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August 8, 2022

Approved By
European Department

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RECENT DRIVERS OF INFLATION IN ESTONIA: A COMPARATIVE PERSPECTIVE WITH THE BALTICS AND EURO AREA[1]

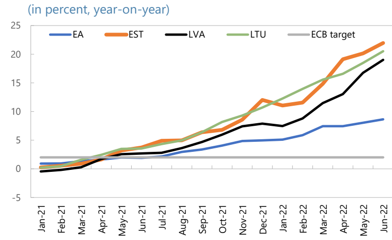
Inflation in Estonia and the Baltics surged over 2021–22 and has been well above euro area average, against the backdrop of a sharp rise in global commodity prices. This paper conducts an empirical analysis of the inflation drivers in the three Baltic countries compared to the euro area. It finds that the passthrough to inflation from global commodity prices in Estonia has been higher than in the other Baltics and the euro area. While Estonia's inflation has so far been largely driven by external factors, domestic factors such as wage growth also appear to be statistically significant drivers of prices of food and several services components of the CPI. The large size of the inflation surge calls for broad-based policy response to prevent an entrenching of high inflation and the associated economic consequences.

A. Introduction

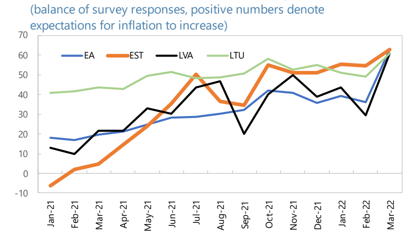
1. The surge in inflation in Estonia and the other Baltics has been large both in absolute terms and relative to the euro area average. Year-on-year harmonized consumer price inflation reached 22 percent in Estonia through June 2022, with Lithuania (20.5 percent) and Latvia (19 percent) being in a similar range (Figure 1). While the same measure of inflation in the euro area has also been quite elevated at 8.6 percent relative to the 2 percent ECB target, it has been substantially lower than in the Baltics. Estonia's inflation perceptions and expectations have also been on the rise. The high level and the wide gap of inflation in the Baltics versus the euro area highlights challenges of the policymakers' responses/toolkits against the backdrop of euro area's common monetary policy. Moreover, much of the recent surge in the consumer prices has been unanticipated, with inflation surprises disrupting expectations-setting processes and complicating macroeconomic analysis, forecasting, and overall policy planning.

Figure 1. Inflation and Inflation Expectations in the Baltics and the Euro Area 2021–22

HICP Inflation in the Baltics and Euro Area
(in percent, year-on-year)



Inflation Expectations in the Baltics by Consumers
(balance of survey responses, positive numbers denote expectations for inflation to increase)

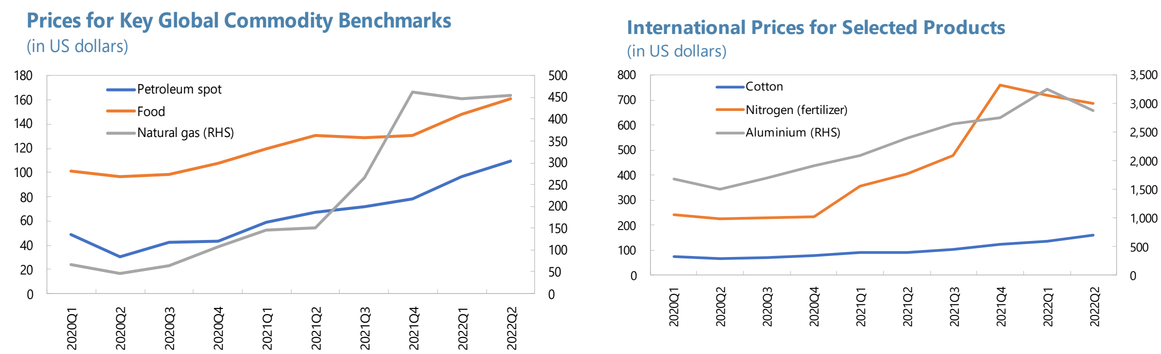


Sources: Eurostat, ECB, and IMF staff estimates.

[1] Prepared by Bogdan Lissovolik (EUR/STA). The analysis benefitted from discussions with the authorities, and the comments received on the presentation that took place during the 2022 Article IV consultation mission.

2. A key element in the recent rise in inflation has been the concurrent upsurge in global commodity prices. The fuel price composite index increased, in US dollar terms, by almost 5 times over a 2-year period in 2022:Q2 (relative to the bottom reached in 2020:Q2 during the pandemic) and by 2½ times relative to the pre-pandemic level of 2019:Q4 (Figure 2). In parallel, international food prices increased by over 60 percent relative to pre-pandemic levels. Other global commodity prices, including for metals, cotton, and fertilizers, have also exhibited strong growth during this period. The global prices are likely to be reflected in the consumer prices as the affected products are direct inputs to the specific components of the consumer basket, as well as through spillovers to other prices. The war in Ukraine has represented a further upward shock to commodity prices, particularly for natural gas, whose prices increased 10 times in 2022:Q2 relative to 2020:Q2.

Figure 2. Prices for Global Commodities and Products, 2020–22Q2



Source: IMF staff estimates.

3. Estonia's characteristics and past empirical estimates suggest that its inflation passthrough from global commodity prices could be relatively high. Small open economies have more limited possibilities to reallocate resources, mitigate external shocks, and substitute imported inputs. While the general relationship between trade openness and the commodity price passthrough is mixed (see Neely and Rapach (2011) and Gelos and Ustyugova (2012)), openness alone is an imperfect control for small size and other characteristics of Estonia.[2] In this context, the literature suggests that economies with higher food shares in CPI baskets, fuel intensities, and pre-existing inflation levels (all of which are Estonia's characteristics) are more prone to experience inflationary effects from commodity price shocks (Gelos and Ustyugova (2012)). Rigobon (2010) confirms that Estonia's commodity price passthrough was significantly higher in the 1990s and 2000s than that for larger euro area economies across sectors computed by the author (e.g., oil, natural gas, and wheat price passthrough). However, Estonia's economic structure and conditions have significantly changed since the estimates were made.

4. The passthrough from global commodity prices needs to be assessed in combination with other inflation drivers. The unprecedented size of the surge of both commodity prices and general

[2] With respect to these structural characteristics, the literature finds that economies with higher food shares in CPI baskets, fuel intensities, and pre-existing inflation levels are more prone to experience sustained inflationary effects from commodity price shocks (Gelos and Ustyugova (2012)).

inflation calls for a more holistic evaluation of external and domestic factors. In particular, there have been several other factors with substantial potential for inflationary effects, including (i) supply chain disruptions; (ii) large policy support packages that were implemented to offset the effects of the COVID-19 shock; (iii) the emergence of labor shortages during the COVID-19 crisis and (iv) sustained expansionary monetary policy stances in advanced economies. It would be desirable to assess these factors in tandem with the passthrough from global prices with a view to gauging the potential for the emergence of sustained inflationary pressures. A better understanding of the current episode of high inflation would also help throw light on its competitiveness and distributional effects, which are important in terms of policy implications.

5. This paper studies Estonia's inflation drivers in comparison to the other Baltics and the euro area, with a particular focus on the role of global commodity prices. Section B presents several global and regional stylized facts regarding Estonia's inflation and its recent surge in a comparative perspective. Section C computes and compares the differences in the global commodity price passthroughs for Estonia, other Baltics, and the euro area average. Section D estimates a more holistic model of Estonia's inflation that combines external and domestic drivers. Section E further assesses the role of some domestic drivers. Section F discusses policy implications and concludes.

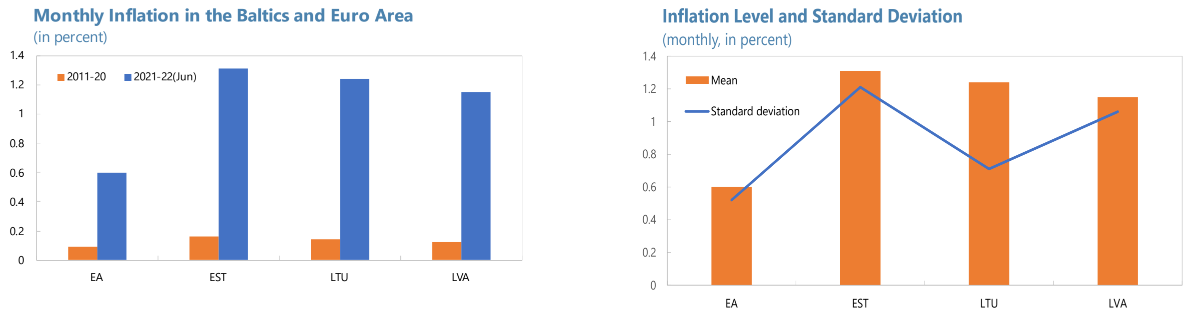
B. Some Comparative Stylized Facts on Estonia's Inflation

6. In 2011-20, inflation in Estonia was well-anchored overall, although it was moderately higher than in the euro area. For the first decade after its accession to the euro area, Estonia's inflation averaged less than 0.2 percent per month and 2¼ percent annually (see Figure 3, left panel). While this level was the highest among the Baltic countries and higher than that in the euro area (by about 1 percentage point on an annual basis), while also exceeding the 2 percent ECB target, it was within the margin that was considered reasonable given the still-substantial room for convergence with the euro area's price level. Estonia's core inflation (1.6 percent annual rate) was lower than the headline inflation for the same period, being higher than in the euro area and Latvia but lower than in Lithuania. [3]

7. Over 2021 and the first half of 2022, Estonia's average monthly inflation rate increased 8-fold relative to the previous 10-year average. Between January 2021 and June 2022, monthly inflation averaged 1.3 percent, which was slightly higher than in Lithuania and Latvia (1.2 percent each) and more than double the euro area average, which also increased perceptibly (to around 0.6 percent monthly). Moreover, inflation in the Baltics and the euro area was on a pronounced accelerating trend during this period. During this period, Estonia's inflation was more variable than that of the euro area and the other Baltic countries, as reflected in a higher standard deviation of the monthly inflation rate (Figure 3, right panel).

[3] This paper uses core inflation measure preferred by the ECB (e.g., excluding energy, food, alcohol, and tobacco).

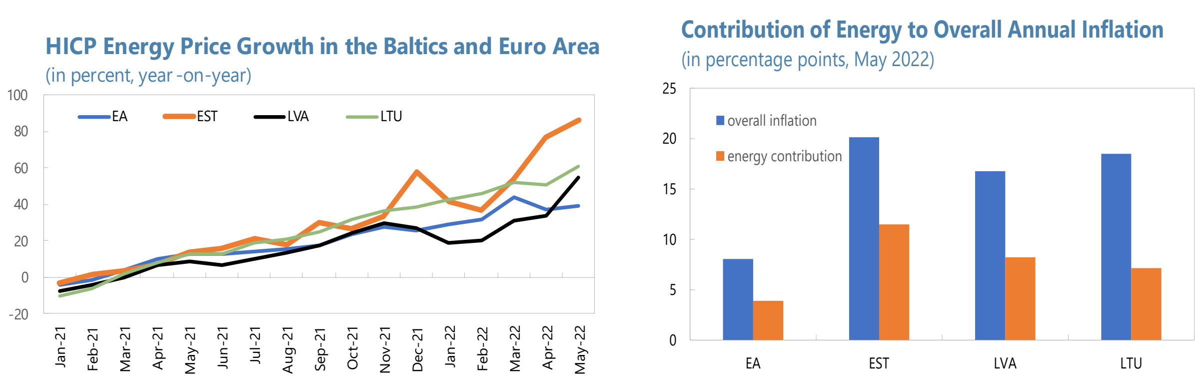
Figure 3. Inflation in the Baltics and the Euro Area, 2011–2022Q2



Source: Eurostat and IMF staff estimates.

8. **Energy prices increased sharply and accounted for a large share of the inflation surges, with Estonia seeing the highest rate of energy price growth.** The energy component of Estonia's HICP increased by 97 percent between December 2020 and May 2022, which was four times the pace of headline inflation for the same period.[4] The same components for Latvia (65 percent), Lithuania (72 percent), and the euro area (52 percent) also experienced large increases, though they were not as high as in Estonia. Within the energy price component of the HICP, Estonia's increases in electricity tariffs have been a major contributor to the difference with other comparators. After adjusting for the weight of the energy in the consumer basket, this component accounted for over one-half (57 percent) of the overall inflation in Estonia over this period (Figure 4). Such direct contribution has also been significant (if somewhat lower) for Latvia and the euro area (about 50 percent) and Lithuania (about 40 percent). All these contributions were well above the weight of energy in the HICP, which ranged from 10 to 15 percent for these countries.

Figure 4. Energy Inflation in the Baltics and the Euro Area, 2021–2022

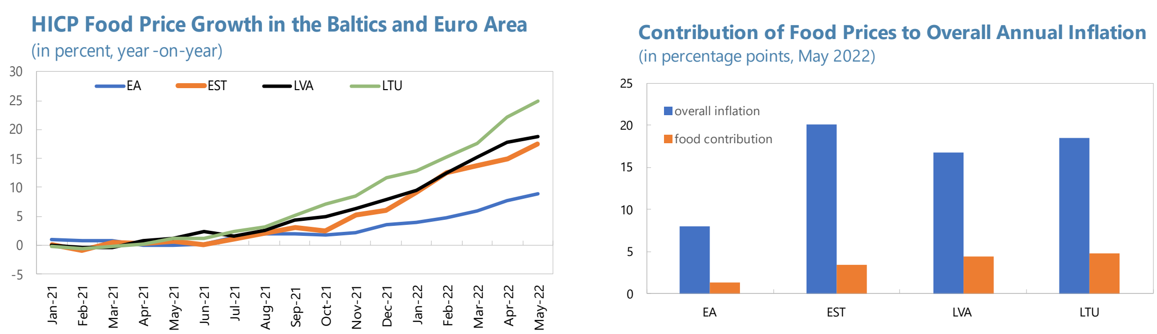


Source: Eurostat and IMF staff estimates.

[4] In this context, the Bank of Estonia has recently highlighted measurement problems of electricity prices that may possibly overstate increases in those prices is recent months (link to Estonian language blog).

9. Food price inflation has been a more modest but growing contributor to the overall inflation, with direct contribution being larger than in the euro area but smaller than in the other Baltic countries. Food price inflation in Estonia accelerated to 17 percent y/y in May 2022 (Figure 5). This was double the euro area average but smaller than the growth of food prices in Latvia (19 percent) and Lithuania (25 percent). Taking account of the weight of the food price component in the HICP, they directly accounted for about 17 percent of Estonia's inflation, compared to around 25 percent for Latvia and Lithuania. For now, the rate of growth of food prices has been similar to that of overall inflation, slightly below this level in Estonia and above it in Lithuania. However, food price growth has been appreciably accelerating for all countries in the first few months of 2022.

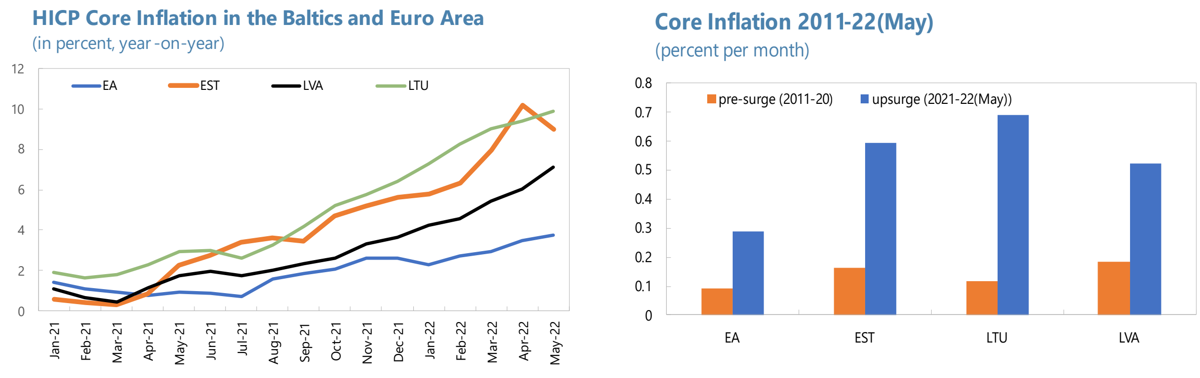
Figure 5. Food Price Inflation in the Baltics and the Euro Area, 2021–2022



Source: Eurostat and IMF staff estimates.

10. Inflation has been becoming increasingly broad-based both in the Baltics and the euro area. Core inflation in Estonia (Figure 6) increased more than four-fold during the recent surge: from 0.14 percent per month in 2011–20 to 0.6 percent per month in 2021–22 (through May). This increase was close to the rates of growth observed in the Baltic peers and higher than on average in the euro area. Lithuania's core inflation was the highest among the Baltics, reaching 0.7 percent per month during the recent surge. Euro area's core inflation has been more contained, being at around one-half of Estonia's rate during the inflation surge and increasing slightly less (by about 3½ times relative to the 2011-20 clip). Core inflation continued to experience a further acceleration during the first five months of 2022: the average monthly pace reached 0.9 percent in Estonia, being below the 1.1 percent observed both in Latvia and Lithuania but well above the 0.4 percent observed in the euro area.

Figure 6. Core Inflation in the Baltics and the Euro Area, 2021–2022



Source: Eurostat and IMF staff estimates.

C. Analyzing the Global Commodity Price Passthrough

11. A simple regression analysis was performed to assess the relative magnitudes of the global commodity pass-through effect on HICP inflation in the Baltics and the euro area. Country-specific time series OLS regressions were run on monthly data from November 2010 through March 2022, aiming to size up characteristics of the passthrough during a period when Estonia and the other Baltic countries were effectively anchored by euro area membership. Regarding the key variables, the domestic HICPs (or their components) were regressed on the following explanatory variables, all expressed in euros: (i) Brent oil prices; (ii) natural gas prices; and (iii) the global food price index.[5] Parsimonious specifications were obtained using general-to-specific modeling, starting with nine lags for all explanatory variables, sequentially eliminating statistically insignificant variables at the standard pre-set criteria. Seasonal dummies, and where relevant, time dummies were used as additional controls. The approach of relying on global explanatory variables as dominant drivers in such regressions includes the advantage of high cross-country comparability at a time of large effects of external shocks. However, this approach has several problems, including (i) potential omitted variable bias for other inflation drivers; (ii) usual reverse causality problems; (iii) overfitting concerns, and (iv) difficulty in disentangling the passthrough effects from concurrent demand and supply shocks. That said, there are several mitigants to these problems.[6]

12. The results suggest that Estonia's global commodity passthrough to the headline inflation has been higher than in the comparators, essentially reflecting passthrough from food prices. Table 1 presents the results of the regressions, with the coefficients for all three

[5] Controls also include the lagged dependent variable. Additional global commodity price indexes were tested as candidates for control variables, but they proved less significant relative to the three commodity price variables that were chosen.

[6] In particular: (i) the omitted variable does not appear to be large for Estonia when additional (domestic) controls are included (see section below); this in part reflects data quality problems for other determinants (e.g., output gap); (ii) concerns over reverse causality or similar issues seem to be mitigated in small open economies (such as the Baltics) and (iii) overfitting can be kept in check through robustness analysis and tests.

commodity prices being consistently positive and statistically significant. Overall, the fit of the models is relatively good with an adjusted R-squared hovering at around 0.6-0.65. The combined passthrough from changes in oil and gas prices is estimated to be comparable between Estonia and the other Baltics, but it is generally higher for the Baltics than for the euro area.[7] Significantly, Estonia has the highest estimated passthrough from global food prices to general consumer prices, which is consistent with the fact that, over the last decade Estonia's food price inflation was higher than that in the Baltic countries and the euro area. Recursive analysis of the regression results suggests that the passthrough may not be fully symmetric, with its absolute size appearing to be smaller during episodes when the commodity prices are falling.[8]

Table 1. Estonia: Comparative Passthrough from Global Prices to Headline HICP 1/ (2010–22 (March)), monthly data

	Oil		Natural gas		Food		Total
	Speed 2/	Size 3/	Speed 2/	Size 3/	Speed 2/	Size 3/	Size 3/
Estonia	3.0	0.018	8.0	0.008	3.9	0.054	0.080
Latvia	0.9	0.026	9.0	0.006	4.0	0.025	0.057
Lithuania	0.3	0.022	5.0	0.004	5.0	0.026	0.052
Euro-area	0	0.014	5.0	0.005	7.0	0.019	0.038

1/ Results based on OLS regressions of HICP on global commodity price benchmarks (in Euros).

2/ In months, weighted average based on coefficients.

3/ Sums of statistically significant coefficients at 5 percent.

13. **Estonia's passthrough from global to domestic energy prices is broadly in line with that of the other Baltics.** Regressing the respective domestic energy components of the HICP on global energy prices puts Estonia in the middle-of-the-pack among the Baltics in terms of the passthrough within the energy sector (Table 2). Interestingly, such energy passthrough is relatively high for the euro area, which would still be consistent with the smaller passthrough to broader HICP given the lower weight of energy in the euro area (around 10 percent) relative to the Baltics. By contrast, Estonia's energy component share in the HICP is relatively high, having risen substantially in 2022 to almost 16 percent, thereby entailing a larger impact of the same increase in domestic energy prices on broader inflation.[9]

[7] Public compensation mechanisms of energy (and possibly food) price increases may be different across countries and therefore might affect comparisons of impact on HICP. For example, gas price hikes could be compensated directly to the gas provider or through transfers to households.

[8] This potential asymmetry is not pursued further in this paper, as it merits a separate in-depth investigation.

[9] Estonia's relatively high energy intensity could be an additional underlying explanation for the high share in the HICP and CPI and passthrough to inflation.

Table 2. Estonia: Comparative Passthrough from Global Prices to Energy HICP 1/

	Oil		Natural gas		Total
	Speed 2/	Size 3/	Speed 2/	Size 3/	Size 3/
Estonia	3.1	0.139	1.6	0.075	0.213
Latvia	1.9	0.158	2.2	0.028	0.186
Lithuania	0.7	0.160	2.6	0.088	0.248
Euro-area	1.2	0.214	2.0	0.017	0.231

1/ Based on OLS regressions of energy HICP on global energy price benchmarks.

2/ In months, weighted average based on coefficients.

3/ Sums of statistically significant coefficients at 5 percent.

14. **Estonia's estimated higher passthrough to overall inflation from global food prices is confirmed by the specific investigation of the domestic food price component.** Regressing domestic food price inflation on global commodity prices results in Estonia's coefficients being significantly higher than for other comparators (Table 3). Interestingly, for all comparators the increase in global natural gas prices has a statistically significant association with the rise in domestic food prices, thereby suggesting a spill-over effect between natural gas and food prices, which however seems to be quantitatively small.

Table 3. Estonia: Comparative Passthrough from Global Prices to Food HICP 1/

(2010-22 (March)), monthly data

	Food prices		Natural gas		Total
	Speed 2/	Size 3/	Speed 2/	Size 3/	Size 3/
Estonia	1.3	0.156	7	0.024	0.180
Latvia	0	0.052	8	0.017	0.069
Lithuania	3.4	0.089	7	0.014	0.103
Euro-area	1.4	0.051	7	0.006	0.057

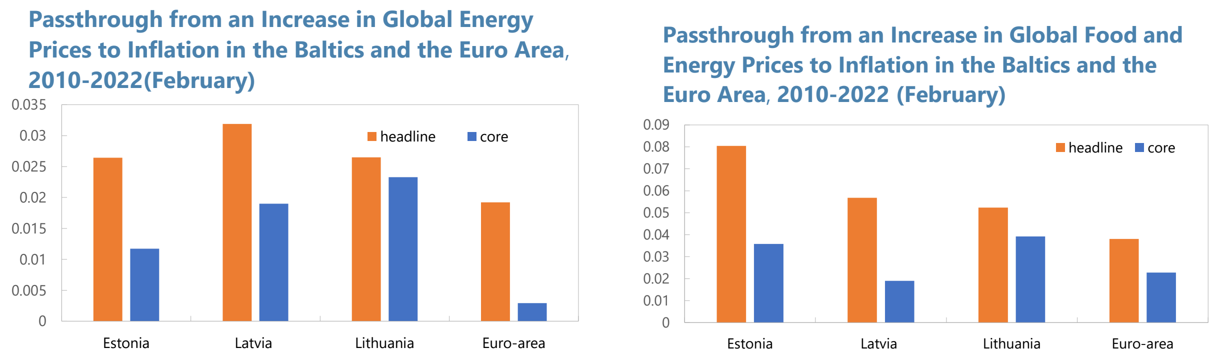
1/ Based on OLS regressions of food HICP on global commodity price benchmarks.

2/ In months, weighted average based on coefficients.

3/ Sums of statistically significant coefficients at 5 percent.

15. **The estimated passthrough from global commodity prices to core inflation is moderately less significant for Estonia.** Overall, the size of the effect is significantly smaller for core inflation than for headline inflation for all countries, with Estonia's passthrough coefficient estimated to be less than half of that for the headline passthrough (Figure 7). In contrast to the results for headline inflation, Estonia's estimated passthrough to core inflation is no longer the highest among the Baltics (e.g., is lower than Lithuania's).

Figure 7. Passthrough from Global Prices to Headline and Core Inflation



Source: IMF staff estimates.

D. A More Holistic Analysis of Estonia's Inflation

16. A mark-up model has been used to assess the drivers of Estonia's inflation more comprehensively. As per De Brouwer and Ericsson (1995) and Ericsson (2009), this model provides a consistent theoretical framework for the inflation process by proxying prices as mark-ups over unit labor costs as well as imported and fuel prices. Such model is particularly appealing for an open economy as Estonia's that relies on imported inputs. The implementation of the model entails a prior analysis of the order of integration of the time series and of possible co-integrating relationships. In the event of the latter, a comprehensive and relatively parsimonious model could be estimated whereby inflation reflects a combination of long-term drivers of the price level and short-term deviations from the path based on cyclical and short-term shock-related factors. This framework combines both external and domestic drivers while helping imbed the global commodity price passthrough within a consistent framework.[10]

17. The mark-up model was fitted to Estonia's monthly and quarterly data. The use of high-frequency data is needed to focus on the relatively short period of interest (e.g., Estonia being anchored by membership in the euro area). Employing both quarterly and monthly data is a useful check on the robustness of the results. It also entails a trade-off of better power of the empirical tests of the monthly data and improved menu of variables for the quarterly data. For example, the data on unit labor costs are only available for Estonia in a quarterly format, so a proxy based on monthly wages had to be used instead in the monthly model. Similarly, the quality of the output gap data is better in a quarterly format as it can be constructed from GDP statistics, which are not

[10] It is important to note that the OLS regressions reported below do not by themselves test for causal relationships but rather should be interpreted as evidence of correlation, unless supplemented by theoretical arguments or additional statistical tests.

available in a monthly format. As in the passthrough analysis of the previous section, a general-to-specific methodology was used, with seasonal and time dummies being additional controls.

18. The empirical analysis of inflation points to the high role of global commodity drivers and is broadly consistent with the passthrough analysis of the previous section. The key results of the inflation regressions are presented in Table 4. The cointegration analysis has permitted to establish long-term relationships between inflation, unit labor costs, and import prices. The cointegrating vector enters the short-term inflation equation as a lagged error correction term (ECM), which is statistically significant and negative as expected. The estimated coefficients of the commodity price passthrough are similar to those that were estimated in the passthrough analysis: the size of the combined passthrough from the global commodity prices is also estimated at 0.08 in the benchmark monthly HICP regression model. Alternative specifications put it in a similar range: 0.1 when domestic CPI is used instead of the HICP. The quarterly model has very similar coefficients for the passthrough from global energy prices but fails to detect a statistically significant passthrough for the food prices, likely highlighting the reduced power of the small quarterly sample.

19. While the analysis is not able to detect a significant role of short-term domestic factors in the inflation process, it at least points to the role of long-term domestic factors. Measures of the output gap, as well as other domestic variables that were attempted to be included (wage growth and fiscal and monetary policy variables) proved to be statistically insignificant in the above regressions for the headline HICP. On the one hand, this result highlights the nature of Estonia as a small open economy, where external factors would be particularly impactful. On the other hand, a significant influence of the domestic factors cannot be ruled out. For one, domestic factors enter through the long-term cointegrating relationship through unit labor costs, which in turn depend on the evolution of wages. The difficulty of establishing a short-term relationship also partly reflects data volatility and weaknesses in Estonia's small economy superimposed on the intrinsic data challenges that are not Estonia-specific. The latter for example include uncertainty over: (i) real-time estimates of the output gap and (ii) appropriate metrics of monetary policy impact in a currency union.

Table 4. Estonia: Regression Estimates from the Mark-up Model

Dependent Variable:	HICP Monthly 2010(12)-2022(2)	Dom CPI Monthly 2010(12)-2022(2)	HICP 1/ Quarterly 2010(4)-2021(2)
ECM_{t-1}	-0.06***	-0.05***	-0.26***
	-3.57	*-3.25*	*-7.04*
$\triangle Brent_{t}$	0.008***	0.010***	0.031***
	3.17	*3.87*	*7.51*
$\triangle Brent_{t-1}$	0.009***	0.011***	0.009**
	3.45	*4.14*	*2.16*
$\triangle Brent_{t-6}$		0.006**	
		2.39	
$\triangle Brent_{t-7}$	0.006**		
	2.36		
$\triangle$Gas prices $_{t-1}$	0.007**	0.006**	0.012***
	2.59	*2.41*	*3.74*
$\triangle$Gas prices $_{t-2}$			
$\triangle$Gas prices $_{t-8}$	0.006**		
	2.27		
$\triangle$Glob. food prices $_{t-7}$		0.029**	
		2.54	
$\triangle$Glob. food prices $_{t-8}$	0.040***	0.038***	
	3.31	*3.29*	
Constant	-0.000	-0.000	0.002
	-0.20	*-0.20*	*1.67*
output gap/slack	insignificant	insignificant	0.021
			0.83
$\triangle$RGSM Rate $_{t}$			
Number of observations	135	135	43
R-squared overall	0.72	0.71	0.82
R-squared adj.	0.68	0.67	0.78
Seasonal/time dummies	yes	yes	yes

t-statistics in italics

***,**, and * denote statistical significance at 0.01, 0.05, and 0.1 level respectively.

1/ WTI price is used instead of Brent price in the quarterly model.

E. Assessing the Role of Wages in Driving Estonia's Inflation

20. A more granular analysis of inflation subcomponents could throw light on an important question of whether the recent spike in prices could morph into sustained inflationary pressure. In this regard, a key factor to consider is that of the wage price spiral. However, comprehensively assessing the potential for such a spiral would involve an analysis of the determinants of not only prices but wages. The latter goes beyond the scope of this paper, which is limited to the narrower investigation of the determinants of prices. Within this more limited scope, this section zooms in on the relationship between wages and different subcomponents of Estonia's consumer price index.[11]

21. While the regression analysis of the preceding section does not to detect a significant relationship between Estonia's wage growth and headline inflation, there is some, if mixed, indication of a positive relationship for *core* inflation.[12] Regressing core inflation on lagged wage growth, changes in global commodity prices, and several other controls, reveals that the relationship between core inflation and wage growth is likely positive and could be statistically significant, at least in some samples. However, the results generated are not very robust to changes in samples and specifications and should therefore be treated with caution.

22. There is evidence of a positive relationship between wage growth and food price inflation in Estonia. Regressing the growth of domestic food prices on the lagged wage growth, global food price growth, and seasonal dummies yields a positive and highly significant coefficient on the lagged wage growth, both in the monthly and quarterly data samples (Table 5). This evidence is consistent with the literature findings in other countries, including India and the US, where wages or general income growth are associated with higher food price inflation (see Lee et al. (2000)) and Samal et al. (2022)).

Table 5. Estonia: Relationship Between Food CPI Components and Wage Growth

Dependent Variable:	Food HICP monthly	Food domestic CPI quarterly
lagged wage growth	0.064*** *5.01*	0.31*** *4.09*
key controls	growth in global food prices growth in global gas prices	growth in global food prices
other controls	seasonals & time dummies	seasonals
number of observations	135	43

t-statistics in italics
***,**, and * denote statistical significance at 0.01, 0.05, and 0.1 level respectively.

[11] Since the mark-up model and the related co-integrating framework apply only to headline inflation but not inflation subcomponents, the analysis below is based on simple OLS regressions that follow an eclectic approach and try to balance theory and empirics.

[12] So far, there has been limited evidence that wage growth is associated with overall inflation in an advanced economy like the US (see Knotek and Zaman (2014)).

23. Regressions also detect a relationship between lagged wage growth and some services subcomponents of Estonia's domestic inflation. Regressing services components of Estonia's consumer price index on lagged wage growth and other controls points to a positive relationship between wage and price increases for (i) transportation, (ii) communications, and (iii) "miscellaneous services" prices (Table 6). This evidence is consistent with the literature findings that rising wages could trigger increases in services prices relative to those of goods prices due to limited competition involved in their provision (see Brauer (1997)).

Table 6. Estonia: Relationship Between Selected Services Prices and Wage Growth

Dependent Variable: rate of growth of a respective services component of the CPI

Sample: monthly 2010(11)–2022(3)

Services component:	**transportation 1/**	**communications**	**miscellaneous**
lagged wage growth	0.349***	0.030**	0.024**
	3.11	*2.67*	*2.55*
other controls	global commodity prices, lagged dependent variable		
Number of observations	137	137	137
R-squared overall	0.73	0.56	0.35
R-squared adj.	0.69	0.48	0.32
Seasonal/time dummies	yes	yes	yes

t-statistics in italics

***,**, and * denote statistical significance at 0.01, 0.05, and 0.1 level respectively.

1/ Represents sum of statistically significant coefficients at 5 percent; t-statistics reported for the highest value.

F. Conclusions and Policy Recommendations

24. The empirical analysis of Estonia's inflation points to a sizable role of the passthrough from global commodity prices, which has been a key source of variation in its inflation rate. Estonia's estimated passthrough has been broadly comparable to—but generally higher than—that of its Baltic neighbors on account of the higher food price passthrough. Furthermore, such passthrough in the Baltic countries is higher than for the euro area. However, some of these numerical estimates of the passthrough effects need to be treated with caution as they are sensitive to sample selection and specification methods, against the backdrop of a relatively short sample sizes, rapid structural change, and data series limitations in the small economies of the Baltic region. Another reason for caution is a possibility of a large structural break in the economic and policy landscape that is marked by the recent upshift in the inflation levels in Estonia and more globally.

25. The role of domestic factors in Estonia's recent inflation developments is more elusive to assess and could well be underestimated. Conventional domestic factors of inflation, such as output gaps, wages, labor market developments, and policy stances and measures do not seem to have a robust (statistical) association with Estonia's headline inflation in recent years. That said, some links can be detected in terms of the longer-term relationships between wages and prices and short-term relationships between the growth of wages and prices for food and some services components of the CPI. The absence of a stronger relationship between domestic factors and broad inflation measures may however reflect data volatility and weaknesses in a period of much lower inflation that was characterized by well-anchored expectations and a relative absence of inflationary shocks. The real time uncertainty over the level of the output gap may be hampering the assessment of the domestic factors that have been contributing to the inflation surge.

26. The recent (and still ongoing) inflation spike has created significant policy challenges. These include: (i) risks of reduced economic and investor confidence because of increased economic, real income, and policy uncertainty; (ii) disruptions to private and public investment planning, including due to increases in construction costs; (iii) adverse impact on income distribution since the high inflation has a particularly deleterious impact on the poor and the most vulnerable; and (iv) potential damage to the credibility of economic policies and frameworks, particularly if some of the other adverse effects of inflation are not well-contained.

27. It is critical to implement policies that prevent an entrenching of elevated inflation while mitigating the effect of the increase in the price level in an efficient manner. The forthcoming normalization of the ECB's monetary policy with a credible strategy to attain the 2 percent euro area-wide target will help steer inflation dynamics in Estonia in the right direction. In parallel, the reversal of the commodity price surge that is currently expected by the futures markets, will provide a powerful disinflationary push if it materializes. The inflation dampening effect from the declines in global commodity prices may be particularly strong given Estonia's high estimated passthrough, although caution is warranted due to the possibility of an asymmetric passthrough. Still, due to extremely high current inflation levels, additional policy action may also be needed to amplify the disinflationary forces, including tighter fiscal policies to restrain demand and structural policies in sectors where greater competitive forces or supply-side measures may help further moderate price pressures, notably in the energy sector. Well-targeted and efficient measures of social support to the most vulnerable will be critical components of such a policy package.

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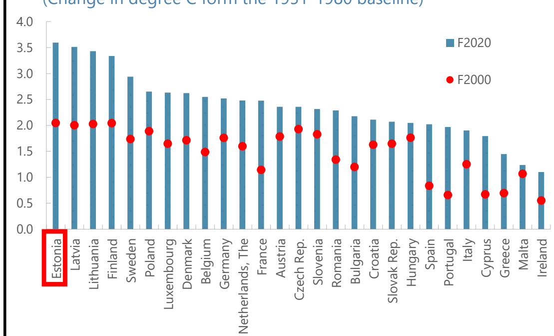
CLIMATE POLICY IN ESTONIA: ACCELERATING MITIGATION IN THE TRANSPORT AND BUILDING SECTORS[1]

The war in Ukraine has reinforced the need to accelerate the green transition and reduce dependence on fossil fuels in the EU. While Estonia has substantially advanced toward achieving its Green Deal's commitments, the progress which has been mostly driven by the restructuring of the oil shale industry, could temporarily be jeopardized by energy security constraints. At the same time, progress with GHG reductions in the transport and building sectors has remained modest. The review of Estonia's comprehensive climate policies reveals room to further incentivize efficiency and promote greener energy sources and sustainability in the transport and building sectors. The analysis shows that the adoption a carbon tax in sectors not covered by the EU-ETS system, supported by appropriate sectoral policies, would help incentivize a greater efficiency in the building and transport sectors and reduce GHG emissions, while generating a net positive welfare effect and a more inclusive growth.

A. Introduction

1. **Climate change is expected to have a sizable impact in Estonia.** The Estonian Environmental Agency (EEA, 2017) documents significant climate-related changes with severe impacts in Estonia. As a result of climate change, the temperature rise in Estonia has been faster than the global average and was accompanied by a steady decline in winter ice and snow coverage. Similarly, heat, drought, and seasonal flooding have become more frequent, with devastating impacts on agriculture and other economic sectors. Furthermore, the rising Baltic Sea level, among the highest in recent years, threatens Estonia's coastal buildings, while stronger storms is a risk to the electricity network and buildings. To limit these impacts Estonia has adopted a comprehensive climate strategy aiming at limiting climate changes through mitigation, adaption, and transition efforts.

Annual Surface Temperature Change in EU Countries
(Change in degree C form the 1951-1980 baseline)



Source: FAO Temperature Change.
Notes: This indicator presents the mean surface temperature change during the period, using temperatures between 1951 and 1980 as a baseline.

2. **This analysis focuses on Estonia's key mitigation policies in the building and transport sectors.** Estonia's adaptation policies, and institutional capacity almost matches climate related risks as measured by the Inform Risk index. Transition policies play a predominant role in the

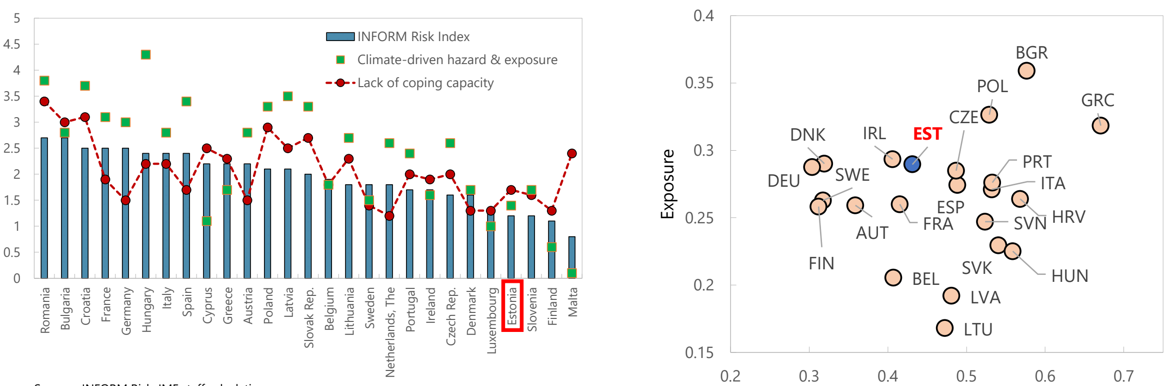
[1] Prepared by Neree Noumon (EUR). The analysis benefitted from discussions with the authorities and comments received on the presentation that took place during the 2022 AIV. Karlygash Zhunussova (FAD) provided helpful comments and supported with the implementation of the CPAT tool.

restructuring of the oil-shale industry and are supported by the EU Just transition Fund. However, progress with mitigation policies in the building and transport sectors has stalled since the mid-90s. The review of Estonia's climate policy in the transport and building sectors highlights room to further promote energy efficiency and sustainability.

Figure 1. Climate Risks and Preparedness for Transition

Climate-Driven Risks and Coping Capacity in the EU, 2021

Preparedness for a Low Carbon Transition in Europe, 2019



Sources: INFORM Risk; IMF staff calculations.
Notes: Higher values of the index means higher risk.

Sources: Pezko et al. 2020

3. **The paper also explores the costs and benefits of implementing a national-level carbon tax in non-ETS sectors to complement existing policies.** The EU Emissions Trading System (ETS) has helped mitigate GHG emissions in Estonia but does not cover the building and transport sectors where progress has been limited.[2] The paper explores the gains that can be achieved by introducing a carbon taxation in non-ETS sectors, using the WB-IMF carbon pricing assessment tool (CPAT) framework.[3] The analysis found that introducing a carbon taxation in non-ETS sectors could reduce (by up to 18 percent) the efforts needed achieve Estonia's NDC in 2030. A carbon tax will also have a positive net welfare effect over time, with climate, transport and air pollution co-benefits outweighing the efficiency costs from introducing a new tax. Furthermore, the revenue from carbon tax, when recycled, in terms of targeted transfers and investments, is expected to promote higher and more inclusive growth than otherwise. This work contributes to policy debate in Estonia by illustrating the costs and benefits of carbon taxation.

B. Estonia's Climate Policy and Greenhouse Gas Emissions

4. **The war in Ukraine and the new EU-level policies call for a faster convergence to green policies.** The war in Ukraine has strengthened Europe's commitment to ensuring energy security

[2] European Union member states (plus Iceland, Liechtenstein, and Norway) are part of the EU Emissions Trading System (EU ETS), a market created to trade a capped number of greenhouse gas emission allowances.

[3] The CPAT uses a granular modelling of sectors and fossil fuels to assesses impact of carbon pricing schemes on energy-related emissions.

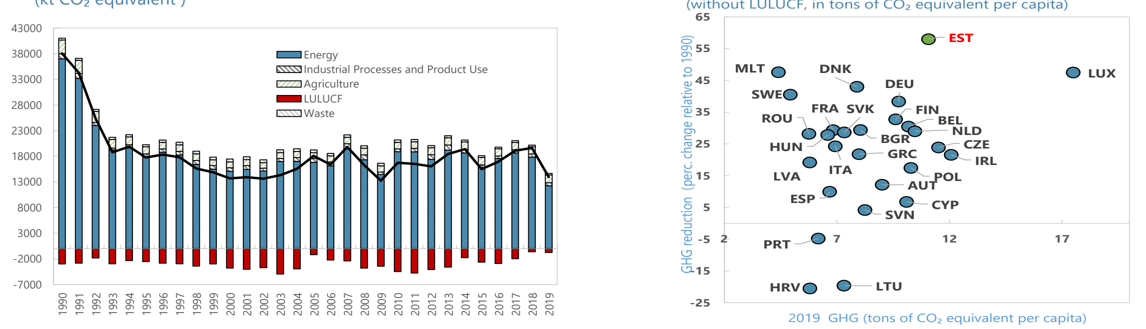
and sustainability and accelerating the global transition to renewable sources of energy. The European Commission's "Fit for 55" proposed package (July 2021) seeks to accelerate convergence to the EU Green Deal's carbon neutrality objective by mid-century and achieve the net GHG reduction by at least 55 percent by 2030, compared to 1990 levels. The proposed Fit for 55 package extends the emissions trading to new sectors, while tightening the existing EU Emissions Trading System, thereby recognizing the existing gaps in the pricing of carbon emissions.[4] The REPowerEU Plan proposes to further accelerate the roll-out of renewable energy, greater energy saving and efficiency, and the diversification of energy supplies.

5. **Estonia has made significant progress in reducing its GHG emissions, but progress has stalled since the mid-1990s.** Estonia's National Determined Contributions (NDC) aim to reduce greenhouse gases by 70 percent by 2030 compared to 1990 levels and achieve climate neutrality by 2050. As of 2020, Estonia GHG emissions reduction was among the highest in the EU, at 72 percent relative to 1990's levels (EC 2022), though also reflecting low transport activity during the pandemic.[5] In parallel, the country's carbon footprint per capita remains among the largest in Europe. Most progress in reducing GHG emissions, came from the oil-shale sector restructuring, with the largest gains achieved in the early mid-90s. The energy sector's emissions have also steadily decreased from 2018, supported by the green transition policies and rising CO2 prices which affected the oil shale sector's competitiveness. As of end-2020, the bulk of Estonia's emissions remained concentrated in the energy sector (59 percent), followed by the transport sector (17 percent), and the agriculture sector (12 percent). The Just Transition Fund is expected to further accelerate, the transition away from fossil fuels.[6]

Figure 2. Greenhouse Gas Emissions, 1990–2019

Estonia. GHG Emissions Reduction, by Sources, 1990-2019
(kt CO_2 equivalent)

GHG Emissions Reduction across Europe, 1990-2019
(without LULUCF, in tons of CO_2 equivalent per capita)



Source: UNCCC; IMF Staff Calculations

Sources: WEO Database; UNFCCC GHG Data Interface; and IMF staff calculations.

[4] The Commission also proposed aligning national taxation policies with the European Green Deal objectives, measures to prevent carbon leakage, and tools to preserve and grow natural carbon sinks.

[5] The land use, land use change and forestry (LULUCF) sector, traditionally a net greenhouse gas sink, became a net emitter in 2020 (about 10 percent of net emissions). This trend, yet to be confirmed, was caused by ageing forests.

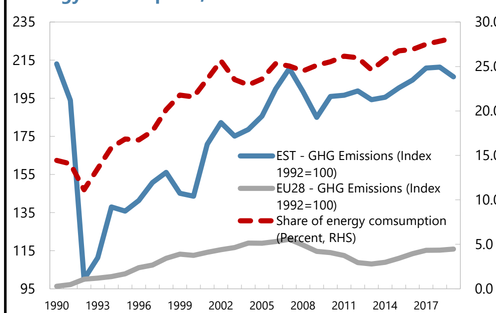
[6] The oil shale sector in Estonia is highly concentrated in the eastern-most region of Ida-Virumaa. As of 2019, oil shale related companies located in the region account for over 50 percent of Estonia's total GHG emissions.

C. Challenges to GHG Emissions Reduction in the Transport and Building Sectors

Transport Sector

6. GHG emissions in the transport sector have steadily increased since the early 1990s driven by road transport. Transport GHG emissions have steadily increased over the last 30 years and reached the double of their 1992 level, as of 2019 (2,395 tons of CO2e), while the EU's GHG transport emissions increased by 16 percent over the same period. The transport sector's GHG emissions represented about 17 percent of net emissions in 2020, mostly originating from road transportation, which was about 7 percent lower than in 2019 owing to the global pandemic. Transport emissions represented 28 percent of all domestically consumed energy as of 2019. In 2020, road transport, about 98 percent of total transport emissions, was the main driver of rising emissions, of which about three quarters was emitted from cars and one quarter from buses and trucks.[7] The increase in the number of vehicles—mostly passenger cars—and kilometers driven over time, reflect rising living standards and income growth in recent years.[8]

Estonia: Transport Sector GHG Emissions and Share of Energy Consumption, 1990-2019

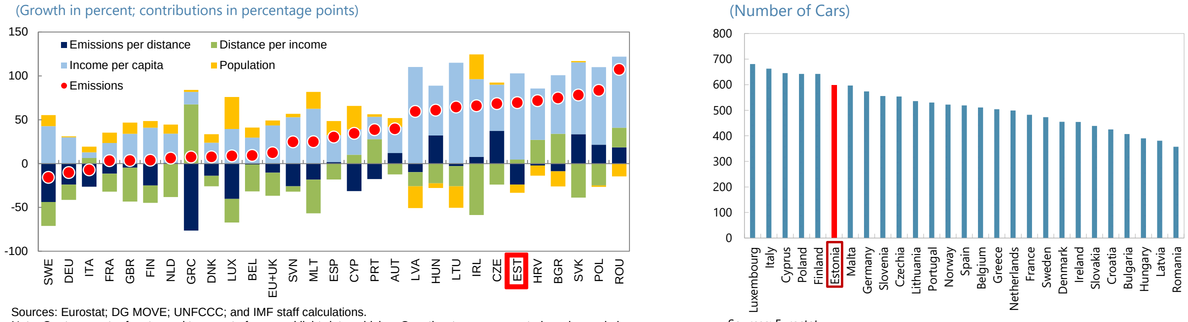


Source: OECD GHG Emissions database; and IEA World energy balance database.

Figure 3. Transport GHG Emissions and Number of Passenger Cars

Drivers of Growth in Car Transport Emissions, 1995-2017
(Growth in percent; contributions in percentage points)

Passenger Cars per 1000 Inhabitants, in 2019
(Number of Cars)



Sources: Eurostat; DG MOVE; UNFCCC; and IMF staff calculations.
Note: Car transport refers to road transport of cars and light-duty vehicles. Growth rates are computed as change in logs.

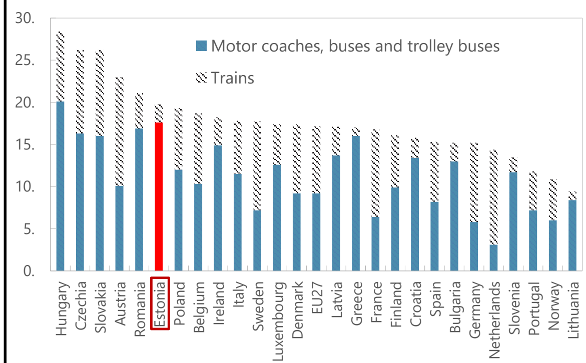
Sources: Eurostat.

[7] GHG emissions from railways, domestic navigation, and domestic aviation represented about 1 percent, 1 percent, and 0.2 percent of 2020 transportation emissions, respectively.

[8] The prevalence of cars in the population in 2018 was similar to that of Germany and Australia, countries with higher living standards than Estonia.

7. Rail transport emissions have fallen over time, partly compensated by growing use of passenger traffic on trains and public transport. Rail transport emissions declined between 2008 and 2018, as freight transport by rail more than halved in volume, though partly offset by road freight which has a higher carbon intensity (UNECE, 2020).[9] Conversely, passenger traffic on trains, a relatively small share of Estonia's public transport, increased by about 60 percent over 2010-2019. Similarly, bus passenger traffic, the bulk Estonia's public transport system, has expanded by a quarter between 2008 and 2019 primarily reflecting international travel as domestic bus traffic remained broadly stable.

Modal Split of Passenger Transport in Europe, 2019
(Passenger-kilometres in percent)



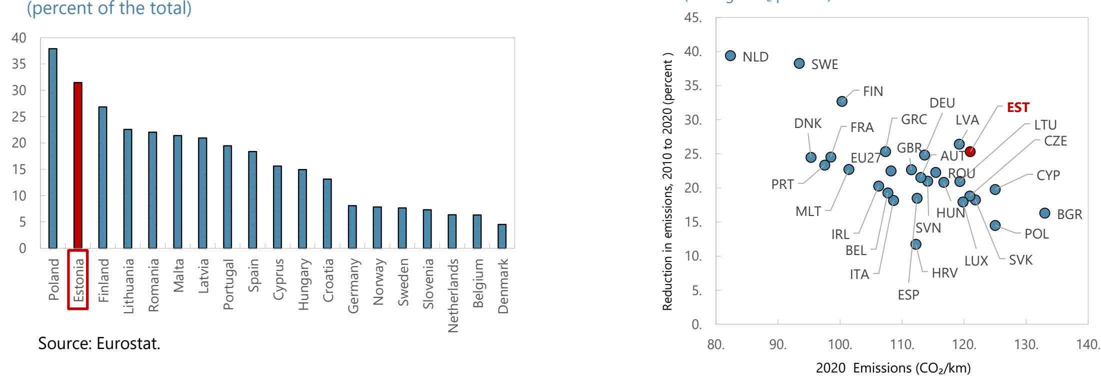
Source: Eurostat.

8. Progress with reducing emissions in the transport sector is constrained by inefficiencies from Estonia's relatively old car fleet. The fuel efficiency of Estonia's passenger car stock is lower than in most European countries. In addition, the rise in the number of cars and miles travelled have contributed to the continued increase in transport emissions. Although the emissions of new passenger cars have declined by about 25 percent from 2010 to 2020, the emission efficiency of new passenger cars in CO2/km has been below the EU average (Figure 4). Estonia's relative less fuel-efficient stock of vehicles, a third of which is 20-year-old or older, is the second-oldest stock of vehicles in the EU (EC 2022).

Figure 4. Passenger Cars Age and Emissions

Share of Passenger Cars Above Age 20, 2019
(percent of the total)

New Passenger Cars Emissions Across Europe, 2010-2020
(Average CO_2 per Km)



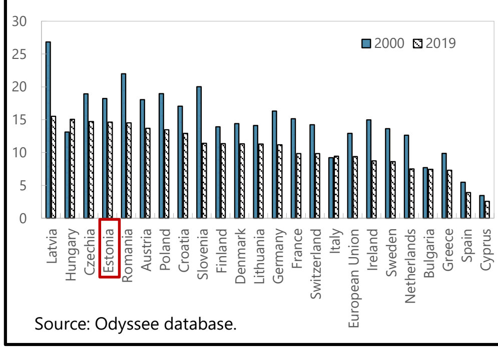
Sources: Eurostat; and IMF staff calculations.

9 UNECE's 2020 Transport Statistics Infocards

Building Sector

9. The building sector accounts for a significant share of total energy demand. In 2019, buildings contributed to 32 percent of total final consumption of energy and represented around 4 percent of total GHG emissions from the use of energy. GHG emissions from buildings has been broadly stable since the early 1990s, reflecting limited progress, compared to other EU countries. Building GHG emissions mostly came from heat and electricity consumption, with electricity accounting for 20 percent energy consumption. Residential buildings—which represent three quarters of the total building floor area (EC, 2021)—account for most of the energy demand and GHG emissions of the building sector. As of 2018, space heating accounted for the largest share (59 percent) of the building sector's energy consumption. Between 2000 and 2019, energy consumption in residential buildings increased by about 2.7 percent, partly due the increase in the number dwellings (ODYSSEE, 2021).[10]

Final Consumption of Residential for Space Heating
(Kilogram of Oil Equivalent/m2)

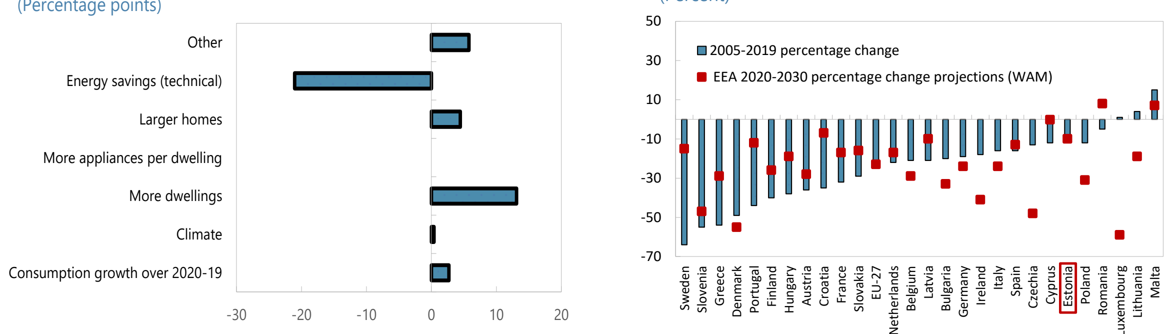


Source: Odyssee database.

Figure 5. GHG Emissions in the Building Sector

Contributions to Households Energy Consumption Growth 2000 -2019
(Percentage points)

GHG Emissions from Energy Use in Buildings in Europe
(Percent)



Source: ODYSSEE, National authorities data.

Source: European Environment Agency.
Notes: WAM means: with planned and existing policies/measures.

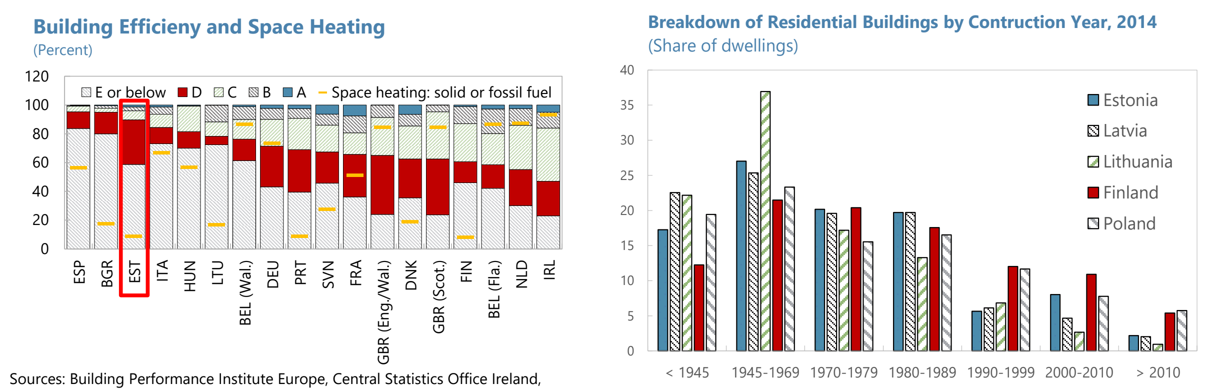
10. GHG emissions reduction in the building sector has been modest, despite a comparatively moderate reliance on carbon-emitting fuels. Although there has been some improvements, Estonia's building stock efficiency is among the lowest in Europe, with close to 90 percent of residences falling into the bottom "D" and "E" categories of the energy-performance standards.[11] GHG emissions in the building sector, is driven by space heating (71.4 percent of

[10] ODYSSEE Estonia country profile, 2021.

[11] EU Member States classify buildings' efficiency from A (most efficient) to G (least), in line with the EU's Energy Performance of Buildings Directive and Energy Efficiency Directive.

households' energy consumption), 50 percent of which is generated by renewables and wastes, which partially mitigate the environmental costs of inefficiencies. Heating demand and Estonia's energy use for residential space heating in 2019 is comparatively higher than in other EU countries, partly reflecting a colder climate. However, space heating energy consumption was also higher than in Nordic countries, which suggests a relatively lower energy efficiency in Estonia. Buildings' energy inefficiency is mostly attributable to Estonia's old residential buildings stock, with about 90 percent of buildings constructed before 1990 (as of 2014).

Figure 6. Building Energy Efficiency and Building Construction Year



Sources: Building Performance Institute Europe, Central Statistics Office Ireland, European Environment Agency, Eurostat, EU Building Stock Observatory and IMF staff calculations.

Source: European Commission EU Buildings Factsheets.

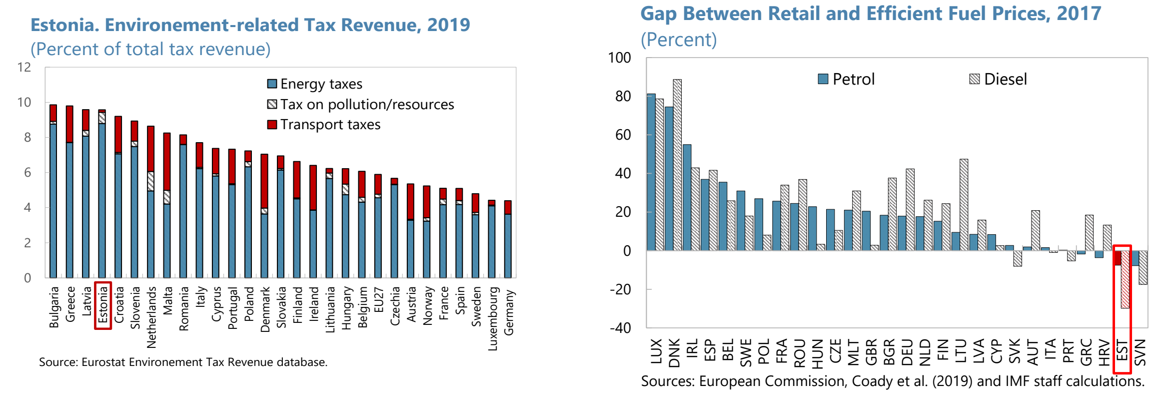
D. Climate Policies in the Transport and Building Sectors

Key Policies in the Transport Sector

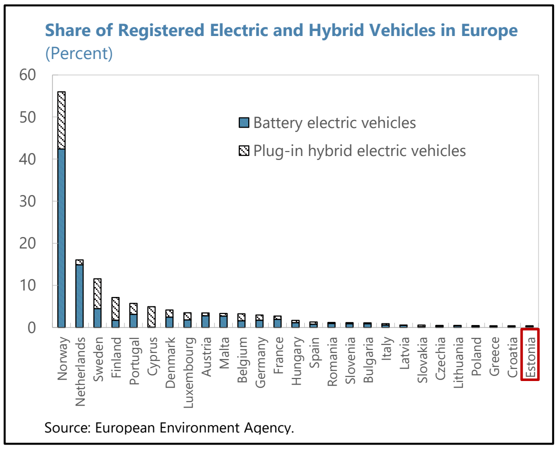
11. Estonia's policies to reduce transport sector emissions are underpinned by the National Development Plan for the Energy Sector 2030 and the Transport and Mobility 2021–2035 plan. Policies in the National Development Plan for the Energy Sector 2030 include (i) car taxation to encourage adoption of more efficient cars, including electric vehicles (EV); and (ii) investments to expand public transport networks and encourage a greater modal shift to public transport (MEAC, 2017a). The IEA estimates that the implementation of Estonia's energy strategy, could reduce transport energy consumption by up to 40 percent (IEA, 2019). Estonia's Transport and Mobility 2021–2035 Masterplan aims to further boost the sustainability of public transport and investments in charging stations for EVs. Estonia's ambition is to reduce transport emissions by 30 percent by 2030 compared to 2005, while not exceeding total vehicle fuel consumption levels recorded in 2012.

12. Estonia's environment-related taxation has room to further incentivize efficiency. Although Estonia's environment-related taxation revenue stood above the EU average, at 8.8 percent of total tax revenue in 2019, it is limited by its narrow base mostly consisting of a relatively high excise tax on road fuels (Figure 7). Although levies do not explicitly target externalities, the price of retail fuel in Estonia was above efficient levels in 2017. This may suggest that negative externalities (e.g., accidents, congestions, and climate-related costs) were mostly accounted for (Coady et al. 2019). At the same time, fuel duties on petrol and levies on diesel have been relatively stable in real terms over 2011–2018. Furthermore, as opposed to many EU countries, Estonia currently does not have a carbon-based tax on transport fuels and there is no vehicle registration tax.[12]

Figure 7. Environment-Related Tax, Retail, and Efficient Fuel Prices



13. Electric vehicle (EV) adoption could be further incentivized through subsidies and investments in charging infrastructure. Estonia's share of registered electric and hybrid vehicles is among the lowest in the EU. This suggests current programs to subsidize electric vehicle, could be expanded (in duration and coverage) to further encourage EV sales and speed up adoption (Broughel and Viiding, 2021). Public sector policies should also accelerate investments to upgrade electric charging infrastructure. EV adoption would also benefit from additional investments in fast-charging stations with a focus on improving access to charging in residential areas.[13] Adopting well-communicated tighter emissions standards with a long-term timetable would also encourage drivers to upgrade to greener vehicles and boost investments in the transport sector.



14. Policies should simultaneously encourage a greater shift to the public transport system and invest in expansion and electrification. Public transportation in Estonia represented

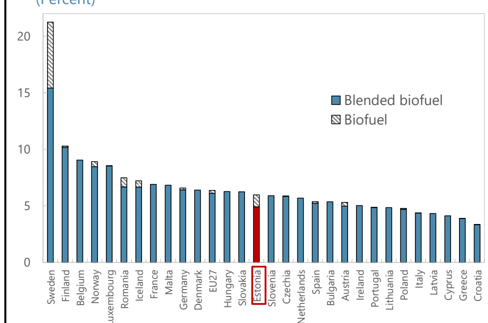
[12] Road tolls are time-based and only for heavy-duty commercial vehicles, while there are no congestion charges in urban areas (EC 2022).

[13] Estonia developed the world's first nation-wide EVs fast-charging network in the early 2010s (Rezvani et al., 2015).

about 20 percent of the total distance travelled in 2019, close to the EU average. While free public transport for residents initially boosted the use of public transport, the share of public transport use has started to fall from end-2016 (IEA, 2019), suggesting more incentives are needed to encourage the use of public transport.[14] Reliance on personal transport could be further reduced through the expansion of rail transport in regions where public transport services is less developed. The ongoing or planned electrification of the main railway lines, supported by EU funds, could be expanded to the whole network to achieve a faster decarbonization of transport. Further investing in electric buses, and in the appropriate charging infrastructure, could also complement existing efforts to use biomethane as a fuel for buses. Moreover, Estonia's rail network, which relies heavily on diesel fuel would benefit from further electrification (EC, 2019).

15. Further incentivizing the use low-carbon fuels will help reduce transport GHG emissions. International experience suggests that the transition to cleaner and low-carbon transport takes time.[15] Estonia has promoted the use of biomethane in public bus system through subsidies to establish biomethane filling stations (since 2015), grants to public bus operators that use methane, and subsidies to locally produced biomethane (since 2018). Nevertheless, the share of biofuels used in transport stood around 6 percent in 2019, below many EU countries. Recent data suggest that in 2020, Estonia's share of renewables used in the transport sector was above 10 percent of total energy consumption (EU Renewable Energy Directive's target). Setting up and facilitating standards adoption could be complemented by a carbon-based tax on fuels, which are generally better incentives to use most cost-efficient biofuels.

Share of Biofuel in Transport Final Energy Consumption, 2020
(Percent)



Source: Eurostat.

Key Policies in the Building Sector

16. The government has supported energy efficiency in the building sector through guarantees and subsidies. The government's programs and grants (through KredEx) support up to 40 percent of the renovation costs of apartment associations and homeowners, and 50 percent of the costs related to hiring technical consultants or renovation supervisors.[16] Renovations are also supported by the EU Cohesion Policy Fund, which finances up to 50 percent of total costs of apartment buildings built before 1993 (ODYSSEE, 2021). In addition, KredEx facilitates access to financing through guarantees covering up to 80 percent of the renovation financing for buildings with a riskier profile (e.g., due to location, size). Improving the terms of the existing long-term credit

[14] In 2013, Tallinn became the first capital city in the EU to provide free public transport to permanent residents.

[15] For example, it would take at least two decades to replace Estonia's entire car fleet with EVs (OECD). Norway's success was supported by a comprehensive package.

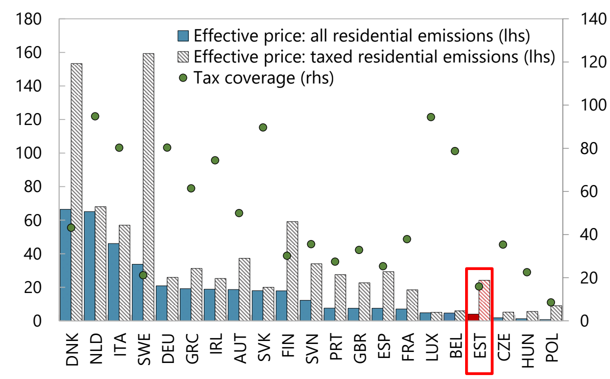
[16] The size of grants linked the expected energy savings gains from the renovation (MEAC, 2017b).

to finance renovation would further incentivize renovation, by mitigating the impact of high upfront renovation costs.

17. Promoting an active renovation market would help accelerate energy efficiency improvements. Absorbing the potential increase in the demand for renovation will require an adequate capacity of the market to satisfy renovation needs to improve energy efficiency. Cross-country experience (IEA, 2019) suggests that setting up a market for energy service companies (ESCOs), has been very effective in delivering on energy efficiency savings across sectors.[17] The public sector could also contribute to a more active renovation market through large projects in the context of its renovation programme to catalyze the renovation of private buildings.[18] Policies to promote the training and skills upgrades of construction sector workers would also help meet the increase in demand for renovations, without putting a pressure on wages and costs. The 2013 building code introduced nearly "zero-energy standard," with which new public and private sector buildings must comply from 2019 and 2021, respectively. Compliance with the zero-energy standard would boost energy efficiency over time, provided that the existing skills—in the construction sector—for its implementation are upgraded.

18. Renovations should be further incentivized, including through carbon pricing. The IEA (2019) estimates that to achieve Estonia's National Energy Strategy, the annual renovation rate in the residential building stock would need to be 2 percent, which is higher than the 2019 renovation rate (0.5 percent). The need to accelerate renovations is reinforced by government studies suggesting that fully renovating buildings would lower heating consumption by up to 70 percent and electricity consumption by up to 20 percent (MEAC, 2020). In parallel, the effective price charged per ton of CO2 for residential buildings is comparatively low and could be complemented by a carbon pricing scheme.

Residential Emissions: Prices and Tax Coverage
(LHS: EUR per tonne CO2 equivalent; RHS: Percent)



Sources: OECD and IMF staff calculations.

E. Exploring the Costs and Benefits of Adopting a Carbon Tax in Non-ETS Sectors

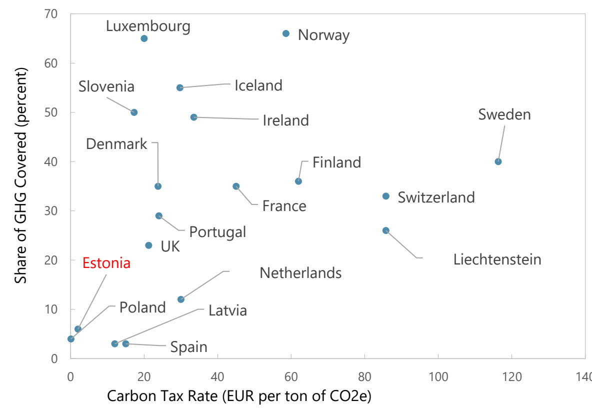
19. Adopting a carbon pricing strategy for sectors not covered by the EU ETS system would complement existing mitigation policies. Several EU countries have adopted carbon

[17] ESCOs are integrated companies of energy engineers and experts that provide energy saving solutions.

[18] 18 The public sector has targeted renovating 3 percent of central government building stock per year, as required by the EU Energy Efficiency, finance by the sale of CO2 allowances (MEAC, 2017).

taxation to complement their environmental regulations, and the EU emissions trading systems (ETS). However, the extent of such taxations varies in terms of the rate and the coverage of greenhouse gases.[19] Estonia carbon tax (EUR 2 per ton of eCO2) applies to all CO2 emissions from thermal energy producers except biofuel emissions and has a comparatively lower rate and coverage among EU countries. Some EU countries (e.g., Austria) are considering the introduction of carbon pricing covering non-EU ETS sectors. The overview of Estonia's challenges in further reducing emissions reveals room to further incentivize energy efficiency and a shift to greener sources of energy in the transport and building sectors. In line with some EU countries (e.g., Denmark, Finland), Estonia could consider introducing a national carbon pricing scheme in sectors not covered by the EU ETS.

Carbon Tax in Europe, As of April 1, 2021



Source: The World Bank Carbon Pricing Dashboard.

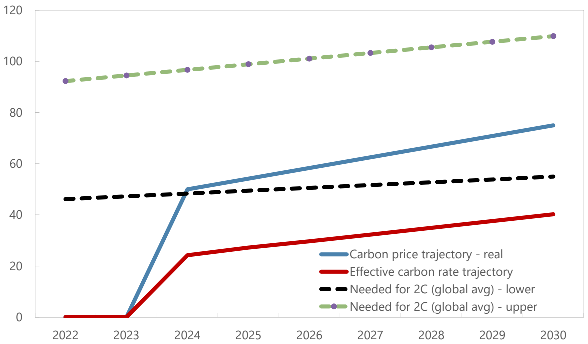
20. Carbon pricing entails trade-offs in terms of energy security, access to energy, and green transition. In the near term, a carbon pricing could exacerbate the high and volatile energy prices environment created by supply bottlenecks and the war in Ukraine. As pressure on energy prices recedes, adopting a national carbon pricing—the most efficient mechanism to reduce emissions—could be considered to further lower the climate impact of high-emitting non-ETS sectors. Precisely, a carbon pricing scheme should be part of broader climate mitigation strategy supported by sectoral policies to effectively achieve climate goals, while protecting low-income households and micro companies.

21. A gradual phase-in of a $75 per ton carbon tax from 2024 would help reduce the efforts needed to reach Estonia's NDC, while generating co-benefits. We analyze the effects of a carbon price applied to non-ETF sectors within the WB-IMF carbon pricing assessment tool (CPAT) framework, while assuming other policies including the EU ETS remain in place. For illustration purpose, we consider a gradual carbon tax phase-in of $75 per ton of CO2 equivalent, consistent with the recommended level by the High-Level Commission on Carbon Prices (Stern-Stiglitz 2017). Such carbon tax, if globally applied would maintain the global average temperature increase below 2°C (relative to pre-industrial levels). Gradually introducing such carbon tax in Estonia from 2024, was found to reduce by about 18 percent the gap between the baseline GHG emissions in 2030 and Estonia's NDC. Furthermore, the net welfare effect is expected to be positive, with climate benefits and transport and air pollution co-benefits outweighing the efficiency costs from introducing a new tax over the medium to long-term.

[19] 19 As of April 2021, Carbon taxes ranged from less than €1 per metric ton of carbon emissions in Poland and Ukraine to more than €100 in Sweden.

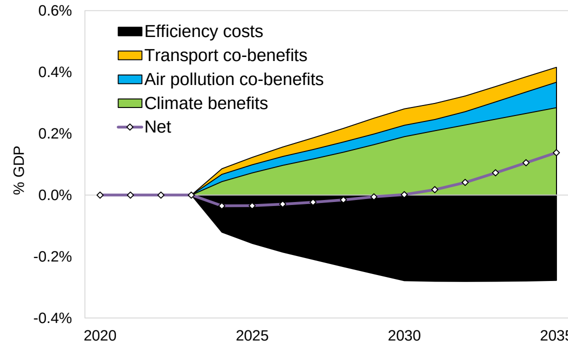
Figure 8. Illustrative Carbon Tax Trajectory and Related Co-Benefits

Estonia: Carbon Price Trajectory, 2023-2030
(US$ per tCO2e, 2019-2030)



Sources: IMF staff calculations; and CPAT.
Notes: Effective carbon rate adjusts for coverage.

Welfare Benefits for US$75 Carbon Tax per tCO2e by 2030
(Percent of GDP)

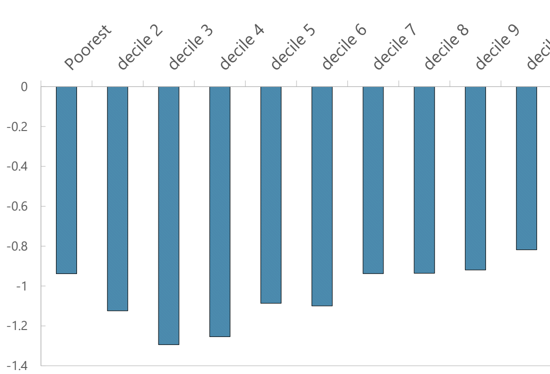


Sources: IMF staff calculations based on the Carbon Pricing Assessment Tool.

22. Fiscal revenue from carbon taxation could be channeled to mitigate distributional impacts. A carbon tax would have a relatively higher impact on the energy consumption for the low-income households given the larger share of inelastic energy demand in their expenditure baskets (e.g., for heating or transport). The disproportionately burden of climate mitigation on vulnerable groups could be mitigated through additional specific measures such as targeted transfers financed though carbon tax revenue.

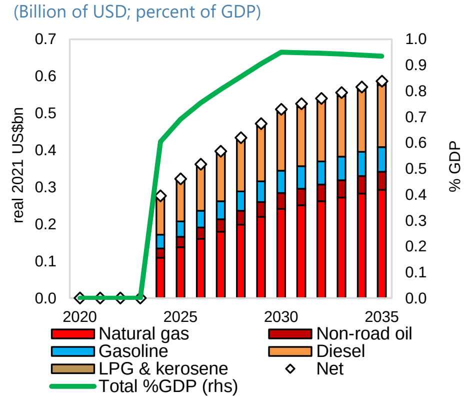
Figure 9. Distributional Effects of Carbon Taxation and Revenue, 2024–2035

Estonia: Relative Mean Consumption Effect of a $75 Carbon Tax per tCO2e in 2030
(Percent of total consumption)



Sources: Carbon Pricing Assessment Tool; IMF staff calculations
Note: The chart shows the fall in household consumption across income deciles from the linear phase-in of a $75 carbon tax on non-ETS emissions over 2024-2030.

Fiscal Revenues from Gradual Phase-in of a $75 Carbon Tax, by fuel and total
(Billion of USD; percent of GDP)

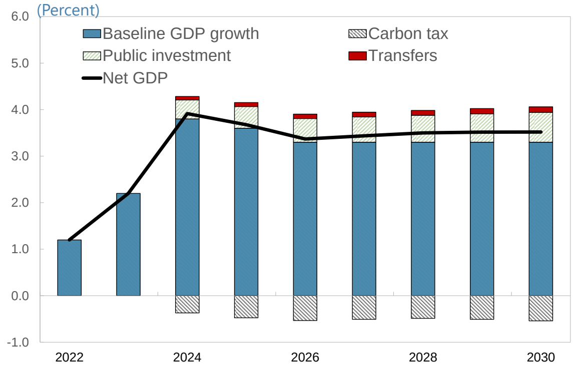


Sources: IMF staff calculations; CPAT tool.

23. Recycling carbon tax revenue into transfers and investments, would also promote higher and more inclusive growth. In addition to be channeled towards mitigating distributional impacts, revenue from carbon tax could also be recycled into investment, including to support the transition to renewable energy and greater efficiency. Simulations show that allocating a higher share of the recycled revenue to investments would generate higher and more inclusive growth than otherwise (Figure 10).

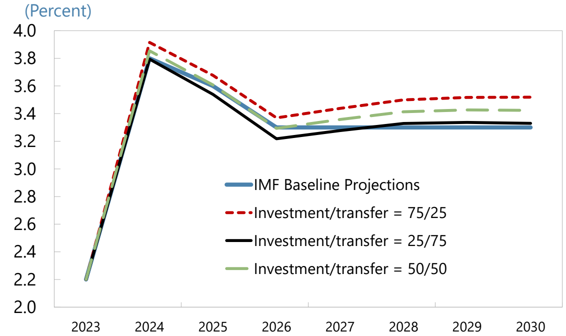
Figure 10. Growth Impacts of Carbon Taxation, 2023–2030

Estonia: GDP Impacts of a Gradual Phase-In of a US$75 Carbon Tax per tCO2e by 2030
(Percent)



Sources: IMF staff calculations based on the Carbon Pricing Assessment Tool (CPAT)
Notes: The carbon tax is gradually phased in from $50 to $75 carbon tax on non-ETS emissions over 2024-2030; Also, 75 and 25 percent of the carbon tax revenue levied is recycled into investment and tranfers, respectively. The growth impacts are based investment and transfer multipliers of 0.9 and 0.5, respectively.

Estonia: Growth Impacts of a $75 per tCO2e by 2030 for Various Revenue Recycling Investment/Transfer Proportions
(Percent)



Sources: IMF staff calculations based on the Carbon Pricing Assessment Tool.
Note: The baseline projections are from the 2022 AIV Staff Report.

F. Conclusion and Policy Recommendations

24. The war in Ukraine calls for accelerating the green transition. As of 2020, GHG emissions in Estonia were reduced by 72 percent compared to 1990 levels, mostly owing to the restructuring oil-share sector. Furthermore, about 32 percent of Estonia's energy use was derived from renewables (EC, 2022). Nevertheless, the war in Ukraine, has strengthened the case for accelerating the green transition. The oil-shale restructuring should continue despite the short-term trade-off between energy security and climate policy. Replacing oil shale in electricity production with low- and zero-carbon electricity sources (e.g., wind power, use of biomass) will also help achieve the GHG gas mitigation objectives. Achieving climate objectives would require accelerating the implementation of Estonia's comprehensive climate policies in line with the EU REPowerEU plan, especially in the transport and building sectors, where there is room to further incentivize efficiency.

- **Policies should further incentivize energy efficiency and sustainability in the transport sector,** including by promoting a greater vehicle efficiency, low-carbon transport, while also investing in the expansion and electrification of public transport. Existing policies and regulations could be complemented by a broader environmental taxation, beyond excise duties, to further incentivize efficiency and the renewal of the road vehicle stock.

- **Renovations to improve energy efficiency in the building sector should be further incentivized.** Reducing buildings' energy demand will require accelerating renovations to increase energy efficiency, which should also be supported by an adequate capacity of the market to provide the requisite services.

25. A comprehensive and predictable carbon pricing strategy remains critical to achieve the emissions targets. Calculations based on the IMF-WB CPAT tool demonstrate that the adoption carbon pricing in the building and transport sectors—after high energy prices abate—would help achieve mitigation goals while also generating a net positive welfare effect. Furthermore, the revenue generated by such reforms could be recycled into targeted transfers to alleviate distributional effects and into green investments to further accelerate the green transition.

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