



PRINCIPALITY OF ANDORRA

SELECTED ISSUES

March 2024

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February 9, 2024

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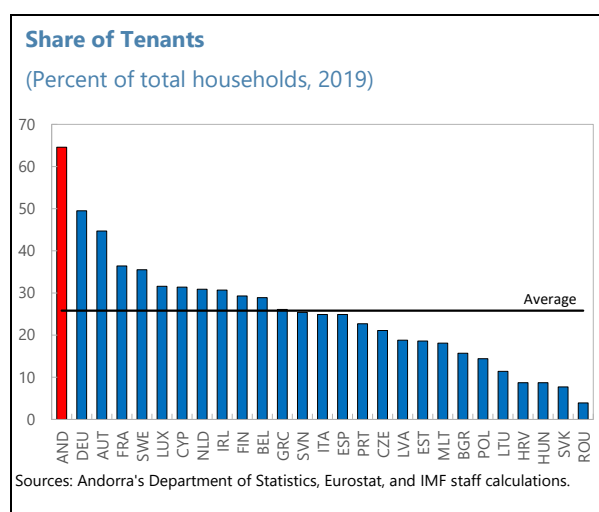
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HOUSING AFFORDABILITY IN ANDORRA¹

Housing affordability is an increasing social and economic concern for Andorra. Changing demographics and increasing real estate prices and rents combine to create a housing affordability issue in Andorra. This paper shows a granular analysis of housing affordability, exploiting microdata from the Survey of Living Conditions, to identify the groups that are most affected and better inform and target housing policies. Evidence that affordability is lower for renters and that Andorra is a renter-dominated real estate market combines to create a housing affordability issue. Low-income and low-skilled workers are disproportionately affected. This study analyzes the evolution and characteristics of housing demand and supply dynamics in the country, which indicates a supply and demand mismatch in the affordable segment of the Andorran housing market as well as insufficient fluidity which exacerbates the shortage of short-term rentals and complicates the hiring of foreign workers. A multipronged policy approach is needed, and a careful balance is needed to minimize market distortions while increasing the stock of housing in the medium-term.

A. Introduction

1. A major political issue in Andorra, housing affordability is also macro-critical. This paper investigates the determinants of the current housing stress to draw policy recommendations. Rising housing affordability concerns result in socio-economic difficulties, distributional issues, and impacts the attractiveness of Andorra as a working and, to some extent, as an investment destination. The limited supply of housing due to the country's geography and the sustained demand for rental housing have pushed up rents, leading to the emergence of a housing affordability problem, especially among certain groups. The lack of affordable housing makes the labor market less attractive, especially for foreign and seasonal workers, and may affect foreign investment decisions for companies that cannot secure housing for their workers, thus limiting potential growth. In a recent sentiment survey, conducted in the first half of 2023, 67 percent of the population considers that housing affordability needs to improve, compared to only 3 percent in 2015.



2. The housing affordability issue in Andorra is directly related to its exceptionally high share of tenants, associated with a growth model reliant on immigration. Generally, housing affordability tends to be lower for renters than for owners. As of 2019, nearly 65 percent of households were renting the property they lived in. This was well above the share of tenants in other rent-oriented markets such as Germany, and in the EU as a whole, which had an average share of

¹ Prepared by Ana Lariau and Michelle Tejada (both EUR).

tenants below 30 percent. The Andorran economy and labor market are highly dependent on temporary migrant workers and permanent residents. As shown in Table 1, nearly 60,000 immigration authorizations were in force in 2022 – equivalent to 62 percent of the total population.² Almost half of them have resided in the country for more than 10 years and have likely established roots in the country. Yet, such a large number of immigrants, who are more likely to be tenants (due to prospects of future mobility of those that do not have rooting in the country and/or limited access to mortgages), puts additional pressure on the rental market. Anecdotal evidence indicates that the demand for rental housing may have increased further during and in the aftermath of the pandemic due the arrival of a large number of foreign residents to Andorra, resulting in a 7 percent population increase. These new residents were attracted by the country’s quality of life, security, infrastructure (particularly high-speed Internet), low taxes, and high labor demand.

Table 1. Andorra: Number of Immigration Authorization in Force by Type
(Percent of total population)

Type of Immigration Permit		2018	2019	2020	2021	2022	
Work & residence	Permanent	<1 years	2.8	2.7	2.3	2.5	3.4
		1-5 years	6.7	7.9	8.7	8.7	8.7
		6-10 years	3.6	3.2	3.2	3.4	4.0
		11-15 years	8.3	7.3	6.0	4.7	3.6
		16-20 years	5.1	5.7	6.0	6.4	6.5
		>20 years	18.3	18.3	18.6	18.6	18.5
	School staff	0.5	0.5	0.5	0.5	0.4	
	Temporary	2.1	2.2	2.3	1.1	3.3	
	Temporary - Studies, research, internship, sports training	0.1	0.1	0.1	0.2	0.1	
	Temporary - Workers of international companies	0.3	0.3	0.2	0.3	0.6	
Work w/o residence (<i>fronterers</i>)	Permanent	2.0	2.1	2.1	2.1	2.1	
	Temporary	0.0	0.0	0.0	0.0	0.0	
Work w/o residence (other)		0.1	0.1	0.1	0.1	0.1	
Residence (family reunification, residence w/o work, other)	<1 years	1.1	1.1	1.0	1.1	1.4	
	1-5 years	4.5	4.6	4.7	4.5	4.2	
	6-10 years	2.3	2.3	2.2	2.4	2.7	
	11-15 years	1.3	1.3	1.4	1.3	1.3	
	16-20 years	0.5	0.5	0.5	0.6	0.6	
>20 years	0.8	0.7	0.7	0.7	0.7		
Total		60.5	60.9	60.8	59.3	62.4	

Source: Andorra’s Department of Statistics and IMF staff calculations.

3. A data-driven analysis is key to adequately inform housing policies. Until recently, data on the residential housing market and on housing affordability was very limited. A new System of Housing Statistics, which systematizes a large amount of residential housing indicators, along with a tool that simulates the supply and demand of rental housing, allows further investigation. These new resources add to the existing set of housing statistics—including on affordability—that were already reported by Andorra’s Department of Statistics. The aim of this study is to complement these initiatives by producing a granular analysis of housing affordability, exploiting microdata from the

² Out of them, 82 percent were associated with a work authorization, either temporary or permanent, and most of them entailed residence in the country. Access to citizenship in Andorra requires 20 years of residence.

Survey of Living Conditions, with the purpose of better identifying the groups that are most affected by this problem and better inform and target housing policies. In addition, this study analyzes the evolution and characteristics of housing demand and supply dynamics in the country.

B. Rental Affordability in Andorra: Stylized Facts

4. Due to the large share of tenants, the problem of housing affordability in Andorra is one of rental affordability, which is typically higher than owners' affordability. Given this, the analysis in this section will focus on two widely used measures of rental affordability used in the literature: the housing cost overburden rate and the rent-to-income ratio. These measures are defined as follows:

- *Housing cost overburden rate:* Share of population within households whose housing costs (including rent, mortgage payments, services, etc., net of housing allowances) represent more than 40 percent of the total disposable income of the household (net of housing allowances).
- *Rent-to-income ratio:* Median across households of the annualized rent as a share of disposable household income.

5. Tenants in Andorra tend to be foreigners, with smaller household size, and with lower levels of education and income. Before diving into the rental affordability issue, it is important to characterize who are the tenants in Andorra. Table 2 provides descriptive statistics by ownership status from the Survey of Living Conditions:

- *Tenants have lower income than owners.* The average annual disposable income of tenants is about 30 percent the one of owners with mortgage, and 40 percent the one of owners without mortgage.
- *Tenants have smaller households.* The average household size is close to three members for owners with mortgage, slightly lower for owners without mortgage, and about 2 for tenants who therefore demand smaller housing units.
- *Tenants are mostly foreigners.* In most households that are tenants (nearly 65 percent), the reference person is a foreigner, while the opposite happens in households who are owners.
- *Tenants tend to have a low-educated reference person* (about 40 percent), owners with mortgage tend to have a middle-educated reference person (about 40 percent), and owners without mortgage tend to have a more even distribution in terms of educational attainment of the reference person (with a slight bias towards higher education levels).
- *Finally, the reference person is generally employed in households that are tenants* and owners with mortgage tends to be employed, while is more likely to be inactive (possibly retired) in households that are owners without mortgage.

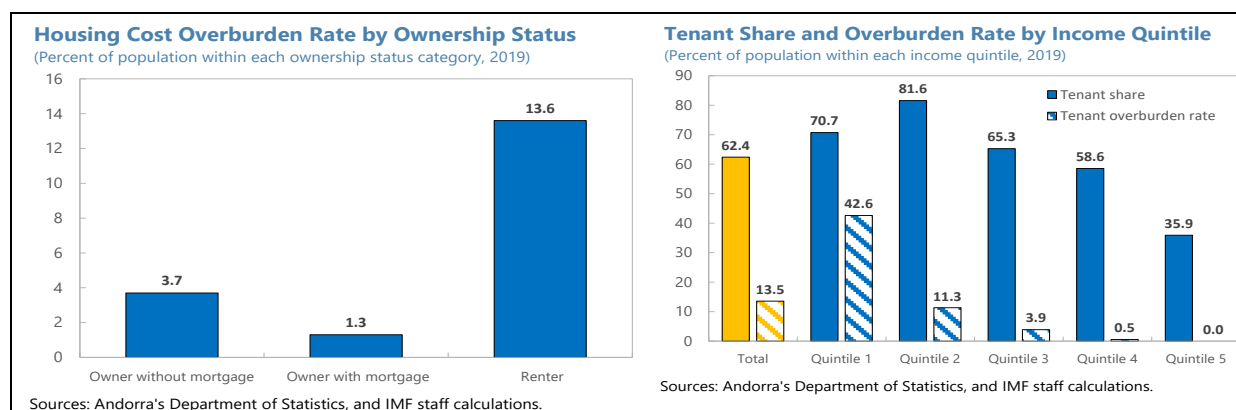
Table 2. Andorra: Descriptive Statistics

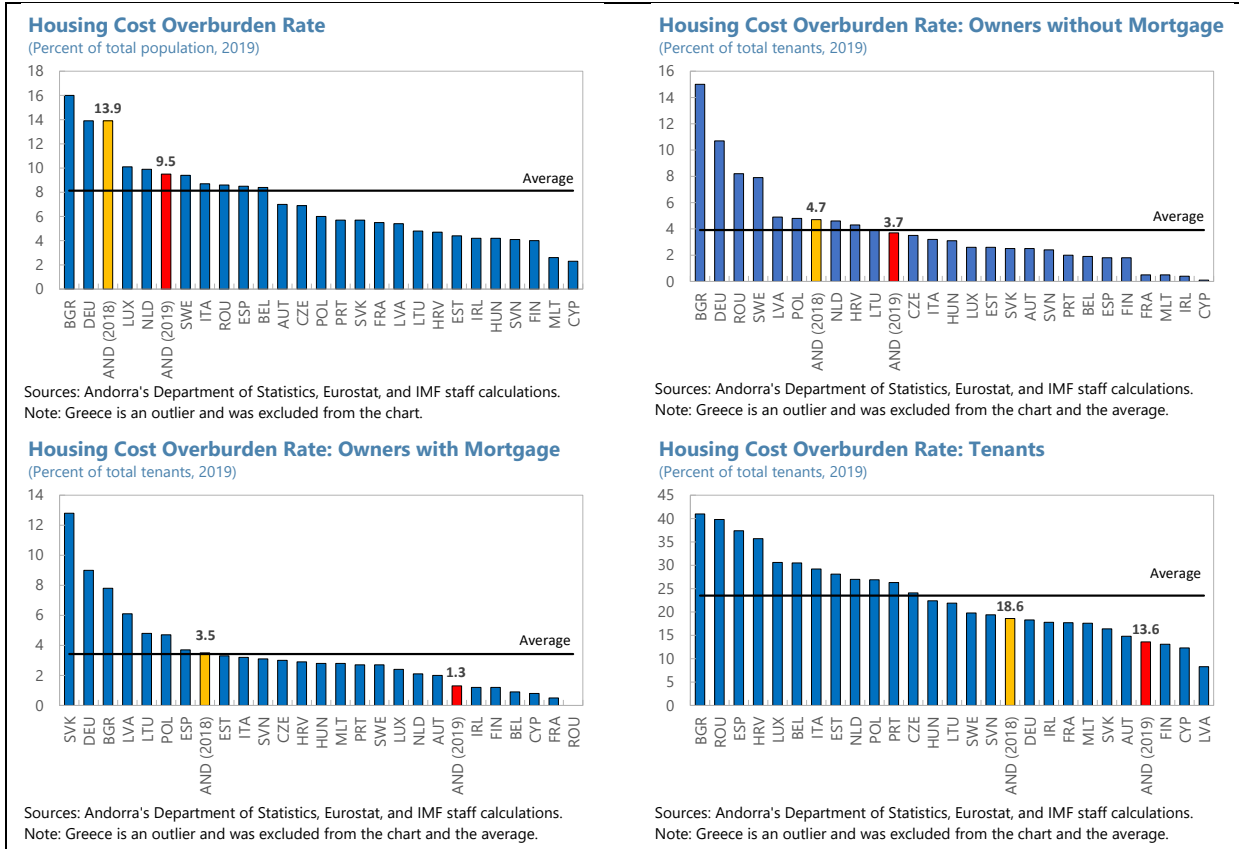
	2018			2019			2020		
	Tenants	Owners with mortgage	Owners without mortgage	Tenants	Owners with mortgage	Owners without mortgage	Tenants	Owners with mortgage	Owners without mortgage
Average annual disposable income (euros)	32,430.0	53,470.4	56,664.1	36,258.8	56,125.4	55,781.2	38,581.2	48,643.6	58,908.2
Average size (number of members)	2.1	2.6	2.2	2.1	2.7	2.2	2.1	2.7	2.1
Share by nationality (percent)									
Nationals	28.4	59.0	52.8	27.0	55.3	55.1	28.8	53.2	60.4
Foreigners	71.6	41.0	47.2	73.0	44.7	44.9	71.2	46.8	39.6
Share by educational attainment (percent)									
Low education	43.9	29.5	28.1	44.3	27.5	30.5	40.6	22.0	34.4
Middle education	32.2	42.5	36.2	34.6	38.6	34.8	36.2	41.6	29.2
High education	23.9	28.0	35.7	21.2	33.9	34.7	23.2	36.4	36.4
Share by employment status (percent)									
Share of employed	78.0	89.2	52.8	79.7	93.1	55.3	80.9	93.3	52.6
Share of unemployed	0.9	0.0	0.8	1.2	0.0	0.7	2.0	3.2	0.0
Share of inactive	21.1	10.8	46.4	19.1	6.9	44.0	17.2	3.5	47.4

Source: Andorra's Department of Statistics and IMF staff calculations.

Note: The (weighted) shares by nationality, educational attainment and employment status are computed based on the characteristics of the reference person in the household.

6. Andorra ranks relatively well on affordability for each ownership type, but the disproportionately high share of tenants results in a deep rental affordability issue. Andorra's overall overburden rate ranks in the top 5 within the region, with 13.9 percent of the population facing housing costs above 40 percent of their income in 2019. However, a disaggregation of the data shows that the overburden rate is around or below regional averages among owners and renters separately. The homeowners overburden rate is estimated at 3.7 percent and 1.3 of owners without mortgage and owners with mortgage, respectively. In contrast, the overburden rate for renters is estimated at 13.6 percent, lower than the regional average but close to four times higher for tenants than for owners. Indeed, the overburden rates are significantly higher for tenants in all countries, but in Andorra, it affects a much larger share of the population, which explains the significant overburden rate on aggregate. Renters dominate the housing market across income levels. 62 percent of the total population lived in rented houses in 2019. By income level, 35.9 percent of those in the highest quintile were tenants in the same year, compared with 70.7 percent and 81.6 percent of those in the first and second quintile, respectively.



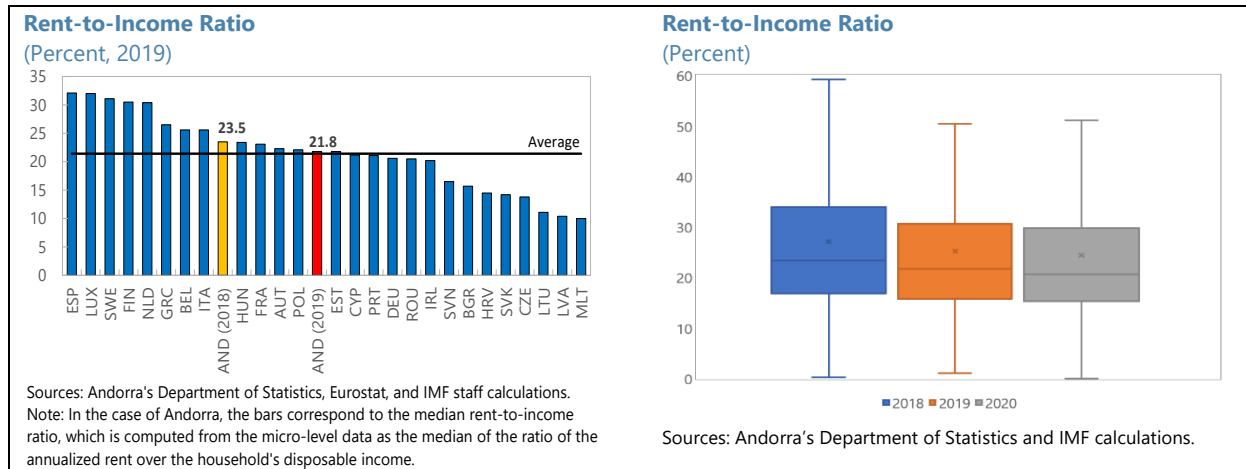


7. Even though the rent-to-income ratio is broadly in line with European levels, the overburden rate in Andorra is among the highest in the region—primarily driven by the large share of tenants. On average, rents in Andorra prior to the pandemic were about 20 percent of disposable income, close to the average for the EU. The housing cost overburden rate, on the other hand, was well above the EU average. While in the EU there was 7 percent of the population with housing costs representing more than 40 percent of the disposable income, in Andorra this share was 9.5 percent in 2019. While the housing cost overburden rate declined in 2019 in line with an improvement in real disposable income compared to the previous year, it remains among the highest in the region.

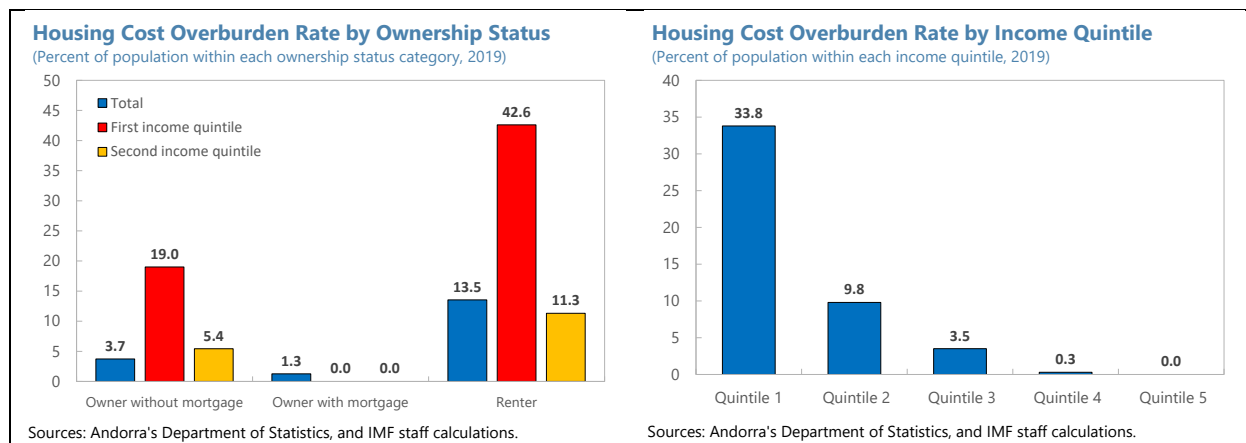
8. The aggregate indicators, however, hide significant heterogeneity, calling for a more granular analysis. For example, the box and whiskers chart of the rent-to-income ratio shows that the median of the rent-to-income ratio of Andorran households is slightly above 20 percent, fairly stable across all years in the sample (with just a small decline towards recent years). However, the interquartile range is wide, of about 15 percentage points. And for some households, the rent-to-income ratio could go above 50 percent. This requires a more granular analysis of the data, as shown below, to better understand what are the households that need to devote a higher share of their income to cover housing costs.

9. Within the lowest income quintile, tenants are the ones suffering the most from housing cost overburden. The disaggregation of the data shows that about 42.6 percent of renters

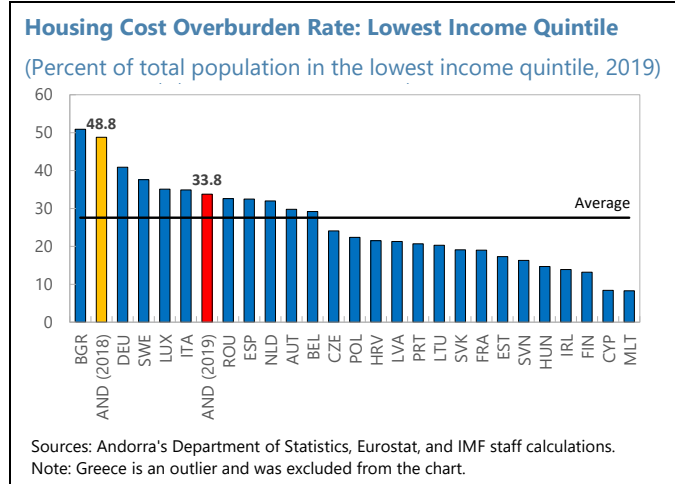
and 19 percent of owners (without mortgage) in the lowest income quintile are overburdened by housing cost. As the income level rises to the second quintile, the housing cost overburden rates drop to about ¼ of the rates for those at the bottom of the income distribution. Moreover, about 70 percent of those in the lowest income quintile are renters and almost 2/3 of them are facing affordability problems.



10. Affordability is mostly an issue for low-income households, a particularly vulnerable segment of the population. These are likely to be low-skilled workers, essential to the service sector – a critical component of the Andorran workforce. The housing cost overburden rate for those in the lowest income quintile is among the highest in the region, estimated at 34 percent in 2019. The overburden rate declines to 10 percent in the second income quintile, while those at the top of the income distribution generally do not face housing affordability issues in Andorra.



11. Moreover, within the lowest income quintile, the most overburdened households are those in which the reference person is a foreigner, high-skilled, or unemployed. Close to 40 percent of foreigners in the lowest quintile residing in Andorra are overburdened by their housing costs compared to 26 percent of Andorrans in the same income group. Furthermore, almost half of those with at least a bachelor’s degree in said income group face housing affordability issues; while this may seem counterintuitive, it could potentially reflect a mix of housing locations,



12. preferences, length of stay and access to housing support. In addition, 61 percent of the unemployed in the lowest quintile are facing housing affordability pressure as their income is likely reduced to unemployment benefits and other social assistance.

Housing Cost Overburden Rate in the Lowest Income Quintile, by Citizenship of Reference Person

(Percent of population within each citizenship group, 2019)

Citizenship	Rate (%)
Total	33.8
Andorran	26.4
Foreigner	38.0

Sources: Andorra's Department of Statistics, and IMF staff calculations.

Housing Cost Overburden Rate in the Lowest Income Quintile, by Educational Attainment of Reference Person

(Percent of population within each educational attainment group, 2019)

Educational Attainment	Rate (%)
Total	33.8
Educ Low	28.9
Educ medium	35.0
Educ High	48.7

Sources: Andorra's Department of Statistics, and IMF staff calculations.
Educ low = Up to lower secondary.
Educ medium = Upper secondary, post-secondary non-tertiary and short-cycle tertiary.
Educ high = Bachelor or higher.

Housing Cost Overburden Rate in the Lowest Income Quintile, by Employment Status of Reference Person

(Percent of population within each employment status group, 2019)

Employment Status	Rate (%)
Total	33.8
Employed	33.8
Unemployed	61.6
Inactive	32.1

Sources: Andorra's Department of Statistics, and IMF staff calculations.

Shares in the Lowest Income Quintile, by Characteristics of the Reference Person in the Household

(Percent of population in the lowest income quintile, 2019)

Characteristic	Share (%)
Foreigner	64.3
Educ Low	47.6
Educ Medium	36.1
Educ High	15.2
Employed	67.6
Unemployed	2.0
Inactive	30.5

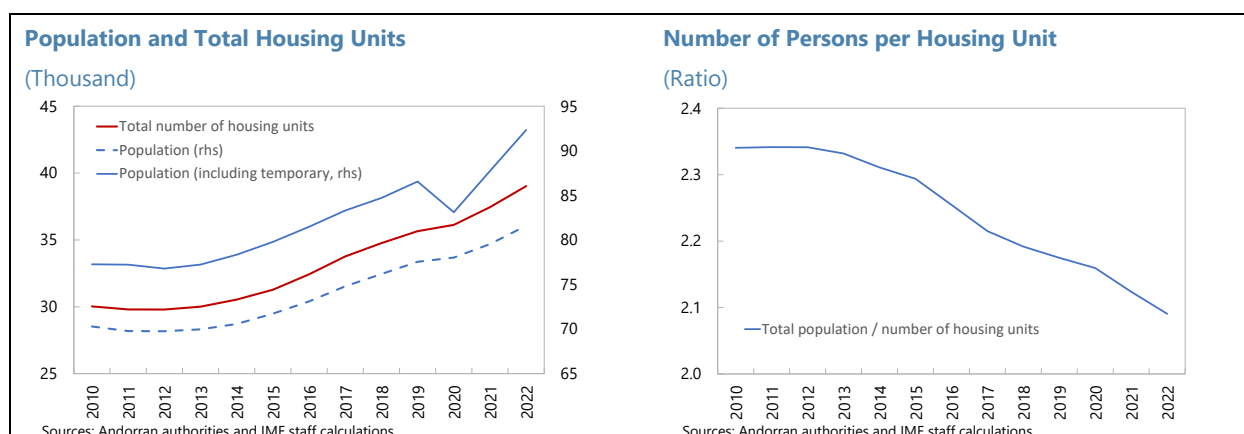
Sources: Andorra's Department of Statistics, and IMF staff calculations.
Educ low = Up to lower secondary.
Educ medium = Upper secondary, post-secondary non-tertiary and short-cycle tertiary.
Educ high = Bachelor or higher.

13. This analysis has been limited by the constraints imposed by the data. There are four issues related to data availability that have prevented us to analyze the impact of temporary and/or seasonal foreign workers on housing affordability, as well as the post-COVID trends. First, the survey does not include information on the immigration status of the reference person in the household, only about the nationality. Second, temporary/seasonal foreign workers are excluded from the survey, even if they are a group that adds significant pressure to the rental housing market, as all seasonal workers can be assumed to be renters. Third, the data for 2020 could be biased by the support package provided to renters during the COVID pandemic and, therefore, the analysis does not incorporate 2020 data. Four, data availability is limited to 2020, not capturing the most recent price developments and most acute increases that would magnify the results.

C. A Growing Housing Market Imbalance

14. The dynamics of housing supply and demand shape the housing market. The demand for housing is affected by a range of factors including population growth, economic conditions, and lifestyles preferences. The number of households is the main determinant of the quantitative demand for housing. The level of wealth influences the characteristics of the demand through preferences for certain features and, in some cases, also by increasing the demand for housing with investment purposes or as secondary residences. The supply of housing depends on the pre-existing inventory, availability of land, the cost of construction materials, and government policies, among others. The interaction between supply and demand – including the degree of housing rotation – determines the prices of housing and its affordability. When the supply of housing is inelastic, as is generally the case in Andorra, prices rise faster as the increasing demand translates into higher prices instead of greater construction activities.

15. At the aggregate level the data does not point to the existence of a housing market imbalance, but a closer look indicates a shortage of affordable housing and insufficient fluidity in the market. On the supply side, the total number of dwellings has increased in line with population and there has been a slight decline in the average number of people per housing unit. The trend is similar when the population is augmented with the seasonal workers. However, there is insufficient supply to match the demand for more affordable units as prices for residential real estates and rental dwellings have increased faster than wages and the mobility in the market has been reduced. Demand pressure also comes from demographic changes beyond population growth. The average household size is decreasing with a greater number of people living alone or forming smaller families, increasing the demand for houses in general and for smaller houses. Greater immigration also puts pressure on the demand for new rental or buying contracts. In addition, seasonal workers temporarily increase the need for short-term housing each year, especially during the winter season. The number of seasonal workers has doubled in the past eight years, while the number of available short-term rental housing has decreased as tenants stay longer in their current lease. All of these dynamics lead to a supply and demand mismatch in the affordable segment of the Andorran housing market.



16. Data on the stock and characteristics of available houses in Andorra is limited, but the authorities are using administrative data from different sources to better assess supply. A study conducted in 1990 shows that there were 21,627 homes at the time, of which 65 percent were used as primary residence. Back then, properties for housing constituted 55 percent of the total properties in the country (3,641 building units), of which 10 percent were detached or semi-detached houses and 90 percent were apartments. However, data on the evolution of the supply of housing since then is very limited. To better assess the housing market in the country, the authorities conducted a Real Estate Census in 2021 using administrative data from different sources. The 1990 and 2021 datasets are not fully comparable but, at the aggregate level the estimated number of properties in the country increased from 6,653 to 10,468, of which 3,442 were intended mainly for housing. The data also shows that the number of housing units in the country has almost doubled since 1990 in line with population, reaching 41,215 units in 2021.

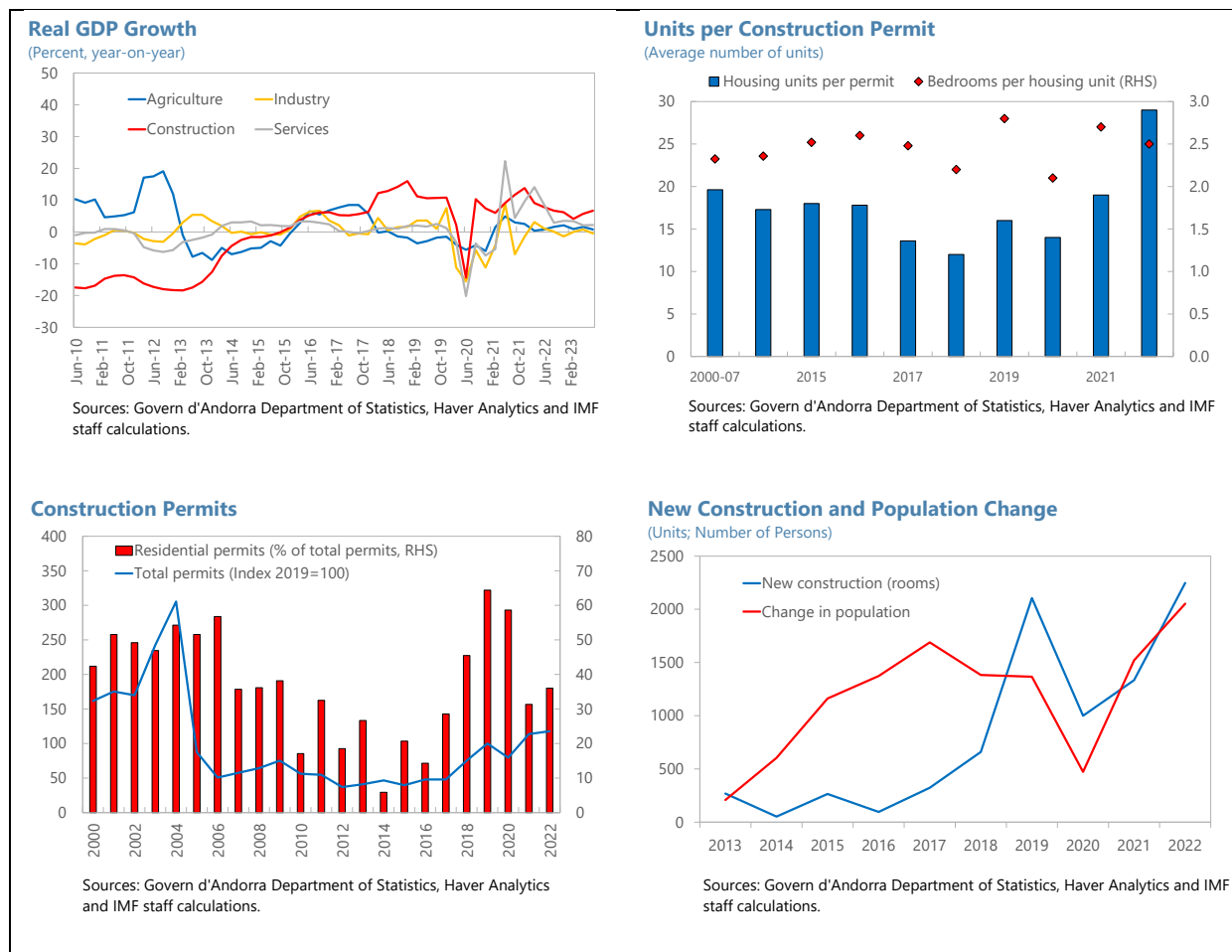
Table 3. Andorra: Housing and Properties Stock by Type

(As of 1990)				(As of 2021)			
Type	Units	Percent		Type	Units	Percent	
Properties for housing (individual house or apartment)				Type of units			
Main residence	14,085	65.1		Housing	41,215	50.0	
Secondary residence	3,451	16.0		Tourist apartment	3,319	4.0	
Accommodation with absent occupant	1,277	5.9		Local	4,642	5.6	
Collective accommodation (hotel, community, etc.)	295	1.4		Parking	14,561	17.7	
Vacant housing	2,495	11.5		Storage room	7,792	9.5	
Other types	24	0.1		Warehouse	1,777	2.2	
Total	21,627	100.0		In works	810	1.0	
Type of properties				Others	2,329	2.8	
Properties for housing (individual house or apartment)	3,641	54.7		No information	5,982	7.3	
Property for agricultural use	979	14.7		Total	82,427	100.0	
Hotel/aparthotel/community	279	4.2		Type of properties			
Industrial, commercial, administrative	1,637	24.6		Housing	3,442		
Type not declared	117	1.8		Others	7,026		
Total	6,653	100.0		Total	10,468		

Sources: Andorran authorities and IMF staff calculations.

17. The recent construction boom may not bring much relief to the stock of available housing and affordability. Anecdotal evidence suggests that most housing construction in recent years have focused on luxury (or expensive) housing, which are unaffordable for most of the population. This trend towards more expensive units has been driven in part by the demand for more higher-end houses by a segment of the population (including foreigners), but also by

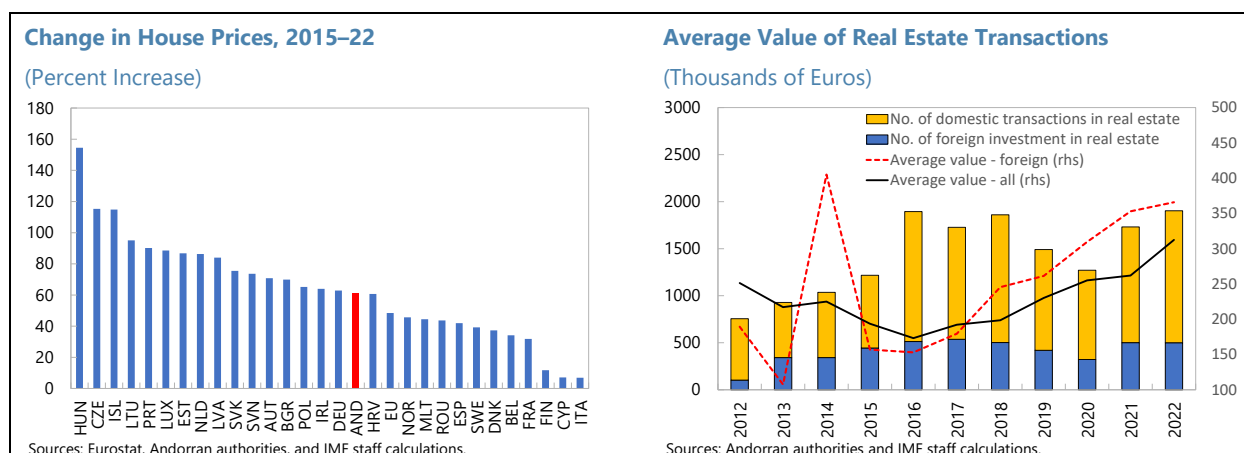
increases in the costs of material and land, which push developers towards more profitable types of housing. As they face increases in the costs of material and land). Construction permits have on average a larger number of bedrooms per unit, thus costing more per unit than smaller housing. Furthermore, although residential permits increased in 2019 and 2020, the increase was still moderate and just in line with population growth, therefore not in line with the increasing demand pressures.



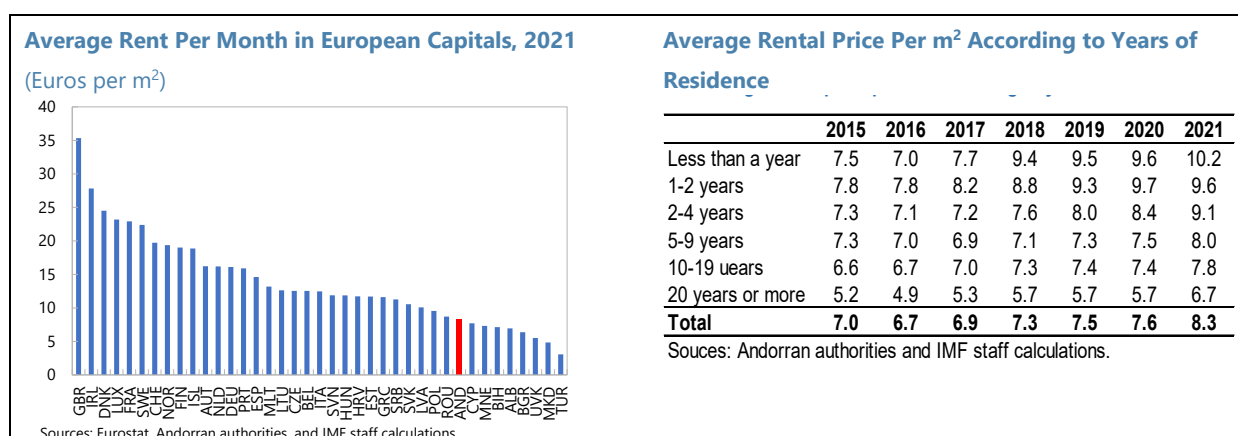
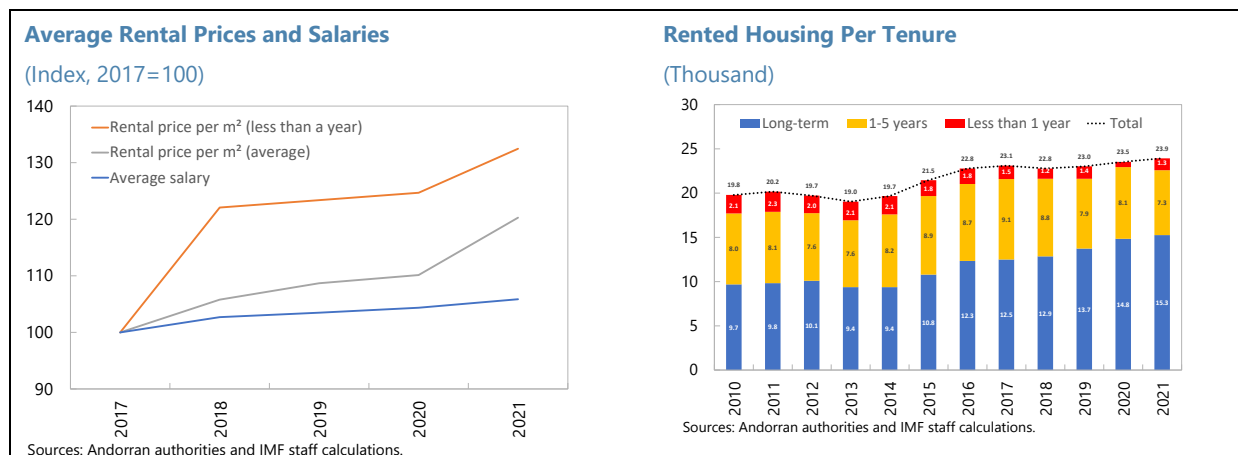
18. With housing prices increasing faster than the EU average and difficult access to credit, many Andorrans are crowded out of the housing market. Between 2015 and 2022 housing prices in the country have increased by 61 percent, compared with 48 percent on average in EU countries. The number of residential real estate transactions has increased in the last decade, with an average of 1,600–1,800 apartment units sold per year. Financial conditions and access to mortgage matter more for residents than non-residents who usually do not require a mortgage or can borrow from another financial market. About half of real estate transactions in Andorra are carried out with mortgage at an average of EUR375,000 in 2022, and a large proportion of them are carried out by Andorrans. Yet, even for residents, the high standards to qualify for mortgage in the domestic financial market and high interest rates means that most of the population cannot access bank financing to become homeowners—affecting directly first-time home buyers and creating a

disparity between wealthier residents able to borrow and the remaining of the population unable to buy housing and therefore stays as renter.

19. The use of housing as a wealth/investment vehicle is contributing the rise in real estate prices. Almost 30 percent of transactions in residential real estate in Andorra are done by foreigners. With a large share of foreigners buying property in Andorra for investment purposes, those units lose their shelter component and become financial assets. This intensifies pressure on real estate prices. If the buyer does not live in the unit or rent it, this increases the stock of vacant properties and reduces housing supply. The total value of foreign investment in real estate was around EUR70 million in 2015 and has grown to EUR183 million in 2022, indicating that foreigners are an increasing player in the domestic housing market. Moreover, the average value of transactions of foreign investment in real estate has almost double since 2012, while the average value of domestic transactions in real estate has increased by 25 percent only. Housing prices in general have accelerated since 2017, especially the prices of dwellings bought by foreigners. Monaco, another microstate favored by the wealthiest, has a similar trend but even more intensified, with the number of real estate sales growing by 130 percent since 2010 despite steep price increases, as the supply is unable to keep with the rising demand.



20. On the rental market, affordability has also worsened with rents increasing faster than wages, especially for those seeking to sign a new lease. Andorra's rental prices tend to be lower than those in the capital of other European countries, but so are average net salaries (EUR1,200 in Andorra compared to EUR1,420 in a sample of EU countries) and low-income earners are more severely affected. In addition, rental prices have increased much faster than wages, with average salary rising only by 6 percent between 2017 and 2021, while average rental price per m² rising by 20 percent in the same period. The increase is more acute for those that have lived in the place for a shorter period of time, with a 32 percent increase in rental prices between 2017 and 2021 for those that have stayed for less than a year. Although prices have increased across the board in Andorra, those increases tend to be lower with the years of residence partly because of rent increases caps and mandatory extension of contracts. As a result, those seeking to sign a lease face much higher prices than households renting a similar place for longer.



21. In addition, rental tenure has lengthened reducing the fluidity of the housing market. Between 2010 and 2021, the share of households occupying their home for more than 5 years has increased from 49 to 64 percent, of which about 13 percent of the total households have stayed for 20 years. Conversely, the share of households occupying their home for less than one year decreased from 11 to 6 percent during the same period, a decline from 2100 to 1350 households. This means that households are staying in the same home for longer, partly because of reluctance of current tenants to move given potentially significant price increases. This reduces the fluidity of the rental market, making it difficult for newcomers (including seasonal workers) to find available units and exacerbating price pressures.

D. A Review of Policies to Tackle Housing Affordability

22. Appropriate policies to tackle housing affordability should have two objectives: first, addressing a significant socio-economic concern; and second, removing a bottleneck to growth. Housing policies typically seek to balance multiple aims, of which affordability and access to housing are only two of the aspects, and typically not the priority ones. In Andorra, affordability is an important social issue, that compounds purchasing power concerns, and an economic issue, as the shortage of affordable housing is becoming a binding constraint on economic growth by lowering the attractiveness of the country to necessary foreign workers. A comprehensive

assessment of costs, benefits, and internal consistency of housing policies is needed. Doing so will also facilitate the development of complementary policies across other sectors that are conducive to a more sustainable urban planning, including ensuring transport, utilities, and other public services.

23. Experience in implementing housing policies other countries provide useful lessons for Andorra’s policymakers:³

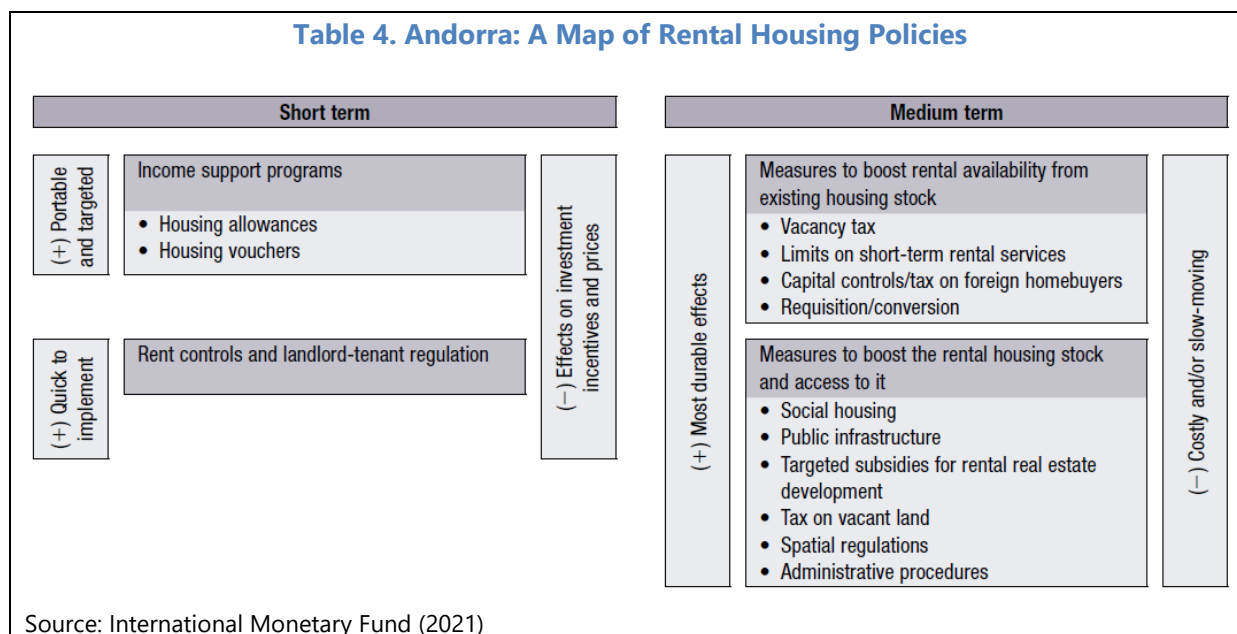
- **Income support programs:** subsidies in the form of housing allowances or housing vouchers can improve housing affordability for those most in need. In Europe, housing allowances tend to be means- and/or income-tested transfers to households, while in the United States these are usually attached to a specific unit of privately-owned housing or given directly to landlords. If well-designed, income support can help provide affordable housing regardless of owner or regulation status (including through the private market), can facilitate labor mobility, and be effective at providing targeted assistance. Moreover, housing allowances make rental income more secure, which is particularly important where eviction is difficult to enforce. However, despite the short-term benefits, housing income support create distortions, including the potential to raise rental prices with landlords settling with renters a higher price, alter the distributions of rents, and be ineffective if there is a lack of supply of affordable housing.
- **Rent control and landlord-tenant regulations:** rent control policies help to prevent sudden and steep increases in rents. They could come in the form of rent ceilings or freezes by governments, or prices could be free at contract setting but have an upper bound for subsequent adjustments. Rent controls are widely used across countries as they can be easily linked to explainable social objectives, prevent landlords from capturing housing subsidies, and increase the bargaining power of renters. However, these policies should be carefully considered as they distort the market and could discourage investment in rental properties. There is no clear evidence that rent controls have led to lower rents over time, but there is evidence that they are associated with lower housing supply. Additionally, rent regulations tend to benefit more longer-stay tenants as landlords seek to set a higher initial rent to compensate for the erosion over time and cause a divide between established households and new households. Gradually de-regularizing tight rent controls could improve landlords’ profits which in turn increases the supply and access to private rental options by improving market forces.
- **Raising the low stock of rental housing from the existing housing stock:** improving the use of existing vacant space can increase the supply of rental housing in the medium-term. This requires taking a stock of vacant properties and identifying the incentives that are creating the vacancies, which are usually related to speculation in the housing market, demand for secondary residencies and/or tax policies. A high vacancy rate can exacerbate rent price increases, especially in scenarios with low housing supply elasticity. In those cases, tax and other regulatory measures could help to increase rental supply in the medium term from the existing housing stock. These include vacancy tax, limits on short-term rental services, capital controls, tax on

³ This section is mostly based on policies outlined in the paper “Affordable Rental Housing: Making It Part of Europe’s Recovery” (IMF, 2021). Refer to the paper for specific examples of policies implemented in different countries.

foreign homebuyers, requisition/conversion, among others. However, the impact is not guaranteed to be felt by low-income renters as these measures tend to affect mostly high-priced properties. In addition, where renter-landlord regulations are not adequately balanced, and equalizing the rights could also increase rental housing supply as more owners would be willing to put their housing units in the rental market. Compulsory conversion of underused facilities into affordable housing should be a last resort for areas facing severe shortage of rental housing and high vacancies. Yet, in some cases, the incentives could be created to transform commercial properties into dwellings, including through “gentle requisitioning” or “solidarity leases”, among others.

- ***Boosting the housing stock and access to it:*** increasing the physical stock of housing is important to address the supply and demand mismatch of affordable housing.
 - The governments can provide incentives for new construction of affordable housing through regulatory measures, financing facilitation and subsidies—grants, loan guarantees or low-interest loans, or sale of land at below-market prices or as long-term leasing—and by disincentivizing holding of vacant land.
 - Social rental housing can also boost affordability for low-income households by providing residencies at below-market prices. These can be developed by the government or through public-private partnerships and, when implemented, should be part of a comprehensive affordable housing strategy, as these are typically costly and less flexible than housing allowances and could intensify poverty traps and other social issues.
 - Social issues. The impact of social housing on the rest of the rental market depends on its size and whether the total number of units in a market can be raised without crowding out the provision of other low-income housing supplied by the private sector. Moreover, if not well-targeted, the provision of social housing can create distortions, including in cases in which large segments of the population are eligible or where the eligibility criteria for social housing are applied only at entry and not revisited over time.
 - Other policies, such as changing zoning regulation, investment in public infrastructure, and urban planning policies have the potential to affect housing supply elasticities, boost new construction and the use of vacant housing, and make more efficient use of land. Regulatory reforms to streamline building permits and reduce bureaucratic hurdles can decrease the cost and time needed to build new housing and lower prices.

Table 4. Andorra: A Map of Rental Housing Policies



24. In the case of Andorra, policies should address the key features driving the affordability issue in the country. The problem of housing affordability in Andorra is associated with rental affordability, given the disproportionate number of tenants in Andorra and should be the priority. Therefore, policies to favor access to ownership are welcome but have limited impact. Andorra also faces a distribution issue in the supply of housing, and therefore measures should create incentives to boost the supply of affordable housing (i.e., quotas, mandated share of IZ units, land availability, tax incentives, etc.) and reduce profits from higher units (i.e., taxes). Policies should also balance the desired to provide income support to low-income renters (i.e., housing allowance, etc.). When designing policies, it is also important to be cognizant of distortions that hinder the market and that are difficult to remove in the medium-term.

E. Policy Considerations and Conclusions

25. Addressing housing affordability is key to the government’s policy agenda. Since, 2021. The authorities have been introducing a series of measures aimed at improving affordability in the short-term and are setting up measures to improve the stock of housing in the medium term. Table 5 provides a detailed list of measures taken and planned by the authorities.

Table 5. Andorra: Authorities’ Planned Measures to Address the Housing Affordability Crisis

GOVERNANCE-RELATED POLICIES	
	<ul style="list-style-type: none"> • Creation of the National Housing Institute and establishment of the Housing Fund. • Development of a strategic plan for the demographic growth model. • Law on the right to adequate housing. • Creation of a property registry. • Government access to housing data for policymaking • Creation of the system of housing indicators, including an inventory of dwellings, rental contracts, and prices by local governments. • Professionalization of the real estate appraiser.

SHORT-TERM POLICIES	
Income support programs	<ul style="list-style-type: none"> • Flexibilization of requirement and increase of rent aid (EUR3.5 million; 1,471 households in 2022) and other rental housing support measures. • Additional benefits, within the Renova Plan, for owners that introduce energy-efficient improvements to rental properties. • Guarantee program for the purchase of a first home, through which it will guarantee 20 percent of the value of a mortgage loan. • Exemption from real estate transfer tax for the first home purchase.
Rent control and landlord-tenant regulations	<ul style="list-style-type: none"> • Mandatory extension of rental contracts (2019–23), and new extension until 2027 of current contracts. • Temporary cap on rent increases (5 percent for extended contracts, 2 percent for contracts in place for at least one year) for rents above EUR8/m². • Creation of an inventory of dwellings, rental contracts, and prices by local governments. • Preparation of a reference price index and determination of the affordable price. • Creation of a guaranteed rental agency of public management. • Creation of a property management fund at a guaranteed price. • Establishing protocols to ensure timely evictions and adequate provision of support to vulnerable households. • Implementation of a tax on foreign real estate investment.

Table 5. Andorra: Authorities' Planned Measures to Address the Housing Affordability Crisis (concluded)

MEDIUM-TERM POLICIES	
Raising rental availability from existing stock	<ul style="list-style-type: none"> • Tax incentives for owners who offer affordable housing (5 percent IS, IRPF). • Limit tourist accommodation licenses (HUT) and increase standards. • Creation of a tax on vacant properties (EUR20 m² and proposed to increase to EUR50 m²) and to be supplemented by an annual Tax Inspection Plan with the aim of bringing 3,000 houses back to the market. • Aid for rehabilitation and exemptions to the compliance with certain rules of rehabilitation of houses intended for rent (accessibility, energy efficiency, parking). • Tax incentives for the acquisition of rental properties. • Promoting expedite resolution of conflicts related to rental contracts.
Boosting the housing stock and access to it	<ul style="list-style-type: none"> • Creation of a public housing park of up to 300 homes at an affordable price (EUR50 million). • Define preferential acquisition rights, program for the acquisition/rental of buildings of public housing. • Public-private partnership, in collaboration with local governments, for the construction of affordable housing through administrative concessions. • Reservation of 10 percent of housing developments intended for sale, in favor of residents of more than 10 years in the country. • Slowdown of construction permits for buildings to sell instead of renting.

26. Our analysis has drawn out the specificities of the Andorra housing market, which calls for a multipronged approach. Given the complexities of the sector, it is important to map housing policies into an overarching national-level strategy to provide a more coherent picture of costs, benefits, and internal consistency of measures, including links to other related policy areas such as public transportation, labor, etc⁴. If well-designed, housing and complementary policies have the

⁴ For example, Portugal developed a national policy for housing which included protective measures for young people, the disabled, the elderly, and families with young children.

potential to enhance long-term income opportunities for low-income households and allow the young population to benefit from the structural transformation of the economy. Targeted rental housing assistance could avoid the emergence of economic disparities. In addition, measures to increase the affordable (social) rental housing stock could stimulate demand, create employment, and reduce the carbon intensity of housing if the investment leads to greater energy efficiency. Short-term measures should focus on containing demand pressure by increasing rental availability from existing stock and by providing temporary economic and social relief without intensifying market distortions, while in the medium-term it is imperative to increase the supply of housing.

27. The problem of housing affordability in Andorra is associated with rental affordability, given the disproportionate number of tenants in Andorra and this should be the policy priority. Focusing on improving affordability for tenants is crucial for Andorran policymakers. Promoting ownership is also important, but helps a small fraction of households and, therefore, may not provide a viable structural solution given the country's economic structure and reliance on a large number of seasonal and foreign workers. It is therefore important for efforts to focus on improving rental housing affordability and/or alleviate its consequences for tenants.

28. The use of administrative controls may provide temporary short-term relief but at the costly expense of market distortions and greater imbalances in the housing market. Mandatory extensions and caps on rent increases are providing a temporary relief for many. However, these policies are also contributing to the lengthening of rental tenure which decreases fluidity in the market and creates a gap in rental prices between new and old tenants, and severely limit the availability of housing for seasonal workers. Income support measures are welcome in the short-term, but their effectiveness is limited.

29. The planned medium-term policies, if implemented, could help increase the supply of affordable housings. The immediate priority should be to use the existing housing stock more efficiently by mobilizing vacant properties, increasing residential mobility, and reducing under-occupation of homes. Efforts to boost housing supply by expanding the stock of affordable and social housing and taxing of unused land and empty dwellings are welcome. In addition, the first steps to build a public social housing stock is also positive, but it will be important for their eligibility criteria to be transparent, targeted, and reviewed periodically. The government should also create the right incentives for the private sector to play a critical role in improving housing affordability through fiscal, regulatory, and zoning and land measures.

30. Given the complexity and length of solutions to rebalance the housing market towards affordable housing, a broad policy medium-term agenda needs to be laid out. Increasing the housing supply is a medium-to long-term effort, and structural policies are paramount. They go beyond traditional policies to include structural measures to reduce elevated construction, provide land access, etc. A housing strategy will be closely related to the economic model that will drive Andorra's policy decisions in the medium-term, touching on issues of greater regional integration, deepening of the services sector and diversification towards higher-value added tourism, immigration policies, infrastructure and public investment considerations—all of which are crucial but largely out of the scope of this paper.

Annex I. Details on the Microdata and Calculations

- The analysis of housing affordability in this study is based on the microdata of the Survey of Living Conditions, provided to IMF staff by the Andorran authorities on a confidential basis.
- The sample covers 2018–20, i.e., does not allow to analyze post-COVID developments.
- The dataset includes information on household and person characteristics, as well as on housing costs and income. The data on household/person characteristics and the housing costs correspond to the survey year, but the disposable income corresponds to the previous year.
- Regarding person characteristics, there are some variables—country of citizenship, educational attainment, and employment status—that were asked only to individuals older than 16 years old prior to 2020. Nevertheless, this does not affect the calculations in the study because, when a personal characteristic is used to filter data, it always refers to the reference person in the household, who is older than 16 years old.
- The housing costs are reported at monthly frequency so, to compute the rent-to-income ratio and the housing cost overburden rate, they were annualized by multiplying them by 12.
- The income quintiles are calculated in terms of income per consumption units, to account for the composition of the household.
- Calculating the housing costs overburden rate requires determining if a household is overburdened or not. This is done as follows:
 - Compute housing costs (sum of rent and other housing expenses, multiplied by 12), net of housing allowances.
 - Compute disposable income net of housing allowances.
 - Identify the households that are overburdened. A household is classified as overburdened if it meets the following criteria:
 - Housing costs net of housing allowances are greater or equal than 0.
 - One of these three conditions is true:
 - Disposable income net of housing allowances is less or equal than zero.
 - Housing costs net of housing allowances are greater or equal than the disposable income net of housing allowances.
 - Housing costs net of housing allowances are greater than 40 percent of the disposable income net of housing allowances.
- The housing costs overburden rate is computed as follows:
 - Calculate the numerator—number of persons in overburdened households—by using the household size and the cross-sectional weights of the overburdened households identified in the previous step.
 - Calculate the denominator—total number of persons in the sample—by using the household size and the cross-sectional weights of all households in the sample.
 - Calculate the housing costs overburden rate by dividing the numerator and denominator computed in the previous two steps.

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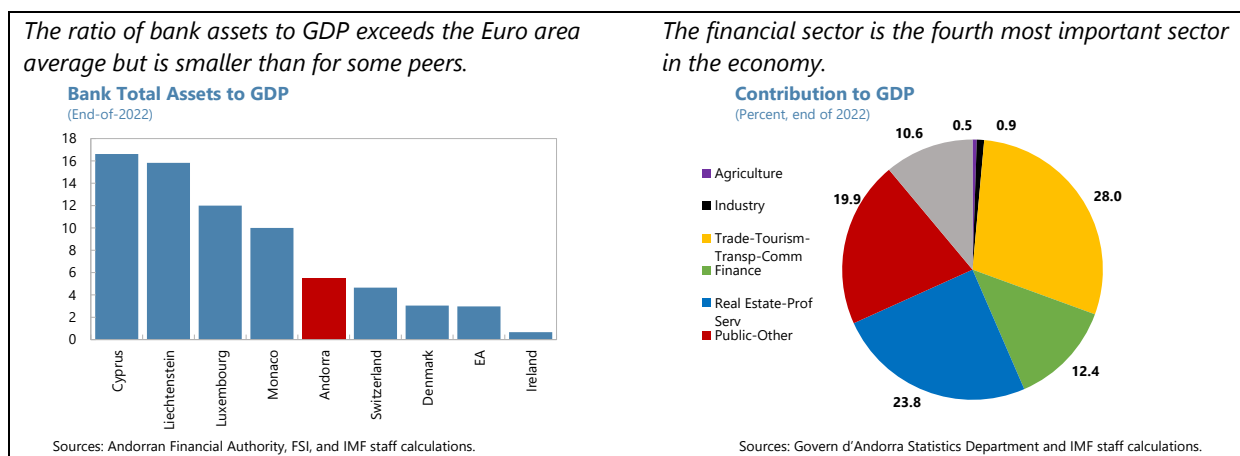
ANDORRA'S BANKING SECTOR: OPPORTUNITIES AND RISKS¹

Andorra is a microstate with a large and unique banking sector, dominated by private banking activities. This paper looks at how Andorran banks and its banking sector compare with regional peers—to provide a better understanding of its specificities but also draw lessons from other countries. We analyze how this unique setup influences bank soundness and performance and find, unsurprisingly, that size, interest rates, and economic growth are key to profitability. Policy lessons are derived from the large size of the banking system—which calls for proactive supervision and risk mitigation.

A. Overview of Andorra's Banking System

1. The Andorran banking sector plays an important role in the economy. To compare Andorran banks in a cross-country context, we selected a peer group of small, advanced economies in Europe with large banking sectors as measured by the ratio of total banking assets to GDP. The peer group includes microstates such as Liechtenstein as well as larger financial centers such as Switzerland (see the chart below). This allows comparing the Andorran banking sector to those in similar countries and draw a few stylized facts:

- The consolidated assets of the Andorran banking sector are €17.5 billion—or 5.5-times Andorra's GDP, at the end of 2022. This places the Andorran banking system around the average of its peers, smaller than in several financial centers in Europe but significantly larger than the Euro area average.
- The financial sector in Andorra contributed to more than 12 percent of the GDP and employed about 4 percent of the labor force in 2022. For comparison, in Switzerland, the contribution of the financial sector to GDP is about 9 percent while its share of employment is about 5 percent, while in Liechtenstein, the corresponding figures are a 20 percent share of GDP and a 17 percent share of employment.

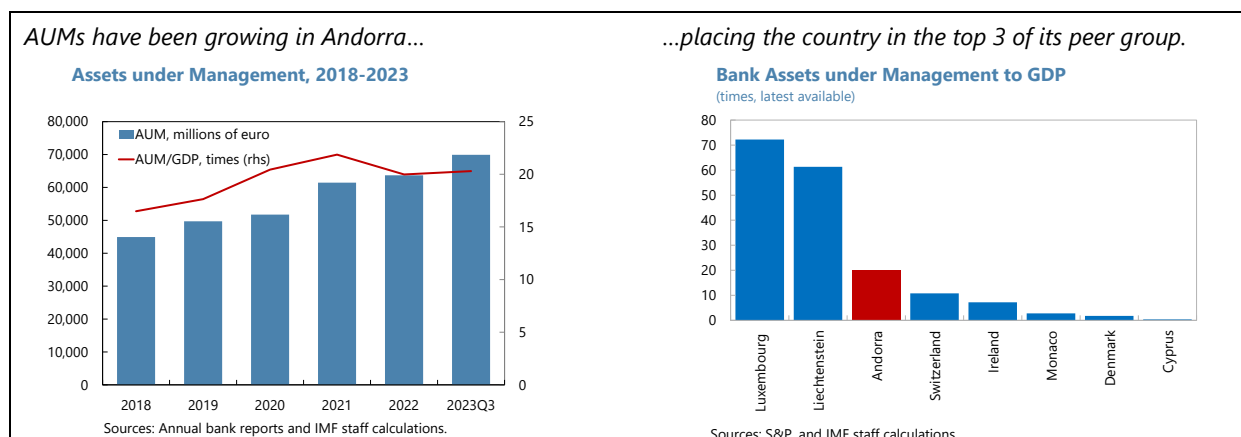


¹ Prepared by Aidyn Bibolov. The author thanks Rodolphe Blavy and seminar participants in Andorra for their comments and Yueshu Zhao for her research assistance.

2. Compared to peers, Andorran banks operate in a different regulatory and institutional environment—and tend to self-insure through large prudential buffers.

- *A different banking landscape:* Only 3 banks operate currently in Andorra after several mergers. All banks are majority privately owned by local families. This is different from peers where foreign banks are present. Andorran banks are banking groups that consist of diversified financial services companies in Europe, Latin America, and the U.S. Some banks have ownership in real sector companies in Andorra.
- *A different institutional framework:* After signing a Monetary Agreement with the EU in 2011, Andorra adopted the euro but does not have a central bank. Thus, Andorran banks do not have direct access to a national central bank or to ECB refinancing facilities unlike banks in peer countries. Introduction of the lender of last resort facility in 2022 helps to alleviate liquidity risks by providing a backstop for a solvent, but temporarily illiquid bank, but is unlikely to change bank holdings of significant liquidity buffers as a self-insurance.
- *Solid prudential positions:* To compensate for limited financial safety nets, Andorran banks have been traditionally holding solid capital buffers. As of 2023Q3, the system-wide total capital and Tier 1 ratios were 16.3 percent and 15.6 percent, respectively.² Liquidity buffers are significant. As of 2023Q3, the system wide LCR ratio was 200 percent, significantly above the regulatory minimum of 100 percent.

3. The primary focus of Andorran banks is on private banking. Their assets under management (AUMs), held primarily off-balance sheet, have been growing consistently, reaching €64 billion- or 20-times GDP in 2022, making them much larger than on balance sheet total assets,³ with private clients mostly in Andorra and Spain, and some subsidiaries in other countries in Europe and in Americas. By the ratio of AUMs to GDP, Andorran banks are the third largest group among their peers.

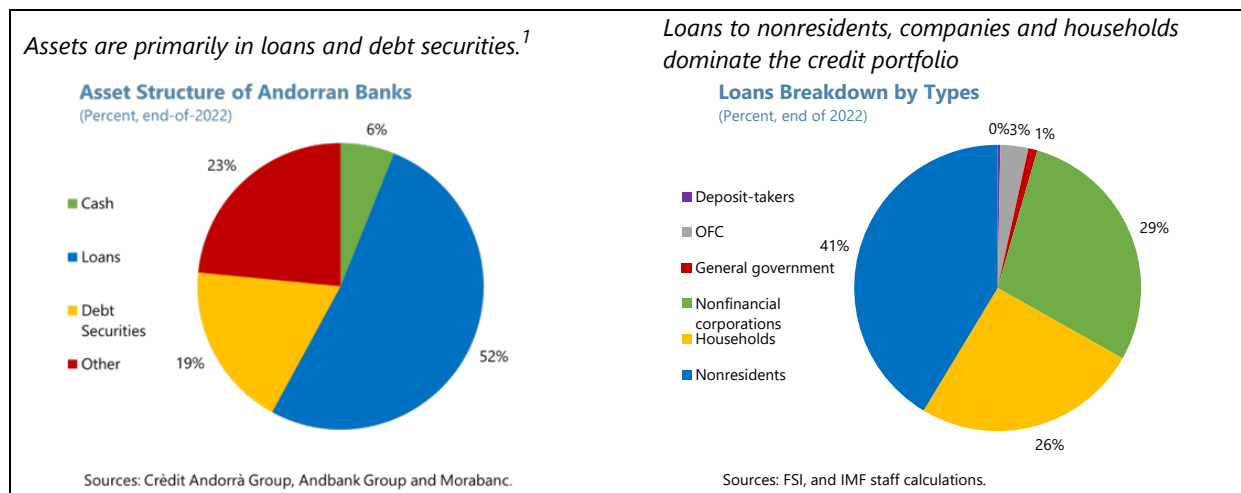


² Unless otherwise stated, in the remainder of the paper we use consolidated data for banks. Data for 2023Q3 is preliminary and not audited.

³ Weaker equity markets and a substantial increase in nominal GDP in 2022 contributed to the decline in the ratio from the peak in 2021.

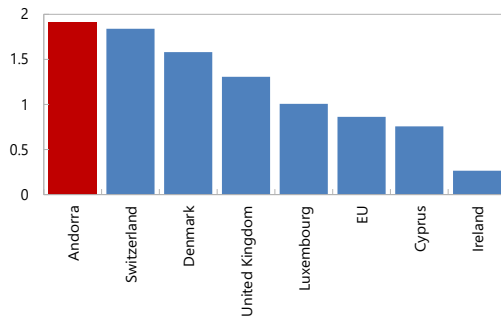
4. Commercial banking activities are significant, benefiting from interest rates increases, and driving high profitability. About half of Andorran on-balance sheet bank assets were in loans, a fifth in debt securities, and 6 percent in cash at the end of 2022. Domestic credit is primarily allocated to private companies and households. Domestic loans to the government are small as the central government switched to borrowing externally from 2020. Substantial commercial banking differentiates Andorra:

- *Andorra is leading its peers on domestic credit...* Credit to the private sector to GDP, at 190 percent, is the highest compared to the peer group, even after a recent substantial decline from the peak in 2020. About 41 percent of those loans are given to non-residents (majority of which are short-term loans to foreign banks to manage liquidity), explaining part of the high level of credit to the economy.
- *... and also on profitability, benefiting from interest rates increases.* Andorran banks led their peer group in 2022 with the ROA of 0.6 percent and the ROE of 6 percent, though they were below the EU average by ROE. Net fees and commissions have historically represented more than half of the total operating income for Andorran banks, while net interest income share was about 20 percent. More recently, interest rates increases boosted net interest margin, to account for an estimated half of operating income in 2023. This development reflects the relative importance of commercial banking for Andorran banks—a useful diversification of activities.



Andorra has the highest credit to GDP ratio in the peer group...

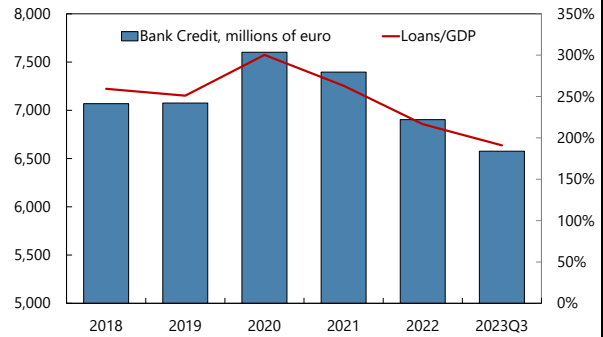
Domestic Credit to the Private Sector as a Share of GDP
(Latest available)



Sources: World Bank, AFA, and IMF staff calculations.

... even after credit has declined in Andorra in recent years.

Credit to the Private Sector, 2018-2023



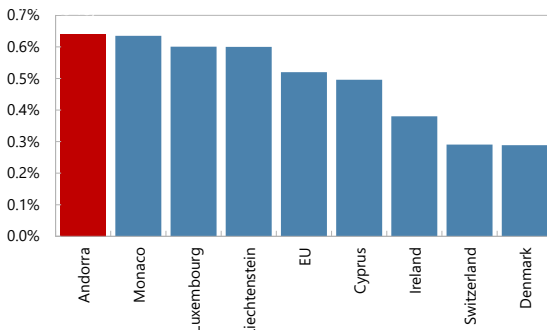
Sources: AFA, and IMF staff calculations.

¹ We use data from the Andorran Financial Authority (AFA) when available. For some charts, we use data from the Andorran Banking Association (ABA) and annual bank reports as indicated. There could be small variations in data due to that.

5. Similar to peers, Andorran banks operate with relatively high-cost structures which reflects their model. Private banking involves high costs due to the personal nature of the operations and the need to maintain a physical presence in the markets served. With the cost-to-income ratio between 70 and 85 percent, Andorran banks are somewhere in the middle of their peer group as a whole and are similar to other private banks.

Andorran banks lead the peer group by return on assets ...

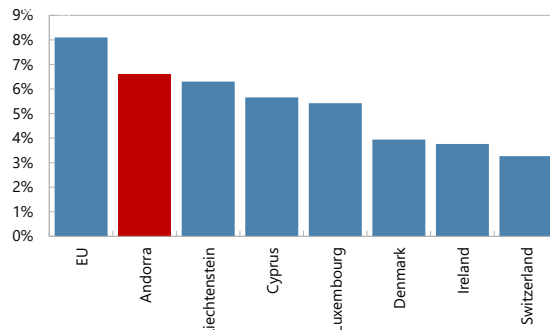
ROA
(End-of-2022)



Sources: FSI, and IMF staff calculations.

... and by return on equity.

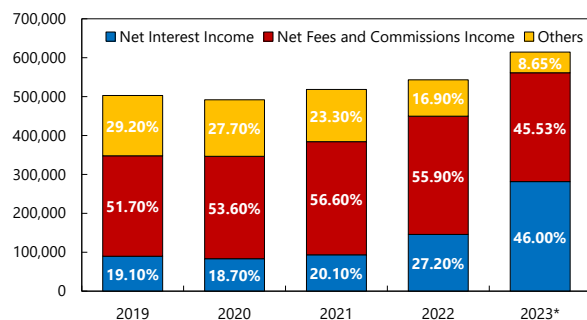
ROE
(End-of-2022)



Sources: FSI, and IMF staff calculations.

Net interest income share has increased on the back of the rising rates.

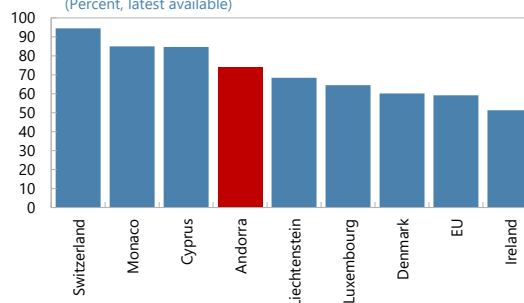
Operating Income of Andorran Banks, 2019-2023
(Thousands of Euros, percent of total operating income)



Sources: Annual bank reports, ABA, and IMF staff calculations.
Note: 2023 data is an estimate based on unaudited and preliminary 2023Q2 data.

Banking system's cost-to-income ratio is similar to peers

Cost-to-income ratio
(Percent, latest available)



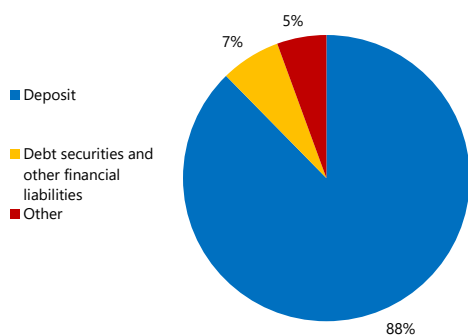
Sources: WBDI, FSI, and IMF staff calculations.

6. Andorran banks rely almost exclusively on deposits for funding, including a large share of foreign deposits.

Deposits account for almost 90 percent of funding. One third of deposits comes from nonresidents, and those are mostly related to the banks' private banking activities. These deposits are typically tied to investments and tend to be sticky, only liquidated together with assets. Banks in Andorra rely significantly less on debt securities and other sources of funding compared to the EU average, where commercial banking dominates overall. Another reason for the low reliance on debt is the high structural liquidity of Andorran banks. This has allowed them to finance growth without much borrowing.

Deposits account almost all funding to Andorran banks ...

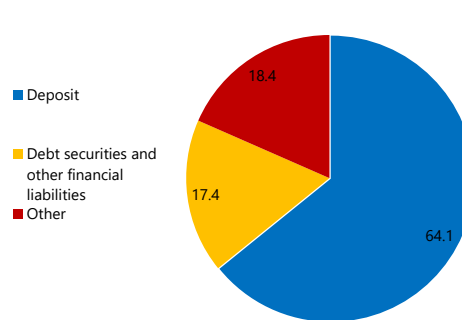
Sources of Funding of Andorran Banks
(Percent of total liabilities, end-of-2022)



Sources: Annual bank reports and IMF staff calculations.

... while their average share in the EU is two-thirds.

Sources of Funding of EU Banks
(Percent of total liabilities, end-of-2022)



Sources: EBA Dashboard, and IMF staff calculations.

7. Growth in the banking sector has mostly been focused on new markets abroad and new sources of revenue.

Given the small domestic market, banks have been actively expanding operations abroad over the past decade, primarily via private banking and asset management services in Europe and Americas where most AUMs are located. Andorran banks receive a significant share, sometimes a majority, of their profits from international operations. Expansion abroad allows diversification but exposes banks to market-specific risks in other countries.⁴ Subsidiaries abroad are

⁴ See Berger et al. (2016).

subject to host countries' regulations and supervision, and in euro area countries, have access to ECB liquidity facilities.

B. Determinants of Private Banks Profitability

8. To better understand the determinants of Andorran banks' profitability, we look at a larger dataset of banks, with a focus on private banking. Stylized facts suggest that Andorran banks, as private banks, have higher costs than purely commercial banks, yet benefit from a relatively more diversified portfolio of activities compared to their peers. Our dataset comprises annual financial statement data for banks that manage wealth (private banks thereafter) from 2013 to 2022 from the Fitch database. There are 275 private banks from 39 countries in the sample, including 5 banks from Andorra (3 existing and 2 that existed before). Most of the banks are from the U.S., Switzerland, and the U.K. While the topic of bank profitability has been covered before,⁵ there is limited evidence about the determinants of profitability specifically for private banks.

9. We use a combination of bank-specific and macroeconomic variables. To capture profitability, we use the return on average assets (ROAA) and the return on average equity (ROAE). We use a combination of bank-specific and macroeconomic variables as explanatory variables. Bank-specific variables include bank size (logarithm of total assets) and capitalization (equity to assets). Macroeconomic variables are real GDP growth and interest rate (for the corresponding reference short-term sovereign notes lagged by one period). In line with previous literature, we expect capitalization, GDP growth, and interest rate to be positively associated with bank profitability. The literature is ambiguous on the impact of asset size. For private banks, the common wisdom is that larger size drives profitability due to the economies of scale and positive externalities associated with size (reputation, market share), and we take this as our hypothesis.

10. Size, capital, economic growth, and interest rate are positively associated with bank profitability. The results of the regressions are presented in Table 1. All explanatory variables have expected signs.⁶ Higher interest rate and capitalization are significant for both measures of profitability. Real GDP growth rate and bank size are significant for the ROAA. The findings confirm the assumptions that larger size is associated with greater profitability and that better capitalized banks are more profitable. These two factors depend on banks and the strategies they pursue. Real GDP growth and interest rate are exogenous to banks and can serve as signals for regulators on the direction of bank profits.

⁵ For example, see Al-Homaidi et al. (2018), Kohlscheen et al. (2018), and N. Petriaa et al. (2015).

⁶ The relatively low R-squared values are common in cross-country banking regressions.

Variables	ROAA	ROAE
log Total Assets	0.302** (0.026)	0.129 (0.605)
Equity/Total Assets	0.118*** (0.000)	0.07*** (0.000)
Real GDP growth	0.304** (0.02)	0.352 (0.143)
Lagged interest rate	0.692** (0.049)	2.263*** (0.000)
Constant	0.925 (0.413)	3.664* (0.077)
Observations	1,919	1,919
Adjusted R-squared	0.166	0.022
F statistic	94.9 (0.000)	11.74 (0.000)

C. The Road Ahead for the Andorran Banking System

11. Understanding the specificities of the Andorran banking system is important to better capture financial sector risks. This is particularly important given the systemic nature of the banking sector in Andorra. With total assets 5.5 times the country's economy, consolidated assets of each bank exceed GDP. In general, the literature suggests that private banking is characterized by lower credit risks since loans are collateralized; market risks from investments are primarily on the clients' side; and therefore, the main risks lie in compliance, reputational, and operational risks. This was illustrated in Andorra with the failure of Banca Privada d'Andorra (BPA) in 2015. Given the small nature of the internal market, there is concentration and related party risk in bank portfolios, though these exposures have been decreasing over the past years.

12. The status of the microstate and lack of a central bank necessitate a specialized approach to banking regulation, supervision, and resolution. Andorra has been developing its regulatory and supervisory framework by moving closer to the EU standards—the process that was facilitated through the signing of the Monetary Agreement with the EU in 2011. The Andorran Financial Authority (AFA) is a financial sector supervisor and regulator established in 1989 responsible for all financial institutions in Andorra. The AFA does annual and thematic on-site inspections of the three banks and had a staff of 25 people at the end of 2022. Andorra adopted a capital conservation buffer, a capital buffer for systemically important institutions, and a countercyclical capital buffer for its banks. The Financial Intelligence Unit of Andorra (UIFAND) was created in 2000 as the authority in charge of the AML/CFT issues. The AFA and the UIFAND are members of international organizations and cooperate with supervisors in countries where Andorran

banks operate. The Agency of Resolution of Banking Entities was created in 2015 and is responsible for recovery and resolution of banking institutions. Together, the three institutions comprise the system of regulators that oversee the banking system of Andorra.

Lessons from past crises call for a solid institutional, regulatory, and supervisory framework.

Lessons from other economies with large banking systems that underwent periods of stress during the global financial crisis of 2008-09 are presented in Box 1. Andorra has factors in place that mitigate risks coming from its large banks: solid capital ratios, ample liquidity, comfortable profitability, solid macroeconomic country performance and prudent policies. The authorities have strengthened the AML/CFT framework with a new AML/CFT law, closer cooperation between the UIFAND and international organizations, and enhanced coordination in joint inspections between the AFA and the UIFAND.

Box 1. Lessons from Countries with Large Banking Systems¹

Banking systems in Hong Kong SAR, Iceland, Ireland, Singapore, and Switzerland grew significantly in the run up to the global financial crisis (GFC) of 2008 with the banking assets reaching between 600 and 900 percent of their countries' GDP by 2007. Despite different experiences during the GFC, common themes are summarized below:

- Rapid asset growth, high reliance on foreign and wholesale funding, and aggressive expansion abroad were among the factors that led to major banking crises in Iceland and Ireland.
- More stringent regulation, such as a lower LTV ratio prior to the crisis helped to cushion banks from a subsequent decline in house prices.
- Countries with a "hands on" supervision in place before the crisis had better experience during the crisis and their banking systems better coped with the stress.
- Subsidiarization of foreign operations helped to reduce spillover risks to the bank groups and their home countries. In contrast, banks that expanded via branches faced higher contagion risks to their groups and home countries.
- Guarantees of banking liabilities transferred risk to sovereigns. This phenomenon was very well evident in Iceland and Ireland leading to a prolonged resolution of banking crises and recessions that accompanied them in countries.
- Maintaining strong fiscal and external buffers prior to the crisis helped countries to deal with stress in financial markets.
- Sovereign liquidity swap lines with major money centers helped to provide liquidity to the affected banking systems when needed.

¹ Based on the IMF (2010). Cross-Cutting Themes in Economies with Large Banking Systems.

13. The recently agreed EU Association Agreement may open up opportunities to access new markets for banks. The financial sector of Andorra has a 15-year transitional period during which to bring financial sector legislation, supervision, and regulation in line with those of the EU. Each of the four financial subsectors are covered – banking, insurance, asset management, and securities market. The Association Agreement provides an opportunity for banks to expand into the single market more easily and at lower compliance costs using the passporting system. The Liechtenstein example, which grew significantly after signing its EU Association Agreement,⁷ provides a useful precedent for Andorra (Box 2). The opportunity to diversify abroad further is valuable as the domestic economy is volatile and exposed to climate change in the medium-term. The possibility for European banks to enter Andorra under the same conditions could lead to significant changes to the domestic financial sector structure. While Andorra has made significant progress in harmonizing its banking regulation with the EU under the Monetary Agreement, a substantial scope of work remains.

Box 2. Association Agreement with the EU: Lessons from the Liechtenstein Experience

Liechtenstein is a microstate with similarities to Andorra, as a small mountainous country landlocked between Switzerland and Austria where the financial sector plays a big role in the economy. Like in Andorra, banks in Liechtenstein primarily specialize in private banking and three local banking groups dominate the sector, each of them being systemic due to its size. At the same time, Liechtenstein is a more diversified economy with substantial industrial production.

Liechtenstein signed an Association Agreement with the EU in 1992 and joined the European Economic Area in 1995. Under the agreement, Liechtenstein banks have access to the EU internal market via the passporting regime, allowing them to offer their (mostly wealth management) products directly to customers in the EU.

Liechtenstein retained its Financial Market Authority as the supervisor of its banks. Liechtenstein adopted the Swiss franc as a currency under a treaty with Switzerland in 1980. Under the treaty, the Swiss National Bank plays a central bank role for Liechtenstein, including providing access to refinancing facilities to its banks. Liechtenstein has 12 banks, mainly operating in the asset management industry.

Since joining the EEA in 1995, Liechtenstein was able to provide its financial sector with growth opportunities beyond the country while integrating its financial sector framework with the EU and becoming a key center for investment funds, while preserving provision of financial services and the domestic financial system. In 2022, Liechtenstein banks' assets under management reached 411 billion Swiss francs, or about 60 times the country's GDP, among the largest in the world.

⁷ See Liechtenstein (2020), and Pelkmans and Böhler (2013) for more details.

D. Policy Implications

14. Diversification helps to stay competitive. Evidence shows that Andorran banks are large, notably in terms of AUMs from their private banking activities, but also important financial intermediaries in the domestic economy. Andorran banks are actively expanding abroad to diversify revenues, but this exposes them to foreign macroeconomic and other risks. Andorran banks keep high liquidity that signals their strong position and acts as self-insurance given the absence of a direct access to a central bank liquidity facility. The relative diversification of the Andorran banks between private and commercial banking activities allows them to balance their performance over changes in market conditions.

15. Proactive supervision and use of the macroprudential tools to contain the risks. Experience of other countries with large banking systems suggests that a close and proactive supervision using macroprudential tools is necessary to contain the risks. Given the size of Andorran banks, keeping substantial capital and liquidity buffers by banks is a prudent strategy. Besides signaling solid solvency, higher capitalization is associated with higher profitability as shown by our empirical investigation. Activation of the countercyclical capital buffer by the AFA to 0.5 percent from Oct 1, 2024, is timely given that the economy is growing above potential, allowing to build buffers in good times. Given the 2023 banking stress experience in the U.S. and Europe, it is important to strengthen the recovery and resolution process in Andorra. Implementing of the EU Bank Recovery and Resolution Directive will further strengthen the supervisory framework in Andorra.

16. Expanding capacity to take advantage of the opportunities and answer future challenges. The Association Agreement with the EU is a test for banks and supervisors. Over the course of the transition period, banks need to prepare for greater competition, while the supervisors have to bring the Andorran financial sector regulation in line with the EU. The AFA should prepare by working together with banks to help them transition to the new environment. As size is associated with profit in the private banking industry as well as a potential consequence of the Association Agreement, Andorran banks are likely to grow further to compete with foreign banks. The AFA's resources, notably its staffing, will need to be expanded to supervise the transition but also what is likely to become an even larger financial sector in the country. Continuing financial and macroeconomic stability during and after the transition period will be key.

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CLIMATE CHANGE IN SMALL OPEN ECONOMIES: THE CASE OF ANDORRA¹

Climate change is macro-critical to Andorra: with (mostly winter) tourism accounting for one third of its economy, Andorra is directly exposed to climate change—shorter winter seasons, declining snow falls, higher costs from artificial snow making are all negatively affecting the economy’s main business. Because of its higher altitude, Andorra is more resilient than other winter tourism locations in the region and should use this window of opportunity to enact needed policies. The authorities’ climate change strategy—with ambitious goals—is focused on mitigation. Using the Climate Policy Assessment Tool (CPAT), this paper analyzes the feasibility of achieving the decarbonization objective under different scenarios of carbon tax and efficiency gains. The results show that achieving the decarbonization objectives would require very substantial efficiency gains in the power, transport, and residential sectors and a considerable increase in the carbon tax and. The adaptation component of the government’s climate change strategy is paramount given the macro-criticality of climate change but is still at an incipient stage.

A. Introduction

1. **Climate change has become a macro-critical issue, particularly in economies such as Andorra with low diversification and sectors highly dependent on climate.** Global warming presents a major threat to the country’s long-term growth and has a direct impact on its wellbeing given its economic dependence on tourists visiting during the ski season. Measures taken now to fight the climate crisis will create a more resilient and greener economy.
2. **Andorra’s tourism sector is particularly vulnerable to climate change.** The number of days with sufficient accumulation of snow in the Pyrenees for various alpine skiing activities are decreasing, and the snow line is migrating towards higher altitudes. The impact of global warming on sky stations will depend on localization, altitude, and management. This could lead to a redistribution of the Pyrenean market between vulnerable and resilient ski resorts, and towards those in higher altitude—which, to some extent, benefits Andorra in the short-to-medium term. Over time, resorts will have to rely more on artificial snowmaking, including those at high altitude. While artificial snowmaking can partially offset the impact of climate change, the higher the temperature the lower the number of resorts that can operate profitably and the shorter the ski seasons. The intensification of global warming could impact landscapes and tourism infrastructure. These will affect touristic attractions and alter the dynamic of tourism flows. In addition, the water demand for snowmaking could lead to conflicts between intensive water-demand sectors.
3. **Energy security and the pace of energy transition would also be impacted by the weather.** Andorra is making efforts to move towards greater use of renewable energy and higher energy efficiency. While energy transition is necessary, it is foreseeable that climate change will

¹ Prepared by Michelle Tejada (EUR).

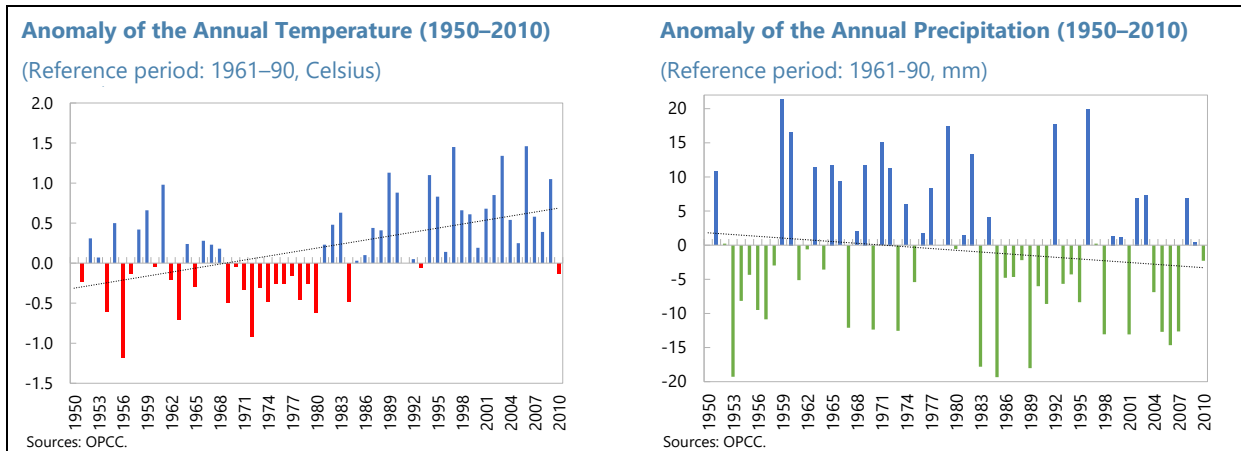
negatively affect the hydropower, thermoelectric and wind production. Moreover, the expected increase in the frequency and intensity of extreme weather could impact energy production and distribution systems. Higher temperatures will also change consumption patterns, with increases in summer energy demand which will be only partly compensated by a decrease in electricity demand for heating in the winter.

4. Andorra has an ambitious climate change and environmental protection strategy with well-development mitigation components, but less developed adaptation components. The strategy has well-designed goals and activities on the mitigation front, focusing on the promotion of renewable energies and high energy efficiency technologies, as well as on ensuring energy saving and efficiency across sectors. While Andorra's global impact on climate is marginal, being at the forefront of the global climate change effort sends positive signals. The adaptation component of the strategy is at an incipient stage and expected to be challenging to implement and costly. Given the country's small size and economic structure dependent on tourism, accelerating the pace of adaptation is crucial for creating a more resilient economy.

5. The focus of this paper is to assess the feasibility and estimated costs of the mitigation agenda, as well as additional policies needed to limit the impact of climate change on the Andorran economy. First, the paper describes climate trends and projections in the country, followed by a stocktaking of the sources of emissions. Next, it summarizes the proposed climate change strategy: its objectives, key targets, and planned activities. Then, using the Climate Policy Assessment Tool (CPAT), the feasibility of achieving the decarbonization objective is assessed under different scenarios of carbon tax and efficiency gains. Lastly, the paper concludes with a policy discussion, including on the important adaptation component of the climate agenda in Andorra.

B. Climate Change and a Shrinking Snow Cover

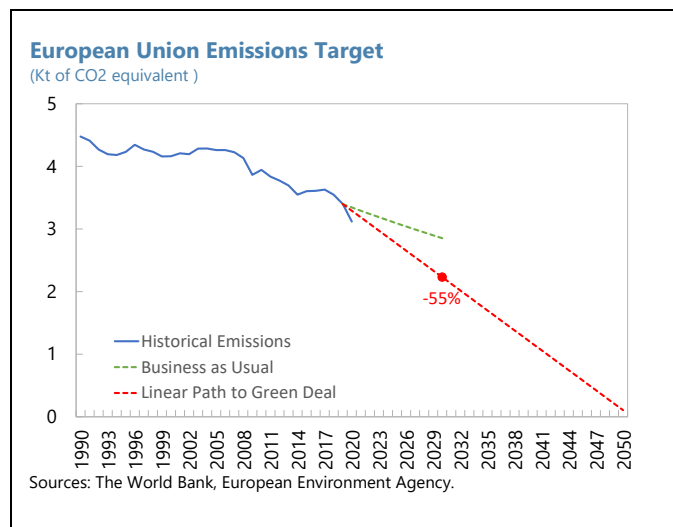
6. Rising temperatures and decreasing annual rainfall are leading to a snow cover decrease in Andorra. Since 1950, the country has experienced an increase in temperature averaging 0.20° per decade—most evident during the summer season—that is resulting in systemically higher annual maximum and minimum temperatures throughout the year. Patterns of precipitation show a tendency towards the shrinking of total pluviometry, including a decrease in the frequency of heavy rain and an increase in dry periods. In turn, annual rainfall has decreased by—22.01 mm per decade since 2050. The reduction in winter precipitation and higher annual temperatures are leading to snow cover decreases in the Pyrenean region.



7. The upward trend temperature is projected to persist in coming decades leading to a further reduction in snow cover. With global warming intensifying, the upward trend in temperature in the Pyrenean region is expected to persist through the 21st century with different intensity depending on the evolution of greenhouse gas concentrations. This will lead to an increase in climate variability and in the temperature and rainfall trends projected, especially in mountainous areas. The projected annual snow cover in Andorra is expected to decline by 75–100cm by 2090 with deep consequences for both the ecosystem and the economy.

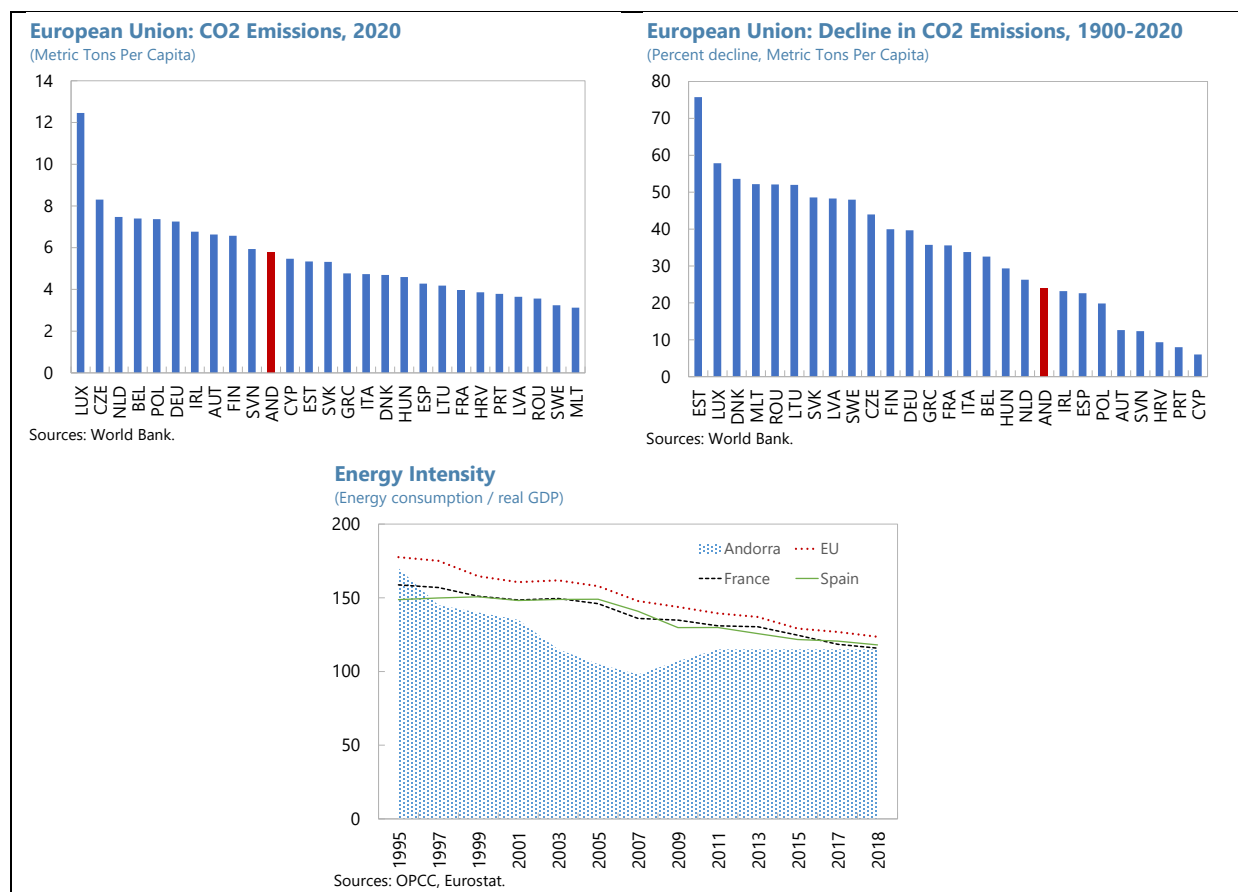
C. Andorra’s Emissions at Par with the Region

8. Europe has historically been one of the biggest contributors to global greenhouse gas (GHG) and CO2 emissions, but the region has made rapid progress to curb it in recent years. The region has produced over 17 percent of cumulative CO2 emissions since the Industrial Revolution began. Acknowledging this, the EU has set numerous emissions-reduction targets. By 2020, EU emissions were close to 30 percent below 1990 levels thanks to numerous policies and regulations, improved energy efficiency, the EU Emissions Trading Scheme (EU ETS), and structural transformation of the economies. As stated in the European Green Deal, the EU aims to reduce greenhouse gas emissions by at least 55 percent below their 1990 levels by 2030 and to become climate neutral by 2050.



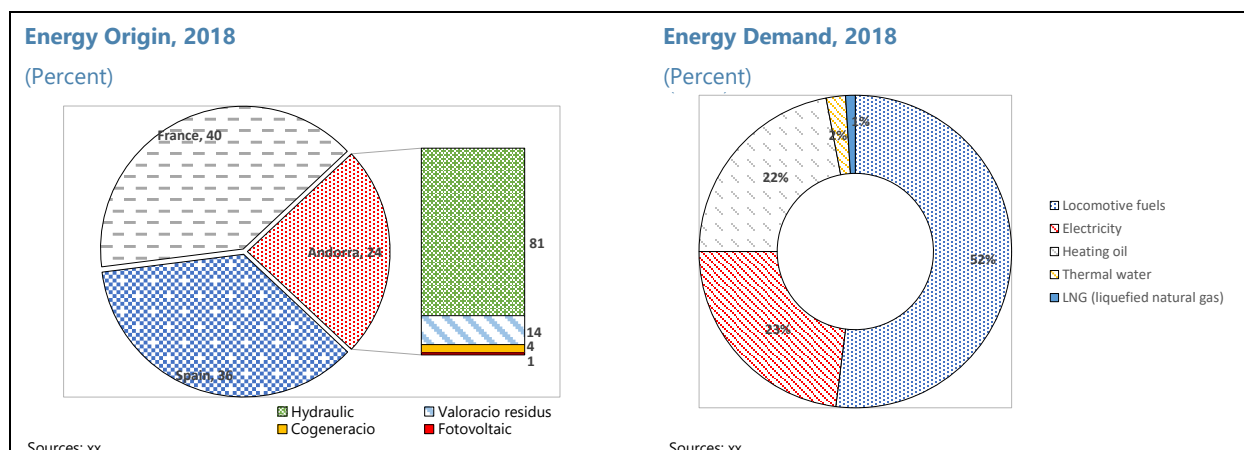
9. Emissions in Andorra are in line with the rest of the region. In turn, CO2 emissions level in Andorra are at the same level as the EU average, estimated at 5.6 metric tons per capita, slightly higher than its neighboring countries France and Spain. Data from 2017 shows that the country’s

forest mass absorbs 23 percent of the CO2 emissions. The percent decline in emissions since 1990 in Andorra has been lower than the EU’s average, as a large proportion of the country’s emission come from transport sector, in which emissions have not fallen rapidly enough. Energy intensity—a measure of energy inefficiency of the economy—is also at par with the Eurozone. After a rapid decline, since early 2000s, Andorra’s energy intensity has been relatively stable between 98 and 115 units of energy per unit of GDP and is comparable to 118–122 in the Eurozone.



10. Carbon emissions in Andorra are mostly caused by transportation, different than in the rest of the EU. The energy sector emits more than 95 percent of greenhouse emissions in Andorra, and the mobility subsector accounts for more than half of energy demand. Fossil fuels amount to 75 percent of the demand, of which 2/3 are related to mobility. The remaining 25 percent are related to electricity consumption and energy production. In comparison, on average, in the EU 30 percent of the energy demand comes from the transport sector as industry, commercial activity, and agriculture and farming play a bigger role on the economy—sectors that are mostly absent in the Andorran economy. One idiosyncratic feature of Andorra is the significant influence of fuel tourism, with 76 percent of the fuels sold in Andorra for road transport being consumed in the neighboring countries. Although consumption of fossil fuels for road transport constitutes one of the main sources of greenhouse emissions, consumption has stabilized since 2010—despite a continued rise in the size of the fleet—thanks to energy efficiency gains and an increased share of electric vehicles.

11. Andorra has a high external dependency on its energy sources, constituting a risk to the energy supply and the economy during fossil fuel related crisis. Imported electricity from France and Spain amount to 76 percent of the demand, including all energy that is required for the mobility sector. The remaining 24 percent is locally produced, almost all of which comes from renewable sources, of which 81 percent is hydraulic and the remaining is also green.



D. An Ambitious Climate Change Strategy

12. The country is committed to fulfill its Paris Agreement pledges through the Andorra's Climate Change Strategy. Despite being a microstate—with, therefore, a limited impact of their action globally—the Andorran authorities remain firm in their undertaking to fight climate change domestically and in demonstrating their willingness to support the international community to address global warming. The country's strategy seeks to achieve the goals set in Law 21/2018 of September 13, 2018, on the promotion of the energy transition and energy efficiency to combat climate change and encourage the adaptation of society to its effects, reduce energy dependence and strengthen the competitiveness of the economy. It has been drawn up by the Ministry of the Environment, Agriculture and Sustainability and reviewed within the framework of the National Energy and Climate Change Committee.

Box 1. Climate Change Regulatory Framework

The regulatory and strategical framework guiding Andorra's Climate Change and the actions envisaged in the Paris agreement is outlined below:

- *Decree of 29-4-2015 creating the Office of Energy and Climate Change*: The Office of Energy and Climate Change (OECC) is created, which is organically, functionally and budgetarily attached to the ministry that is responsible for the environment.
 - *Nationally Determined Contribution*: reporting statistics on efforts to reduce emissions in accordance with the Paris Agreement. First submitted in 2017 and updated in 2020 and 2022.
 - *National Law 21/2018*: of 13 September, on the promotion of the energy transition and climate change (Litecc).
 - *Sustainable Development Goals*: national strategic plan for the implementation of the United Nations 2030 Agenda for Sustainable Development, approved on 17 April 2019.
 - *Acknowledgement of the climate crisis and the declaration of the state of climate and ecological emergency in January 2020*.
 - *National energy strategy against climate change*: sets Andorra's vision to enable mitigation and adaptation measures over the period 2020-2050.
 - *Edict of the 27-1-2021*: call for grants from the Renova program for the improvement of the national real estate park, the improvement of the energy efficiency of buildings and the use of renewable energies for 2021.
 - *Andorran strategy for environmental education for sustainability*: approved in 2022.
 - *Green Fund*: the 2022 general budget law creates within the state budget a Green Fund for the energy transition and the fight against climate change.
 - *Carbon Tax*: as an additional element of the general branch of the excise tax on hydrocarbons whose use general GHG emissions.
 - *Law 25/2022 on circular economy (LEC)*: to promote the transition towards a circular economy.
 - *Law 31/2022* for the development and diversification of the livestock and agricultural sectors.
- Multiple decrees to regulate emissions, energy efficiency, transport, among others.*

13. The strategy has clear objectives and key sectoral targets to achieve decarbonization, especially on mitigation. The goal is to reduce 37 percent of non-absorbed emissions compared to 2005 levels by 2030, and to achieve carbon neutrality by 2050 (see Table 1)². It also seeks to reinforce the country's resilience to the effects of climate change. To achieve these objectives the strategy outlines key sectoral targets for 2030 and 2050. On mobility, it seeks to reduce 50 percent of internal emissions, to have 20 percent of electric vehicles by 2030, and to achieve decarbonization by 2050. On buildings, the strategy aims to reduce consumption by 40 percent by 2030 and to achieve decarbonization by 2050. On the electricity sector, it aims to increase the share of locally produced electricity from 24 percent to 33 percent by 2030 and to 50 percent by 2050, reducing the country's external dependency and its resulting vulnerability. The overall targets on energy consumption are similar to those adopted by other European countries. However, given Andorra's

² The authorities plan to revise the target on reduction of non-absorbed emissions from 37 to 55 percent by 2030.

disproportionate size of the transport sector—driven in large part by visitors and fuel tourism—the largest gains would have to come from progress in the mobility sector.

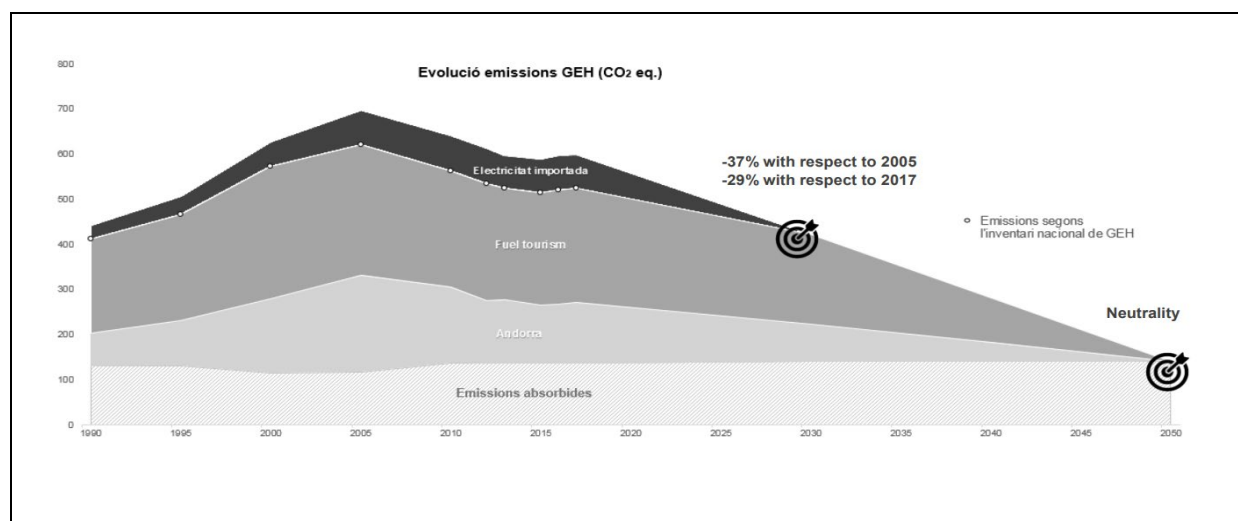


Table 1. Andorra’s Climate Change Strategy: Key Sectoral Targets

Year	Overall Targets	Sectoral Targets		
		Mobility	Buildings	Electricity
2030	Reduce 37 percent of non-absorbed emissions compared to 2005.	<ul style="list-style-type: none"> Reduction of 50 percent internal emissions from mobility. 20 percent electric vehicles. 	Reduce consumption by 40 percent.	<ul style="list-style-type: none"> 33 percent electricity consumption from national production. 100 percent imported electricity with zero emissions.
2050	Decarbonization	Decarbonization	Decarbonization	50 percent electricity consumption from national production.

14. The key activities of the strategy are outlined in five actions programs (see Table 2). These seek to reach carbon neutrality by 2050, develop a climate change adaptation plan, structure a funding system to carry out the planned actions, sensitize and educate the population on the topic, and to conduct the needed research and innovation tasks needed to understand and respond to the environmental and technological challenges that lie ahead.

Table 2. Andorra’s Climate Change Strategy: Programs and Activities

Decarbonization	Adaptation and Resilience	Financing Tools	Social Transition	Innovation, Research and Observation
<ul style="list-style-type: none"> • Energy transition. • Sustainable, connected, and safe mobility. • Agriculture and forest management respectful towards the territory’s sink capacity. • Circular economy. • Industry and use of industrial products. 	<ul style="list-style-type: none"> • Plan for adaptation to climate change. • Promotion of nature-based solutions for greater resilience. 	<ul style="list-style-type: none"> • National carbon credit market and renewable energy. • Green Fund and other taxation tools. 	<ul style="list-style-type: none"> • Sensitization and dissemination on carbon neutrality. • Educational transition. • Training to achieve carbon neutrality. • User information and protection. • Participation of the different agents in the process to achieve carbon neutrality. 	<ul style="list-style-type: none"> • Innovation • Research and knowledge transfer. • Systemic observation.

15. The strategy creates an ambitious and binding policy plan to coordinate the measures and projects aimed at combating climate change:

- *On climate mitigation*, the strategy focuses on the promotion of renewable energies and high energy efficiency technologies, aiming to increase national production of electricity, while ensuring that it remains at least 80 percent renewable (domestic production is currently entirely renewable).
- *On climate adaptation*, the authorities have been conducting an analysis to identify the impact of climate change on the socio-economic and environmental sectors and design adaptation strategies that allow an effective increase in the resilience of the territory.
- *Cross-cutting measures* include incentivizing citizens’ behavioral changes, public and private sustainable finance (i.e., Green Fund), carbon pricing, and other market mechanisms. *Other measures* include waste management and circular economy, and measures related to ecosystem services, biodiversity, land use, and agriculture.
- *International cooperation* is also important. Andorra is a member of the Pyrenees Climate Change Observatory and the Ibero—American Network of Climate Change Agencies.

Climate Mitigation

16. The authorities have outlined key measures to accelerate energy transition towards its decarbonization objective. These include improving the electricity sector, promoting renewable energies and high-efficiency energy technologies, and encouraging energy savings and energy efficiency, particularly in construction. Forces Elèctriques d'Andorra (FEDA), the electricity SOE, is executing the needed infrastructure and digitalization investments.

17. The electrification and improvements to mobility are also at the center of the authorities' mitigation efforts. The transport sector represents 56 percent of GHG emissions in Andorra and 52 percent of the energy demand. The national mobility strategy seeks first to prioritize public transport and promote motorized or assisted non-public mobility (i.e., walking, biking, etc.) and, secondly, electrify motorized mobility with clean energy. The authorities are studying alternative means of transport including cable transport; and the possibility of requiring companies with more than one hundred workers to have collective and sustainable mobility plans. The promotion of electric mobility in both the private and public mobility fleets would facilitate the energy transition with a reduction in dependence on fossil fuel consumption and an increase in the use of renewable sources of energy. It must be accompanied with the implementation and management of the charging infrastructure for electric vehicles throughout the country. Given the importance of tourist cars, improvements in car efficiency in neighboring countries, a development outside of Andorra's remit, will be key to advancing mitigation.

18. The authorities are also working on other sectors contributing to climate change, even if to a lesser extent. These include: i) the promotion of agriculture and forest management cognizant of the territory's sink capacity; ii) a move towards a circular economy that allows for greater savings in the consumption of raw material, energy, and water; and iii) ensuring the development of a green economy with high value-added industries based on clean and sustainable technologies.

Climate Adaptation

19. As the impact of climate change is already noticeable in the country, accelerating adaptation is essential to increase socio-economic and environmental resilience. Guaranteeing the quality and supply of water and maintaining the tourist appeal of the Pyrenees, among other things, should be vital parts of the adaptation efforts. Most of the focus has been on assessing the vulnerabilities of Andorra to climate change and identifying the needed adaptation measures to address them. A participatory process was carried out in 2014 to assess the vulnerabilities of the country to global warming which led to an initial roadmap. Further studies are being conducted to identify needed adaptation measures, assess their cost, and design a monitoring system to oversee progress; as well as improving the definition of impact indicators and adaptation measures. In line with Litecc priority sectors, the focus is primarily on tourism, energy, health, and agriculture sectors. At this stage, it is imperative to further develop the components on climate adaptation and accelerate their implementation to strengthen the country's resilience to climate change.

Financing Tools

20. Decarbonization and adaptation are expensive and require appropriate financing tools. The authorities are setting up various financing vehicles, but the resources allocated may still be insufficient and need to be scaled up. The full cost of implementing the climate change strategy is unknown at this stage as a greater understanding of the adaptation efforts is needed before it can be assessed. The authorities are also putting in place a voluntary and regulated emission offset system.

21. The Government established a Green Fund to help finance the country's climate change mitigation and adaptation initiatives. It is primarily intended to finance aid programs already in operation such as the Engega Plan which incentivizes the purchase of electric vehicles or the Renova program which improves the energy efficiency of buildings, and to provide universal access to public transportation. This Fund is incorporated into the draft general budget law every year and is sustained by earmarked taxes, complementary budgetary allocation provided for in the State's general budget laws, as well as donations and contributions from other sources.

22. The authorities introduced a carbon tax in 2022 to incentivize emissions reduction and to partially support the Green Fund, but the level is below the European average. The tax rate of the CO₂ branch is set at €30 per ton of carbon dioxide equivalent, half of which is assumed by the government, thus mitigating the impact of the implementation of the measure.

The current carbon tax is below the regional average of €42 per ton of CO₂, and well below the level required to bring a significant decline in

emissions. The IMF estimates that a floor of USD75 per ton of CO₂ is needed for advanced economies to reduce emissions by 29 percent by 2030, and more recent estimates suggest a rate of €120 per ton of CO₂ would be needed in 2030 to decarbonize by 2050 in euro area countries.

23. The required infrastructure for energy transition is being financed by FEDA and the private sector. To this aim, FEDA has a 5-year investment plan at cost of €208.80 million (7.43 percent of 2024 GDP) that is currently being executed (see Table 3).

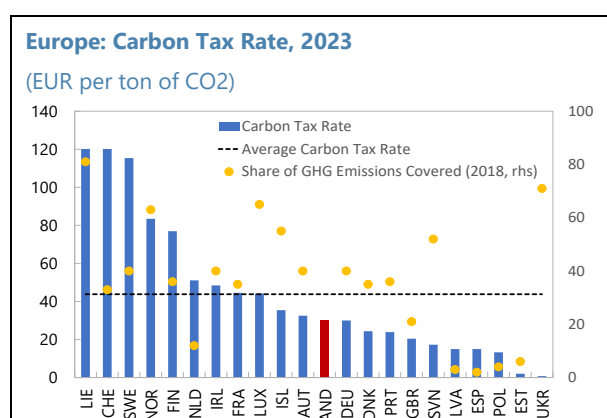


Table 3. Andorra: FEDA: Investment Plan—Main Projects (2024–28)

Subsector	Area	Millions of EUR	Percent of 2024 GDP
Electricity	Generation	97.62	3.47
	Transmission	45.01	1.60
	Distribution	8.34	0.30
Heating	Generation	9.70	0.35
	Distribution	19.56	0.70
Mobility	Electric charge	1.32	0.05
	Mobility	2.03	0.07
Waste	Environment	0.70	0.02
	Efficiency	10.32	0.37
General	Digitalization	9.34	0.33
	Others	4.86	0.17
Total		208.80	7.43

24. The issuance of green bonds and other tax tools are also expected to support climate policies. All public debt issues since 2021, amounting to EUR1.175 billion, provide financing to be used under the “Green, social and Sustainability Framework”. Green bonds help to allocate funds to climate policies.

E. Climate Policy Assessment Tool: Applying the Model to Andorra

25. This paper uses the CPAT toolkit to assess the feasibility of the decarbonization objective in Andorra. It was jointly developed by the IMF and the World Bank and covers over 200 countries as a tool to help policymakers design and implement effective, efficient, and equitable climate change policies to achieve their climate mitigation targets and development goals jointly. It is a “model of models” that allows to estimate the economic and non-economic effects of climate mitigation policies such as carbon pricing and fossil fuel subsidy reform, among others. It has four key components: mitigation, distribution, air pollution, and transport modules. Depending on data availability for the country, the model helps to assess the impact of climate policies on energy and emissions, the macroeconomy, distributional impact, and development co-benefits.

26. Given data limitations and the focus of this paper, our analysis focuses only on the CPAT mitigation model. It relies on a reduced-form macro-energy model for estimating impacts of climate mitigation policies on energy consumption, prices, GHGs by sector, local air pollutants, revenue, GDP, and welfare. The module uses projections of income growth and fuel prices to project consumption by energy sources (fossil fuels, other non-renewables, or renewables) across economic sectors (power, residential, transport, and industries). The model distinguishes energy consumption in the power, industry, transport, buildings, and other sectors; and distinguishes energy sources by fossil fuels and electricity.

27. The general equation for energy demand is as follow:

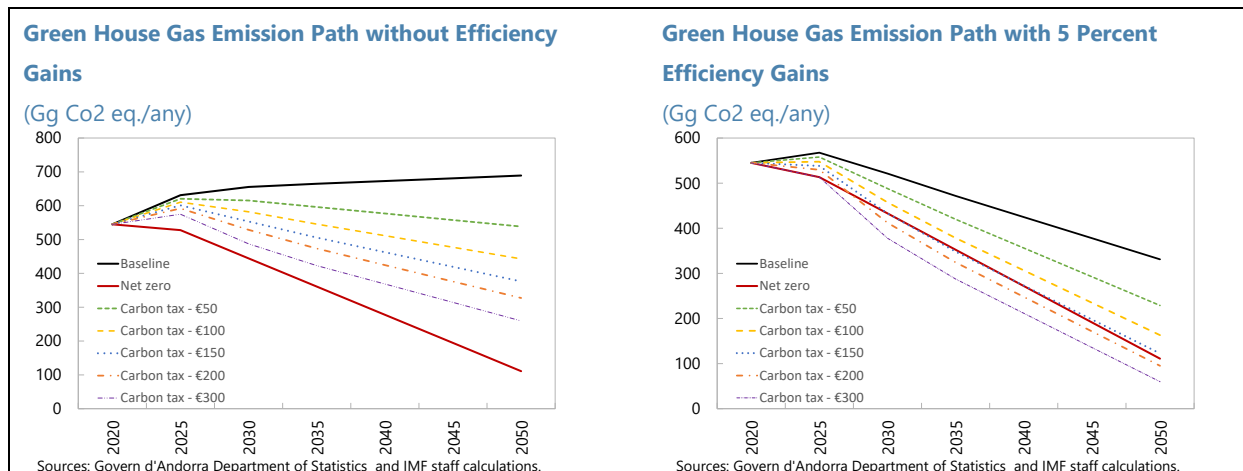
$$E_t = \left(\frac{u_t}{u_{t-1}} \times \frac{h_t}{h_{t-1}} \right) \times E_{t-1}$$

Sector-specific demand for energy source E = Change in usage of energy-consuming products in that sector x Change in energy consumption rate in that sector X Previous sectoral demand for energy

28. ...which could be re-written as follow:

$$E_t = E_{t-1}^{Ei} \left(\frac{GDP_t}{GDP_{t-1}} \right)^{v_t} \left(\frac{1}{(1+a)} \right)^{1+n^u} \times \left(\frac{p_t}{p_{t-1}} \right)^{n^h+n^u+n^h n^u}$$

Sectoral demand for energy E in sector year t = Previous year's demand x Growth effect x Exogenous technical change effect (less rebound) x Price effect. Own price elasticity, endogenous efficiency, and rebound (increased efficiency increases energy demand)



29. In the CPAT mitigation model, energy efficiency is associated with an autonomous annual energy efficiency improvement parameter. This parameter captures the productivity gains achieved from improvements in technical efficiency and gradual retirement of older, less efficient capital with newer, more efficient capital (e.g., power plants, cars, etc.). The typical pace of improvement typically varies by sector. For example, between 2020 and 2020 the efficiency of energy of vehicles improved by 1.7 percent, while that of residential buildings rose by an annual average of 1.3 percent. Productivity improvement at power plants varies. For coal, annual average productivity growth of 0.5 percent is expected; while for natural gas, nuclear, and hydro, there is more room for productivity improvement, with annual growth estimated at 1 percent annually. In the case of renewables, the costs have declined rapidly, and productivity growth rate of 5 percent have been observed. In the CPAT model, the energy efficiency parameter is set at around 0.5–1 percent annually in the baseline scenario—and increased for the scenario analysis presented

below—and the rates vary across sectors and fuels to reflect assumed differences in rates of technological change.

Results

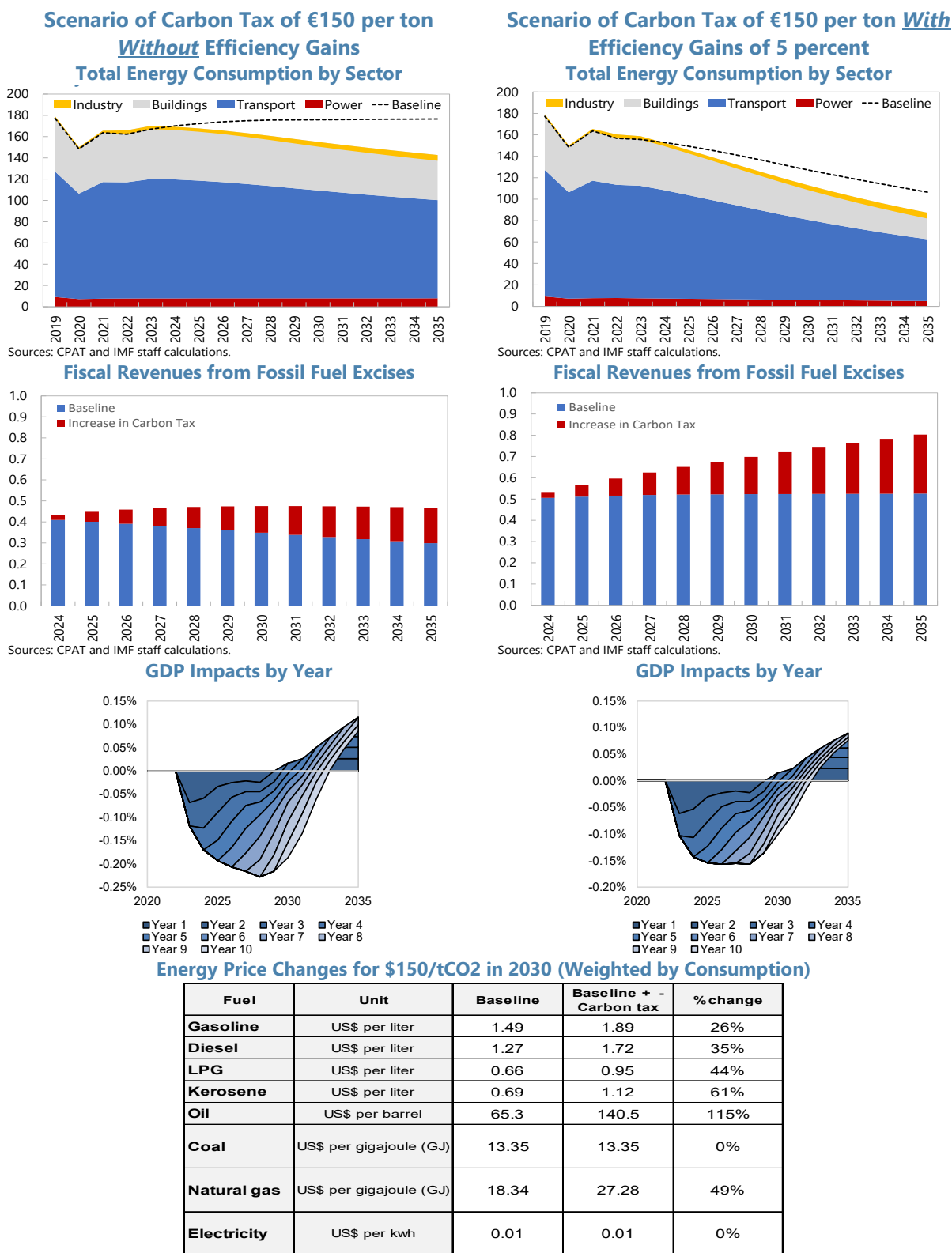
30. Achieving decarbonization in Andorra would require a significant increase in the carbon tax and very ambitious efficiency gains. This can be assessed by comparing the different scenarios with the net zero by 2050 path, at which point the total emissions produced and the amount that are removed from the atmosphere are balanced. Based on the estimates for Andorra, the decarbonization target can be achieved by increasing the carbon tax to €150 per ton by 2030 accompanied by efficiency gains of at least 5 percent in the power, transport, and residential sectors. However, efficiency gains of at least 5 percent as suggested in the model could be too ambitious to achieve with existing technologies and the current pace of innovation, especially because of a large share of the emissions come from the transport sector and is largely exogenous. This means, that for Andorra to achieve carbon neutrality, a major overhaul of the transport system is essential, including through a reduction in the absolute number of vehicles transiting in the country and a transition towards cleaner and more efficient transport for both locals and tourists.

31. The carbon tax without additional energy efficiency measures is insufficient to achieve carbon neutrality in Andorra. The responsiveness of emissions to pricing and other policies depends on induced changes in energy prices and fuel price responsiveness in different sectors. In advanced economies, the use of pricing tools alone fails to reduce emissions rapidly as income and price elasticities of energy are low, especially in Europe where energy intensity is already lower than in other regions thanks to existing policies.

32. The proposed carbon tax and efficiency gains would have some implications for macroeconomic variables and energy consumption. The increase in the carbon tax has macroeconomic implications primarily through the taxation of household consumption and firms' energy inputs, and the corresponding income and price elasticities. In the case of Andorra, the projected decline in energy consumption is mostly driven by increasing energy efficiency, as the carbon tax alone—which would mostly impact the mobility sector—is not estimated to bring sizable changes to consumption patterns in Andorra. The impact on the macroeconomy of a carbon tax of €150 per ton by 2030 with and without additional efficiency gains is estimated as following:

- Fiscal revenues from fossil fuel excises are estimated to reach between 0.5–0.8 percent of GDP depending on efficiency gains.
- Impact on GDP growth is estimated to be limited. However, the model does not account for the potential impact of the tax on fuel tourism and its potential weigh on growth.
- The carbon tax will have implications for energy prices, potentially leading to an over 100 percent increase in oil prices, while other sources of energy are expected to increase between 26 and 61 percent depending on the energy type.

Figure 1. Andorra: CPAT Results: Energy Consumption and Macroeconomic Effects Under Different Scenarios



F. Policy Discussion

33. Andorra’s climate change strategy is ambitious and comprehensive, but it is not clear if enough to achieve decarbonization objectives. The authorities have well-designed initiatives on mitigation, but more is needed on the adaptation front. Because of its higher altitude, Andorra is more resilient than other winter tourism locations in the region, but it is still impacted, and should use this window of opportunity to enact needed policies.

34. While some elements of the strategy have funding identified there are still financing gaps. On the mitigation front, FEDA’s investment plan is so far the most concrete. The Green Fund is aiding in the allocation of resources to key projects in the transport sector and energy efficiency of buildings but may need to be scaled up. In addition, as shown in the analysis above, raising the carbon tax gradually, but proactively, could help to achieve the decarbonization objective.

35. Pricing tools need to be complemented with large scale energy efficiency improvements. Efficiency gains of at least 5 percent as suggested in the model could be too ambitious to achieve with existing technologies and innovation. A large proportion of the emissions in Andorra are from the transport sector which relies heavily on fossil fuels, of which a large share comes from foreign car which are subject to regulations in the owners’ countries. Therefore, among other measures, a major transformation of the transportation sector and a ramp up of renewable energy is needed to achieve a sharp decline in emissions, including a reduction in the economic reliance on fuel tourism.

36. Adaptation efforts should accelerate given the country’s dependence on winter tourism. The proposals on adaptation are still at a more incipient stage, mostly at the research and design stage. It is therefore important to understand the feasibility and estimated costs of climate adaptation policies as the structural transformation and infrastructure required on this front are expected to be challenging to implement and costly. Partly thanks to adaptation measures applied on the tourism sector, recent large increases in the number of tourists through the year illustrate the potential of diversifying tourism away from the winter season. Enhancing the resilience of the tourism sector, reducing its seasonality, are useful. However, the structural change required to achieve this is a slow and resourceful process that requires the authorities’ attention.

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