



PRINCIPALITY OF LIECHTENSTEIN

SELECTED ISSUES

March 2026

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March 5, 2026

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European Department

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LONG-TERM SPENDING PRESSURES IN LIECHTENSTEIN

Liechtenstein faces long-term fiscal spending pressures from aging and higher pension obligations, climate mitigation and adaptation, and enhanced national security. These pressures have not been quantified in detail, so that their impact on public finances has yet to be assessed. This paper's preliminary estimate suggests spending needs of about 3.5 percent of GDP annually by 2050. Liechtenstein's strong fiscal position—consistent surpluses over the past decade of approximately the same magnitude—suggests scope to accommodate these challenges. Costing and systematically integrating these pressures into the fiscal framework through independent evaluation and regular sustainability assessments would enhance transparency, sustainability, resource allocation efficiency, and credibility.

A. Introduction

1. **Liechtenstein faces rising long-term spending pressures.** Unlike many European economies that face substantial fiscal burdens exacerbated by the pandemic and energy shock, Liechtenstein has maintained a strong fiscal position with consistent surpluses and limited public debt, partially driven by one-off income tax effects. Nevertheless, the Principality faces imminent and growing spending pressures from aging, climate change, and security needs, including cybersecurity, and modernization of police. The burden of these costs will be felt in the near term and increase considerably over time.
2. **Accounting explicitly for long-term spending pressures promote macroeconomic stability, fiscal sustainability, and intergenerational equity.** Systematic assessment enables evaluation of the consistency of current fiscal positions with long-term solvency, creating a common foundation for policy dialogue and affording timely adjustment, reducing the risk/need of abrupt adjustment (Clements and others 2015; Debrun and others 2013; Caselli and others 2022; Eble and others 2025). Transparent disclosure of fiscal pressures—and timely adjustment—may bolster market confidence, reduce sovereign risk premiums, and avoid leaving obligations for future generations (IMF 2018; Gaspar and others 2016).
3. **The paper provides an initial assessment of long-term spending pressures in Liechtenstein.** Section B describes the methodology for projecting climate, pension, and security expenditures. Sections C–E present findings for climate-related spending, pension spending, and security spending, respectively. Section F provides the bottom-line assessment, while section G discusses good practices for integrating long-term pressures into budgetary frameworks. Section H concludes.

B. Methodology

4. **Spending pressures are defined as the deviation of projected expenditure from baseline levels.** This section estimates spending pressures from aging and pensions, security and

climate needs. For pensions and security, baselines are set at 2023 levels in percent of GDP, the most recent year with comprehensive data. For climate spending, the baseline incorporates investments already underway. Spending pressures are calculated as the difference between projected annual expenditure requirements and baseline levels, expressed both in percent of annual GDP and in percent of baseline-scenario GDP (Eble and others 2025).

5. Costing climate expenditures utilizes a bottom-up sectoral framework integrating Marginal Abatement Cost Curve (MACC) optimization. Following best practices identified by Kesicki and Ekins (2012) for MACC construction and the sequential optimization approach of Vogt-Schilb and Hallegatte (2014), the approach ranks mitigation measures by cost-effectiveness, enabling optimization of climate investment strategies. The methodology proceeds through six analytical steps:

- *Emissions baseline.* Sectoral greenhouse gas (GHG) emissions trajectories are disaggregated across energy, transport, buildings, industry, agriculture, and waste using the Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines classification. Business-as-usual projections through 2050 are derived using sector-specific activity drivers and emission factors, informed by technology trends, and using global warming potentials from the IPCC's Fifth Assessment Report.
- *Abatement gap calculation.* Required emissions reductions are derived comparing business-as-usual path against the Nationally Determined Contribution (NDC) targets—a 55 percent reduction by 2030, 68 percent by 2035, and net-zero by 2050, relative to 1990, leading to abatement requirements of 62 ktCO₂e by 2030, rising to 166 ktCO₂e by 2050.
- *Mitigation measures identification.* Specific interventions are identified across all major sectors, including building envelope retrofits, heating system replacements (primarily heat pumps), electric vehicle adoption, solar PV deployment, industrial efficiency improvements, agricultural methane reduction, and waste management enhancements. The analysis relies on data from the Swiss Federal Office of Energy, IEA technology assessments, and EU climate policy evaluations.
- *Cost-Effectiveness Ranking.* Measures are ordered from lowest to highest marginal abatement cost. Technology costs incorporate Swiss Federal Office of Energy benchmarks, IEA technology assessments, and European market data adjusted for Liechtenstein's scale and Alpine context.
- *Pathway Optimization.* The optimal mitigation strategy prioritizes lowest-cost options subject to technical constraints, financing availability, and implementation capacity. The first 62 ktCO₂e of abatement demonstrates negative net cost (averaging -CHF 85 per ton), while remaining abatement requires positive investment (averaging CHF 120 per ton).
- *Financing Structure.* Public expenditure concentrates on building efficiency subsidies under the Energy Efficiency Act, CO₂ levy, district heating infrastructure, and regulatory implementation. Private investment is mobilized through carbon pricing, vehicle efficiency standards, and market-based instruments.

6. Several factors motivated the use of MACC analysis. First, granular data on actual unit costs for heat pumps, building retrofits, and solar installations are readily available. Second, the MACC produces CHF expenditure estimates that may feed directly into fiscal planning, unlike aggregate models that project policy effects without budget line items. Third, the framework disaggregates public and private financing—essential given the importance of the private sector in Liechtenstein. Fourth, Liechtenstein's scale (41,000 residents, 167 ktCO₂e emissions, 11 municipalities) makes discrete investments measurable events, rendering bottom-up accounting more accurate than cross-country averages. Fifth, the 26-year projection aligns with the 2050 net-zero target, beyond the typical 10–15 year window of aggregate models. Finally, the approach captures institutional arrangements with Switzerland—the customs union, shared carbon levy, connected electricity grid—that create policy spillovers not reflected in standardized models.

7. Pension expenditure projections employ a cohort-component demographic model (Amaglobeli and Shi, 2016). The approach disaggregates spending into replacement rate, coverage ratio, old-age dependency ratio, and inverse labor force participation. Population projections use UN World Population Prospects (2024 revision, medium-fertility variant) calibrated to recent demographics. The replacement rate applies average pension-to-GDP-per-capita ratios from 2018–23 to projected output per worker. Outputs are validated against actuarial calculations from Liechtenstein's pension authorities and tested for sensitivity to wage growth, inflation, and labor force participation assumptions.

8. Security spending projections combine policy analysis and cross-country benchmarking. The analysis incorporates announced government policy objectives on defense cooperation, cybersecurity strategy, and border control modernization, translating qualitative commitments into quantitative expenditure estimates using comparable programs in neighboring countries and required technological investments. Projections account for the European security environment, cybersecurity threats, enhanced border control needs, and police equipment system modernization. Given limited public information on specific budget allocations for security programs, estimates reflect the order of magnitude of prospective pressures rather than precise forecasts.

C. Climate-Related Spending

9. Liechtenstein has achieved significant emission reductions while successfully decoupling growth from GHG intensity (Table 1). Total emissions have fallen by 27 percent from 1990 levels and per capita emission stood at approximately 4.2 tCO₂eq in 2023, well below the EU average of 6.8 tCO₂eq. Liechtenstein's forests and managed land absorb approximately 7.3 ktCO₂eq annually, partially offsetting emissions from other sectors (UNFCCC 2024). However, the NDC target excludes Land Use, Land-Use Change, and Forestry (LULUCF) categories.

10. The energy sector dominates the emissions profile (Figure 1), with buildings and transport constituting the main abatement challenges (Figure 1a). Energy accounted for 79.8 percent of total emissions in 2023, 8 ppts lower than 1990. Within the sector, residential and commercial heating

(33.2 percent of total emissions) and road transport (32.3 percent) together account for 65 percent of energy-related emissions. Non-energy sectors are structurally stable: agriculture contributes 14.5 percent of total emissions, driven by enteric fermentation with limited abatement potential; Industrial Processes and Product Use (IPPU) adds 4.7 percent, dominated by fluorinated gas substitution; and waste accounts for a minor 1.0 percent.

Table 1. Liechtenstein: Greenhouse Gas Emissions Trajectory and Targets, 1990–2050
(Kilotons of Carbon Dioxide Equivalent, ktCO₂eq)

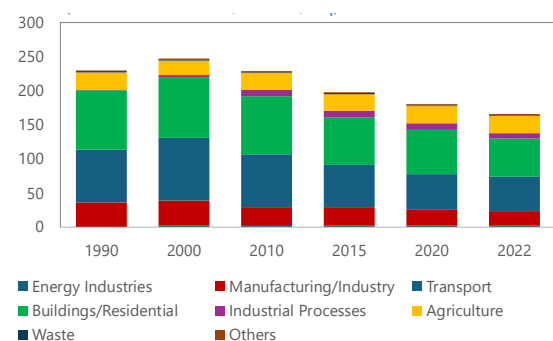
Year	1990	2022	2030	2035	2050
Total emissions (ktCO ₂ e)	229.0	165.5	103.1	73.3	0.0
Reduction vs 1990 (percent)	—	-28	-55	-68	-100
Required abatement (ktCO ₂ e)	—	—	62.4	92.2	165.5
Total emissions (ktCO ₂ e)	229.0	165.5	103.1	73.3	0.0

Source: National Inventory Document 2024 (UNFCCC); Second Nationally Determined Contribution; IMF Staff Calculations.

Figure 1. Emissions Profile and Trajectory

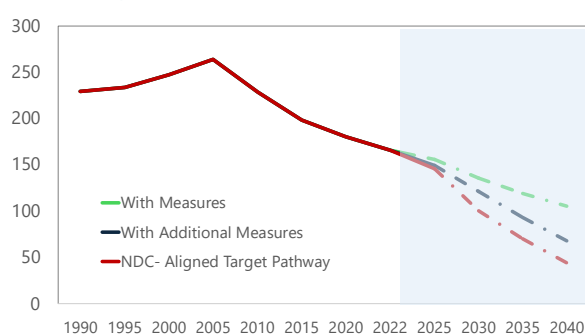
The energy sector accounts for 80 percent of emissions, concentrated in buildings and transport....

Sectoral Breakdown of Greenhouse Gas Emissions
(Baseline scenario, KtCO₂, eq)



The with-measures scenario falls short of the 2030 and 2035 targets, necessitating for additional policy action.

Emission Reduction Pathway Under Different Scenarios
(KtCO₂, eq)



Source: Second Nationally Determined Contribution 2025.

11. Current policy paths fall short of NDC commitments (Figure 1b). The second NDC targets a 55 percent reduction below 1990 levels by 2030 and 68 percent by 2035 (UNFCCC 2025). The With Measures (WM) scenario projects only a 44–45 percent total reduction by 2035, leaving a gap of 10 and 22 ppts. relative to the 2030 and 2035 targets respectively; only the With Additional Measures (WAM) scenario reaches 57–58 percent by 2035, still short of the 68 percent commitment. Closing the 2030 gap will require annual reductions of three times the pace achieved over the past decade during 2023–2030, underscoring significant execution risk absent accelerated policy implementation.

12. Buildings and transport represent the most cost-effective abatement opportunities.

Building insulation, electric vehicles, heat pumps, and industrial efficiency generate lifetime operational savings exceeding upfront capital costs (Table 2). Solar PV and agricultural interventions contribute additional reductions, albeit at positive cost.

Table 2. Liechtenstein: MACC Analysis: Investments by Cost-Effectiveness			
Rank	Measure	MACC (CHF/ktCO₂)	Abatement (ktCO₂)
1	Building Installation	-150	18
2	Electric Vehicles	-80	15
3	Heat Pumps	-50	12
4	Industrial Efficiency	-30	8
5	Solar PV	+20	5
6	Agriculture Measures	+50	3

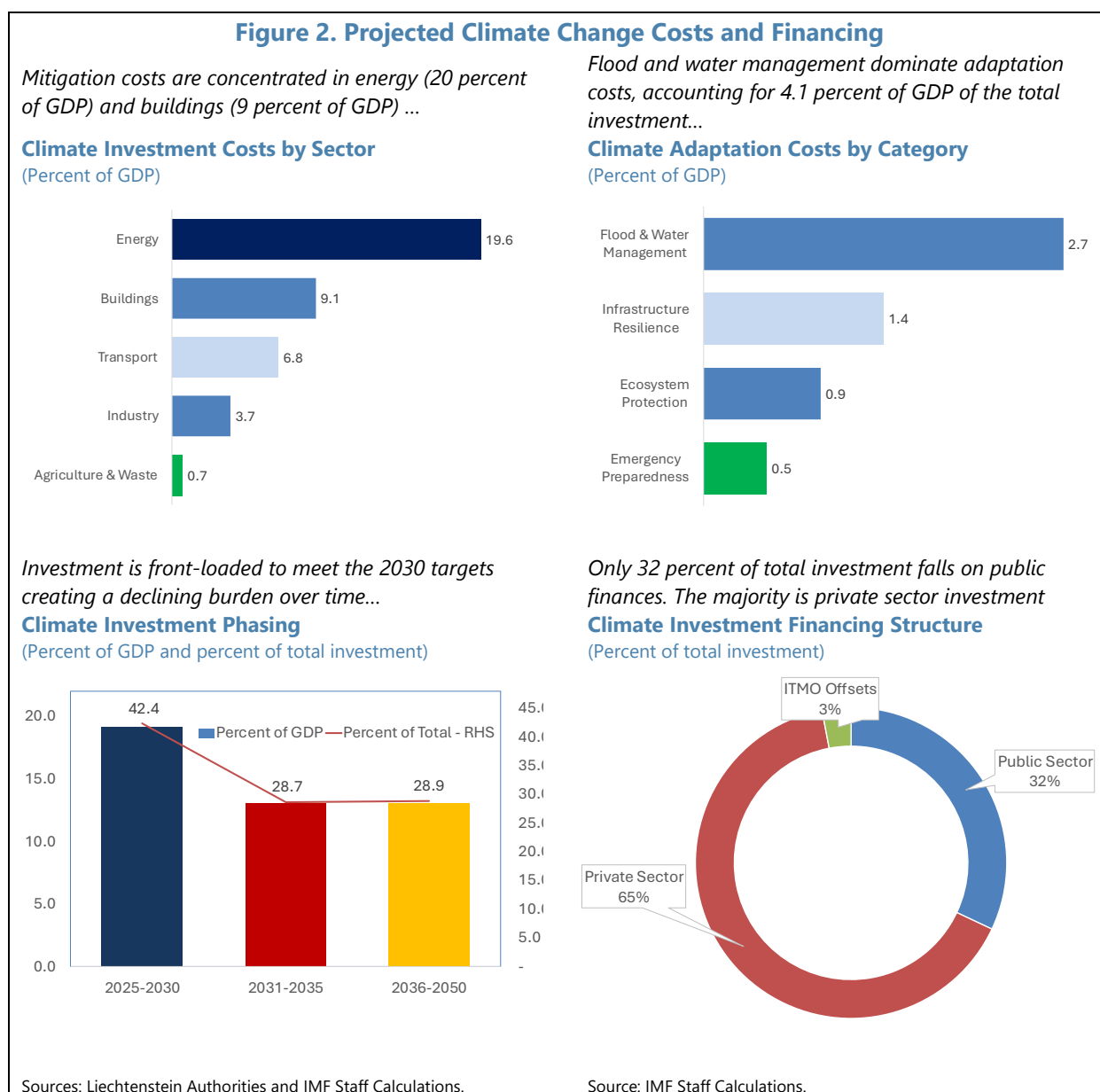
Sources: UNFCCC 2025 - Second Nationally Determined Contribution (NDC) and MACC Calculations.

13. The green transition requires total investment of around 45 percent of current GDP through 2050. Mitigation accounts for 40 percent of GDP (88 percent of the total), concentrated in energy (20 percent of GDP) and buildings (9 percent of GDP), reflecting the capital intensity of renewable energy deployment, grid modernization, and building retrofits. Transport and industry contribute a further 7 and 4 percent of GDP respectively, with agriculture and waste accounting for a modest 1 percent. Adaptation expenditure of 5 percent of GDP (12 percent of the total) is concentrated in flood and water management (3 percent of GDP) and infrastructure resilience (1 percent of GDP), consistent with exposure to Alpine climate hazards.

14. The aggregate investment requirement is relatively modest. At approximately 1.7 percent of cumulative GDP over the 26-year transition period, the required pace of around CHF 129 million per year is broadly in line with Switzerland's climate strategy and with the 1–2 percent of GDP per annum envisaged under the EU Green Deal (European Commission 2019). The costs, while significant, represent a cumulative capital stock transformation rather than a recurring fiscal burden.

15. Mitigation costs are concentrated in energy and buildings, reflecting the importance of fossil fuel combustion (40 percent of GDP). The energy sector has the largest share, comprising renewable electricity generation, grid modernization, and heat decarbonization of about 20 percent of GDP (UNFCCC 2024; IEA various years). Buildings require retrofitting of the existing stock through insulation, window upgrades, and heating system conversions (9 percent of GDP). Transport costs cover fleet electrification, upgrades, and demand-side measures, with transition complexity due to dependence on cross-border commuters (7 percent of GDP). Industry, agriculture, and waste account for the residual, with limited abatement potential in the latter expected to be addressed through negative emission technologies or international offsets as net-zero approaches (5 percent of GDP).

16. Adaptation investment reflects physical exposure. Flood and water management accounts for 50 percent of adaptation costs, covering Rhine flood protection, urban drainage, and water retention (UNFCCC 2024). Infrastructure resilience—transport network adaptation, critical utilities protection, and heat-resistant construction—accounts for a further 25 percent. Ecosystem protection absorbs 16 percent, and emergency preparedness—natural hazard mapping, civil protection systems, and early warning infrastructure—the remaining 9 percent. As the underlying benefits constitute public goods, adaptation costs fall on the public sector.



17. Staff analysis suggests that the primary financing burden for climate transition will rest more on the private sector with public expenditures playing a more targeted role. The private sector could account for 29 percent of GDP through heat pumps, building insulation, and

electric vehicles, driven by rising carbon prices, subsidy incentives, and improving technology economics. The public sector could finance 15 percent of GDP, concentrated in infrastructure investment, subsidies for building retrofits and heating system conversions, and public transport electrification. International carbon credit offsets (ITMOs) account for the residual 1 percent of GDP, limited to genuinely residual emissions after domestic abatement potential is exhausted.

18. Investment needs are heavily front-loaded. The 2025–30 period accounts for a large share, 42.4 percent, reflecting the urgency of foundational infrastructure—renewable energy systems, building retrofit programs, and transport electrification—ahead of 2030 target (Vogt-Schilb and Hallegatte 2014). Spending moderates in the 2031–35 period at 28.7 percent, as the initial capital stock is established and incremental deployment becomes less capital-intensive and stabilizes at 28.9 percent over the longer 2036–50 horizon. The phasing implies the concentration of public expenditure in the near term and calls for climate spending to be systematically integrated into medium-term budget frameworks to avoid crowding out competing priorities.

19. Delayed action could increase transition costs. Postponing investment in efficient buildings and low-carbon transport locks in fossil fuel infrastructure for 15–20-year operating lifetimes, extending carbon payback periods and compressing timelines to meet interim targets. A five-year delay would require accelerating the annual abatement rate by approximately 40 percent to achieve the 2030 target, concentrating investment into a shorter period and raising aggregate financing requirements. Delay also erodes negative-cost opportunities: building retrofits and heat pump installations become costlier as the stock ages, while foregone operational savings reduce financial attractiveness (Vogt-Schilb and Hallegatte 2014). Later action further constrains the use of ITMOs, as deferred domestic abatement exhausts flexibility to rely on international offsets within Paris Agreement frameworks.

D. Pension Spending

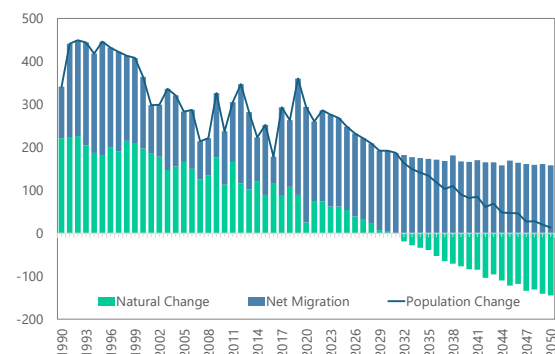
20. Population growth has trended upward driven primarily by net migration. The population increased approximately 25 percent during 2000–24, with net migration consistently outpacing natural population change (UN 2024). Under the trend scenario, the population is projected to increase by 7 percent by 2030 and by a further 8 percent by 2050.

21. The speed of population ageing is advancing. The old-age dependency ratio—defined as the ratio of people 65 and older to people between 15 and 64—is expected to increase from 33.3 percent in 2023 to 51 percent in 2050. The 65+ and 80+ cohorts are projected to increase by 7.7 and 6.1 percentage points, respectively, to 27.8 percent and 11 percent. The expansion of older population cohorts will strain social support systems. Further, given the large share of commuters in the labor market, their net inflow growth constitutes a key contributor to the potential Pillar I fund-to-expenditure ratio trajectory.

Figure 3. Population Trends

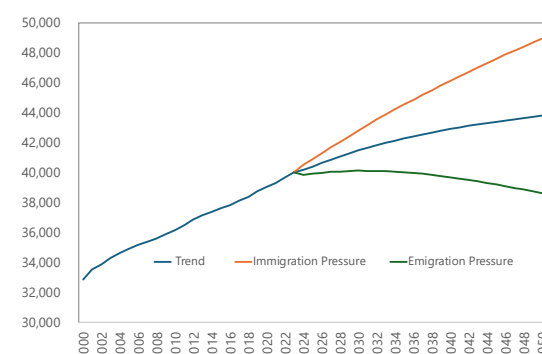
Net migration has been the dominant driver of Liechtenstein's population growth since 1990, consistently outpacing natural change....

Contribution to Total Population Growth



Migration dynamics will be the primary driver determining whether Liechtenstein's population grows modestly or substantially through 2050.

Population Projections 2024–2050



Sources: United Nations, World Population Prospects and IMF Staff Calculations.

22. Demographic changes are projected to significantly increase pension expenditure. The impact is assessed using benefit and coverage ratios from projections of age dependency ratios and labor force participation rates (Clements and others, 2015). In line with actuarial assumptions of 2 percent nominal wage growth and 1 percent inflation, the proxy replacement rate for Pillar I pensions declines from a peak of 37 percent in 2011 to 20 percent in 2050. Labor force participation rates and output per worker are endogenous. Pension spending pressures are projected to increase by 1.5 percent of GDP annually, consistent with trends in advanced economies.

E. Security Spending

23. Security spending pressures reflect the shifting geopolitical landscape. Across Europe, countries are increasing defense spending, with a number increasing the 2-year moving average of defense outlays as a share of GDP rises by at least 1 percentage point (Eble and others 2025). Liechtenstein has no army. Security spending pressures focus on cybersecurity, and police modernization. Outlays on security represent 3–4 percent of total government spending and averaged 1 percent of GDP during 2013–23.

24. Several factors point to the need for increased security spending. In a baseline scenario, security spending increases from 1.0 to 1.3 percent of GDP, reflecting expansion of cybersecurity capabilities for law enforcement and government infrastructure, enhanced border control technology, and modernization of police equipment. This would involve an enhanced police force with advanced technology, robust cybersecurity infrastructure, improved intelligence sharing, and expanded emergency response.

F. Summary of Long-Term Spending Needs

25. Liechtenstein faces long-term fiscal pressures estimated at 3½ percent of GDP annually by 2050. Climate mitigation and adaptation constitute the largest component at 1.7 percent of GDP, followed by pension obligations at 1.5 percent of GDP, and enhanced security of 0.3 percent of GDP (Table 3).

Table 3. Liechtenstein: Spending Pressures in 2050
(Percent of GDP)

Category	Total Spending Pressures
Pension spending	1.5
Security spending	0.3
Climate mitigation and adaptation	1.7
Total spending pressures	3.5

Source: IMF Staff Calculations.

26. While these pressures are substantial, Liechtenstein has significant fiscal space. The Principality's exceptionally strong fiscal position—characterized by consistent surpluses of 3 percent of GDP or more, virtually zero public debt, and substantial net public assets—provides a solid foundation to address spending pressures without threatening fiscal sustainability.

G. Options for Accounting for Long-Term Spending in Budgetary Frameworks

27. Several options should be considered for accounting for long-term spending pressures (Eble and others (2025)). Liechtenstein, like peer countries, should explore:

- *A comprehensive assessment of long-term fiscal pressures.* This would involve a proactive approach, with regular publication of long-term forecasts under different scenarios.
- *Publication of annual fiscal sustainability reports with medium- and long-term forecasts of public finances* (Debrun and others 2013; Curristine and others 2024). These would include sensitivity analyses to changes in key demographic, macroeconomic, and other relevant assumptions.
- *Automatic adjustment mechanisms with built-in prudence factors* to help address uncertainty while maintaining the credibility of the multiannual framework (Eble and others 2025).
- *Enhanced data and institutional frameworks to support policies addressing medium- to long-term spending pressures* (Caselli and others 2022; Eble and others 2025). More detailed actuarial projections for pensions and health care assessing the fiscal effect of legislative reforms.

Several countries in Europe have established independent fiscal councils (Beetsma and Debrun 2016; Debrun and others 2013). The council would be mandated to conduct independent evaluations of

long-term spending pressures. This could be considered in Liechtenstein once macroeconomic and fiscal data are improved and once there is sufficient capacity to do so.

H. Conclusion

28. Liechtenstein faces significant but manageable demographic, security, and climate transition spending pressures. Staff analysis suggests that these pressures could reach 3½ percent of GDP annually by 2050. Liechtenstein's strong fiscal position—low public debt, substantial net assets, and prudent budgetary management—provides a solid foundation for addressing these challenges. However, further assessment and near-, medium- and long-term budget planning are needed. The gradual materialization of spending pressures affords time for implementing reforms and mobilizing resources, although action should begin promptly—particularly in the climate area—and be maintained across political cycles.

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PRODUCTIVITY DYNAMICS AND LONG-RUN GROWTH

This Selected Issues Paper examines the drivers of productivity and long-run growth in Liechtenstein. Although productivity levels remain among the highest in Europe, growth has slowed amid factors including demographic pressures and skills shortages. Further, relative productivity has been declining over the past two decades, presenting potential long-term competitiveness issues. The analysis points to the need for continued structural reforms including labor supply expansion, human capital upgrading, innovation support, and infrastructure reforms.

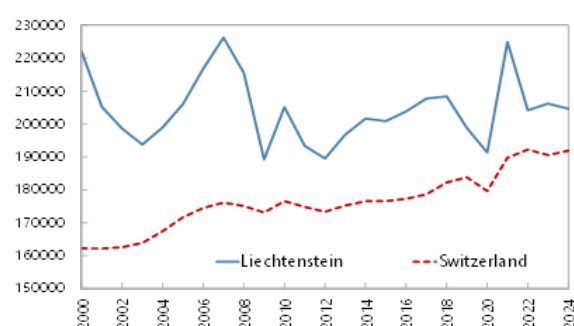
A. Introduction

1. Labor productivity in Liechtenstein is among the highest in Europe, but productivity growth has been weak for an extended period. High labor productivity reflects an export-oriented, highly specialized manufacturing and financial sectors, and a growth model that relies heavily on skilled cross-border commuters. In level terms, productivity—measured by real GDP per full-time equivalent (including cross-border commuters)¹—remains comparable to Switzerland and above most European peers. However, productivity growth has been limited for more than two decades, and relative productivity has declined compared with peer economies, including Switzerland and the United States (Figure 1). GDP per worker has remained broadly flat over this period, and these patterns are observed across business cycles, suggesting a prolonged structural slowdown rather than cyclical weakness.

Figure 1. Aggregate Productivity Trends in Liechtenstein

Productivity in Liechtenstein is high though growth has been limited—narrowing the gap with Switzerland...

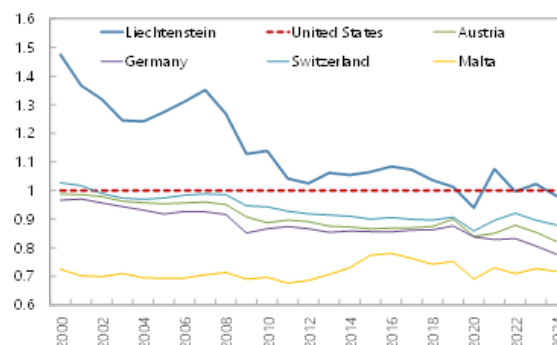
Productivity in Liechtenstein and Switzerland
(Real GDP per FTE, CHF)



Source: Liechtenstein Authority

...while relative productivity vis a vis the U.S. has declined more sharply than comparator economies.

Productivity Relative to the U.S.
(GDP per worker, PPP International Dollar)



Source: World Economic Outlook

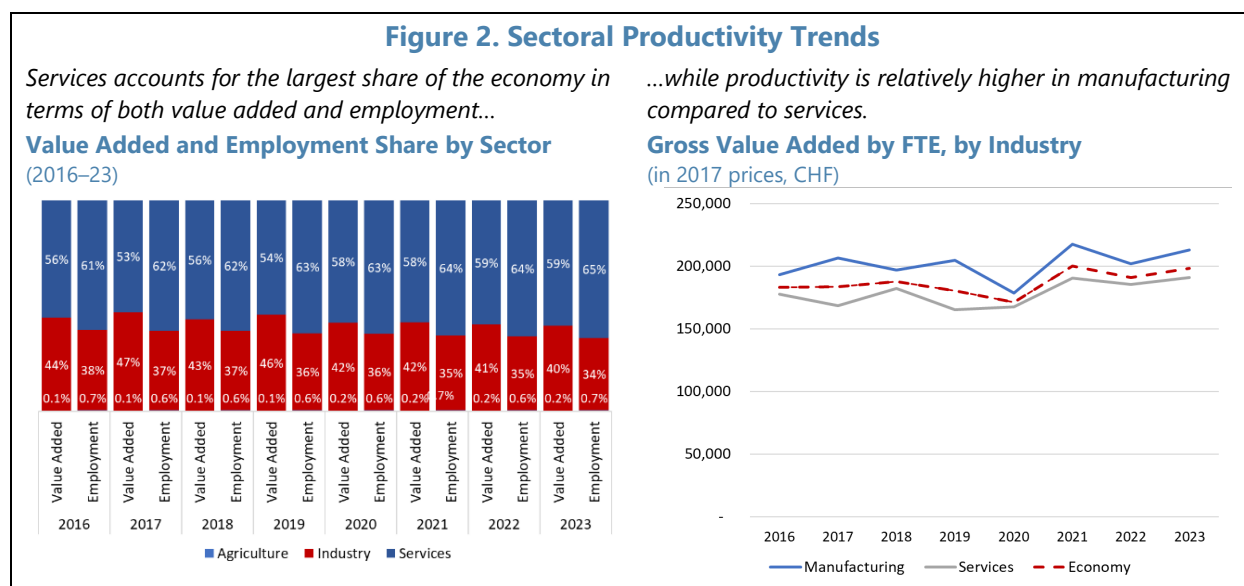
¹ Domestic employment covers Liechtenstein residents working in Liechtenstein and inward commuters from abroad working in Liechtenstein (Liechtenstein residents working abroad are not included). An alternate measure, GNI per capita, would allow for a cross-country comparison at the firm level.

2. Long-run growth depends on productivity, labor input, and capital accumulation.

Liechtenstein's economy combines an important, highly export-oriented manufacturing sector with a large financial sector relative to GDP. However, limited land availability and natural resource endowments and a small resident population, constrain the scope for expanding factor inputs. Performance has relied on maintaining high productivity levels, high private R&D investments (6 percent of GDP), supplementing domestic labor with cross-border workers, and sustaining capital accumulation through private investment at home and abroad. This Selected Issues Paper (SIP) examines how each of these channels has evolved over time, structuring the analysis around productivity outcomes, labor input dynamics, and capital accumulation.

B. Sectoral Analysis of Productivity

3. Economy-wide productivity dynamics are shaped by differences in productivity performance across sectors. Services—including financial services—account for a major share of Liechtenstein's economy—58 percent of gross value added and 64 percent of total employment. The manufacturing sector consists of small and medium enterprises (SMEs) which account for 95 percent of registered firms as well as a small number of larger multinational enterprises (MNEs).² Productivity levels in manufacturing remain high but have shown limited gains over the past decade (Figure 2). Productivity growth in services has been lower, consistent with the sector's lower capital intensity and smaller average firm size.³ The resulting productivity gap between manufacturing and services would constrain aggregate productivity growth especially when labor reallocation across sectors is limited.



² Based on data from Office of Statistics, SMEs employ 1–49 workers. While manufacturing SMEs account for 95 percent of registered firms, they account for 25 percent of domestic employment in 2023.

³ Financial sector accounts for 17 percent of services value added.

C. Drivers of Long-Run Growth

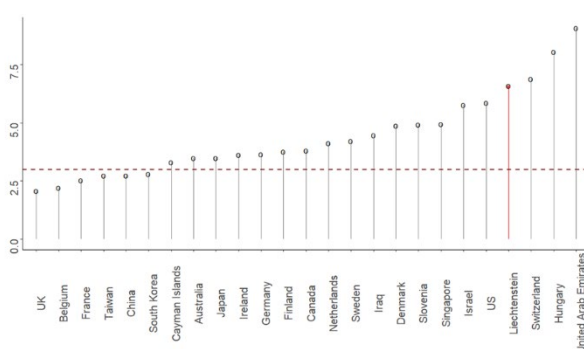
4. Innovation activity supports high productivity but is concentrated. The industrial sector is characterized by small and medium enterprises (SMEs) as well as a small number of larger multinational enterprises (MNEs) that employ up to 70,000 workers worldwide—more than double the resident population. R&D investment is concentrated in manufacturing and increased from 6.6 percent of sales in 2013 to 8.5 percent of sales in 2023. About 47 percent of R&D spending is devoted to product development and basic research; a quarter of employees are engaged in R&D (see Figure 3). The share of public sector R&D spending in Liechtenstein is low—at around 2 percent of total R&D spending in 2023—primarily on personnel in educational and research institutes. During 2013–23, productivity and innovation indicators relative to the United States declined, in line with broader European trends.

5. Registered intellectual property, a key metric of innovation, offers insight into competitive and productivity advantages that support sustained growth. There is a strong correlation between the volume of registered IPs and elevated productivity levels, as measured by GDP per worker. In 2022, Liechtenstein was among countries with the highest number of registered intellectual properties on a per capita basis, including designs, technologies, and trademarks.⁴ The average individual in Liechtenstein holds three IPs; the typical Swiss resident holds fewer than one. Recent decades have seen a relative decline in registered IPs per capita, corresponding with reduced productivity (refer to Figure 4). This trend may be linked to structural challenges such as demographic shifts, domestic skill gaps, and the pace of digitization and AI adoption.

Figure 3. Private Sector R&D Investment and Productivity

Liechtenstein enterprises are among the highest R&D investors in the world

R&D Spending: Share of Net Sales

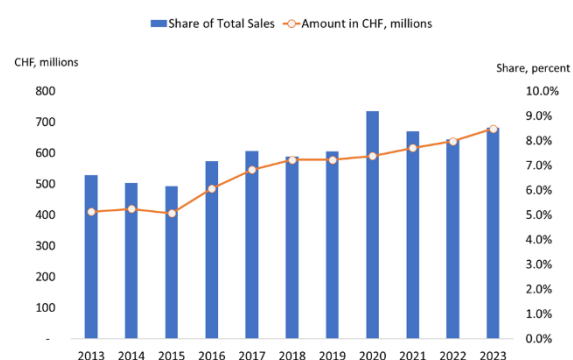


Source: EU Industrial R&D Investment Scoreboard.

Note: Dotted horizontal line represents world average of 3 percent. The data is pooled spending across sectors. The two Liechtenstein companies that are among the top R&D spending are included in the data.

R&D spending increased from 6.6 percent of total sales in 2013 to 8.5 percent in 2023.

R&D Spending, Manufacturing (Amount and share of total sales)



Source: Liechtenstein Chamber of Commerce and Industries (LCCI).

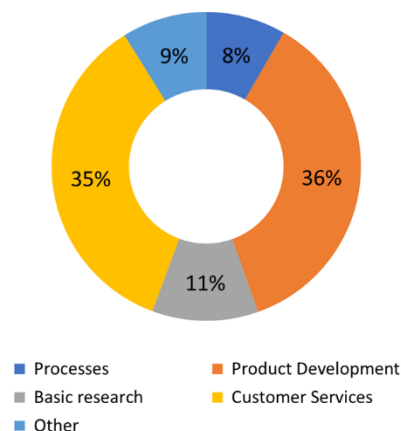
Note: Private sector R&D spending represents spending only by members of LCCI.

⁴ World Intellectual Property Organization.

Figure 3. Private Sector R&D Investment and Productivity (Concluded)

A large share of R&D spending is on product development and customer services.

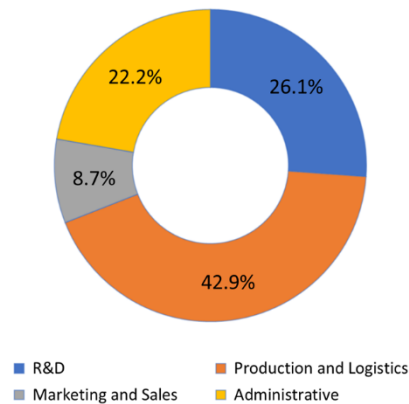
Average Distribution of R&D Spending by Area



Source: Liechtenstein Chamber of Commerce.
Note: Shares are average between 2017 and 2023.

More than a quarter of the total employees are engaged in R&D activities.

Average Distribution of Employment by Functional Department

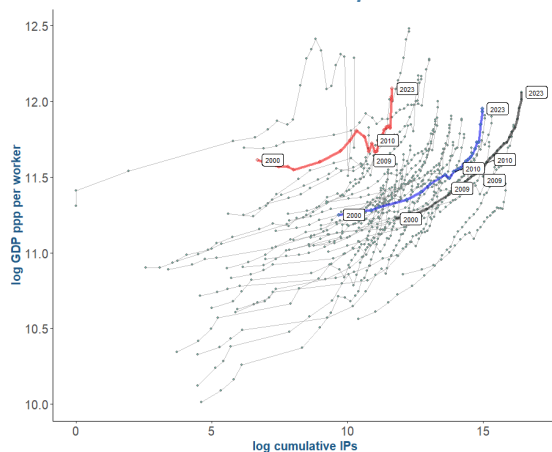


Source: Liechtenstein Chamber of Commerce.
Note: Shares are average between 2017 and 2023.

Figure 4. Intellectual Property (IP) and Productivity

Productivity has been positively correlated with the number of registered IPs; growth in the number of IPs for Liechtenstein has stalled in recent years.

Cumulative IP and GDP Per Worker, PPP



Sources: EU Industrial R&D Investment Scoreboard; WEO
Note: The total number of countries in the data is 41 between 2005 and 2022. Red line=Liechtenstein, blue= Switzerland, black=United States. Cumulative number of registered IPs is the sum of all IPs, grey=rest of countries in the data.

The decline in the number of IPs per person is associated with the decline in relative productivity.

IPs per Person and Relative Productivity



Sources: EU Industrial R&D Investment Scoreboard; WEO
Note: Red dotted line=productivity relative to the US, black solid line=number of IPs per person, and black dotted line=IP per person adjusted by commuter workers. The IP per person covers the period 2005–2022, whereas relative productivity series covers 2000–2023 and IP per person: 2005–2025.

6. Skills shortages constrain productivity gains across sectors. Labor market indicators and firm-level surveys point to persistent shortages of workers with technical and specialized skills, particularly in advanced manufacturing and engineering-related occupations. These shortages reflect strong demand for high-skilled labor from export-oriented firms and a limited domestic labor pool. While cross-border commuters have mitigated skill gaps, shortages appear persistent and affect firms' ability to adopt new technologies, expand high-value activities, and reorganize production processes. As a result, skills mismatches are likely constraining productivity improvements even in sectors with high capital intensity and technological capability.

7. Labor input is characterized by a high reliance on cross-border commuters alongside demographic constraints with important implications for the growth model. A significant share of employment consists of non-resident workers, such that total employment exceeds the resident population (Figure 5). Cross-border commuters are employed across manufacturing and services, including engineering, specialized manufacturing, and financial services, supporting high GDP per capita and a high-wage economic model. At the same time, population aging and low labor force participation among older workers and women relative to men (Figure 6) limit the expansion of the domestic workforce. While commuter inflows have historically mitigated these pressures, infrastructure constraints—particularly transport congestion and limited cross-border capacity—affect the scope for further expansion. In addition, the wage premium relative to neighboring regions has narrowed over time, which may influence cross-border labor supply decisions. Taken together, these labor market features may shape the contribution of labor input to long-run growth.

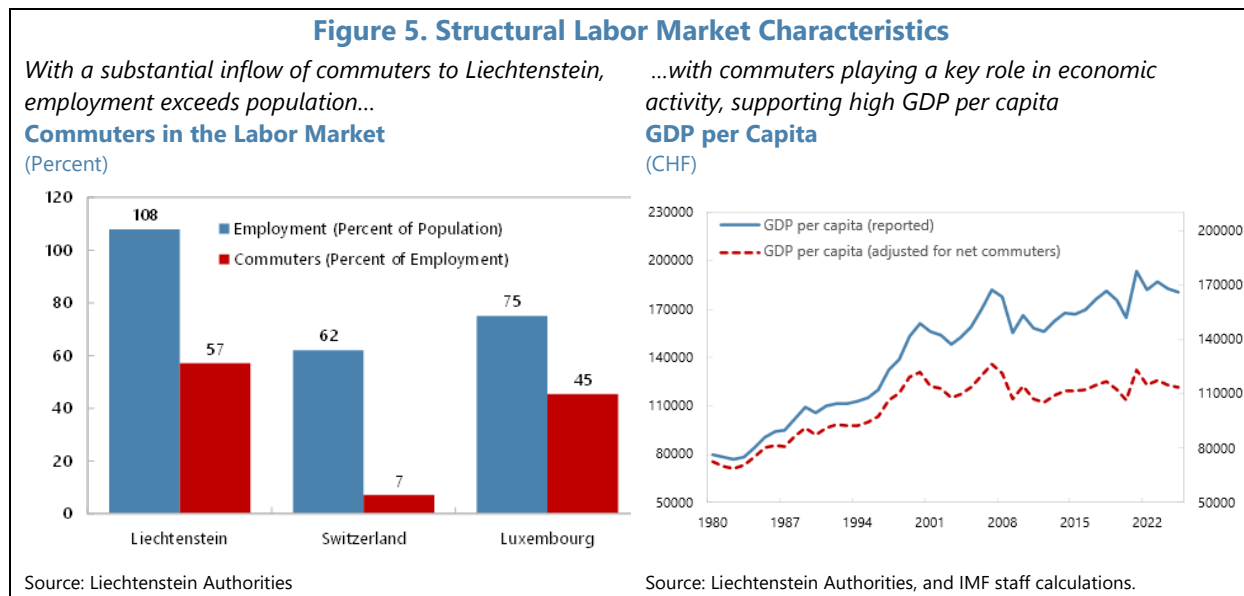
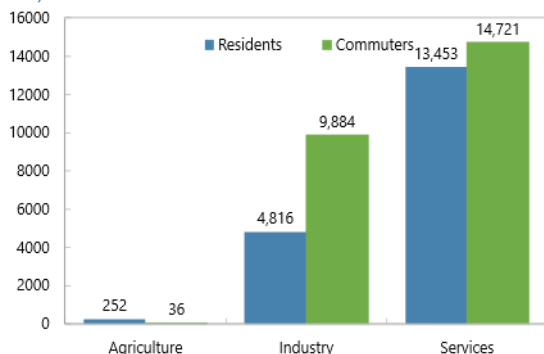


Figure 5. Structural Labor Market Characteristics (Concluded)

Employment of commuters and residents is primarily in the industry and services sectors...

Employment Across Sectors

(Unit)

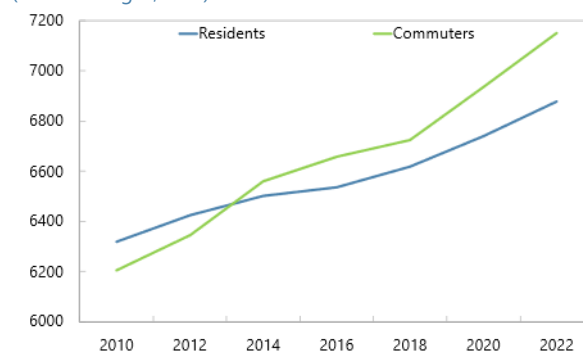


Source: Liechtenstein Authorities

...while the need for skilled workers has led to a wage premium for commuting

Evolution of Wages by Resident Status

(Median wages, CHF)



Source: Liechtenstein Office of Statistics

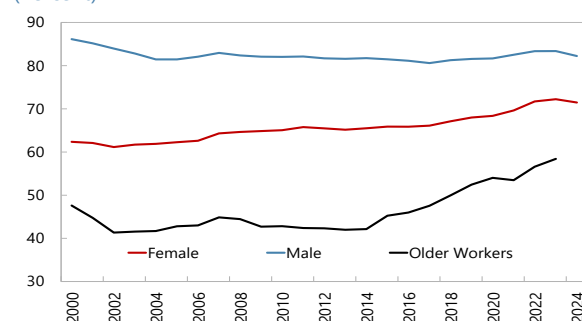
8. Capital accumulation is a key component of the growth framework, although lack of data prevents a detailed assessment for Liechtenstein. Conceptually, capital deepening is an important channel through which economies sustain productivity and long-run growth. However, the absence of detailed capital stock data and firm-level investment information limits the ability to assess the specific contribution of capital accumulation in Liechtenstein. Available information indicates that investment supports the country's capital-intensive production structure. At the same time, persistent transport congestion—reflecting high reliance on cross-border commuters and infrastructure capacity pressures—characterizes the environment. Beyond this, data constraints limit quantitative assessment of capital's contribution.

Figure 6. Labor Supply by Gender and Age

The labor supply of women and older workers in Liechtenstein remains low relative to men, though their labor force participation has increased in recent years...

Labor Force Participation Rate

(Percent)

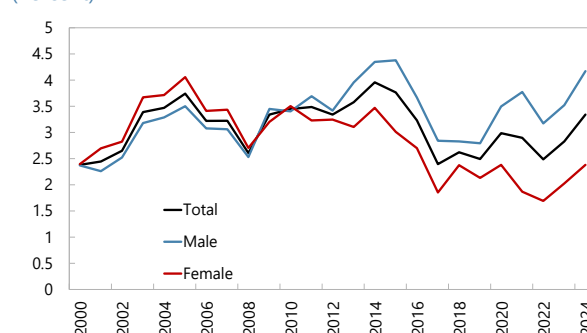


Source: Liechtenstein Authorities

...while the unemployment rate of women is lower than that of men, and declining for the past decade.

Unemployment Rate

(Percent)



Source: Liechtenstein Authorities

Note: The unemployment rate in the chart follows ILO's definition which includes both registered and unregistered employment

D. Reform Options

9. Sustaining productivity and long-run growth requires targeted structural reforms.

European cross-country evidence links specific reform areas to stronger productivity and growth outcomes (IMF, 2025a). This reflects the role of structural reforms in raising per capita incomes and helping narrow cross-country income gaps by improving productivity and resource allocation. The following priority areas are relevant for Liechtenstein:

- **Human capital and skills upgrading.** Expanding STEM and digital skills and strengthening skills-based training systems are consistently associated with higher productivity growth. These findings align with Liechtenstein's strong vocational and dual-training system and support further modernization, expansion of digital and STEM upskilling, and scaling of mid-career reskilling for older workers. Based on World Development Indicators (WDI) data, public expenditure on education is close to 5 percent of GDP in Switzerland and Austria, while it is closer to 4 percent of GDP in Liechtenstein (IMF, 2025b).⁵
- **Innovation and firm capability upgrading.** Innovation policies that support applied research, facilitate technology adoption, and promote SME innovation generate high returns. Strengthening linkages between large multinational firms and smaller domestic enterprises helps diffuse technology and productivity gains across the economy. Increasing public R&D spending through public-private partnerships could supplement private sector R&D investment, and potentially reverse declining trend in IP per capita. An example of public-private innovation partnership includes Swiss Innovation Park.⁶
- **Labor supply expansion.** Higher female labor force participation is associated with sizeable growth gains (IMF, 2018). Policies that encourage longer working lives—including through lifelong learning initiatives, reskilling programs in technological fields, and greater workplace flexibility—alongside expanded parental leave and improved childcare and after-school care, would help ease labor supply constraints given demographic pressures.
- **Physical and digital infrastructure investment.** Addressing transport bottlenecks, improving congestion management, and expanding digital infrastructure are associated with improved productivity performance by supporting skilled labor mobility, firm connectivity, and efficient factor use.

⁵ [Government expenditure on education, total \(percentage of GDP\) | Data](#)

⁶ Swiss Innovation Park is a public-private innovation partnership including public sector, research organizations, and private sectors (<https://www.sbf.admin.ch/en/swiss-innovation-park>).

E. Conclusion

10. This SIP examined the contributors to long-run growth in Liechtenstein. Drawing on available macroeconomic and sectoral data,⁷ the analysis indicates that productivity growth has stalled over an extended period, while skills shortages, demographic pressures, and transport constraints remain salient features of the economic environment. Sectoral productivity gaps, relatively low public sector R&D investment, reliance on cross-border labor, and infrastructure pressures shape the current economic environment and affect growth. At the same time, limitations in capital stock and firm-level data constrain deeper assessment of total factor productivity dynamics and the relative contributions of capital, labor, and technology, underscoring the need for improved data to support more granular analysis. Sustaining high living standards will require continued productivity improvements, and cross-country European evidence highlights priority reform areas—including labor supply expansion, human capital upgrading, public-private innovation partnerships, and infrastructure reforms—that provide possible directions for strengthening medium- to long-term growth.

⁷ It is important to note that data are limited to measure the full extent of private sector productivity, including total factor productivity across firms of different sizes. For instance, there were around 4860 SMEs in 2024 with 10 or less employees creating employment opportunities and value addition. Measuring productivity, firm dynamism and examining key driving factors could shed some light on this important sector of the economy. Available tax data—which has detailed information on firm characteristics, sales, material and wage cost, etc.—could be leveraged to perform such analysis.

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