a brief discussion of freight transportation in the section on economic drivers. In Chapter 3, we discuss expected challenges of financing Oregon's transportation infrastructure. Chapter 4 pulls the previous three chapters together to describe scenarios that ODOT can use to policies and capacity investments for different growth scenarios.

## Recommendations on regional analysis

One of the primary objectives of this white paper is to provide guidance on the benefits of conducting scenario and policy analysis at the regional level for the forthcoming OTP and OHP studies. Based on the evaluation conducted in this study, there is reliable data that allows for differentiation between regions and value to applying a regional lens to the OTP and OHP studies. Additionally, the demographic and economic data are enough to help support a robust approach to scenario planning that can weigh the benefits and costs for various planning strategies and ultimately identify scenarios that improve the efficiency of the state's transportation system.

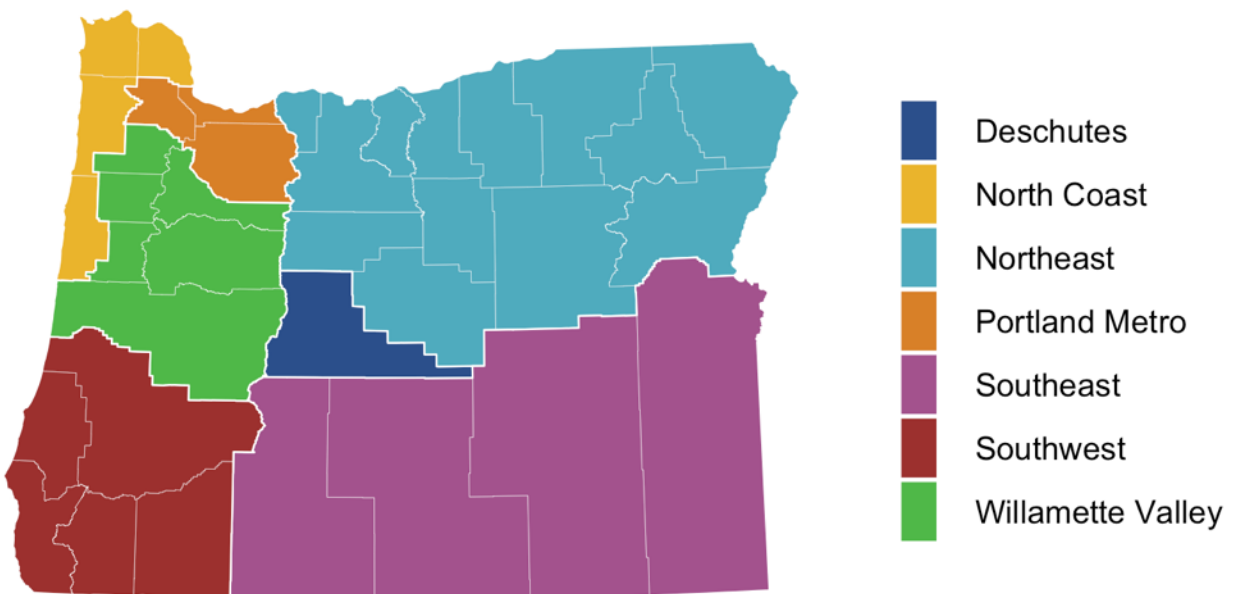
# Oregon Department of Transportation

## Oregon Economic & Demographic Regions White Paper

Over the course of this analysis, we determined that an alternative grouping of PUMAs may be more effective for the OTP/OHP planning process. Figure 5 displays the recommended regional configuration for OTP/OHP. The primary difference is the aggregation of northeast Oregon PUMAs and Southeast Oregon PUMAs into single regions, rather than the earlier approach used for this white paper. The reason that this configuration is preferred is that it better aligns economic areas with existing transportation networks. Additionally, it also aligns with other work being performed by other State agencies examining transportation networks and housing. We believe that this change will allow ODOT to better align their long-range transportation planning with other critical efforts being performed with other State agencies, such as Oregon Housing and Community Service, which is currently studying the relationship of housing affordability and mobility needs.

### Figure 5. Recommended Regional Configuration

Source: ECONorthwest



#### Implications for OTP/OHP

- Many of Oregon's demographic and economic changes have been regional and have policy implications for long-term transportation planning
- The State of Oregon should consider including a data-driven approach to incorporate regional analysis in the OTP/OHP process
- Our recommendation is to use PUMAs as a guide to aggregate regions to ensure reproducibility and harmony across for all metrics used in the OTP/OHP process

## CHAPTER 2 – DRIVERS OF TRANSPORTATION DEMAND IN OREGON

This chapter identifies key demographic and economic trends that will affect transportation needs in Oregon through 2050. Rapid growth in Oregon's population has been part of a broader story of economic success for the state since the Great Recession, with the economy growing faster than the national average during that time. Although this growth has provided many benefits to the state by increasing wealth and employment opportunities, rapid growth also comes with costs. For the transportation network, growth has meant more people relying on the existing road infrastructure to commute or move goods and services. Increasing utilization, in turn, had other social costs such as growing noise and pollution, along with crashes and congestion.

Transportation policies have traditionally relied on examining the need for increasing capacity; however, those policy solutions do not address the broader mobility needs of vulnerable individuals or encompass the externalities associated with the social costs of increasing transportation. Developing policies that account for these broader issues requires an understanding of how individuals, households, and businesses choose to travel. Understanding these key drivers of demand helps identify effective mechanisms that can be used to moderate demand and fund public infrastructure.

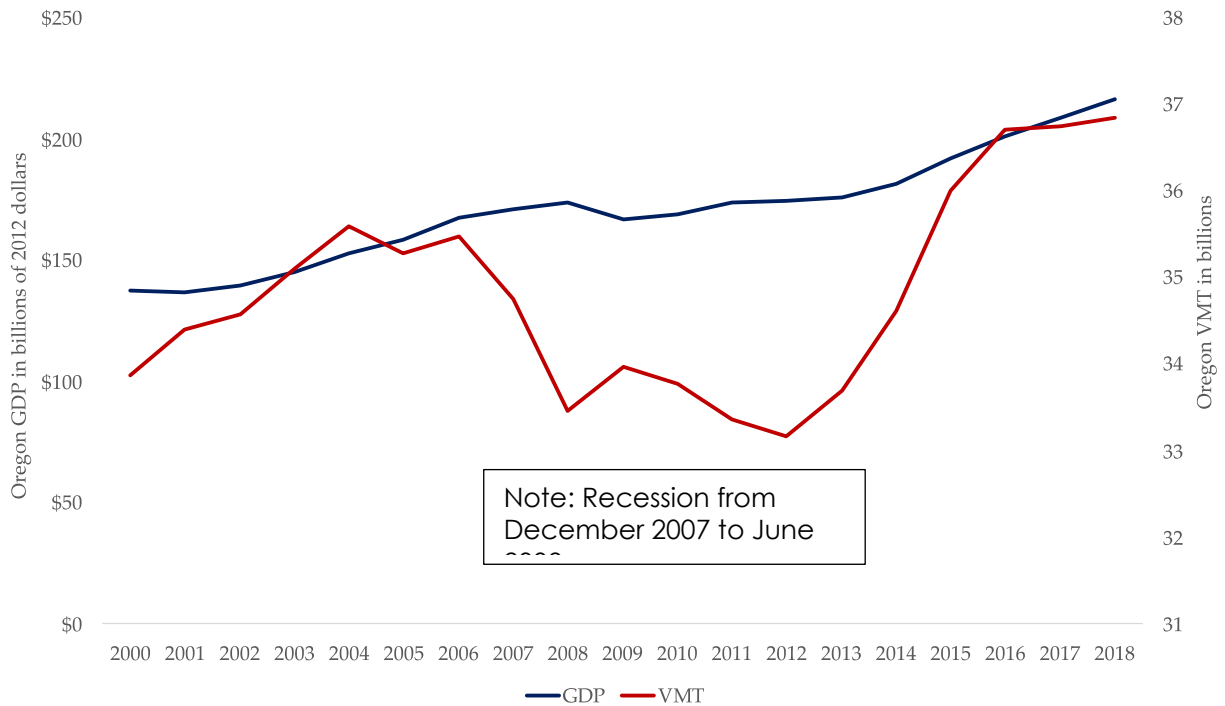
This chapter reviews recent demographic and economic trends in Oregon as a guide for understanding a range of potential future outcomes and their impact on transportation demand, planning, and revenue statewide. While this white paper explores a broader set of indicators (see the technical appendix for a complete review), this chapter focuses on the key indicators that are likely to be drivers of regional transportation demand that also have implications for the OHP and OTP. There are two categories of demand that will be explored further in this chapter—structural drivers and impacts from the regional economy (economic and demographic). The structure of demand section frames the relationship between transportation and the regional economy, including identifying key measures of demand, such as VMT. After a brief discussion on the structure of transportation demand, important economic and demographic indicators are identified describing how the regional economy influences demand for transportation.

### Structural drivers of transportation demand

Transportation demand is integrally related to the growth of the regional economy. One drives the other, and vice versa. Investments in transportation infrastructure are an important input to understand the productivity of a region's economy. These investments in transportation networks support industry clusters that rely on that infrastructure to access skilled labor and key factor inputs. In other words, transportation networks can help create a comparative advantage for regional industry clusters.

**Figure 6. Oregon VMT and GDP growth, 2000 to 2018**

Source: Federal Highway Administration, Bureau of Economic Analysis



The relationship between transportation demand and growth in economic activity is complex, and as a result, there is not consensus around the strength or directionality of the relationship. Does transportation demand result in economic growth? Or does economic growth result in transportation demand? The following are the major frameworks used to describe the possible nature of the relationship, each of which results in different implications for public policy and scenario planning:

**1. Changes in transportation demand "cause" changes to economic activity**

- Suggests that the regional economy is responsive to changes in transportation demand, and therefore increases in travel demand is an essential component to economic growth. Policies that emphasize transportation demand reduction may have unintended consequences.

**2. Changes in economic activity "cause" changes to transportation demand**

- Suggests the opposite of the first framework, whereby demand for travel is responsive and dependent on economic growth. Policies designed to reduce transportation demand may be implemented without impinging economic activity.

**3. The relationship between transportation demand and economic activity is bidirectional**

- Suggests a more interrelated relationship where economic activity and transportation demand growth impact each other through feedback loops. Policies can be nuanced in objectives, for example attempting to meet the

goals of reducing transportation demand while benefitting the regional economy.

**4. *There is no direct relationship***

- Economic activity and transportation demand are independent and do not have a direct relationship. Policies designed to change transportation demand would have no impact on economic activities

Based on the existing literature and our professional experience, we believe the appropriate framework to describe the structural relationship is bidirectional. This has important implications for scenario planning, whereby a nuanced understanding of a proposed policy is required to measure the impact of the policy in terms of impact in transportation demand and economic activity. Before describing the important economic variables that drive transportation demand, it is important to define measures of transportation demand.

**VMT and Planning for the Future**

Vehicle Miles Traveled (VMT) is the most commonly used measure of transportation demand used to:

- Forecast revenue (gas tax, user fees, tolls)
- Measure system usage, which drives potential maintenance (Fix-it) and capital (Enhanced) investment priorities

Increasing population does not correspond with an equivalent growth in VMT. Figure 7 displays the trends in VMT and VMT per capita in Oregon from 2000 through 2018. Since 2000, VMT per capita has continued to decline. As Oregon's Office of Economic Analysis has noted, some of this change is due to broader changes in the business cycle, however, others appear to be generational. The share of young adults with driver's licenses declined rapidly since 2000<sup>2</sup>. Other factors that contribute to declining VMT per capita may be the result of increasing transportation costs and policies designed to reduce car dependence or technological changes that reduce the need for travel.

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<sup>2</sup> <https://oregoneconomicanalysis.com/2017/03/15/oregon-traffic-a-vmt-update/>



**Figure 7. VMT and VMT Per Capita in Oregon, 2000–2018**

Source: Portland State University, Population Research Center; Oregon Department of Transportation

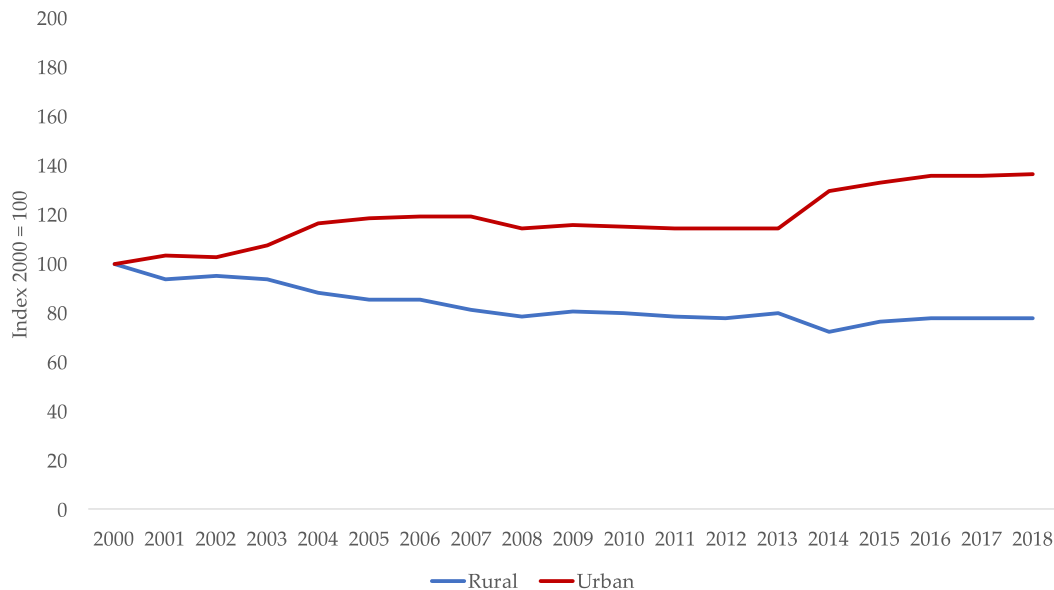


Although declining VMT per capita can be a positive attribute, that benefit has been offset by the rapid increases in both VMT and population in Oregon. When VMT increases while VMT per capita remains flat or declining, this indicates that more cars are using the transportation infrastructure. If existing capacity does not keep pace with the increase in demand, then congestion levels will also increase. This in turn, has subsequent effects on traffic time delays, safety and other relevant concerns for transportation planning. Those effects will be more apparent in regions where population growth is occurring fastest.

As a result, VMT is not evenly distributed across the transportation network statewide, but rather concentrated in areas of increasing population, specifically areas increasing in density. Figure 8 displays how the growth in urban and rural VMT has diverged in Oregon since 2000. Although it's unlikely that all the growth can be attributed to demographic changes in the region, the large increases in commuter flows (See Figure 4) suggests that it may be a strong driver of VMT growth.

**Figure 8. Growth in Urban and Rural VMT in Oregon, 2000–2018**

Source: U.S. Department of Transportation, Federal Highway Administration Highway Statistics, Table VM-2



### Other Measures of Transportation Demand

Although VMT is a good broad measure for the total demand on the transportation network, it is not necessarily the best measure for the purpose of transportation planning and policy analysis. VMT does not directly correspond to measures of capacity and congestion, which are often important policy considerations that negatively impact economic activity, not to mention the quality of life of residents. Measures such as Average Annual Daily Travel (AADT) are an alternative measure better suited to evaluate peak demand and congestion on a transportation network.

In addition to the traditional VMT measure, ODOT uses the following metrics to measure congestion and reliability on Oregon's roadways:

- **Average Annual Daily Traffic/Capacity (AADT/C).** Average annual daily traffic (AADT) divided by peak hour capacity (C) identifies where large-scale congestion occurs and enables ODOT to monitor locations over time for spreading beyond a typical two-hour peak period.
- **Travel Time Index (TTI).** This congestion measure compares the 80<sup>th</sup> percentile travel time of a trip on each highway segment at a peak hour compared to an off-peak uncongested hour. The higher the TTI, the longer the travel times and higher the congestion. For example, a TTI of 2.0 indicates that a trip that takes ten minutes in light traffic will take 20 minutes in congested conditions.
- **Planning Time Index (PTI).** This reliability measure represents the total travel time users should account for in order to be on time 95 percent of the time relative to free flow speeds. Free flow speed is defined as the posted regulatory speed limit. The lower the PTI, the more reliable the travel time will be. For example, a PTI of 3.0 indicates

that a trip taking ten minutes in light traffic should plan for 30 minutes to ensure arriving on time with 95 percent confidence.

## Economic and Demographic Drivers of Transportation Demand

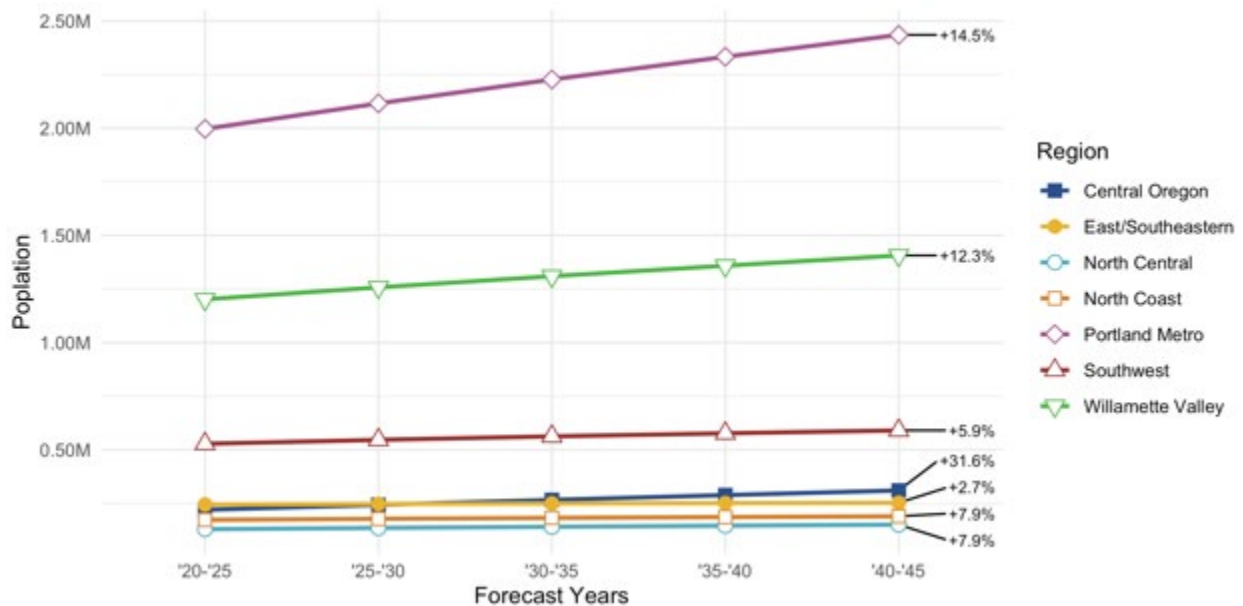
### Population Growth

Total population growth across the state is important because it is the primary variable impacting the number of vehicles expected to use the transportation network in Oregon. At the same time, it is important to measure how that growth is distributed across the state. Understanding this distribution is key to identifying the demographic changes that lead to effective regional policies and infrastructure investment.

Since 2000, Oregon's population has increased rapidly, growing by 24 percent (around 815,000). Although all regions in Oregon have experienced some population growth over the last 20 years, almost all that growth has been clustered in regions along the I-5 corridor. The rapidly increasing number of people living in the Portland Metro area and along the Willamette Valley<sup>3</sup>. The State of Oregon projects that another 341,000 individuals (~8 percent) living in the state by 2029, with most of that growth occurring due to in-migration.<sup>4</sup>

**Figure 9. Total forecasted population growth by region 2020 to 2045**

Source: Portland State University, Population Research Center.



<sup>3</sup> Detailed regional forecast data are displayed in the technical appendix to this white paper.

<sup>4</sup> Oregon's short-term population forecast through 2029.

<https://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx>

### **Aging population and labor force participation**

The distribution of age cohorts within the growing population provides further insight into how population growth may affect transportation demand. Like other areas of the United States, the aging of the Baby Boomer generation has increased the share of the population that is 65 years or older, recreating, and desire to continue working will influence they types of regional transportation planning required to support that population.

For this segment of the population, mobility challenges can be especially acute. Older citizens may lose their ability to drive and require help from family or friends or the use of public transportation. The inability to access safe and affordable modes of transportation can have a profound effect on well-being, resulting in social isolation and financial hardship.<sup>5</sup> In both urban and areas, these may include adjustments to public transit corridors or active transportation investments to address their unique health, financial, and social needs.

In Oregon, as in many states, suburban and rural areas are aging more rapidly than in the Portland Metro. With aging-in-place increasingly common, this presents some unique challenges for transportation planning. The availability of transportation services that can support the aging population is likely to differ between urban, suburban, and rural areas. Accounting for this variation in both need and availability of services is an important consideration for developing regional guidance on transportation planning.

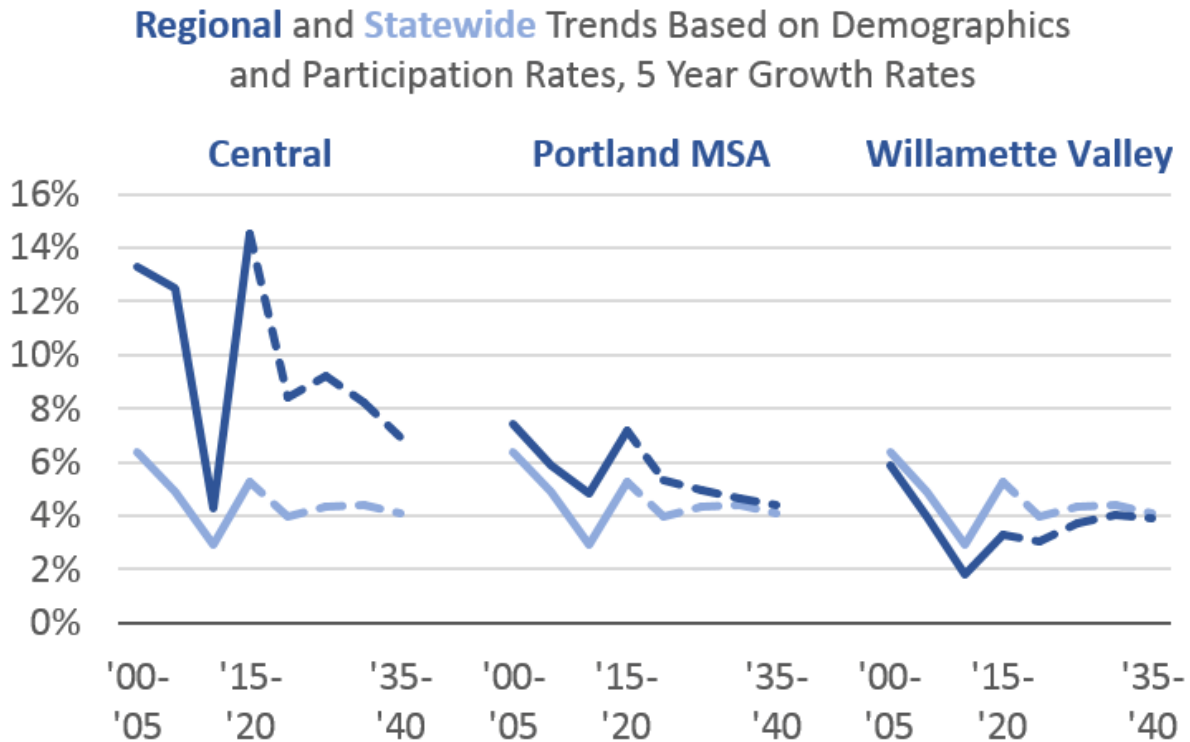
Changes in population growth patterns and age distribution both have implications for the state's labor force. Consistent out-migration in rural areas of Oregon have resulted in an aging population resulting in lower growth in the labor force. Since 2000, employment growth in Oregon has largely been clustered around the fastest growing population centers in Central Oregon, Portland Metro, and the Willamette Valley. Although forecasted growth rates are expected to decline over the next 20 years, employment in these three regions are anticipated to continue growing faster than the state average.

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<sup>5</sup> DeGood, Kevin. Aging in Place, Stuck without Options: Fixing the Mobility Crisis Threatening the Baby Boom Generation. 2011. Transportation For America.

**Figure 10. Labor Force Growth Rate by Region compared to State Average**

Source: Oregon Office of Economic Analysis, U.S. Census, Portland State

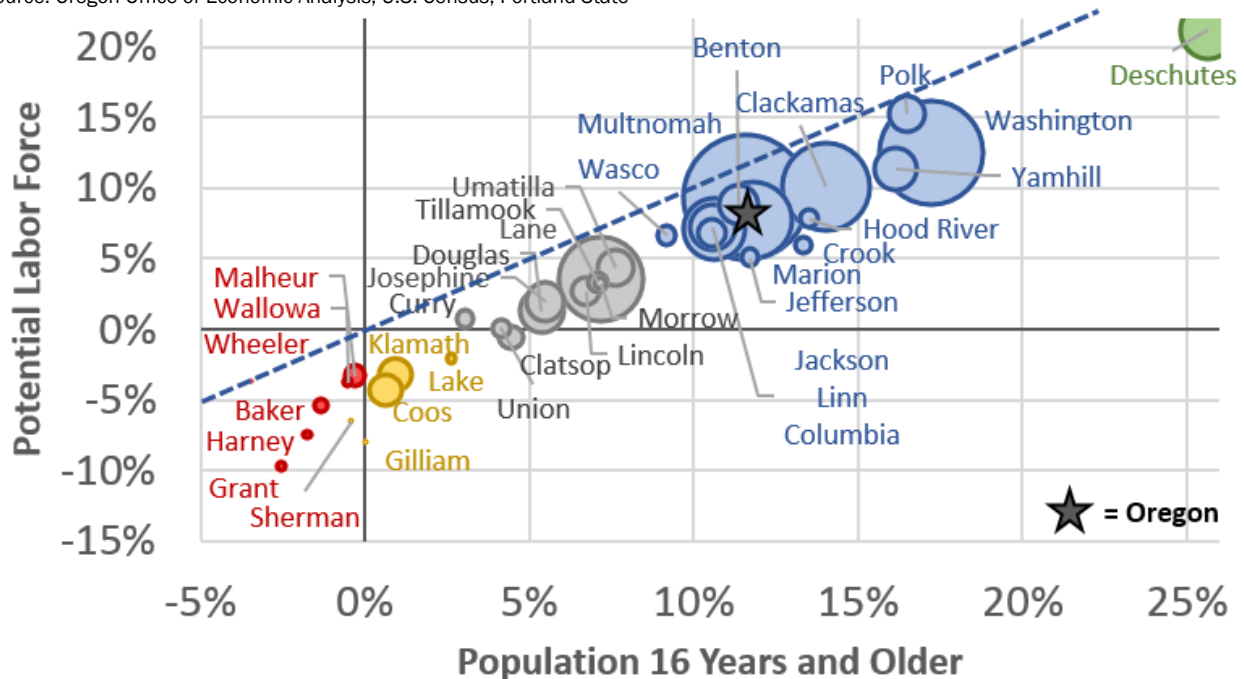


Through 2030, 11 counties (see Figure 11) are expected to have smaller workforces than they do today, and across the state, the labor force is expected to grow less than the total population. The implications for the economies in those regions can be widespread and circuitous. A slower growth in the labor force can result in lower income growth and fewer businesses, which contribute to outmigration.



**Figure 11. Labor Force Forecast from 2020 to 2030 by County**

Source: Oregon Office of Economic Analysis, U.S. Census, Portland State



In urban regions such as Portland where many of the economic benefits have accrued since 2000, the cost is increased loads on aging bridges and roads and increasing time delays, all which contribute to a lower quality of life. In rural areas, with slower or negative labor force growth can lead to lower tax revenues to support local infrastructure, along with transportation investments that are reallocated to the urban corridors to mitigate acute congestion problems. This, in turn, results in mobility problems for an aging population in rural areas where transportation networks are tied to health and health care access.

### Urbanization and Housing Affordability

This concentration of population growth is part of a broader urbanization trend globally, however the implications for transportation planning are local and regional. As mentioned earlier, most of the Oregon's population growth is occurring along the I-5 corridor with those increased concentrated in the Portland Metro area.

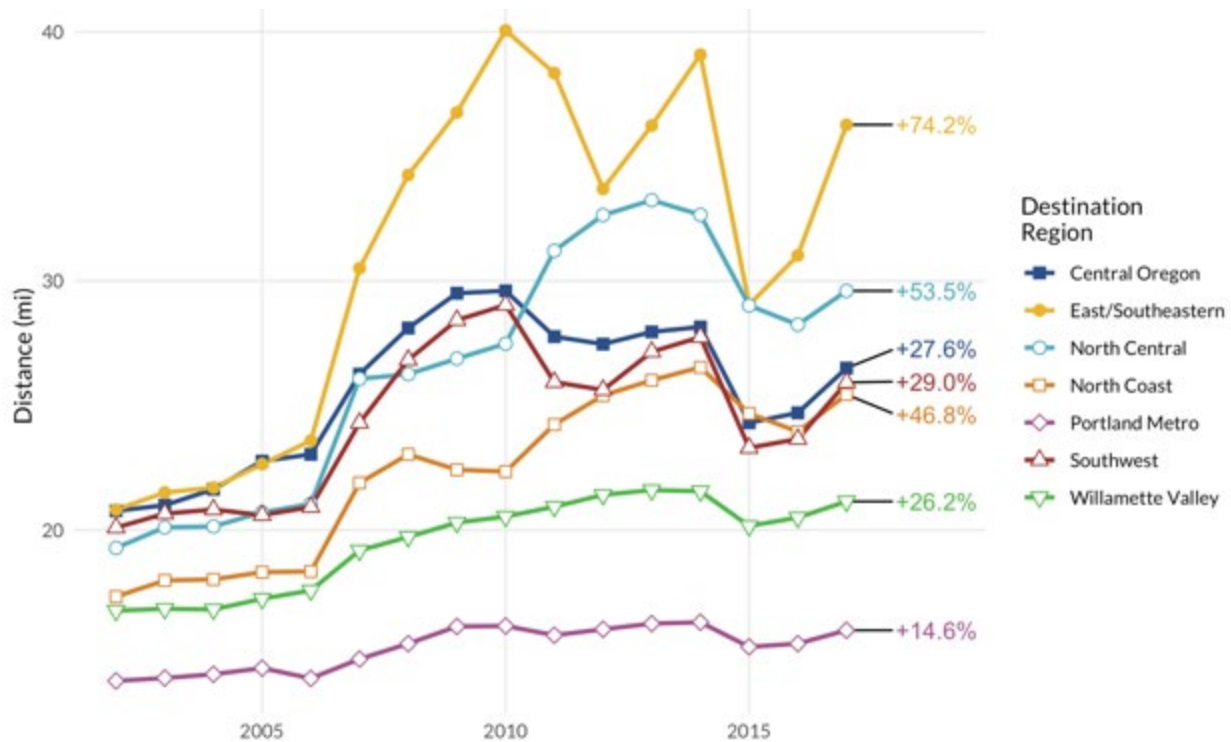
Urbanization has benefits and costs to society. While increasing commuting patterns suggest that people are moving to the Portland Metro to take advantage of economic opportunities, the concentration of traffic in the region is increasing congestion levels on the existing infrastructure and decreasing reliability of the network. ODOT's recent findings in their 2018 Traffic Performance Report for the Portland Metro Region found that hours of vehicle delays increased by 20 percent between 2015 and 2017 and the

number of hours the roads are congested increased by 13.4 percent over that same period.<sup>6</sup>

**Figure 12. Weighted average commute distance by destination region, 2002 – 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.

Note: Distances are geodesic straight-line distances between block groups, and commutes are limited to only those occurring entirely within Oregon.



While congestion may be less of a concern for resident who live outside of the Portland Metro, those that travel into the Metro area for work may still be affected. Figure 12 shows that many residents outside the Portland Metro need to commute longer distances to access urban centers where jobs have migrated. For those individuals facing long drives into and out of congested areas, reliability, time delay and safety are all important considerations and regional transportation policies should consider that connectivity to the congested network.

Jobs and housing balance is often times what is sacrificed as affordability decreases in a region. Households trade off housing that is more affordable for increased travel distance to their place of employment. The cost of housing is an important driver of transportation demand—as housing becomes less affordable, travel distances and times increase. Higher transportation costs increase the overall cost of housing, which should be thought of as the combined cost of housing and transportation. Cost burdening (where households spend more than 30% of their gross income on housing) is at a high rate across the state. When adding in transportation costs, locations that

<sup>6</sup> Oregon Department of Transportation. Portland Region 2018 Traffic Performance Report. December 2018: <https://www.oregon.gov/odot/Projects/Project%20Documents/2018TrafficPerformanceReport.pdf>

appear within reach for a household, often times are no better off than closer locations when considering travel costs (and time). When applying for a home mortgage or rental unit, the ratio of income to housing cost is capped. Transportation costs are not factored in, the result is often times inequitable access to housing for low income households and communities of color. This has broad implications for regional mobility, as well as for regional economic productivity.

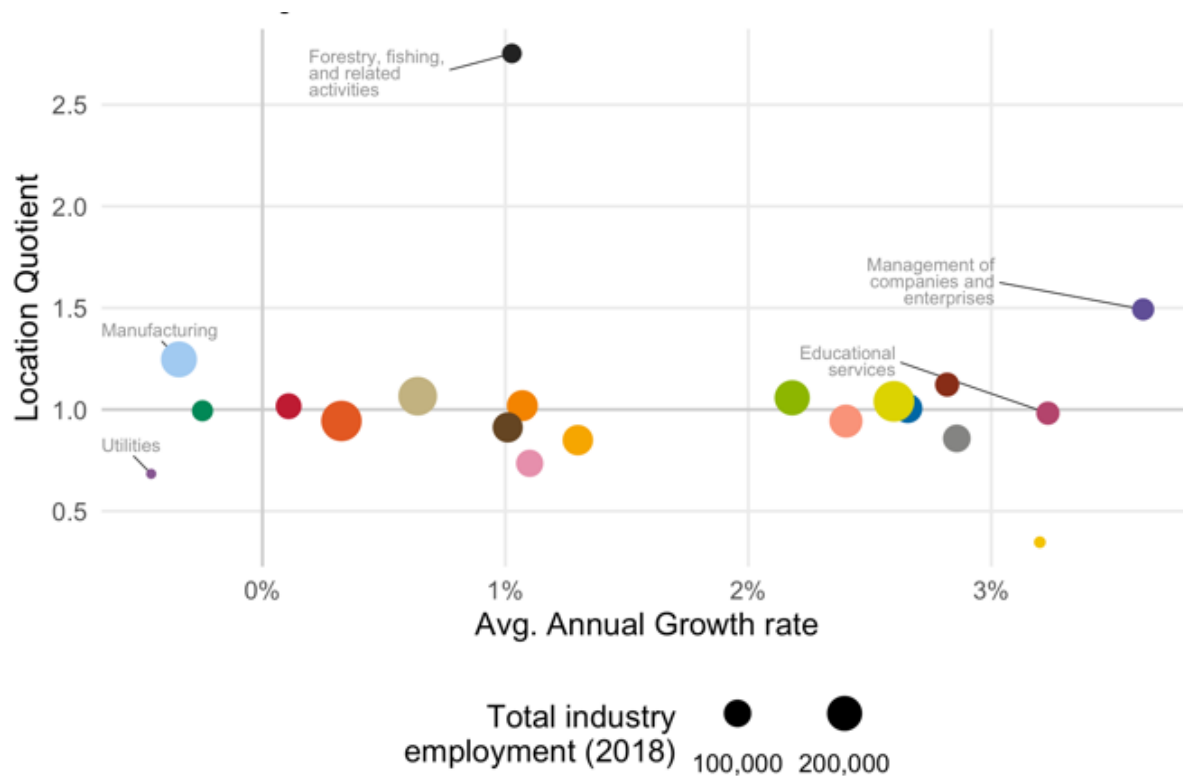
### **Industry Composition and Resiliency**

Industry composition is important to understanding how regional economies are changing over time. From a broader lens, change in industrial composition affect how a region's economy will respond to negative shocks or downward swings in the business cycle. Until the 1990's, Oregon's economy was concentrated in procyclical and trade-dependent industries including natural resources and manufacturing, which led to wider swings in employment during recessionary and expansionary periods.

Although those industries continue to serve as an important driver of employment, especially in regions outside of the Portland Metro, Oregon's economy has become more diverse, with growing sectors in professional services and technology. Figure 13 displays how Oregon's employment concentration has changed since 2010. The trend over the last decade indicates that industrial sectors with the highest concentration (location quotient), which have long served as drivers of Oregon's economy have experienced the least growth. Since 2000, much of the growth has occurred in the service sector, with increasing specialization in management and professional services. Location quotient (LQ) is a measure of how concentrated an industry is in the state compared to the national average. An LQ larger than one indicates a higher concentration in that industry than the national average, conversely values smaller than 1 indicate less industry concentration.

**Figure 13. Industry Concentration and Growth in Oregon, 2010–2018**

Source: U.S. Bureau of Economic Analysis



Looking ahead, the Oregon of Economic Analysis (OEA) expects that many of the industries where Oregon has traditionally been highly specialized will continue to see slower growth (see Figure 14). Statewide, OEA expects that the emerging (fourth quintile) industries are expected to see the highest rate of growth, indicating that regionally some sectors of strength are expected to grow rapidly, while some of the lagging sectors are also expected to grow to more closely aligned with national concentrations. This broadly parallels the expectations about slower growth in the labor force in regions outside of the urban corridors, which continue to be highly dependent on natural resources and manufacturing to support the local economic base.

**Figure 14. Statewide Employment Forecast 2018-2028 by Industry Concentration**

Source: Oregon Office of Economic Analysis

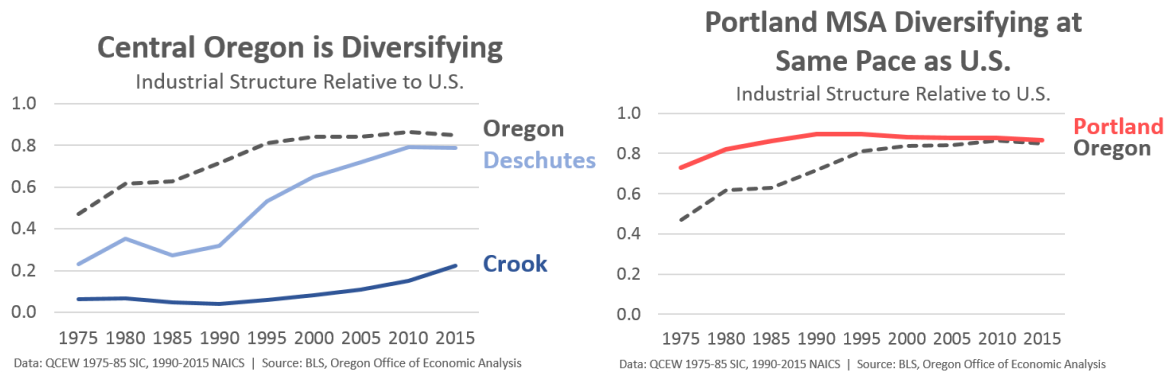


Source: Oregon Employment Department, Oregon Office of Economic Analysis

While rural regions of the state face ongoing and future challenges with changing economic conditions that impact the local labor force, the Portland Metro and Central Oregon are becoming increasingly diverse (see Figure 15). Industrial diversity is important because it helps a region's economy withstand economic shocks. Regional diversification compared to state and national concentrations) is important within the context of OTP/OHP because it will impact the demand for transportation compared to the current system demand statewide.

**Figure 15. Pace of Industry Diversification by Region relative to State Average**

Source: Oregon Office of Economic Analysis



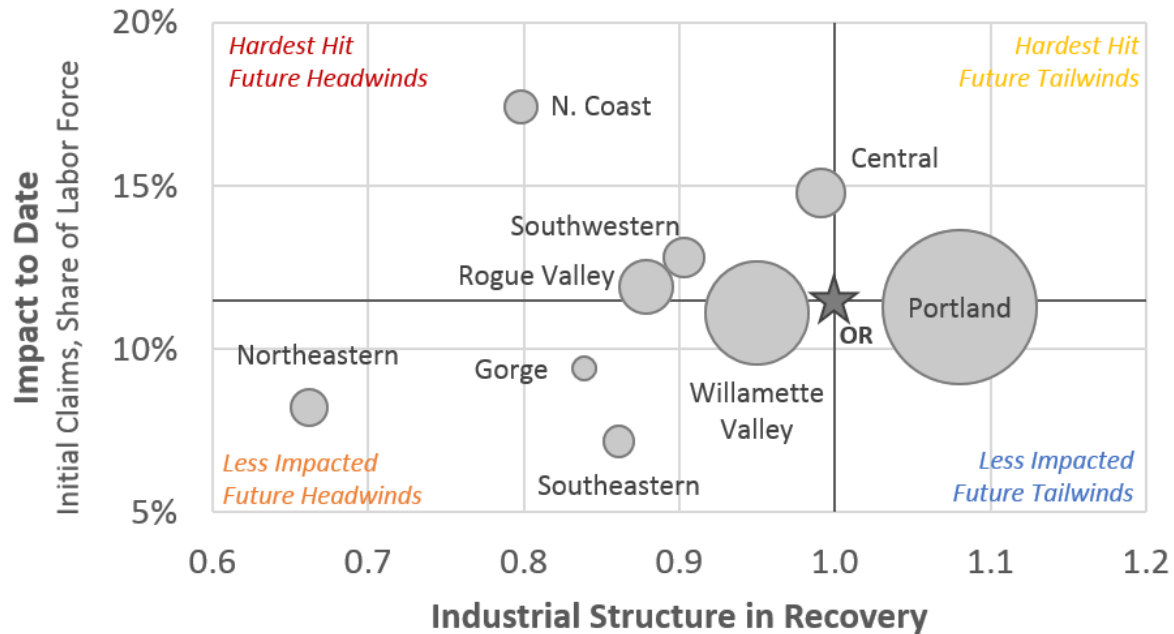
The current Covid-19 pandemic gives us an opportunity to evaluate the regional impact of a catastrophic economic shock (see Figure 16) and the disparities in Oregon's regional economies. While industrial diversification has made Oregon more resilient than in recent economic downturns, much of those benefits accrue to the Portland Metro, Central Oregon, and the Willamette Valley that rely on the business and professional services sector where Oregon sees increasing growth and



specialization. Conversely, Northeast Oregon which is highly specialized in traditional natural resource extraction and manufacturing is anticipated to see limited future opportunities for growth by OEA.

**Figure 16. Covid-19 Job Losses by County compared to Industry Diversification**

Source: Oregon Office of Economic Analysis



Impact to Date: Number of initial claims 3/15 - 5/9 above baseline as share of labor force. Industrial Structure: impact of industry mix on job growth through 2027 using statewide industry growth rates. | Source: BLS. Oregon Employment Dept, Oregon Office of Econ Analysis

## Recommendations on regional transportation demand

Oregon's demographic trends and economic structure have changed rapidly since 2000 and is expected to continue into the foreseeable future. The uneven growth around the state reveals a diverse set of challenges for communities across the state. In order to effectively address the unique mobility needs for each region, we recommend incorporating regional indicators that are highly correlated with key drivers of transportation demand. We believe the indicators we include here are important because they can effectively be tied into scenario planning for the OTP/OHP process, however, they are not exhaustive and do not directly incorporate some of ODOT's planning goals, such as equity, which are tied to economic outcomes, but are being explored in other white papers.

**Implications for OTP/OHP**

- Understanding the distribution of population growth is key to identifying the demographic changes that lead to effective regional policies and infrastructure investment
- All regions in Oregon are facing diverse transportation challenges. The increasing demands on urban infrastructure, along with health and safety concerns for rural residents should be considered as part of the OTP/OHP process.
- The changing mix of industries growing and declining around the state will also affect the type of transportation investment that will be needed. The OTP/OHP should account for these regional changes to understand how to build scenarios that can help prioritize investments.

## CHAPTER 3. ECONOMIC FACTORS IMPACTING THE SUPPLY SIDE

The emphasis of this white paper is on structural factors that drive increased demand for transportation. Increased demand leads to a variety of social costs, including greater levels of pollution, congestion, and increased time delays. Solutions to these social problems cannot be solved without also considering the supply of transportation infrastructure. The supply side of transportation is complex because public investment in fixed assets is often produced through taxes and bonding in the public sector, and often lags changing consumer demand.

Unlike other goods and services, consumers pay for transportation infrastructure indirectly, which obscures the costs of provisioning roads from the amount of transportation demanded by consumers. Many drivers believe that their tax dollars cover the full cost of transportation infrastructure. Economists frequently discuss how to appropriately value public goods in a way that improves social benefits—transportation financing has a long history of being at the center of that debate.

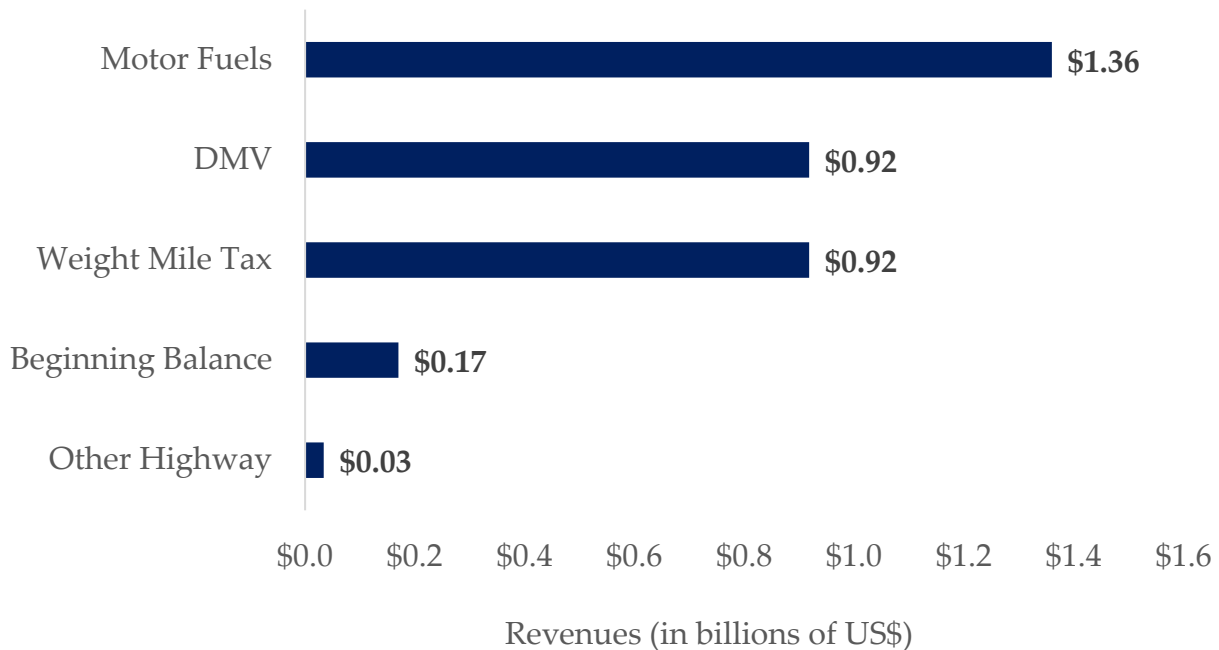
It is important to be able to evaluate demand for transportation (statewide and regionally) within the context of revenue streams expected to maintain and enhance supply. Infrastructure will deteriorate and investment trade-offs should be evaluated. Tolling, congestion pricing, privatization, and innovative tax instruments have all been proposed as solutions for increasing revenues and the supply of transportation infrastructure, while also moderating demand. Evaluating the broad range of potential solutions for increasing investment in transportation infrastructure is outside the scope of this white paper, however, it does help frame the challenges faced by State DOT's who are charged with managing increasing load (VMT) on their facilities.

### **Financing highways in Oregon**

Like other states, Oregon receives federal funding for highway construction projects based on a set formula for distributing federal fuel tax and heavy vehicle taxes. The majority of the funding for state roads comes from state fuels taxes and registration fees, though a smaller share derives from taxes on cigarettes, lottery funds, and other state fees. In 2017, the Oregon State Legislature also created revenue sources from the sale of new cars, payroll taxes, and new bicycles. The Legislature also approved a sliding registration fee based on fuel efficiency to help offset revenue losses to the fuel tax. Figure 17 displays the anticipated distribution of the \$3.4 billion in highway revenue approved by the Oregon Legislature for the 2019-2021 budget.

**Figure 17. State highway revenue for the 2019-2021 budget**

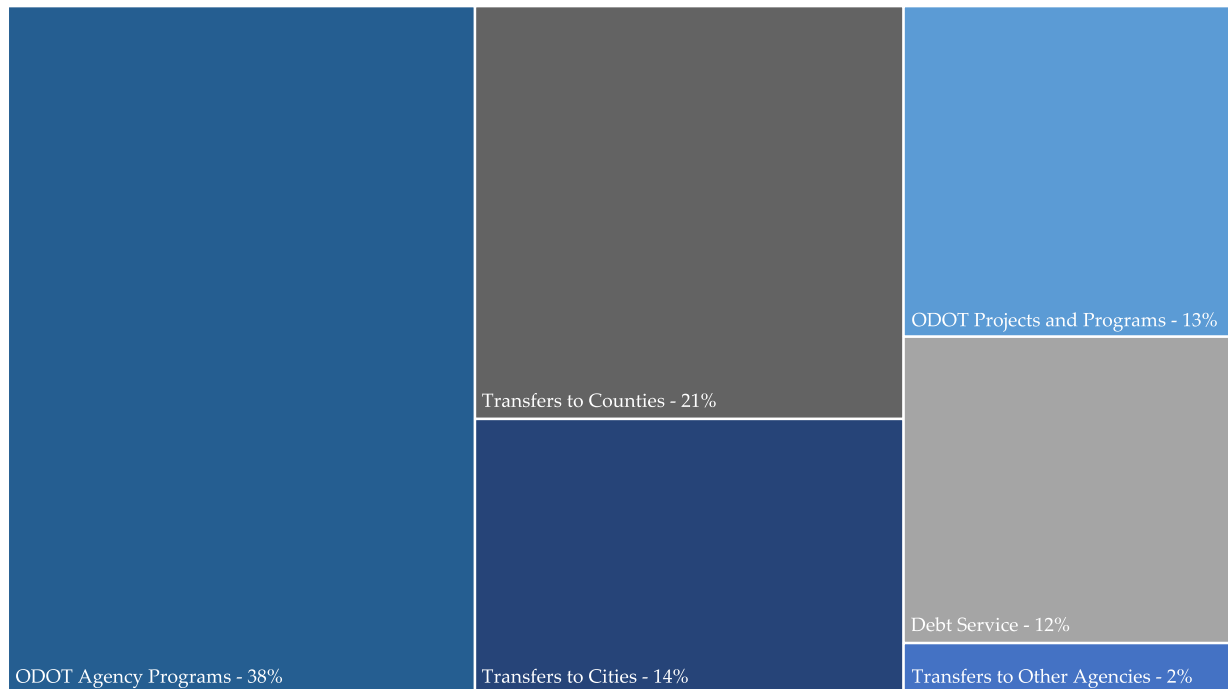
Source: Oregon Department of Transportation



The Oregon State Constitution requires revenues generated through the State Highway Fund be spent on road construction and maintenance, along with mobility improvements in the highway right-of-way. Oregon governs the State Highway Fund using the concept of cost responsibility. Broadly, this means that the state collects a fair share of revenue from each highway user class that are proportionate to the costs they impose on the state highways. Functionally, the revenues are distributed through the state's Statewide Transportation Improvement Program, which incorporates cost responsibility and long-range planning goals from the OTP and OHP, with a public review process for selecting and allocating funding to transportation investments. Figure 18 displays how the Oregon Legislature intends the \$3.4 million in Highway Fund revenues be dispersed during the 2019-2021 biennium.

**Figure 18. State highway fund disbursements for 2019-2021**

Source: Oregon Department of Transportation



### Headwinds in financing Oregon's highways

Despite Oregon's intentional approach to investing in the state's transportation infrastructure, Oregon faces several challenges in the future. Since year 2000, Oregon's population has seen dramatic growth from 3.4 million residents to 4.2 million residents (a 22 percent increase). Over that same period, VMT increased from 33.9 billion miles to 36.8 billion miles (an 8.8 percent increase). During that time state-owned lane miles have remained flat.

Considering a range of factors to contribute to stresses on existing infrastructure, many roads will require additional preservation to extend their lifespan. Half of Oregon's bridges were built prior to 1970 and were designed to handle smaller loads than current mobility demands.<sup>7</sup> Recent information about a Cascadia Subduction Zone event has increased the need for seismic upgrades to mitigate risks to human life and minimize disruption to the state's economy. Rapid changes in the climate also increase vulnerabilities to the state's infrastructure from coastal erosion, rock fall, landslides and increased flooding pose risks to communities around the state.

Economic and technological changes too, may require innovative tools to finance transportation infrastructure in the future. Recent changes from the Coronavirus pandemic have led to dramatic changes in mobility requirements for workers, with new technologies that have allowed many office workers to shift to remote work.

<sup>7</sup> Oregon Department of Transportation. 2019 Bridge Condition Report and Tunnel Data. Retrieved at: <https://www.oregon.gov/odot/Bridge/Documents/Bridge-Condition-Report-2019.pdf>

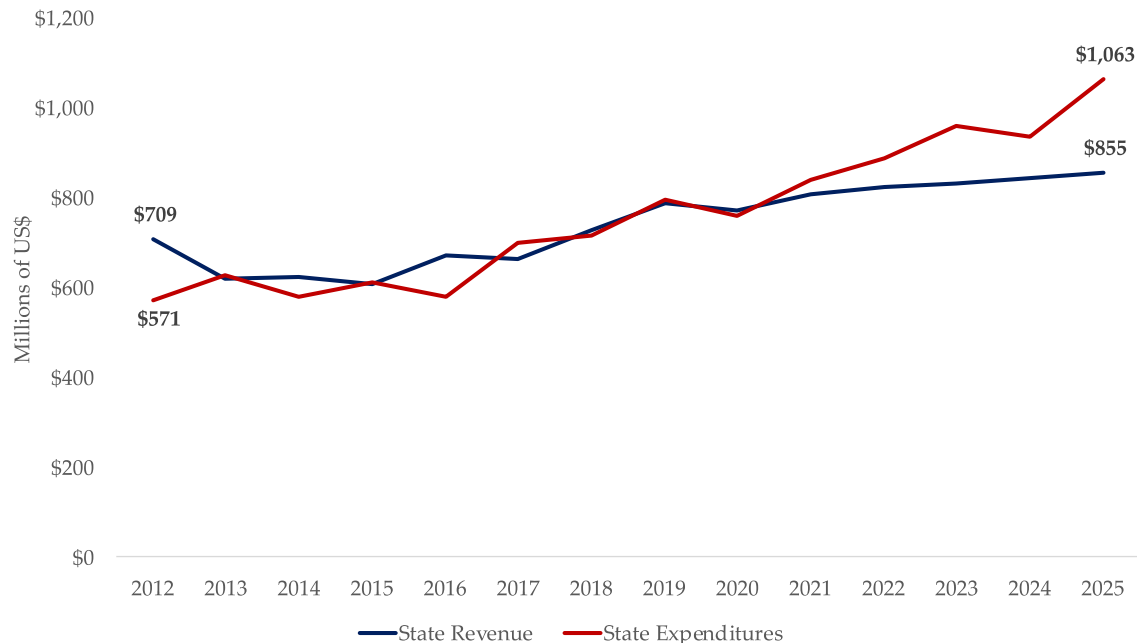


Though it's too soon to know how many of the changes are permanent, the ongoing impact of alternative work arrangements combined with social distancing are expected to depress revenues and require greater use of the budgetary reserves<sup>8</sup>. For ODOT, declining traffic statewide volumes are expected to reduce motor fuel revenues in the short run, which are important revenue source of the Highway Fund.<sup>9</sup> Long run shifts toward more fuel efficient and electric vehicles all are expected to reduce the efficacy of motor fuel taxes as a revenue source for transportation investments<sup>10</sup>.

Prior to these recent shocks, long run forecasts suggest that the expected revenues from existing financing instruments will not be sufficient to cover the costs of maintaining the state's existing roads and bridges. According to a recent study, maintaining the existing infrastructure to meet today's standards would require \$2.6 billion over 20 years<sup>11</sup>. Current forecasts predict revenues to increase by 2% annually, while costs increase by 6% annually, making operating and improving facilities particularly challenging (See Figure 19).

**Figure 19. ODOT State Highway Fund revenue cash position (April 2020)**

Source: Oregon Department of Transportation



<sup>8</sup> Oregon Economic and Revenue Forecast. June 2020. Oregon Office of Economic Analysis. Retrieved from: <https://oregoneconomicanalysis.com/2020/05/20/oregon-economic-and-revenue-forecast-june-2020/>

<sup>9</sup> State Highway Fund Transportation Revenue Forecast. Oregon Department of Transportation. Retrieved from: <https://www.oregon.gov/odot/Data/Documents/April-2020-Forecast-Report.pdf>

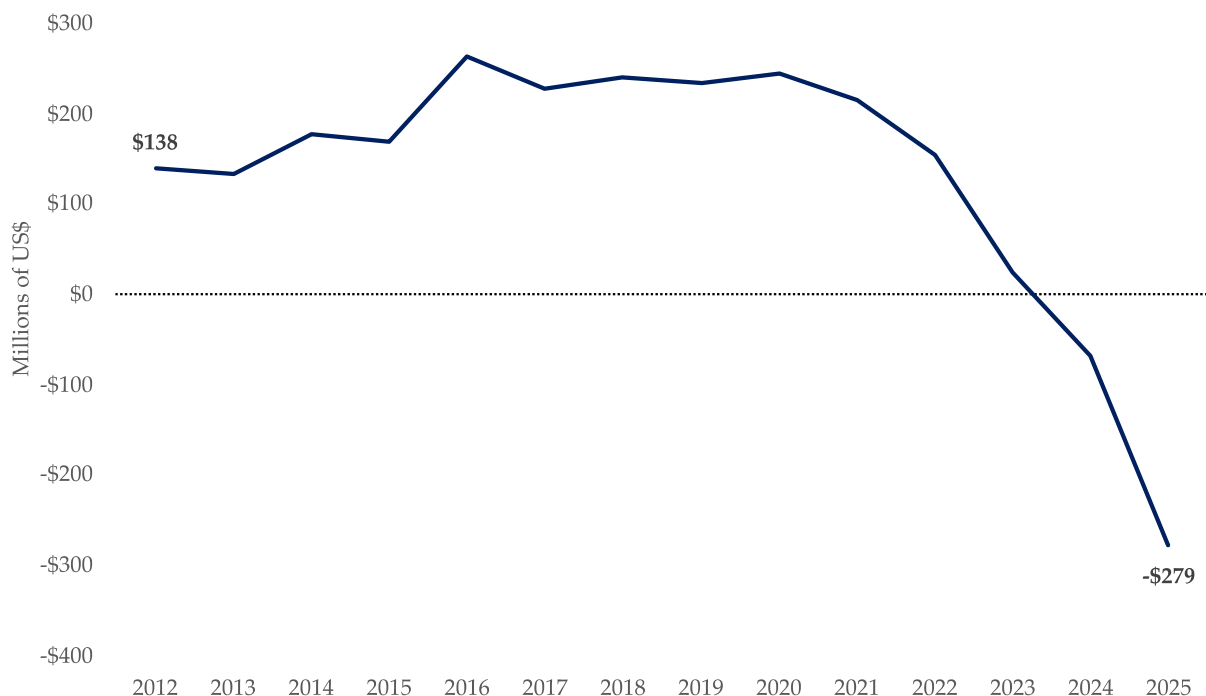
<sup>10</sup> Oregon is exploring programs like OReGO that would help the state move away from fuel taxes by implementing a pay-per-mile tax of 1.8 cents per mile for light-duty passenger vehicles.

<sup>11</sup> Oregon Department of Transportation. Rough Roads Ahead 2. Economic Implications of Deteriorating Highway Conditions. February 2017. Retrieved at: <https://www.oregon.gov/odot/Planning/Documents/Rough-Roads-Ahead-2.pdf>

Increasing costs and changing conditions that dampen the effectiveness of existing revenue instruments will require new approaches to financing the state's transportation system<sup>12</sup>. Under the state's current forecasts, the state's highway fund is expected to be drawn down to \$0 in the 2021-23 biennium, leading to a \$300 million shortage through 2025. The rapid decline in available revenue, especially for operations and maintenance costs associated with transportation infrastructure will require that the State of Oregon weigh the trade-offs of delaying investments in transportation infrastructure against increasing taxes and fees during a period of economic uncertainty.

**Figure 20. ODOT State Highway Fund anticipated balance (April 2020)**

Source: Oregon Department of Transportation



## Transportation supply and implications for OTP/OHP

In the context of the OTP and OHP, the existing tax revenue instruments will be increasingly inadequate in the future. Increasing resource scarcity for investment suggest that Oregon develop new approaches for evaluating statewide and region transportation demand while balancing costs and revenues to maintain and enhance existing public assets. Incorporating regional analysis that weigh the value of increased public benefits relative to investment costs is often a recommended approach to systematically and transparently allocating public resources. Subsequently, developing alternative financing mechanisms that serve multiple goals of efficiently raising

<sup>12</sup> The Highway Fund is a dedicated fund that comes from user fees only. Oregon does not invest general funds in the transportation system, so there is not currently a revenue instrument that allows the state to adapt to rising fuel efficiency or to account for other stated transportation goals, such as reducing greenhouse gas emissions.

revenues while moderating demand is an important consideration for developing a sustainable transportation system.

**Implications for OTP/OHP**

- Total lane miles have remained flat for the state's facilities, while population growth and environmental changes have placed increasing stresses on the state's aging roads and bridges.
- Changing consumer preferences will impact the efficacy of existing revenue instruments and will not be enough to maintain enough investment in the state's transportation infrastructure in the future.
- With declining revenues and increasing demand, the OTP/OHP process should emphasize strategies that guide prioritization of transportation investments and demonstrate which investments result in the largest public benefits.

## CHAPTER 4. SCENARIO PLANNING AND UNCERTAINTY

Scenario planning: helps decision-makers identify critical uncertainties associated with a range of policies and investment choices related to operating and maintaining the transportation system. Importantly, these scenarios can help policymaker understand how exogenous (and uncertain) forces will affect the drivers of transportation demand and supply. The scenarios alone cannot evaluate the efficiency of a given policy choice, but they help enforce discipline in the process of exploring choices, so that policies can be as thoughtful and comprehensive as possible.

This chapter begins the process of tying together the data about the key drivers with realistic but hypothetical understanding of the exogenous forces that will be acting on the system in the future to explore key themes that should be explored in the scenarios. For the purposes of this white paper, we organize the scenarios around major themes that should be considered for further exploration in the coming OTP / OHP update, along with a rationale for each.

### Theme 1: Land use and density

#### **Why explore this theme?**

Location of origins and destinations is key; changes in those will greatly affect where capacity is needed. This relates to urbanization and population growth topics discussed throughout the report. Decisions about land use should be tied to an understanding of where transportation capacity is available, and transportation investment policies should respond to where growth is likely to occur.

#### **How is this related to demographic and economic drivers?**

This theme has a strong relationship with population growth and commuting patterns. The availability of land for development across the urban fringe and rural areas throughout Oregon drive household and business location decisions.

#### **What transportation questions are connected to this theme?**

- Roadway capacity and congestion
- Accessibility and connectivity
- Parking supply
- Connection of housing and transportation

### Theme 2. Changing Nature of Freight

#### **Why explore this theme?**

Shifts in purchasing preferences are already having impacts on transportation network and will continue to do so in the future. On-demand delivery services are changing the economics of freight and contributing to increased loads on the state's highway infrastructure. In order to remain competitive in a global market, the transportation networks accessed for moving freight need to be efficient and reliable. Additionally,

the growth in road use by trucks needs to be accounted for in Oregon's Highway Cost Allocation Study.

**How is this related to demographic and economic drivers?**

Freight is related to industrial composition and concentration and where those changes are occurring around the state. Additionally, it is relevant for any discussions about current and future commodity flows (see Technical Appendix) and how those commodities will be moved to and from regional markets.

**What transportation questions are connected to this theme?**

- Changes in supply chain management (growth in smaller service-based deliveries)
- Capacity / congestion
- International trade (increasing reliance on global goods and services)
- How are delivery vehicles (especially those in the 10,000 – 26,000 weight class) increasing costs and congestion on Oregon's roads?
- Changes in mode shift for freight across the multimodal network

### Theme 3. Long Run Structural Changes in the Economy

**Why explore this theme?**

The growth of emerging industries and decline of traditional industries in Oregon will impact the types of investments that will need to be made to support future economic growth. Understanding these regional changes and demand for transportation across industries will help the state develop an effective strategy for prioritizing investments that contribute to the economic well-being of Oregon.

**How is this related to demographic and economic drivers?**

This theme is foundational and incorporates all the demand drivers discussed in the white paper. Long run structural changes in the economy are influenced by changes in household and industry demand for transportation, impacting revenue streams and the financing of highway and multimodal infrastructure.

**What transportation questions are connected to this theme?**

- Revenue
- VMT changes
- Interaction with industry clusters
- Capacity / congestion / reliability

## Theme 4. Resiliency and Exogenous Shocks

### Why explore this theme?

Resilience is a topic that is growing in importance across multiple disciplines. Investing in transportation infrastructure that is resilient to natural disasters and climate change will help the state's economy recover more rapidly after an event. Additionally, recent changes such as the COVID-19 pandemic are affecting how and where we work and may require consideration of new mobility challenges in the face of this and future public health crises.

### How is this related to demographic and economic drivers?

Population growth, aging and mobility needs, and the location of industry clusters are all key drivers that feed into any discussions about resilience of the transportation network and the ability of the state's regional economies to respond after a major natural disaster.

### What transportation questions are connected to this theme?

- Economic competitiveness
- Structure of the Oregon economy
- Revenue
- VMT changes
- Interaction with industry clusters
- Capacity / congestion



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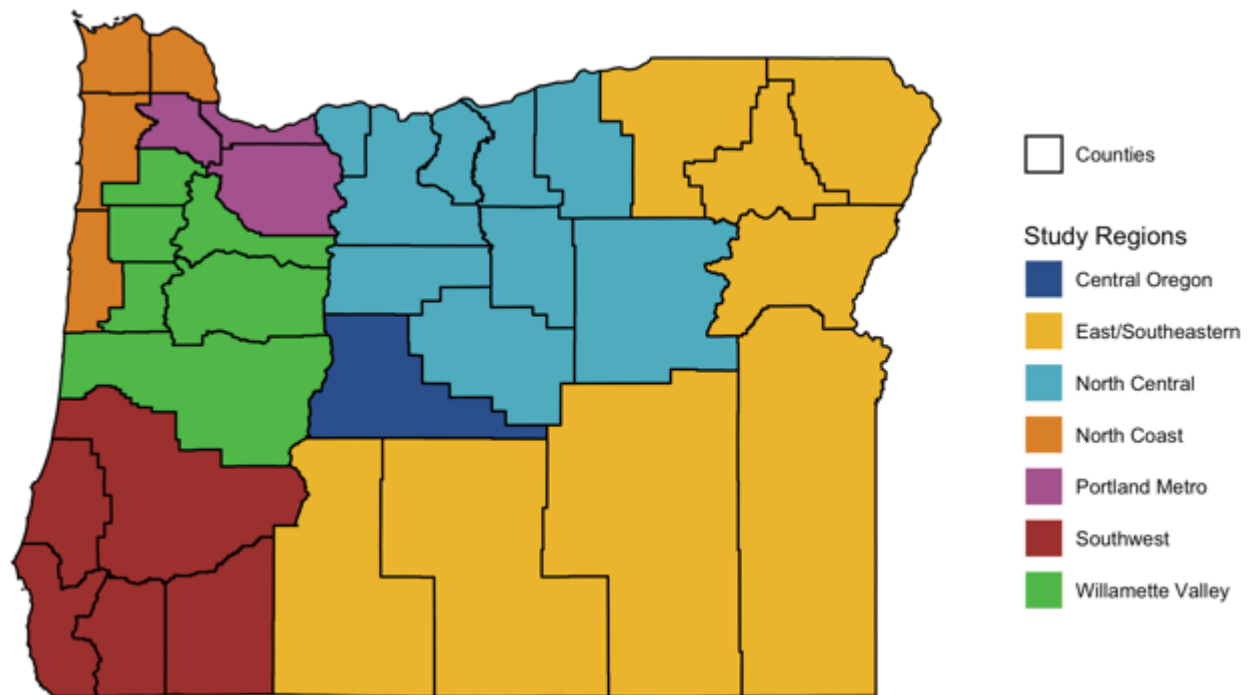
# APPENDICES

## APPENDIX A. PROJECT OVERVIEW

The following technical appendices will serve as the foundation for the technical memorandums investigating past and futures economic and demographic drivers of transportation demand throughout Oregon. In previous Oregon Transportation Plans and Highway Plans the state was evaluated singularly. That is to say, there were not specific regional analysis conducted or policy differentiation. These memos collectively will investigate regional differences, as such, the following regions will be used to compare past and future drivers for the phase 1 reports.

**Figure 1. Study regions with county overlay**

Source: ECONorthwest.



Census Public Use Microdata Sample (PUMS) data was used to construction regions so that annual data could be obtained along with lower margins of error. PUMS data is only available in PUMA geographies—several PUMAs were combined to create the 7 proposed regions. The effectiveness of these regions will be evaluated at the completion of the phase 1 reports.

It should be noted that subsequent to the technical analysis, a determination was made to recommend a slightly different regional configuration. This is discussed in more detail in the preceding chapters. The remainder of this technical appendix uses the regional configuration displayed in Figure 1.

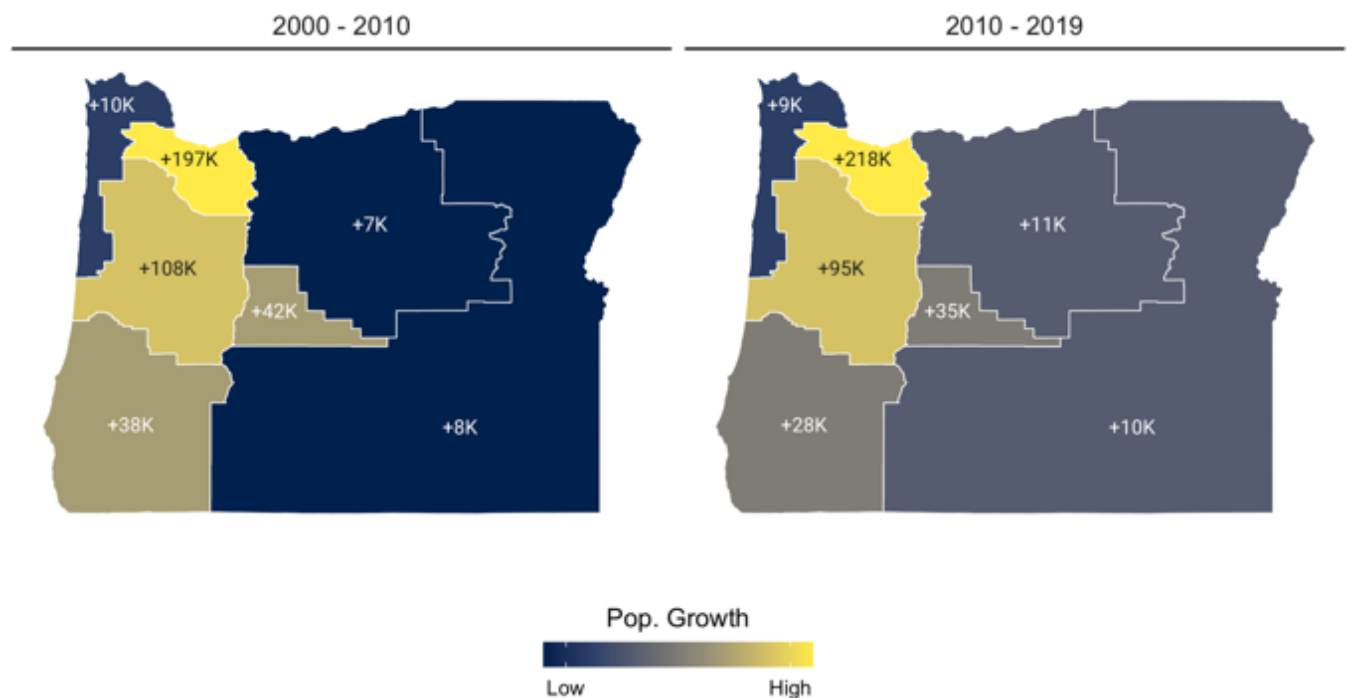
## APPENDIX B. DEMOGRAPHICS

### Recent demographic trends

Oregon's population increased by approximately 815,000 from 2000 to 2019 period, which is a 24 percent increase. Almost all the growth has occurred in the regions along the I-5 corridor, including the Southwest, Willamette Valley, and Portland Metro regions, in addition to the neighboring Central Oregon region. Figure 3 shows population growth in the study regions for two time periods: 2000 to 2010 and 2010 to 2019. From 2000 to 2010, population growth in the I-5 corridor accounted for 94 percent of the state's total growth. Similarly, from 2010 to 2019 these regions accounted for 93 percent of total population growth.

**Figure 2. Population growth by region, 2000–2010 and 2010–2019**

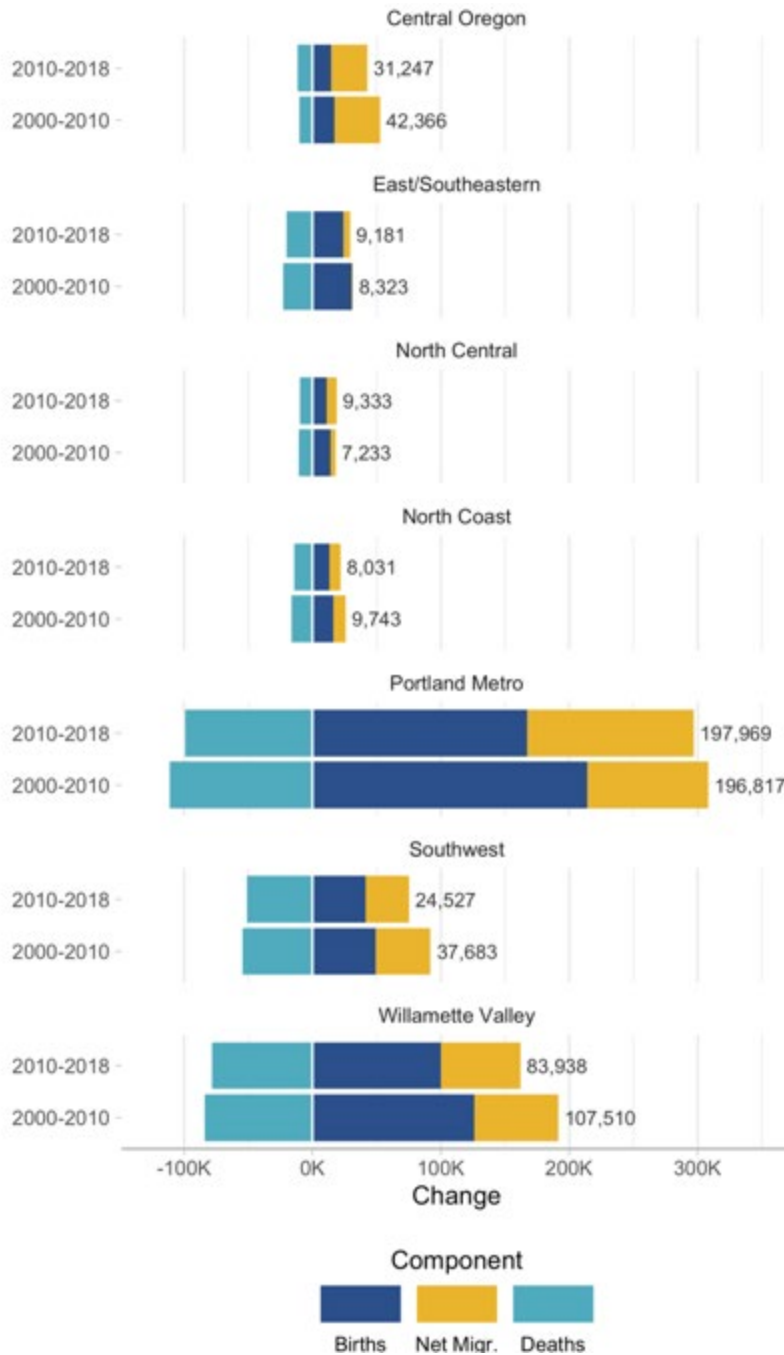
Source: Portland State University, Population Research Center.



Net migration is the primary driver in population growth across Oregon. In some regions, such as East/Southeastern Oregon, it is less pronounced; however, net migration tends to exceed a region's natural population change (births minus deaths). The Portland Metro region experienced the highest level of net migration relative to all other regions over the 2010 to 2018 period, followed by the Willamette Valley, Central Oregon, and Southwest regions.

**Figure 3. Components of annual population change (net migration), 2000-2010, and 2010-2018**

Source: U.S. Census Bureau, Census Estimates Program, 2000-2018.

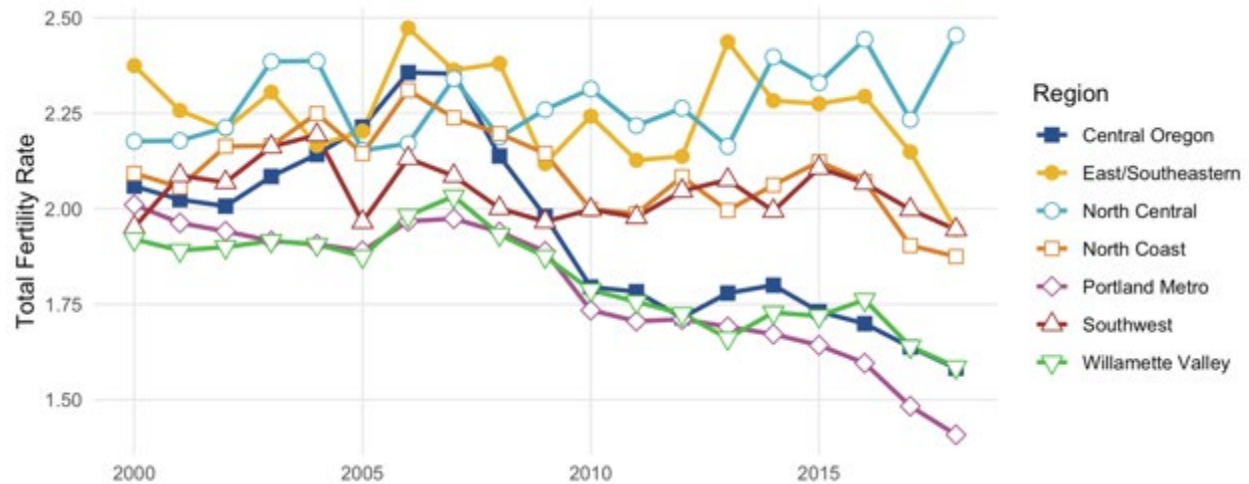


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Fertility rates are one leading indicator of population growth. A standard assumption is that a fertility rate of 2.1 suggests that women are giving birth to enough babies to be able to maintain the existing population. Fertility rates have decreased in every region except for the North Central since 2000. The three highest income regions—Portland Metro, Willamette Valley, and Central Oregon—have all experienced the largest decline in fertility rates.

**Figure 4. Fertility rate by region, 2000 – 2018**

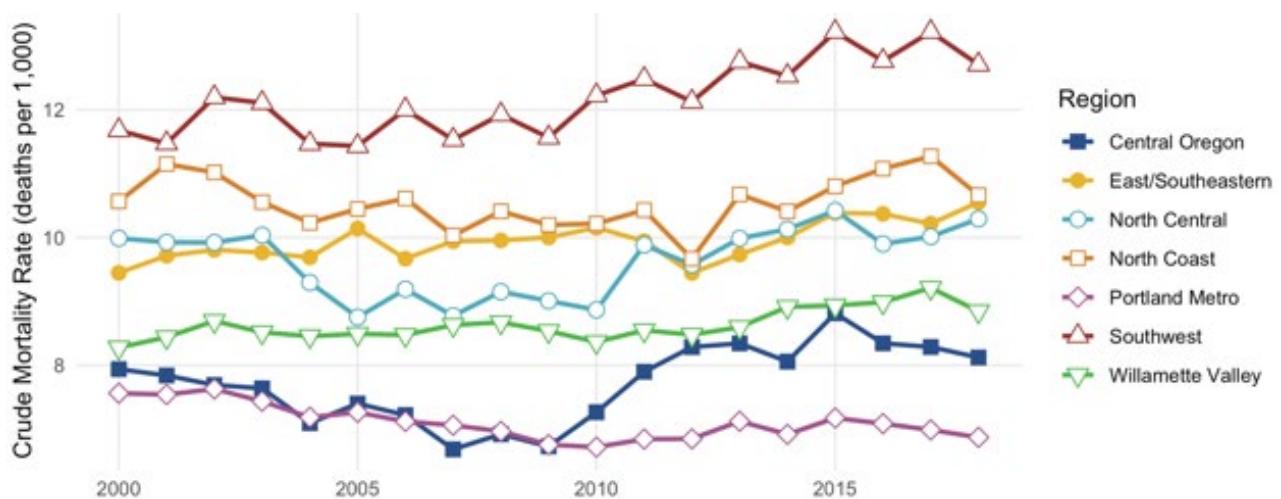
Source: Oregon Health Authority, PSU Population Research Center.



Mortality rates will generally trend upward as populations increase in size and age. Figure 6 displays the crude (not normalized by age across regions) mortality rate by region between 2000 and 2018.

**Figure 5. Crude mortality rates by region, 2000 – 2018**

Source: Oregon Health Authority, PSU Population Research Center.

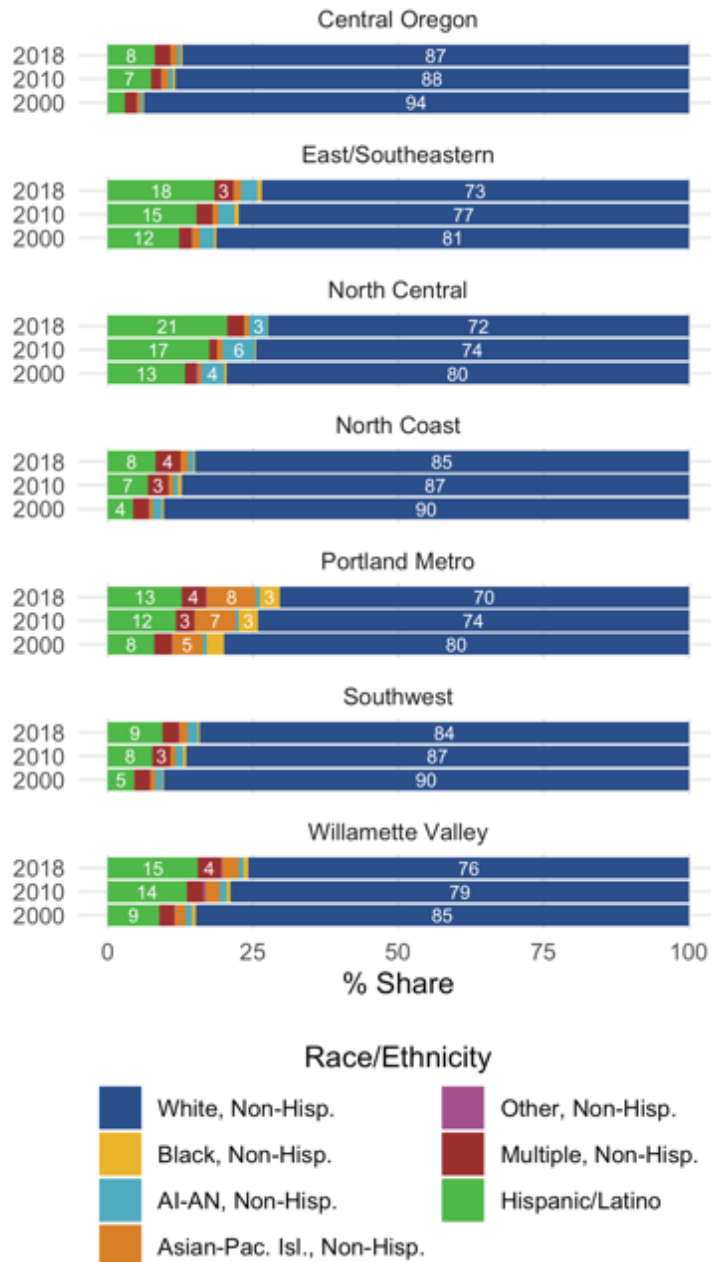


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The racial and ethnic mix of residents across all regions have become more diverse over the 2000 to 2018 period. Portland Metro region saw the largest change, increasing the proportion of its non-White population by 10 percentage points, followed by a nine percentage point increase in the Willamette Valley, and an eight percentage point increase in both the East/Southeastern and North Central regions.

**Figure 6. Race and ethnicity by region, 2000, 2010, and 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000, 2010, and 2018.





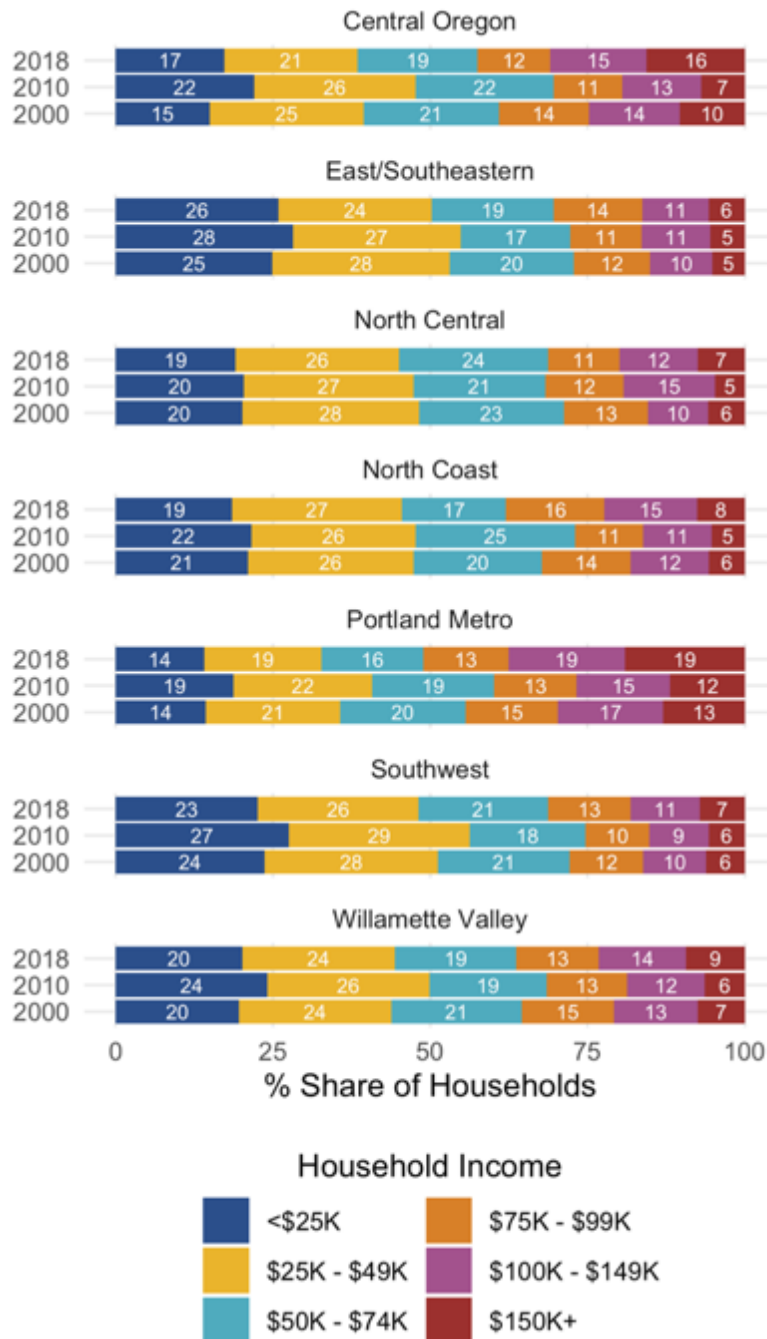
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Figure 8 displays how incomes are distributed across households in each income bracket as defined by the U.S. Census. The Portland Metropolitan area and Central Oregon have seen the largest growth in households in the upper ends of the income bracket. This chart does not adjust for the cost of living, and therefore does not account for variation across regions for expenses such as housing or transportation.

**Figure 7. Income distribution by household and income bracket, 2000, 2010, and 2018 (in 2018\$)**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000, 2010, and 2018.



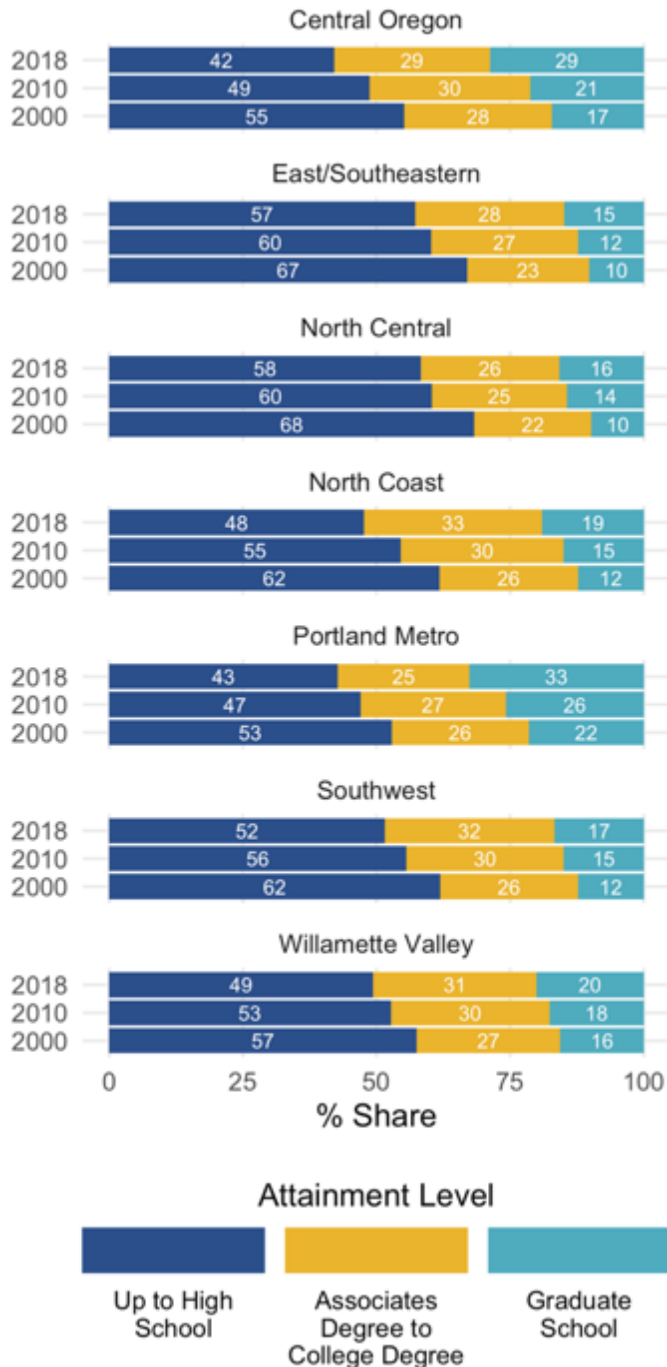
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## Oregon Economic & Demographic Regions White Paper

The share of residents with a postsecondary education has increased across all regions during the 2000 to 2018 period. Except for the Willamette Valley, all regions have seen a decrease of at least 10 percent in the share of residents that hold a high school diploma as their highest level of educational attainment. (See Figure 9).

**Figure 8. Educational attainment, by region, 2000, 2010, and 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000, 2010, and 2018.

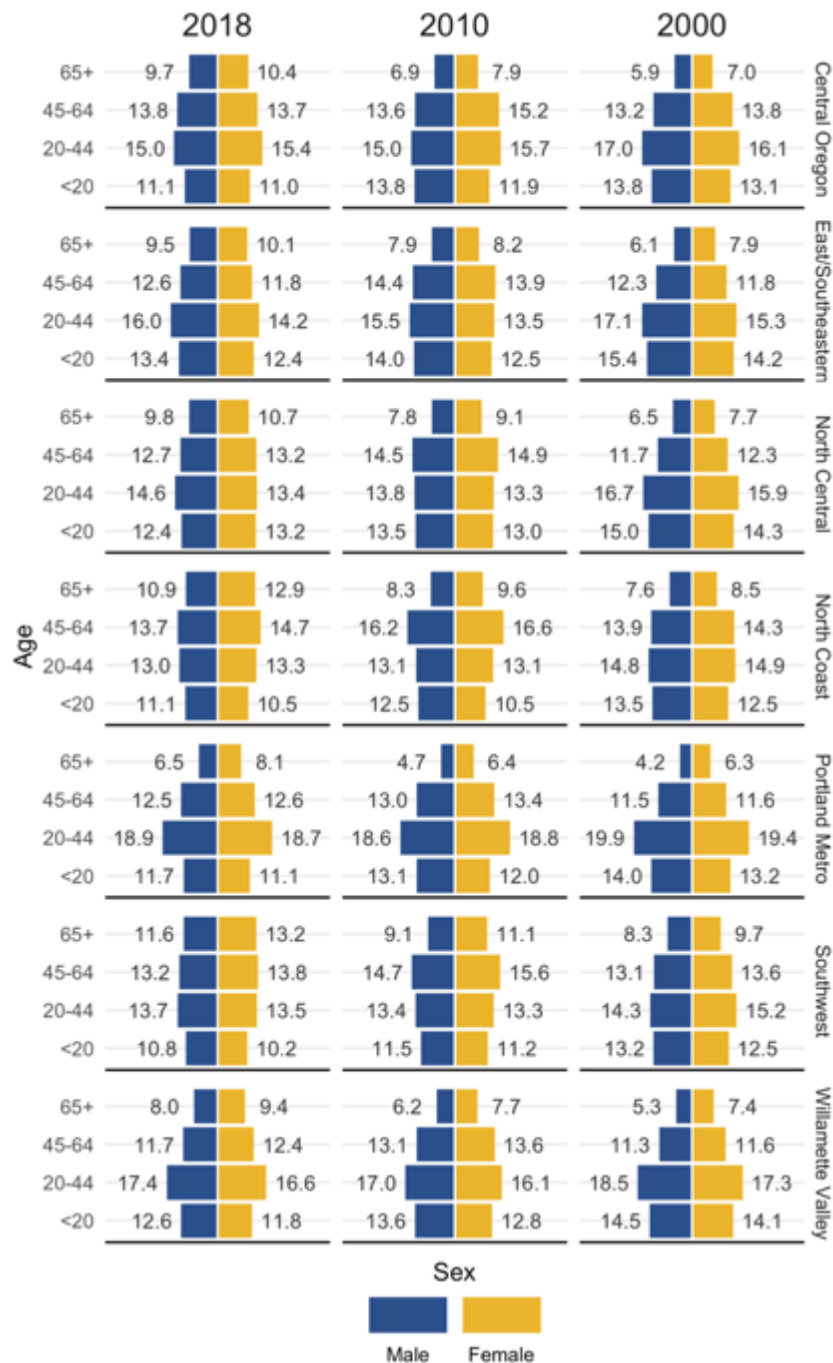


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Oregon's population continues to age. Across the 2000 to 2018 time period, the share of residents 65 years and older in each region increased. Residents between the ages of 45 to 64 also increased across this period, less so than for those 65 and older (Figure 10). Age cohorts below the age of 20 and those between the ages of 20 and 44 decreased in size across every region.

**Figure 9. Age cohort distribution by region, 2000, 2010, and 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000, 2010, and 2018.

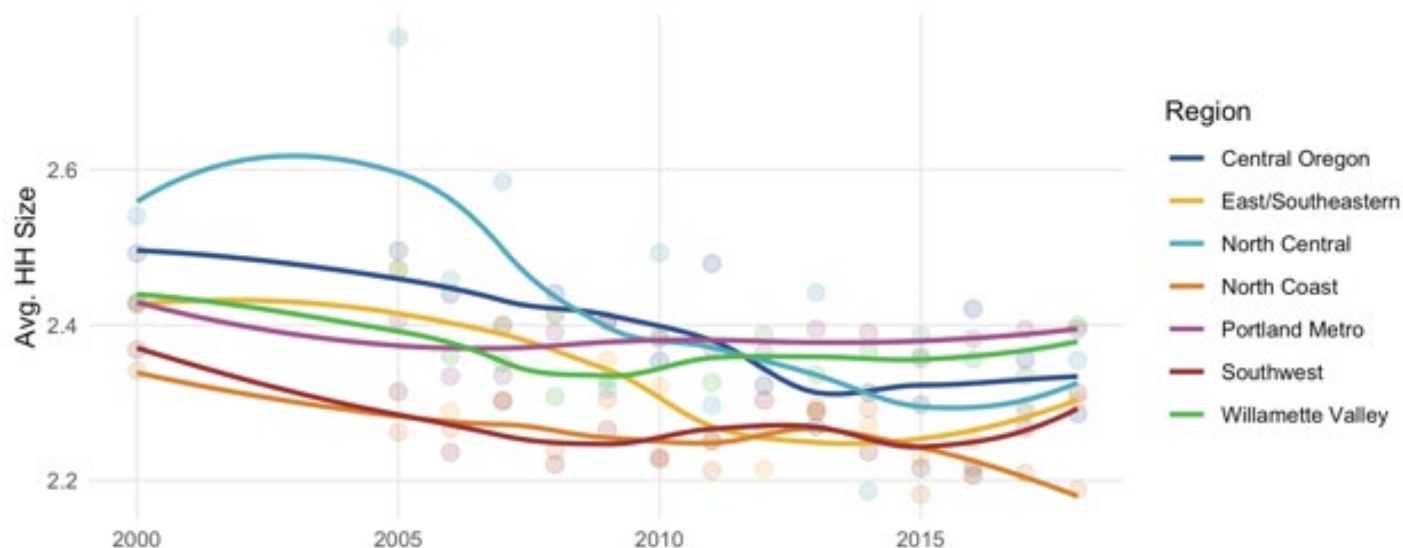


Average household sizes have declined in every region from 2000 to 2018. The Central Oregon, North Coast, and North Central regions experienced the largest declines, decreasing by approximately 0.2 persons per household (Figure 11). In the East/Southeastern and Southwest regions, the average size decreased by 0.1 persons. The Portland Metro had the smallest change, but currently has the largest average household size at approximately 2.4 people per household.

**Figure 10. Household size by region, 2000 – 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000 and 2005-2018.

Note: Dots represent actual values reported in PUMS and lines smoothed averages between years.



When trying to quantify the concentration of poverty and low-income households in regions across the state, there are two variables that are commonly used—median family income (MFI) and the poverty rate. MFI represents the median income for a family of 4 at the county level. Households earning 60% of less of MFI are eligible for regulated/subsidized housing and is therefore a good measure of low-income households. The second measure is the poverty rate, which is an indicator developed at the state level based on the number of people in a household and doesn't vary across regions within the state. As referenced in Figure 12, 60% of MFI is greater than the poverty rate in all regions.

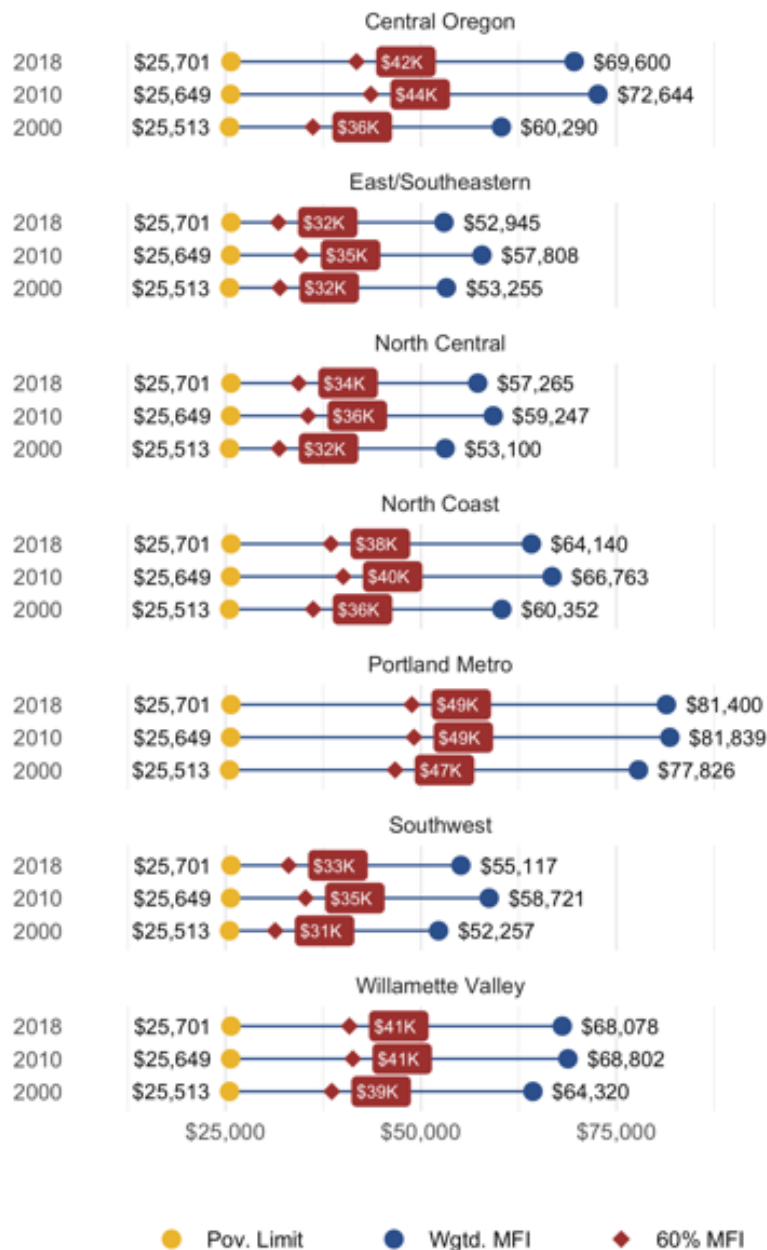
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## Oregon Economic & Demographic Regions White Paper

**Figure 11. Median family income (MFI) by region, 2000, 2010, and 2018 (in 2018 dollars)**

Source: U.S. Census Bureau, U.S. Department of Housing and Urban Development.

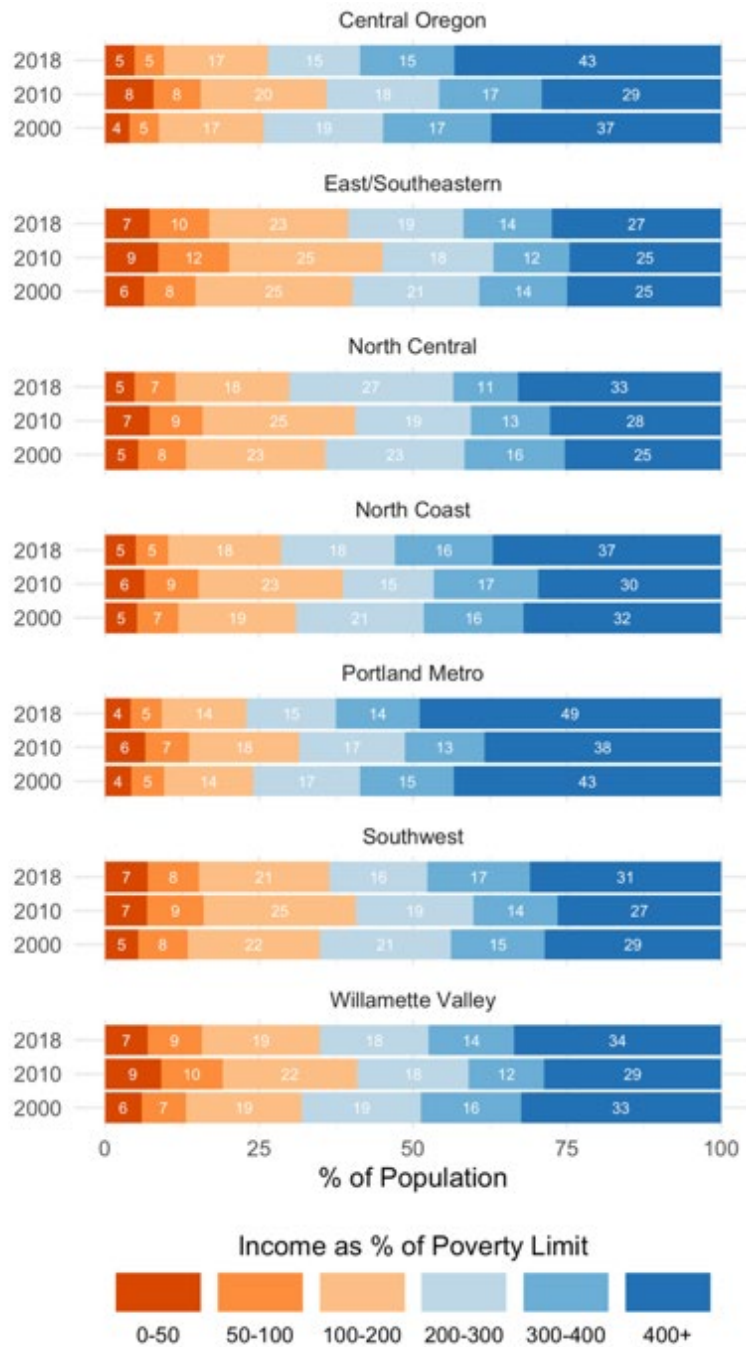
Note: Regional MFI is calculated as the population-weighted average of county-level MFI; Poverty limits are for families of four to conform with HUD's MFI method.



In the Willamette Valley region, the share of residents earning under 100% of the Federal Poverty Limit (FPL) increased by three percentage points, while all other regions saw a decrease ranging from a two percent decrease to no change. The North Central region had the largest decrease (five percent) in its share of residents earning between 100-200% of the FPL relative to all other regions, indicating positive income mobility.

**Figure 12. Poverty level by region, 2000, 2010, and 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000 2010, and 2018.



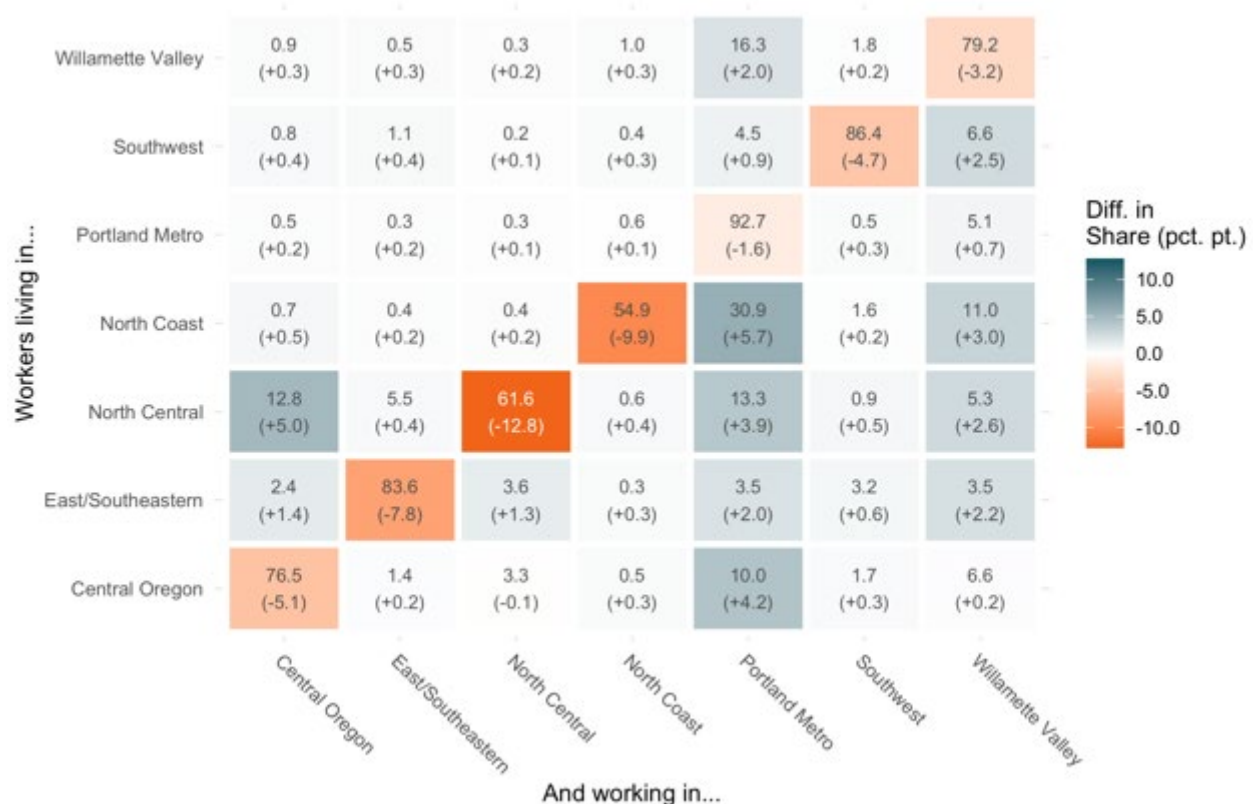


## Recent transportation trends

Figure 14 displays trends in job flows across each region. The data shows where workers live relative to their places of employment, providing some understanding around how commuting patterns have changed over time. Broadly, businesses in the Portland Metro have seen the largest increase in workers living in other regions of the state. One caveat with this dataset, however, is that while it can indicate broader trends in commute patterns, it also includes workers that complete some share of their jobs remotely (e.g., telecommute) and may not need to commute often.

**Figure 13. Region-to-region commute flow change (as shares of origin region's total out-flow) by region, 2002 - 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.  
 Note: Commutes are limited to only those occurring entirely within Oregon.



The majority of workers statewide commute to their jobs via private passenger vehicles. In general, this trend has shifted little across the 2000 to 2018 period for all regions. The share of workers in the North Central, East/Southeastern, and the Willamette Valley regions have remained mostly the same over the analysis period. However, the Portland Metro and Central Oregon regions have seen some sizable shifts in the modes of transportation workers take to commute to their jobs. In Central Oregon, the share of employees working from home increased by five percentage points, from eight percent in 2000 to 13 percent in 2018.

**Figure 14. Counties included in cross border commute flows**

Source: ECONorthwest.

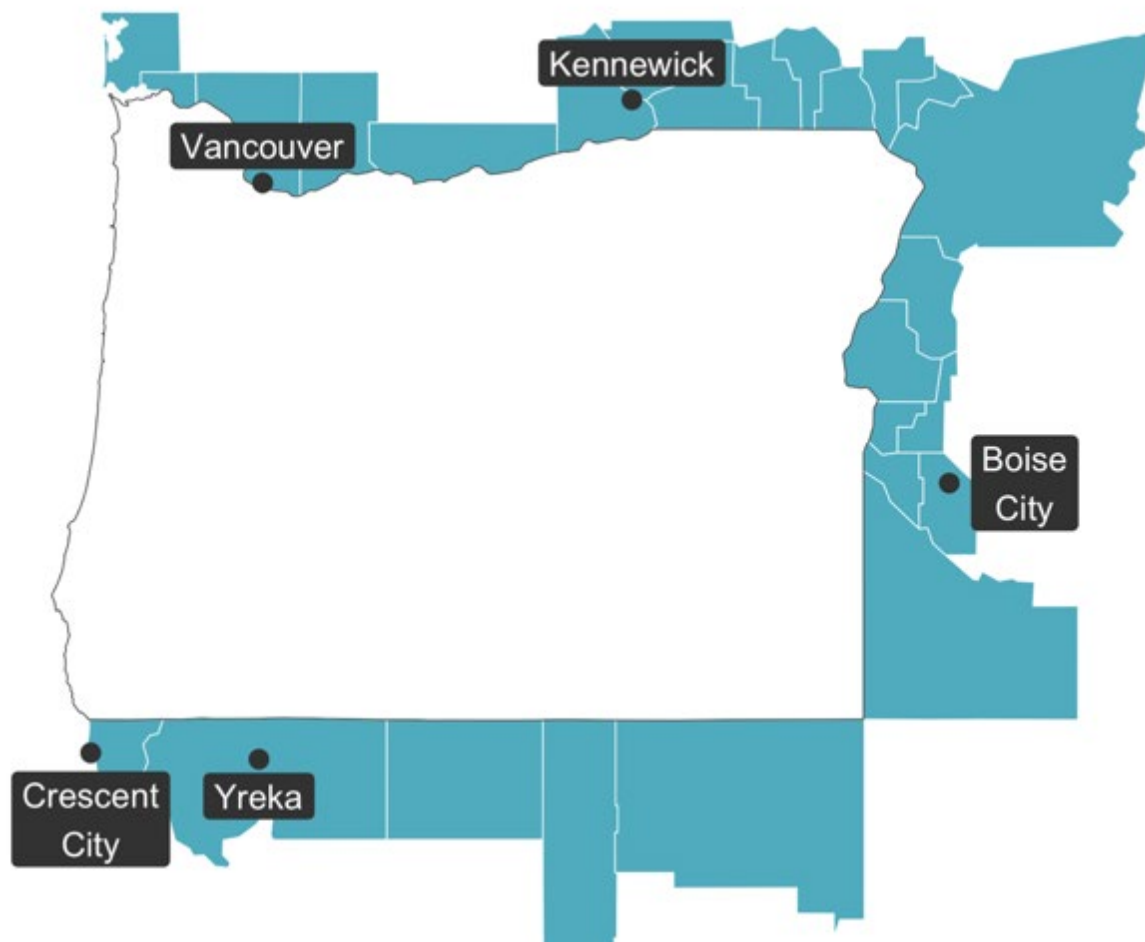


Figure 16 lists cross region commute patterns but does not include any cross-border commute flows. There are several large population and jobs markets near the state border. As such, it is important to quantify the amount of cross state border commuters, as those transportation facilities are often some of the major congestion points in the system. Figure 15 indicates which counties were included to in the measurement of live and workflow across state borders. We include neighboring counties in California, Idaho, Nevada, and Washington.

Figure 16 calculates the share of workers in each region that live and commute from another state from 2002 to 2017. The share of workers commuting from out of state is increasing in all regions.

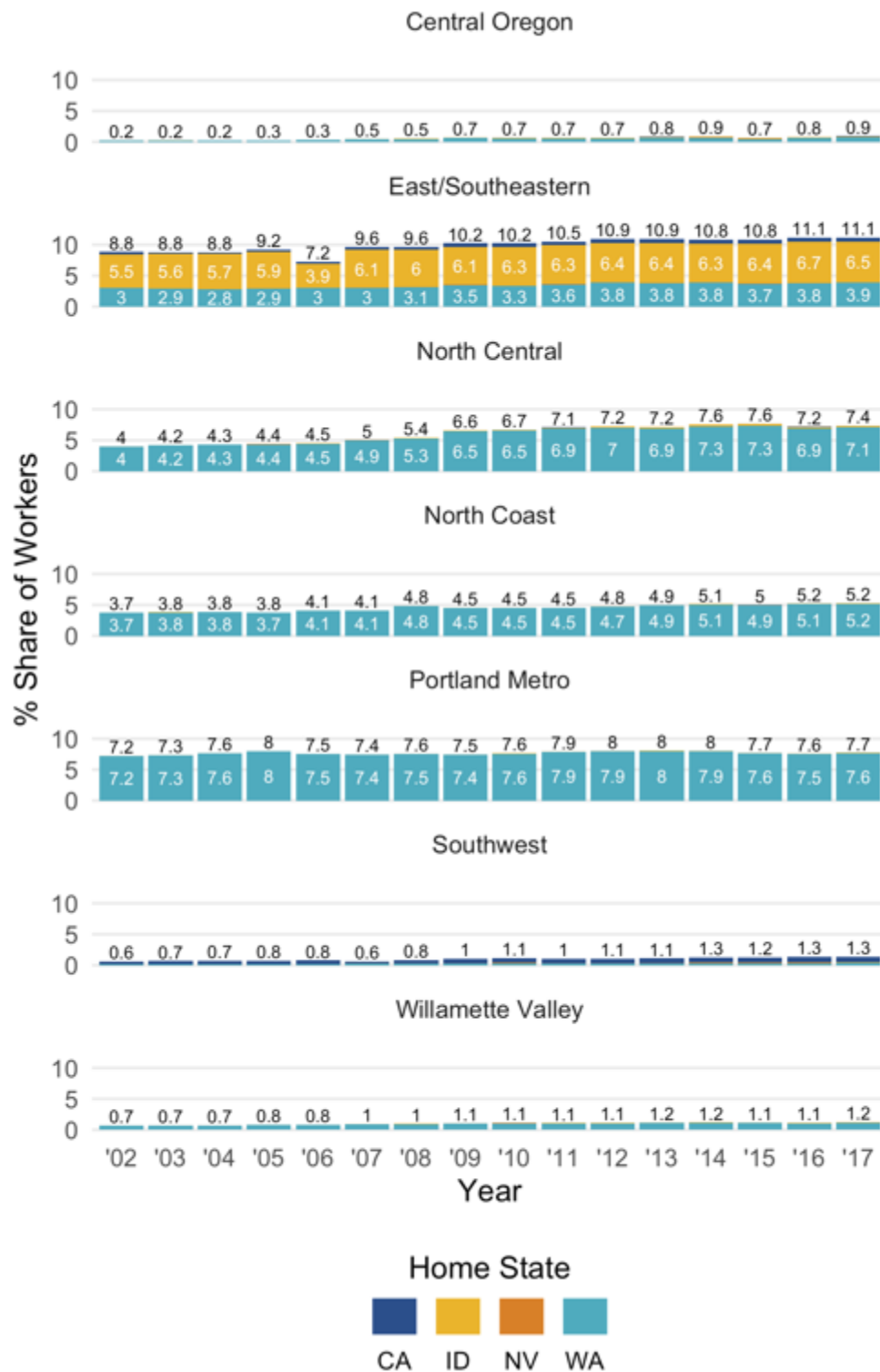
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**Figure 15. Inbound cross-border commutes for Oregon, by region, 2002 – 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.

Note: Out-of-state commutes were limited to counties neighboring Oregon.



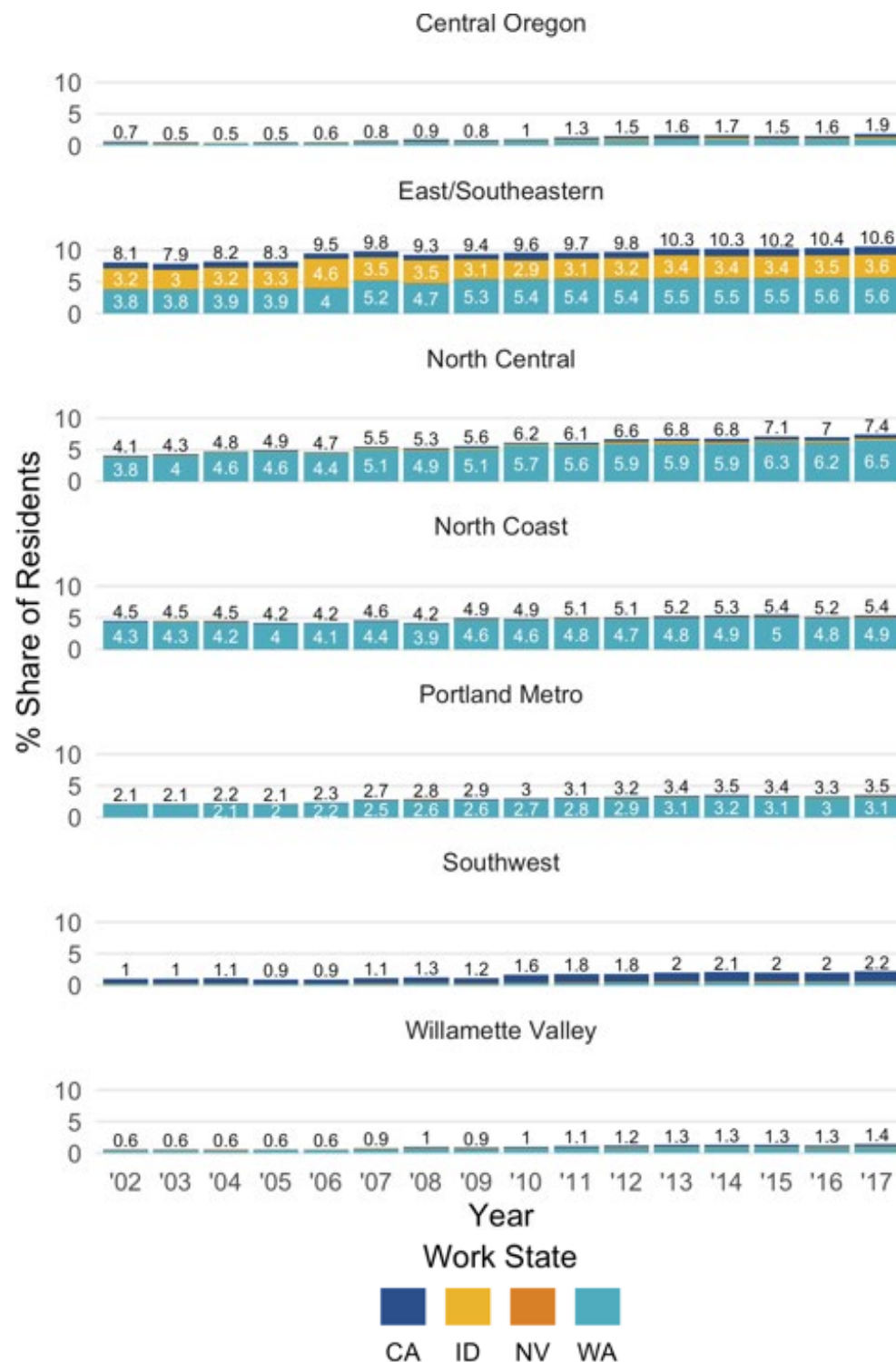
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Figure 17 shows the percentage of the population living in each region that works in another state. In all regions except for Central Oregon, more workers commute inbound to the state, than residents leaving the state for employment in another state.

**Figure 16. Outbound cross-border commutes for Oregon, by region, 2002 – 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.

Note: Out-of-state commutes were limited to counties neighboring Oregon.



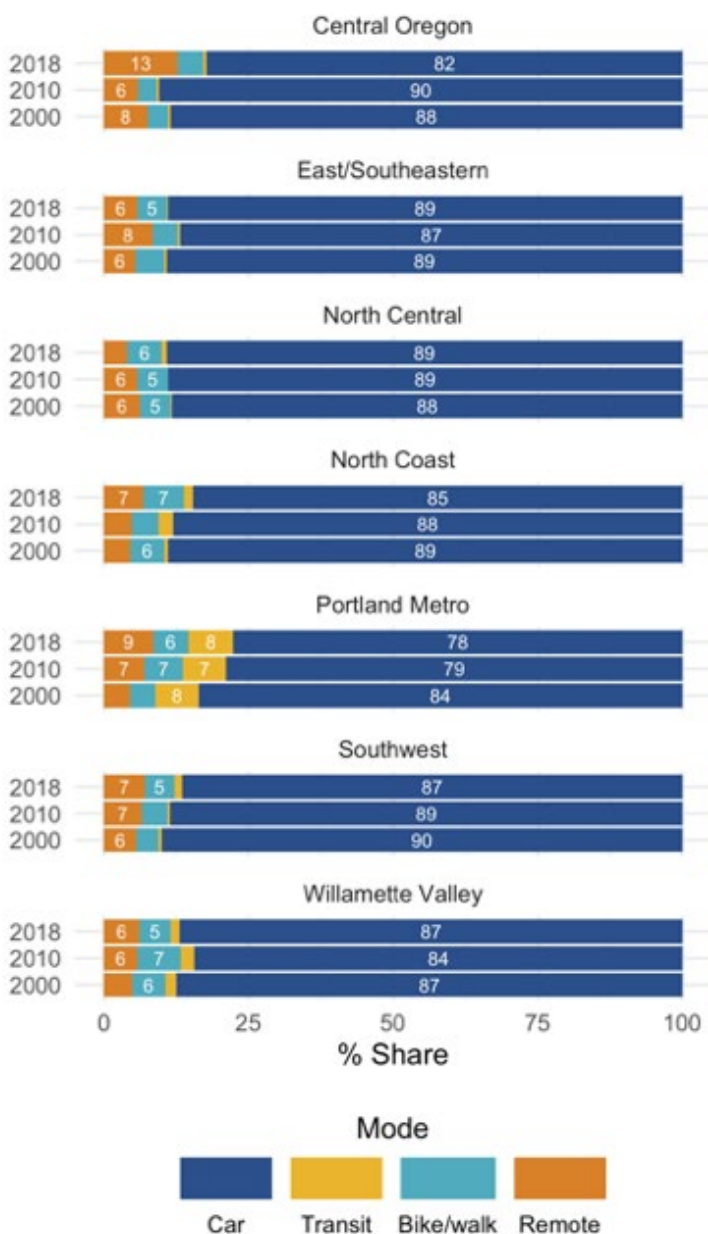
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Over the 2000 to 2018 period, the vast majority of workers in all regions commuted to their jobs via private passenger vehicles (Figure 18). During this time, however, there has been a shift toward workers working remotely in certain regions. Of note are the share of remote workers in Central Oregon, which grew by about five percentage points, from eight percent in 2000 to 13 percent in 2018. In the Portland Metro region, the share of those working remote grew from sub-five percent to nine percent in tandem with a bike/walk transit increase of sub-five percent to six percent.

**Figure 17. Mode of transportation to work by region, 2000, 2010, and 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000 2010, and 2018.

Note: Estimates represent home-based trips to place of work.



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Commuting distances have increased across all regions during the 2002 to 2017 period. The East/Southeastern, Central Oregon, Southwest, and North Central regions all had an approximately 20-minute average commute time in 2002, though over the following fifteen years, these times increased in all regions (see Figure 19). The largest average commute distance increase occurred in the East/Southeastern region, growing by about 74 percent over the analysis period.

**Figure 18. Weighted average commute distance by destination region, 2002 – 2017**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.

Note: Distances are geodesic straight-line distances between block groups, and commutes are limited to only those occurring entirely within Oregon.

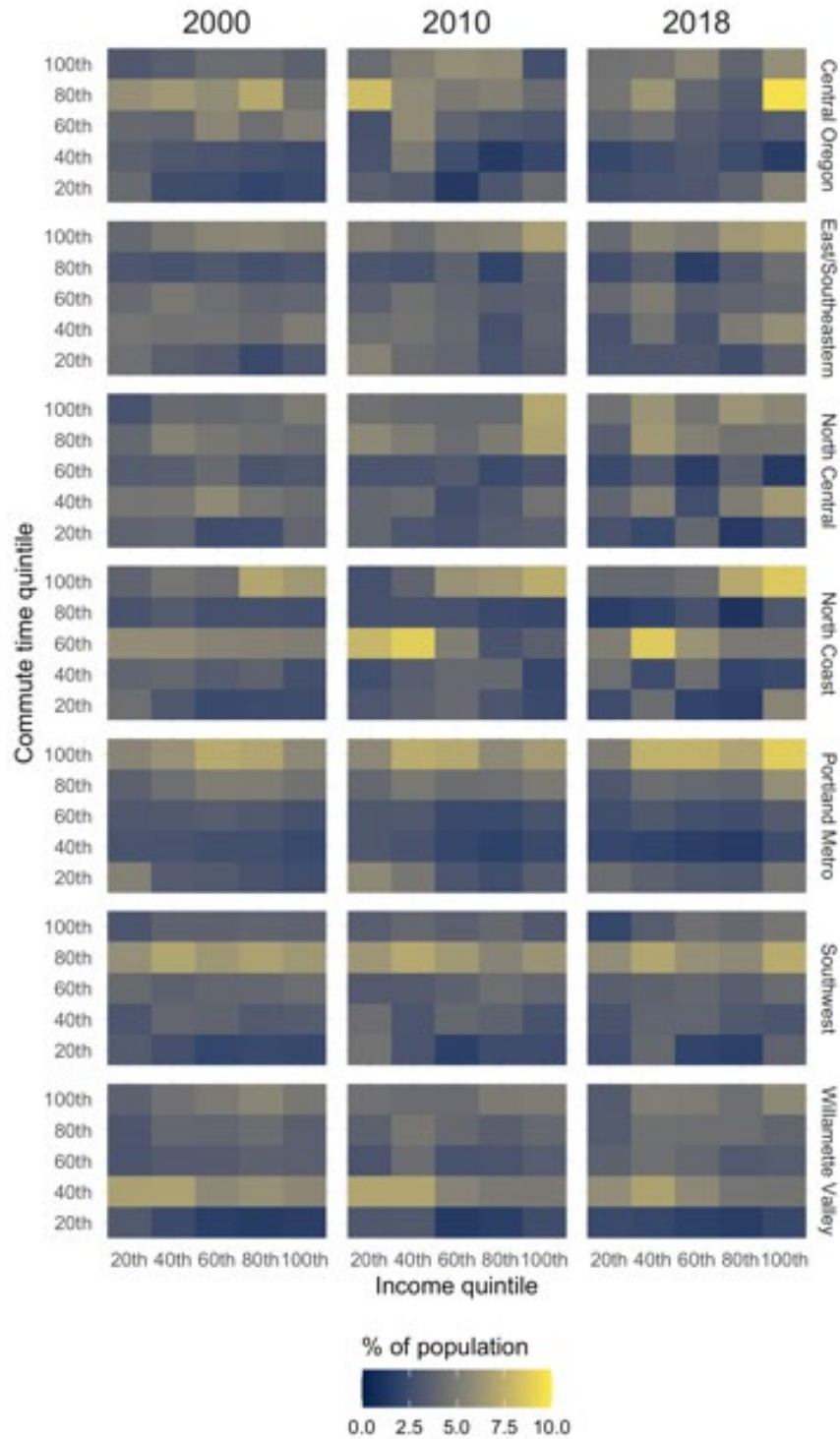




**Figure 19. Commute time by income and region, 2000, 2010, and 2018**

Source: Longitudinal Employer-Household Dynamics (LODES), 2002-2017.

Note: Quintiles are region-specific. Income has been adjusted to 2018\$

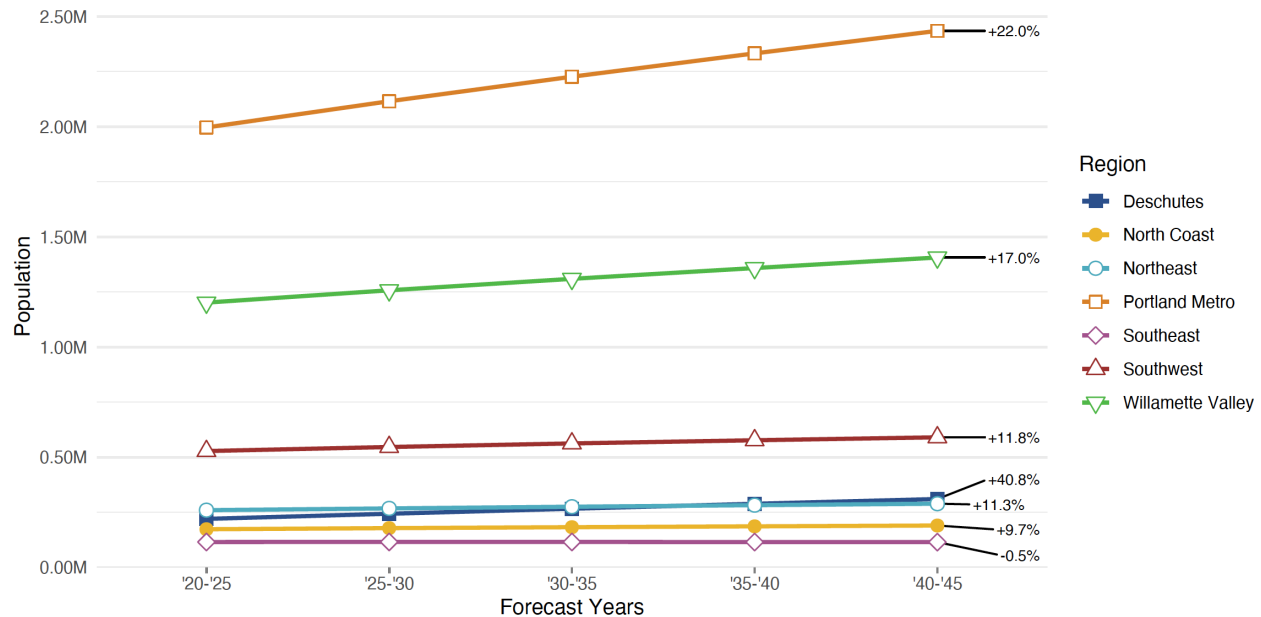


## Drivers of future population and demographic trends

The population in all regions is expected to grow through 2045. Figure 21 shows the forecasted population growth in five-year intervals for each region. Central Oregon is expected to grow by 32 percent, with the Portland Metro and Willamette Valley the only other regions forecast to grow by more than 10 percent. All other regions are expected to grow by less than 0.5 percent per year through 2045.

**Figure 20. Total forecasted population by region, 2020 – 2045**

Source: Portland State University, Population Research Center.

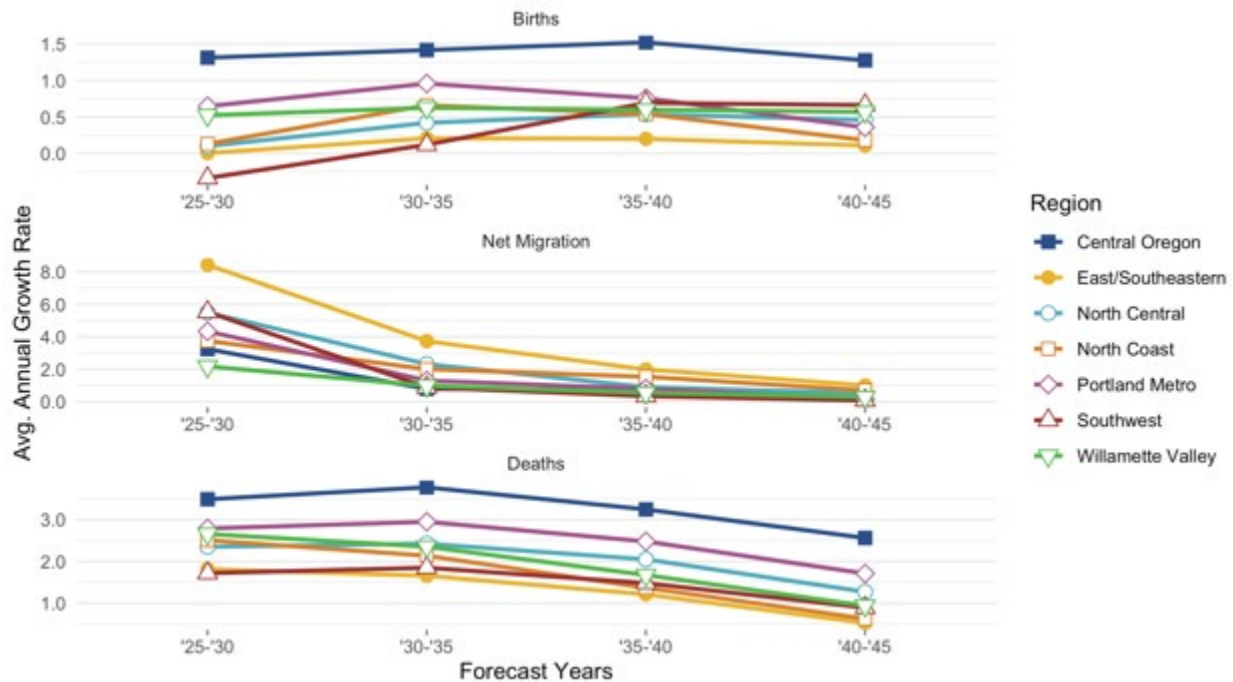


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Population growth is sum of births, deaths, and net migration. Figure 22 breaks down each component, for each of the regions, in 5-year increments. With the exception of the birth rate in the Southwest, the rate of growth is expected to slow for all three components of population growth in all regions through 2045. The most impactful decrease is in the projected net migration rate. Given the statewide forecast of negative natural growth (births minus deaths), the state will be entirely reliant on net migration in order to achieve any population increases.

**Figure 21. Forecasted average annual population growth by region, 2025 – 2045**

Source: Portland State University, Population Research Center.



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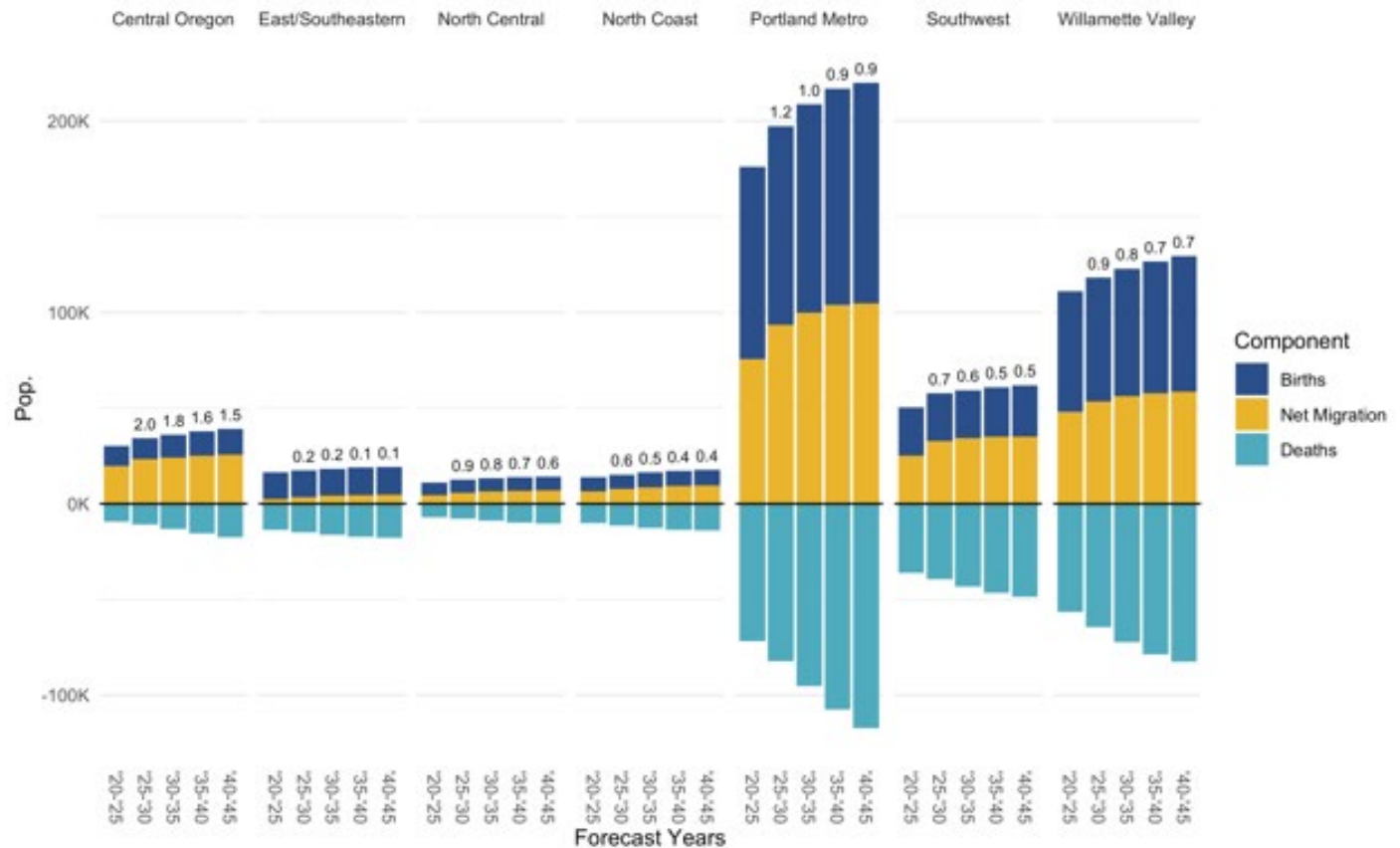
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Figure 23 provides an alternative data visualization, stacking the 3 components of population change for each region, in 5-year increments. The label above each of the bars represents the average annual growth rate for each 5-year period in the region. All regions across the state are expected to have decreasing population growth rates through 2045. Central Oregon is the only region expected to observe growth rates greater than one percent in 2045.

**Figure 22. Components of forecasted population change by region, 2020 – 2045**

Source: Portland State University, Population Research Center.

Note: Average annual growth rate by period indicated in the label above each bar.



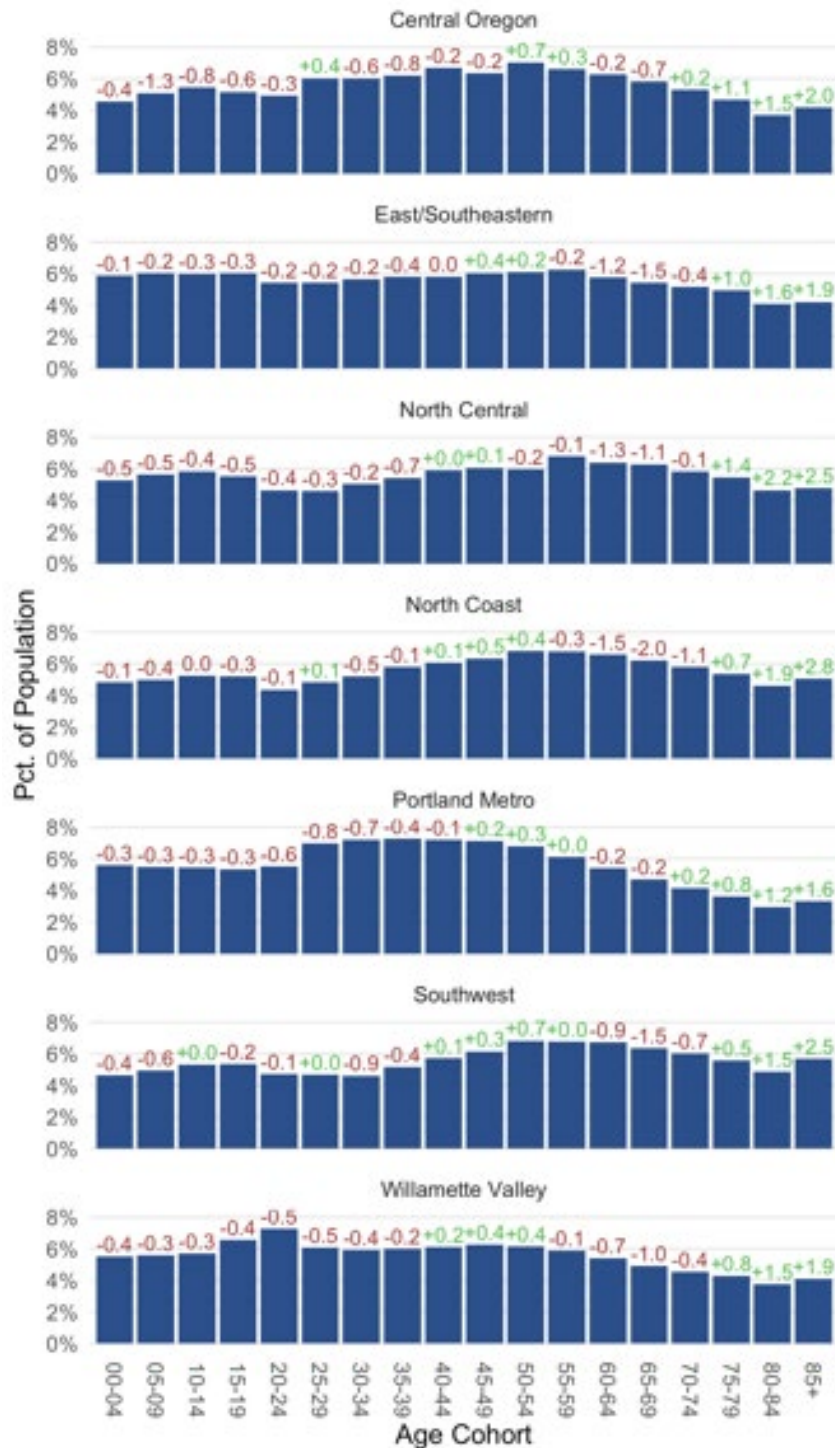
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Figure 24 shows the forecasted change in each age cohorts share of the population from 2020 to 2040. In most regions, the population below 40 is expected to decrease as a share of the population. Put differently, the population is expected to age in all regions compared to the distribution in 2020.

**Figure 23. Change in population (as a share) between 2020 and 2040 by age cohort**

Source: Portland State University, Population Research Center.



## APPENDIX C. ECONOMICS

### Recent economic trends in Oregon

An accepted framework for measuring a region's economic health relies on several measure of wellbeing (e.g. jobs and income) along with broader measures of quality of life (e.g., the social and natural environment). Often, data for measuring these broader measures are constrained and unavailable, and typically we rely on narrower definitions of economic activity for planning purposes. In the context of Oregon's highway and transportation system, this includes trying to incorporate demand for the transportation network for both households and businesses. The previous section focused on socioeconomic trends around that state that are correlated with household drivers of demand for the transportation network. This section focuses on outlines the directionality of labor and industry activities across the study regions, which can be used to support transportation planning.

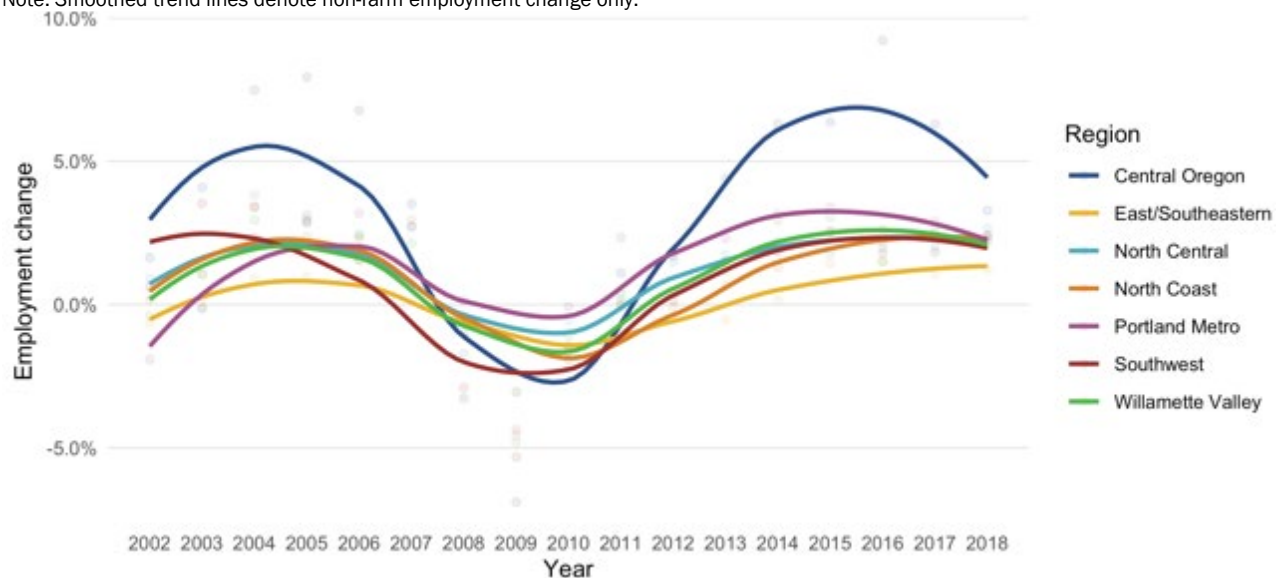
#### Labor force and employment characteristics

Employment levels across all regions have increased during the 2001 to 2018 period, however, the rate of employment growth has slowed to about one-to-three percent in recent years for all regions.

**Figure 24. Annual change in total employment by region, 2001 – 2018**

Source: Bureau of Economic Analysis.

Note: Smoothed trend lines denote non-farm employment change only.



The employment-to-population ratio is a macroeconomic indicator that describes the proportion of a region's working population relative to its overall population. Over the 2000 to 2018 analysis period, this ratio fluctuated for all regions. During the Great Recession, this ratio declined quite severely for the Central Oregon, Southwest, and North Coast regions, and less severely for the others; however, since recovering from the economic downturn, most regions have not reached their respective pre-recession peaks. Figure 26 shows the change in employment-to-population ratio for all regions.



**Figure 25. Employment-to-population ratio by region, 2000 – 2018**

Source: Portland State University, Population Research Center; Bureau of Labor Statistics.

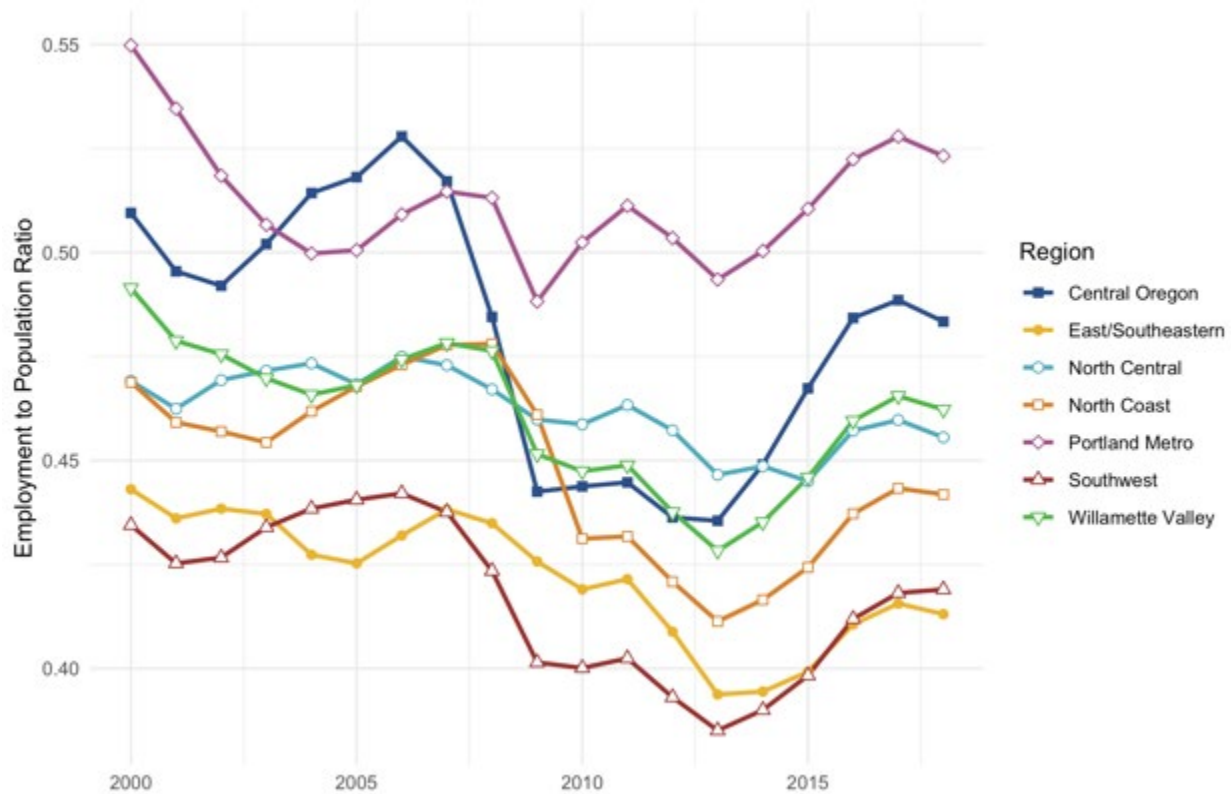


Figure 28 through Figure 34 show the industry concentration and average annual growth rate by North American Industry Classification System<sup>1</sup> (NAICS) sector for each respective region. Figure 27 provides a high-level description of each NAICS sector, its color coding in the region-specific charts to follow, and an example firm within each sector. The x-axis shows the average annual growth rate over the 2001 to 2018 period, and the y-axis shows the location quotient for each sector. Location quotient is a way to measure the specialization of a sector in a region relative to the statewide economy.

A value of 1.0 indicates that a region's sector is equally specialized in comparison to the state. A quotient exceeding 1.0 indicates that a region's labor force is more concentrated relative to other areas of the state. Each NAICS sector is denoted by a bubble and its size represents its employment in 2018. For each regional figure, the three NAICS sectors with the highest location quotients are labelled as are the two sectors with the highest average annual growth rates and the two with the lowest growth rates.

<sup>1</sup> The North American Industry Classification System (NAICS) is used by the United States, Canada, and Mexico to classify businesses by their primary industry.

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**Figure 26. NAICS industry descriptions and example firms**

Source: ECONorthwest.

| Color Code | NAICS Sector Code | NAICS Sector Title                                  | NAICS Sector Description                                                                                                                                                                                                                                                    | Example Firm                       |
|------------|-------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
|            | 11                | Agriculture, Forestry, Fishing and Hunting          | Establishments primarily engaged in growing crops, raising animals, harvesting timber, and harvesting fish and other animals from a farm, ranch, or their natural habitats.                                                                                                 | Lochmead Dairy Farms               |
|            | 21                | Mining, Quarrying, and Oil and Gas Extraction       | Establishments that extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas.                                                                                                            | Portland Sand & Gravel Co.         |
|            | 22                | Utilities                                           | Establishments engaged in the provision of the following utility services: electric power, natural gas, steam supply, water supply, and sewage removal.                                                                                                                     | Northwest Natural Gas Co.          |
|            | 23                | Construction                                        | Establishments primarily engaged in the construction of buildings or engineering projects (e.g., highways and utility systems).                                                                                                                                             | OEG Inc.                           |
|            | 31-33             | Manufacturing                                       | Establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products.                                                                                                                                   | Precision Castparts Corp.          |
|            | 42                | Wholesale Trade                                     | Establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.                                                                                                                          | Adidas Intl. Inc.                  |
|            | 44-45             | Retail Trade                                        | Establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise.                                                                                                                            | Winco Foods                        |
|            | 48-49             | Transportation & Warehousing                        | Establishments providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation.                                                                       | Alaskan Airlines                   |
|            | 51                | Information                                         | Establishments engaged in the following processes: (a) producing and distributing information and cultural products, (b) providing the means to transmit or distribute these products as well as data or communications, and (c) processing data.                           | Oregon Public Broadcasting         |
|            | 52                | Finance and Insurance                               | Establishments primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions.                                                                    | Blue Cross & Blue Shield of Oregon |
|            | 53                | Real Estate and Rental and Leasing                  | Establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services.                                                                                                        | Vacasa Inc.                        |
|            | 54                | Professional, Scientific, and Technical Services    | Establishments that specialize in performing professional, scientific, and technical activities for others.                                                                                                                                                                 | ECONorthwest                       |
|            | 55                | Management of Companies and Enterprises             | Establishments that hold the securities of (or other equity interests in) companies and enterprises for the purpose of owning a controlling interest or influencing management decisions or establishments (except government establishments) that administer, oversee, and | Adidas America Inc.                |
|            | 56                | Administrative and Support and Waste Management and | Establishments performing routine support activities for the day-to-day operations of other organizations.                                                                                                                                                                  | Securitas Security Services Inc.   |
|            | 61                | Educational Services                                | Establishments that provide instruction and training in a wide variety of subjects.                                                                                                                                                                                         | Reed College                       |
|            | 62                | Health Care and Social Assistance                   | Establishments providing health care and social assistance for individuals.                                                                                                                                                                                                 | Kaiser Foundation Hospitals        |
|            | 71                | Arts, Entertainment, and Recreation                 | Establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons.                                                                                                                             | Trail Blazers Inc.                 |
|            | 72                | Accommodation and Food Service                      | Establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption.                                                                                                                                                    | Hilton Portland & Executive Tower  |
|            | 81                | Other Services (except Public Administration)       | Establishments engaged in providing services not specifically provided for elsewhere in the classification system.                                                                                                                                                          | Mannahouse Church                  |
|            | 92                | Public Administration                               | Establishments of federal, state, and local government agencies that administer, oversee, and manage public programs and have executive, legislative, or judicial authority over other institutions within a given area.                                                    | Multnomah County                   |

In Central Oregon, the management of companies and enterprises sector had the highest annual average growth rate (6 percent) during the 2001 to 2018 period; however, it's one of the smallest industries by employment count in the region (0.8 percent of total employment). The largest industry is government and government enterprises, which totaled almost 17,000 employees, or 13 percent, of the Central Oregon's total workforce in 2018. Construction and real estate and rental and leasing had the highest location quotients region-wide at 1.4 and 1.3, respectively. (See Figure 28).

**Figure 27. Industry concentration and growth in Central Oregon, 2001 – 2018**

Source: Bureau of Economic Analysis.

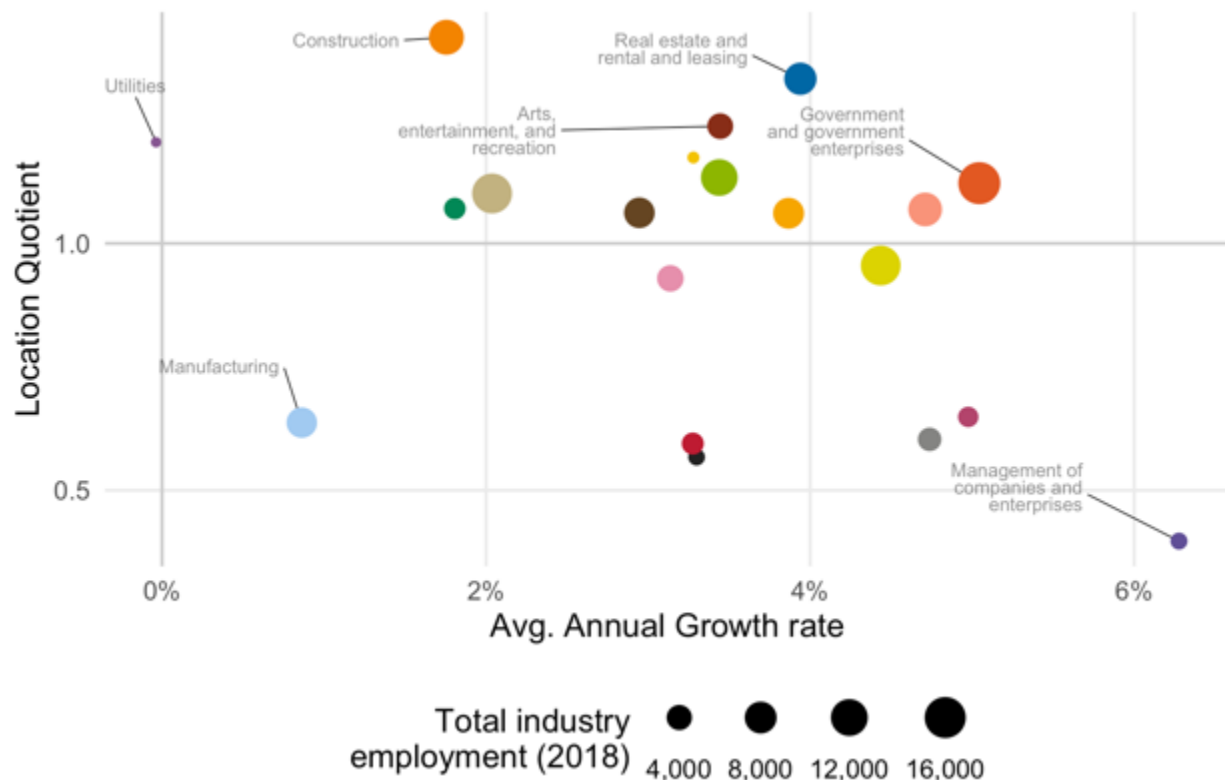
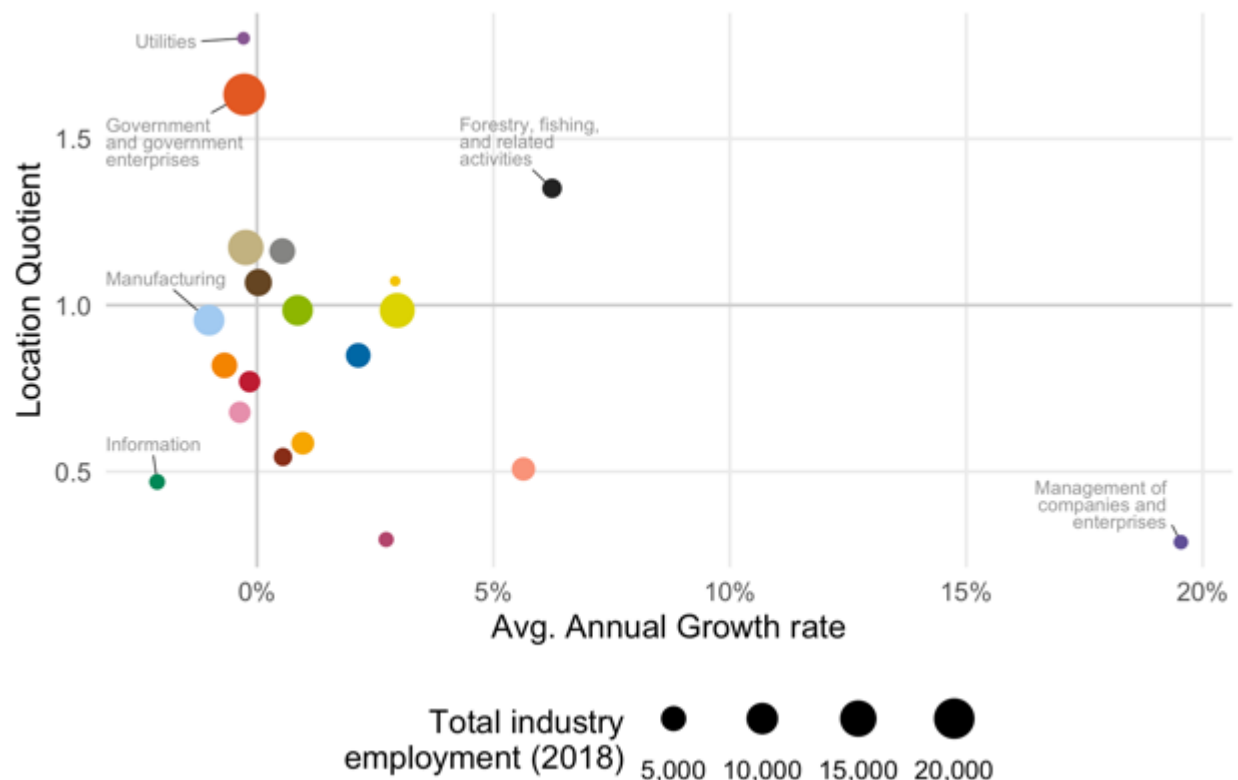


Figure 28 reveals many industries in Oregon's East/Southeastern region shrank during the 2001 to 2018 period. The largest contractions occurred in the information (2.1 percent average annual decrease) and manufacturing (1.0 percent average annual decrease) sectors. At the same time, the management of companies and enterprises grew by nearly 20 percent per year, but like the Central Oregon region, this sector's share of overall employment is small, making up only 0.6 percent of the East/Southeastern regional employment in 2018. Forestry, fishing, and other related activities had one of the largest growth rates in the region, increasing by approximately six percent per year, however, its total employment is only 1.8 percent of the regional total. The region's largest employment by volume, government and government enterprises (19 percent of total employment) decreased in size by about 0.3 percent annually.

**Figure 28. Industry concentration and growth in East/Southeastern Oregon, 2001 – 2018**

Source: Bureau of Economic Analysis.

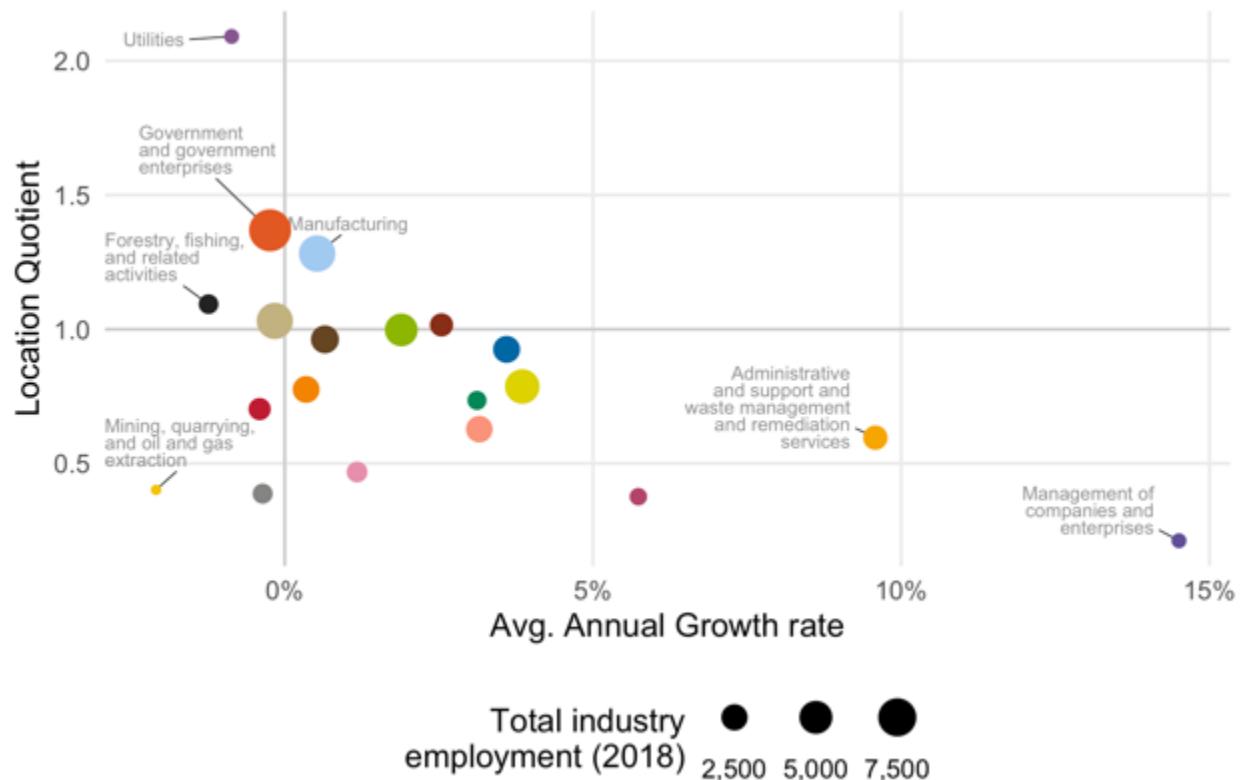


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The majority of employment sectors in the North Central region falls below that of the statewide average, as indicated by the location quotient values that are less than 1.0. Administrative, waste, and remediation services, along with management of companies experienced the largest average growth between 2001 and 2018, however both remain a smaller share of overall employment in the region (3.2 percent and 0.4 percent of total employment, respectively). Like other areas of the region, employment concentrated in production activities remains high in certain industries, but experienced limited growth. (See Figure 30).

**Figure 29. Industry concentration and growth in North Central Oregon, 2001 – 2018**

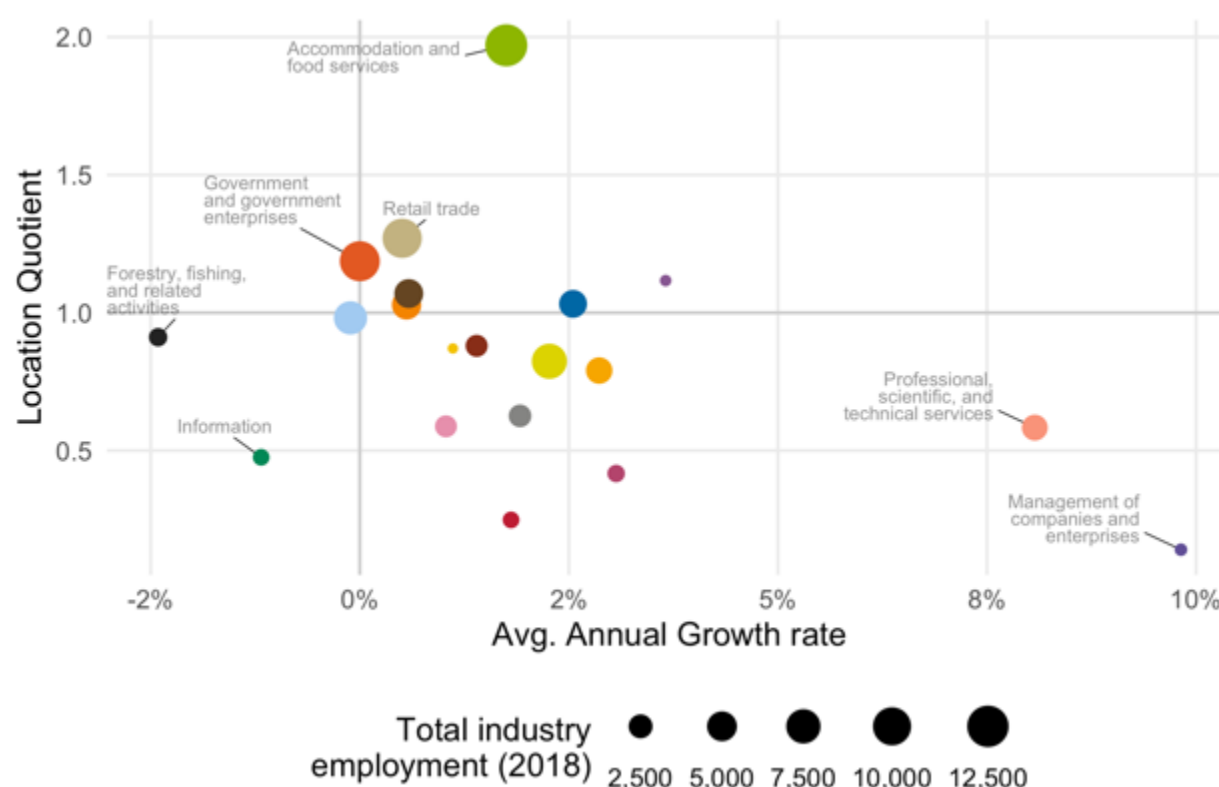
Source: Bureau of Economic Analysis.



The majority of industries in the North Coast region are not specialized relative to statewide trends. However, the accommodation and food services sector has the highest location quotient in the region, meaning the sector's output more than meets local demand for its residents (see Figure 31). Additionally, this sector has the highest level of employment in the region, making up approximately 16 percent of its 2018 total employment. Other large employment sectors include government and government enterprises (14 percent of total employment in 2018) and retail trade (13 percent of total employment). The professional, scientific, and technical services sector had one of the highest average annual growth rates across the region, which increased by about eight percent per year.

**Figure 30. Industry concentration and growth in North Coast Oregon, 2001 – 2018**

Source: Bureau of Economic Analysis.

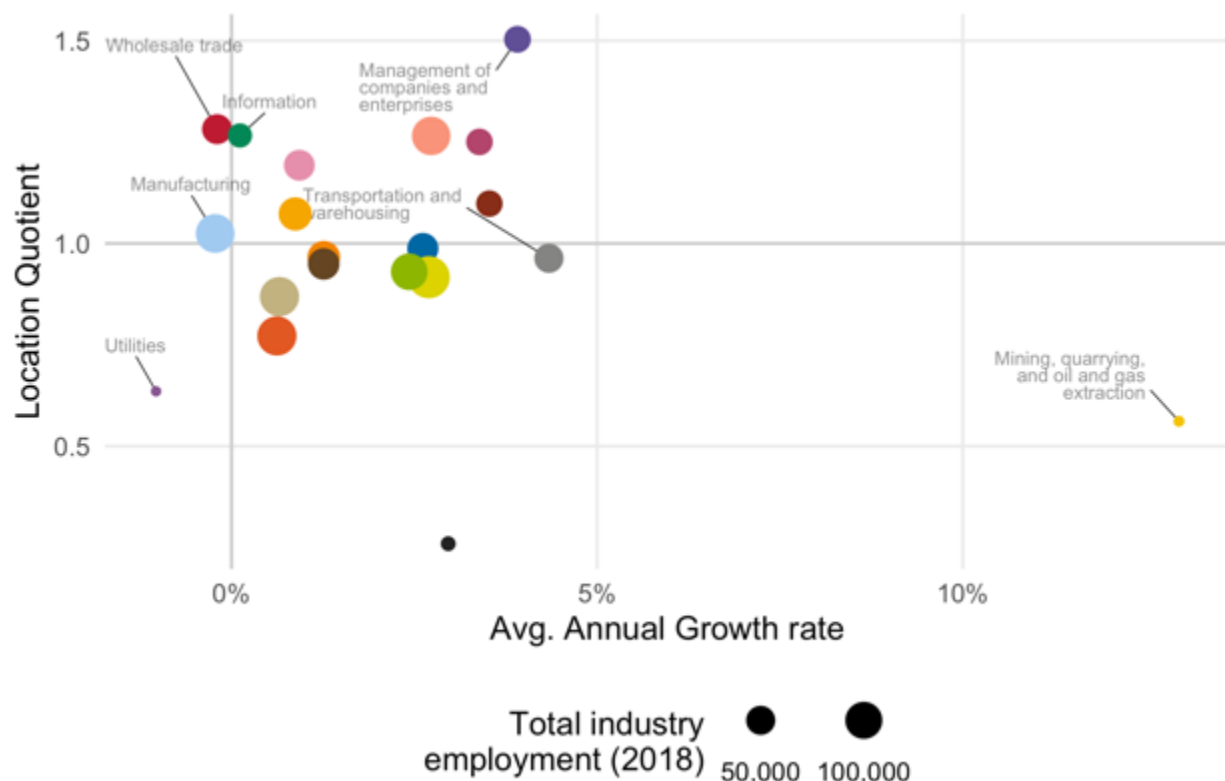




In 2018, the Portland Metro area made up approximately 51 percent of the state's total employment. The mining, quarrying, and oil and gas extraction industry grew the most on an annual average basis (13 percent per year) relative to all other industries in the area, however, it is one of the smallest employment sectors. Management of companies and enterprises had the largest location quotient in the region, and it grew approximately 3.9 percent per year, growing by nearly 18,700 jobs from 2001 to 2018. Of particular note is the average annual average growth of the transportation and warehousing sector (4.3 percent). During the 2001 to 2018 period, its share of employment relative to total employment grew from 2.4 percent to 3.9 percent, or an increase of 1.5 percentage points. (See Figure 32).

**Figure 31. Industry concentration and growth in Portland Metro, 2001 – 2018**

Source: Bureau of Economic Analysis.



Retail trade and health care and social assistance make up the largest share of total employment in the Southwest region at 14 percent and 13 percent, respectively. Forestry, fishing, and related activities had the highest location quotient in the region, though it only grew by 0.1 percent per year during the 2001 to 2018 period. The real estate and rental and leasing sector had the highest average annual growth rate in the region, increasing by about 2.7 percent per year. During this period, the real estate sector's employment as a share of regionwide employment grew by 1.2 percentage points, from 3.7 percent in 2001 to 4.9 percent in 2018. (See Figure 33).

**Figure 32. Industry concentration and growth in Southwest Oregon, 2001 – 2018**

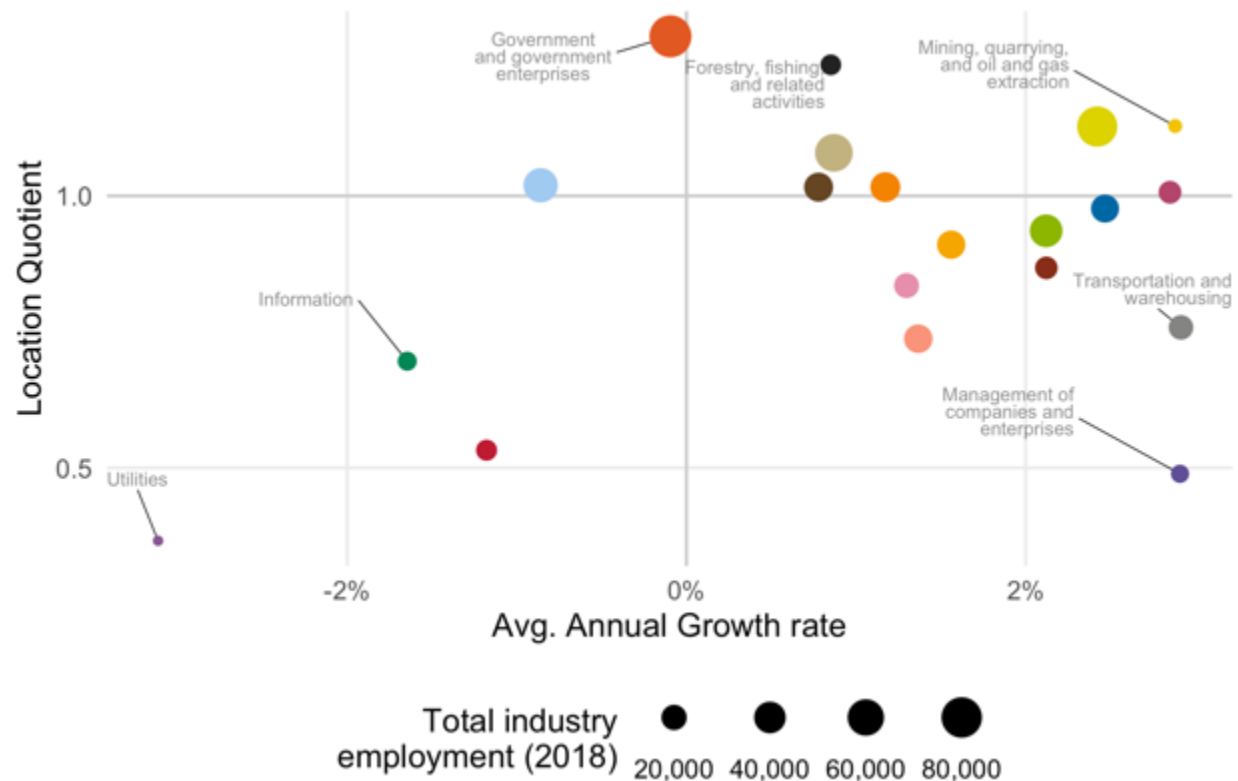
Source: Bureau of Economic Analysis.



In the Willamette Valley region, government and government enterprises was the largest employment sector, making up about 15 percent of region-wide employment in 2018.; however, this sector shrank by approximately 0.1 percent per year on average. Retail trade is the second largest employment sector as it makes up about 11 percent of total employment, though it only grew by approximately 0.9 percent per year. Transportation and warehousing had the largest annual average growth rate, increasing by 2.9 percent per year. During the 2001 to 2018 period, this sector's share of total employment increased by 0.4 percentage points, from 2.7 percent in 2001 to 3.1 percent in 2018. (See Figure 34).

**Figure 33. Industry concentration and growth in Willamette Valley, 2001 – 2018**

Source: Bureau of Economic Analysis.

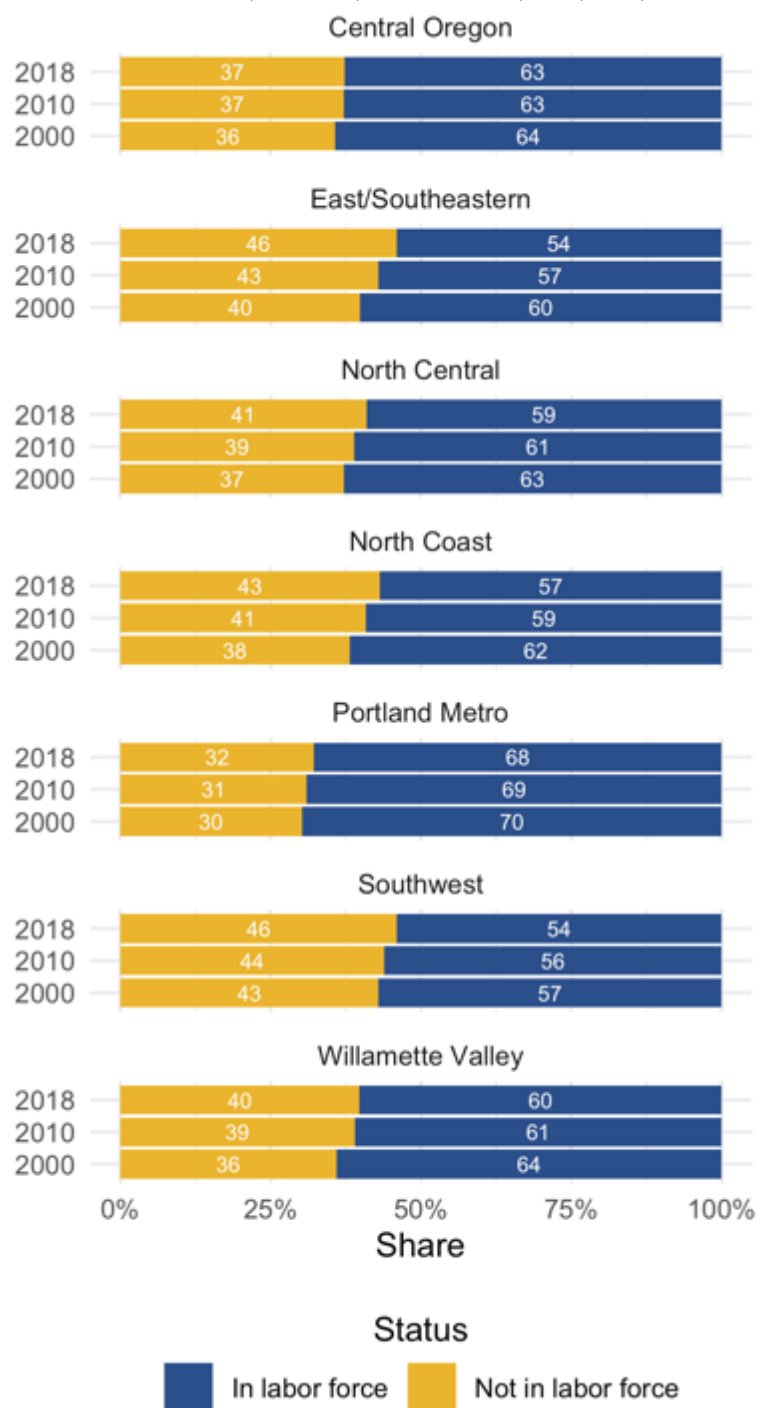


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The labor force participation rate describes the share of the working age population (those 16 years of age and older) that are currently employed or are actively seeking employment in the labor market. Across all regions for the 2000 to 2018 period, the participation rate has declined. The largest decreases occurred in the East/Southeastern (six percentage points), North Central (five percentage points), and Willamette Valley (four percentage points) regions. (See Figure 35).

**Figure 34. Labor force participation rate for the population 16 and older, 2000 – 2018**

Source: U.S. Census Bureau, ACS PUMS, 1-Year Estimates, 2000, 2010, and 2018.



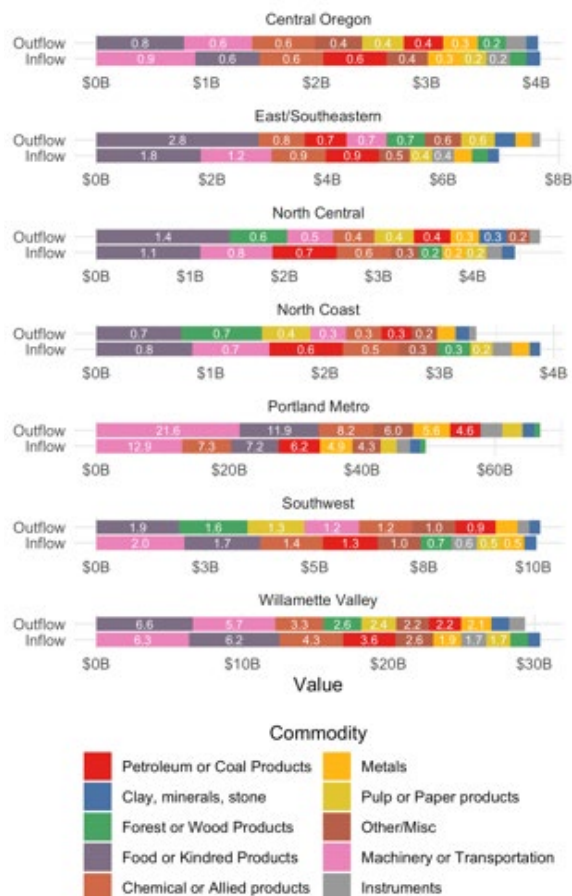
### Regional industry activity

Demand for the transportation network is not just driven by household demand for commuting and non-labor use of the road. Freight transportation helps increase economic value by moving goods and services to markets where they can be used for consumption or production of other goods and services. This helps support a broad range of economic activity from traditional commodities used in manufacturing to more novel forms of service delivery for e-commerce. Although an important component of the economy, freight transportation increases demand for the transportation network and can increase maintenance costs due to the heavy trucks and equipment needed to move these goods and services to market.

One way to understand how freight can affect our study regions is to look at how commodities are moved and utilized across the state. This is helpful context for understanding which commodities are being exported to areas outside the region, and which are being used as intermediate inputs for local production. Figure 36 displays the inflow and outflow of commodities by region for 2019. Machinery and Transportation, along with Food represent a large segment of inflows and outflows for most regions around the state. This broadly aligns with Oregon's large traded sector industries in semiconductors, e-commerce/distribution, and food processing.

**Figure 35. Value of commodity flows by region, 2019**

Source: Oakridge National Laboratory, Freight Analysis Framework



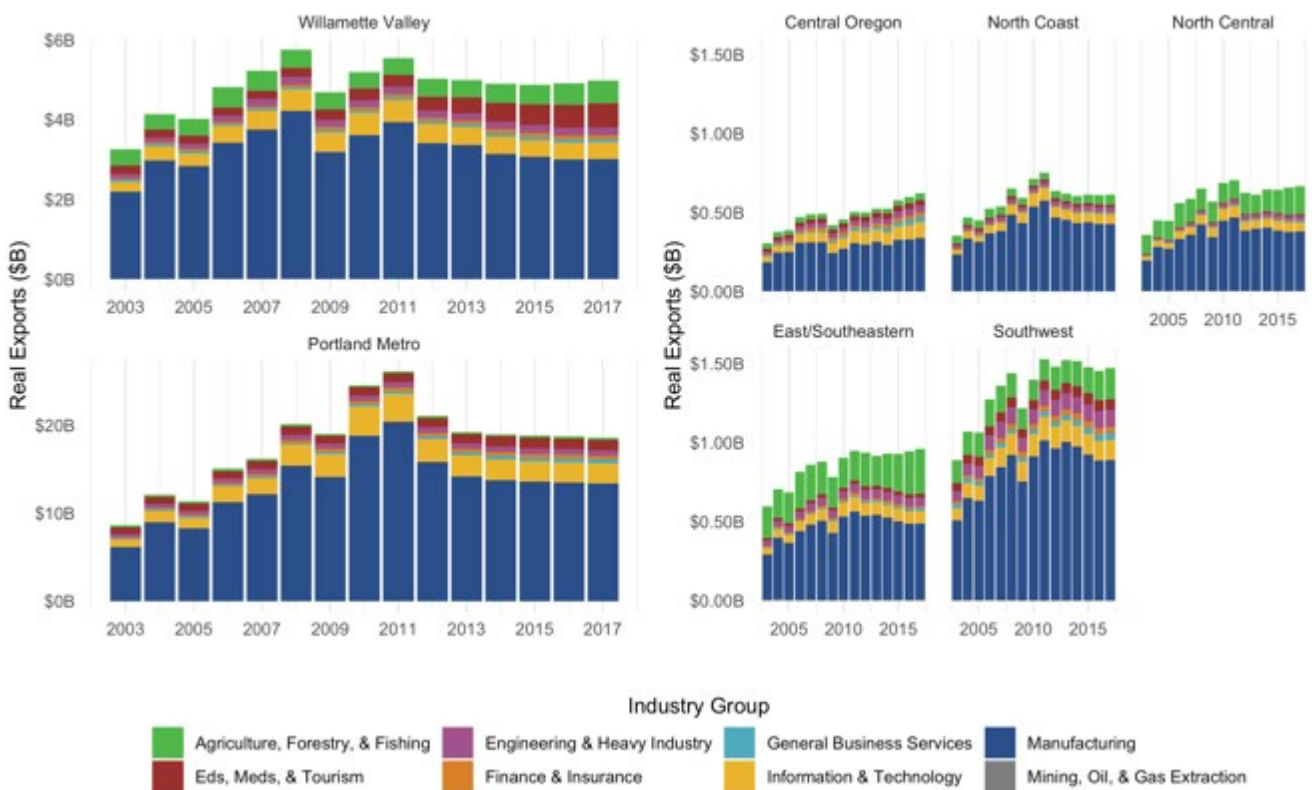
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The Portland Metro region, by value, exported<sup>2</sup> the most goods compared to any other Oregon region, followed by the Willamette Valley and then Southwest Oregon. Exports are goods produced in a local economy that are then sold and transported to domestic (e.g., other counties in Oregon) and international firms not located within a commodity's place of origin. In 2017, approximately \$28 billion in goods were exported from Oregon. Portland accounted for 67 percent of the value of all 2017 exports. The Willamette Valley region exported approximately 18 percent of Oregon's total export value and the Southwest region exported about five percent. The remaining regions exported less than five percent of total exports apiece, with three percent coming from the East/Southeastern region and two percent coming from each of the North Central, North Coast, and Central Oregon regions.

**Figure 36. Real exports by region, 2003 – 2017**

Source: Brookings Institute Export Monitor



The majority of exports for every Oregon region come from the manufacturing sector. Though this fluctuates year-over-year, every region exported at least 50 percent of all their exports in this sector. The Portland Metro region had the highest share of manufacturing exports compared to all other regions at 72 percent of its 2017 total. Other industries that made up sizable shares of exports include information and

<sup>2</sup> Export sectors are defined as those that bring revenue into a region from another market. For this analysis, we include both domestic and international exports.



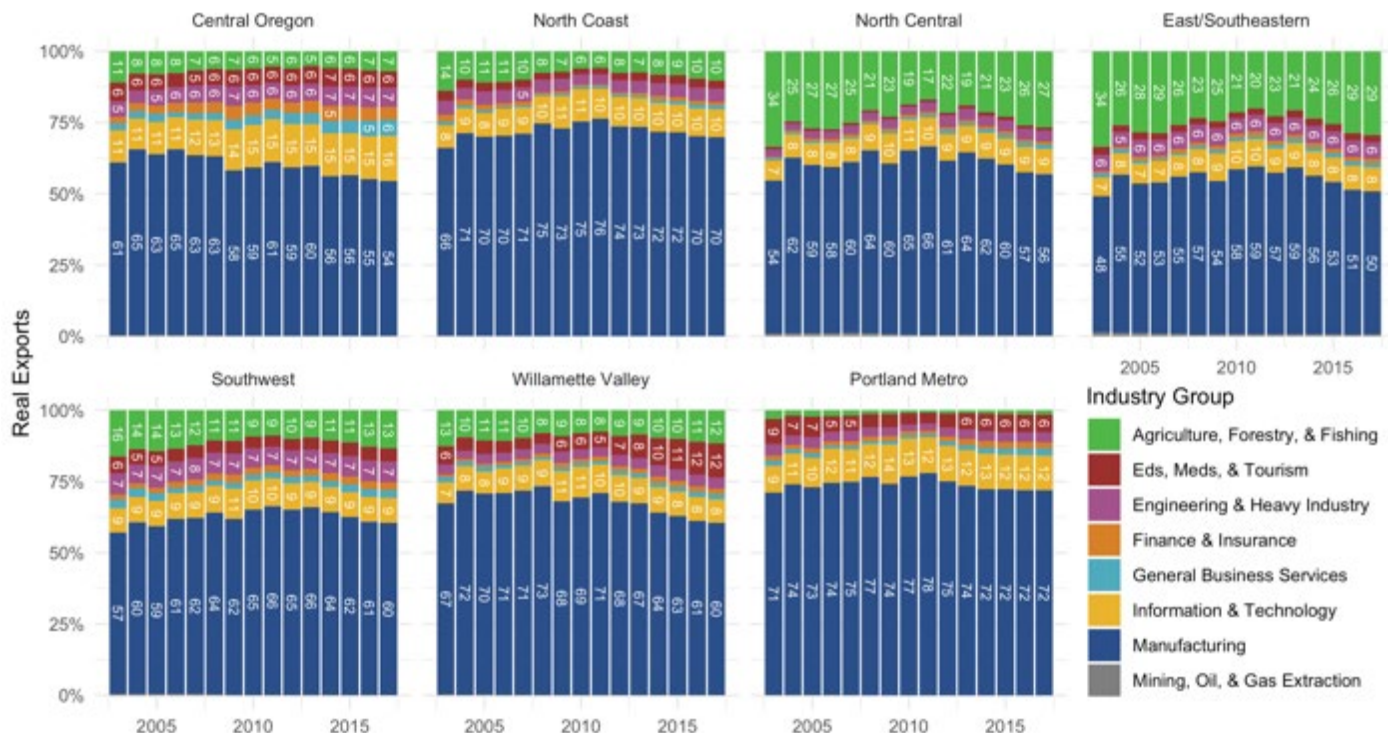
# Oregon Department of Transportation

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technology and agriculture, forestry, and fishing. The East/Southeastern region had the highest share of agricultural exports at 29 percent of its export total, followed by 27 percent of North Central's export total. Information and technology made up a sizable share of Central Oregon's exports with 16 percent of its total in 2017.

**Figure 37. Share of real exports by region, 2003 – 2017**

Source: Brookings Institute Export Monitor.



In addition to the total value of goods exported from Oregon's economy, the export market supports well over 100,000 total jobs across the state. These jobs include direct export jobs, which are jobs directly supported in an industry, plus jobs supported by the export market in an industry's supply chain.<sup>3</sup> In 2017, approximately 177,130 total jobs were supported by the export market in Oregon, a 39 percent increase from the 127,700 total export jobs supported in 2003. Across all regions, manufacturing supported the most jobs in 2017, making up 54 percent of total export jobs (about 96,340 jobs), followed by information and technology with 16 percent of the total (about 28,000 jobs), and then eds, meds, and tourism with 12 percent (about 21,800 jobs). Figure 39 describes the change in total export-supported jobs by NAICS sector for each region. Unsurprisingly, the Portland Metro region had the highest share of export-supported jobs

<sup>3</sup> As noted by the Brookings Institute, "• Direct export jobs are jobs supported by exports in that particular industry. Total export-supported jobs include direct export jobs as well as jobs supported by exports in the exporting industries supply chain. The value is based on the national multiplier for that industry and does not reflect an exact count of workers involved in the physical production of exports, but rather the number of jobs that a given amount of export sales can support."

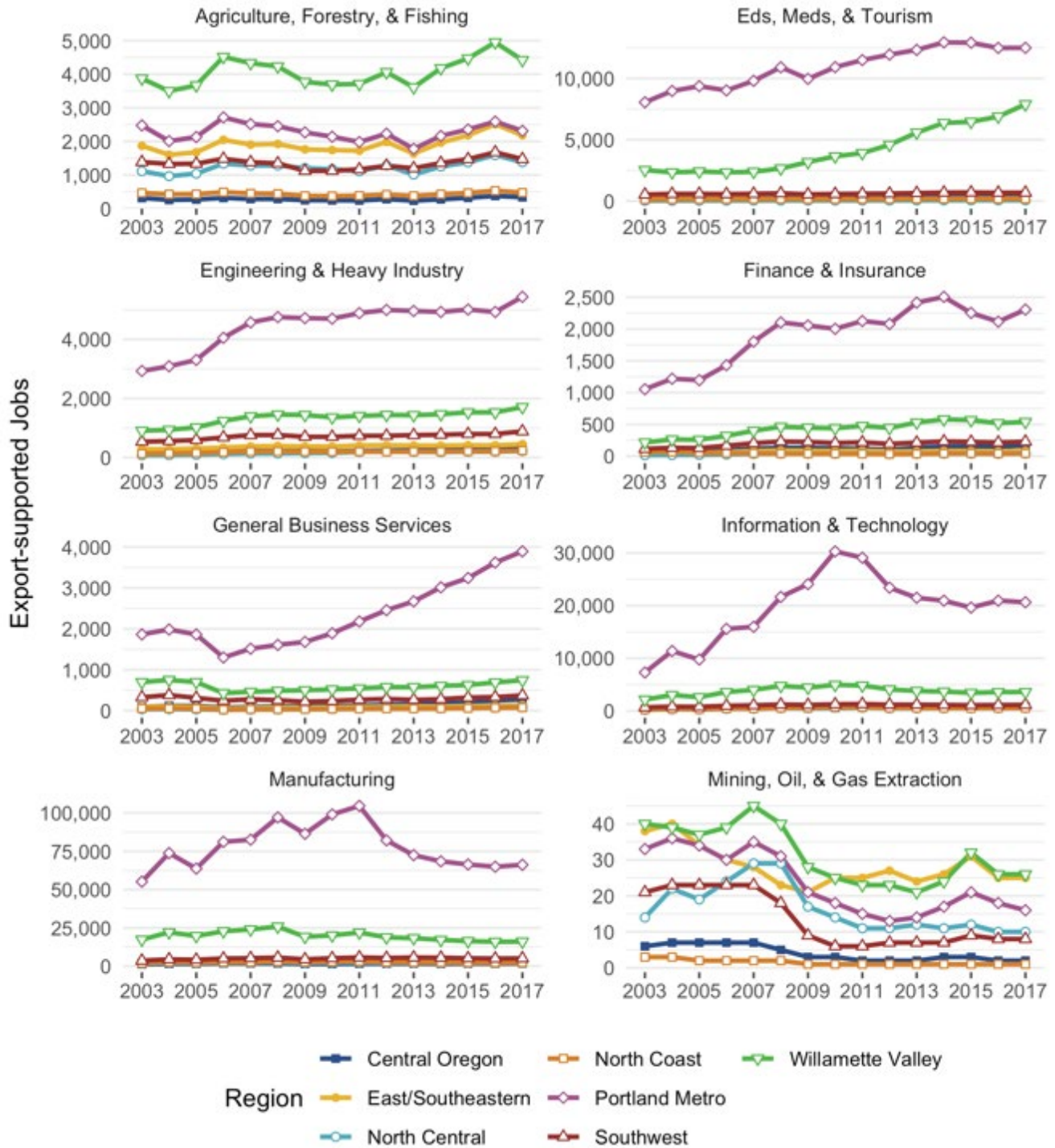
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in Oregon for 2017 (64 percent), followed by the Willamette Valley (20 percent) and Southwest (20 percent) regions.

**Figure 38. Total export-supported jobs by NAICS sector, 2003 – 2017**

Source: Brookings Institute Export Monitor.



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A traded cluster is an industry that serves markets outside of its local region through both sales and/or investment and they also indicate a region's competitive advantages. In general, traded sectors tend to have high value-added jobs and they bring in outside dollars from surrounding local regions and beyond, which makes them desirable investments as they continue to bolster a region's competitive advantages. Figure 40 shows the top five traded economic clusters by employment in each region in 2016. In this analysis, we analyzed the employment levels of each top traded cluster in 2016 and compared the change to their respective 2000 employment levels. Notable increases include the growth in the food processing and manufacturing sectors for the Willamette Valley (68 percent), North Coast (78 percent), North Central (126 percent), and Central Oregon (346 percent) regions. Distribution and electronic commerce also grew by sizable percentages in the Willamette Valley (34 percent), Portland Metro (20 percent), North Central (23 percent), East/Southeast (53 percent), and Central Oregon (18 percent) regions.

**Figure 39. Change in major traded economic clusters by region, 2000 – 2016 (top five clusters)**

Source: Harvard Business School and the U.S. Economic Development Administration

|                   |                                               |                                               |                                               |                                                             |                                              |
|-------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|----------------------------------------------|
| Willamette Valley | Distribution and Electronic Commerce<br>33.8% | Business Services<br>14.6%                    | Food Processing and Manufacturing<br>67.8%    | Wood Products<br>-18.2%                                     | Education and Knowledge Creation<br>5.3%     |
| Southwest         | Business Services<br>53.4%                    | Wood Products<br>-35.7%                       | Hospitality and Tourism<br>4.1%               | Distribution and Electronic Commerce<br>-13.8%              | Forestry<br>-11.5%                           |
| Portland Metro    | Business Services<br>37.9%                    | Distribution and Electronic Commerce<br>20.4% | Education and Knowledge Creation<br>36.8%     | Information Technology and Analytical Instruments<br>-18.7% | Hospitality and Tourism<br>17.6%             |
| North Coast       | Hospitality and Tourism<br>12.8%              | Business Services<br>96.0%                    | Food Processing and Manufacturing<br>77.6%    | Paper and Packaging<br>-52.8%                               | Wood Products<br>-14.1%                      |
| North Central     | Hospitality and Tourism<br>58.0%              | Distribution and Electronic Commerce<br>23.3% | Food Processing and Manufacturing<br>126.4%   | Wood Products<br>-54.3%                                     | Construction Products and Services<br>650.0% |
| East/Southeastern | Distribution and Electronic Commerce<br>52.8% | Business Services<br>17.9%                    | Food Processing and Manufacturing<br>-34.4%   | Wood Products<br>-34.4%                                     | Hospitality and Tourism<br>-1.2%             |
| Central Oregon    | Hospitality and Tourism<br>24.4%              | Business Services<br>27.2%                    | Distribution and Electronic Commerce<br>18.4% | Wood Products<br>-41.4%                                     | Food Processing and Manufacturing<br>345.7%  |
|                   | #1                                            | #2                                            | #3                                            | #4                                                          | #5                                           |
|                   | Cluster Rank (2016 Employment)                |                                               |                                               |                                                             |                                              |



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A local cluster is the analogous counterpart to a traded cluster insofar that it describes industries that are important to local economies. We took the identical analytical approach we performed with traded clusters for local clusters. Health services was among one of the most important clusters for almost every region, being the top cluster in 2016 for five out of the seven regions. It grew in the Willamette Valley (38 percent), Southwest (38 percent), Portland Metro (58 percent), North Coast (20 percent), North Central (49 percent), and Central Oregon (129 percent) areas. Hospitality establishments was generally the second-most important local cluster, followed by real estate, construction, and development. (See Figure 41).

**Figure 40. Change in major local economic clusters by region, 2000 – 2016 (top five clusters)**

Source: Harvard Business School and the U.S. Economic Development Administration

