LUXEMBOURG

SELECTED ISSUES

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LUXEMBOURG

SELECTED ISSUES

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ANNEXES

AUTOMATIC WAGE INDEXATION IN LUXEMBOURG: LIMITATIONS AND OPTIONS FOR REFORMS

Automatic wage indexation is a distinctive feature of Luxembourg's labor market institutions. It reflects national consensus, and, during the great moderation, has, overall, not posed major challenges. However, the resurgence of high inflation has called into question the appropriateness of this scheme, leading to the postponement of its application in 2022. This note summarizes the recent literature on the effects of automatic indexation of wages on the economy, including specifically in Luxembourg. It discusses potential pitfalls of the current system and explores some policy options to tackle them and make the system more resilient.
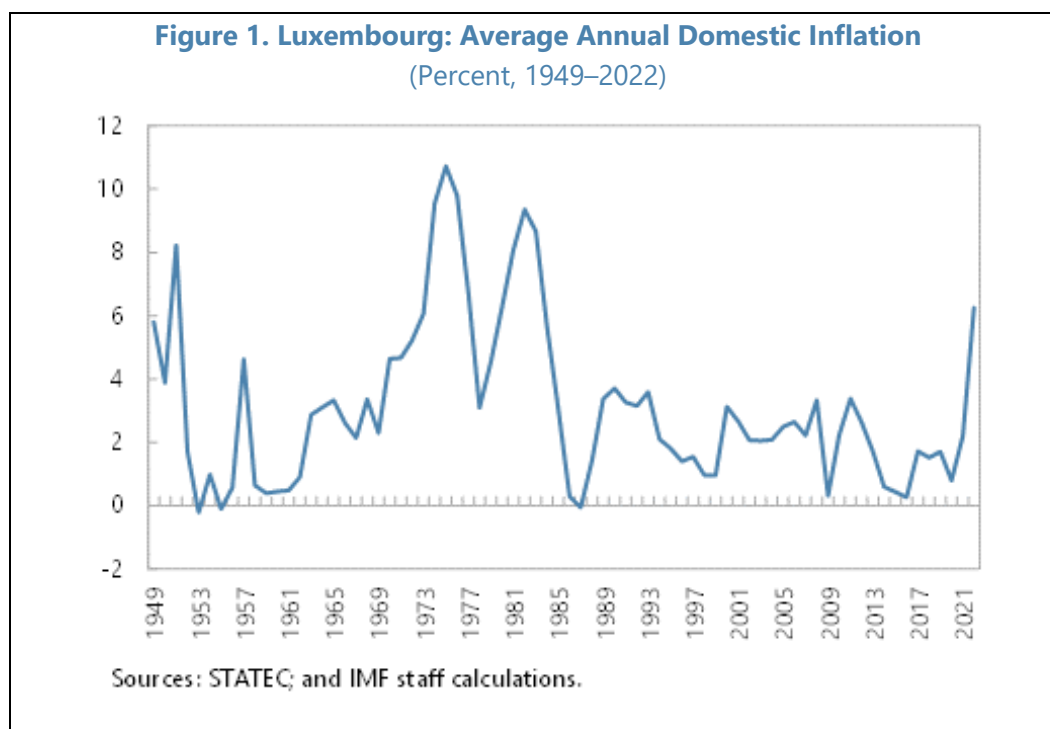
A. Introduction

1.   **While automatic wage indexation (AWI) has not posed major challenges during the Great Moderation, it has been a recurrent topic of debate in Luxembourg and the subject of multiple modulations.** Proponents of the system argue that indexation is a crucial labor market institution for the Luxembourgish economy, which helps maintain social peace. Together with the Tripartite system (allowing for meetings of Trade Unions, Employers' Associations, and the Government to reach consensus on important social and economic issues), these institutions are credited with the long-standing track record of avoiding social unrest in the country. At the same time, however, discussions around the indexation and its potential adverse effects tend to reemerge during periods of low economic growth or higher inflation. In the past, such discussions have sometimes led to modulations of the indexation system, including limiting the indexation to once per year or postponing the application of the index tranche.

2.   **Following the sudden increase in energy prices, notably after the war in Ukraine, inflation in advanced economies has reached levels not seen since the 1980s.** During the pandemic, governments in many advanced economies took unprecedented support measures to shore up the economy and to preserve incomes, as many sectors had to shut down due to lockdowns and movement restrictions. The ensuing supply chains difficulties led to widespread shortages of goods and a recrudescence of inflation. Following Russia's invasion of Ukraine in February 2022, gas and oil prices soared, and Europe was hit particularly hard. By mid-2022, headline inflation reached levels not seen in decades (Figure 1). This reignited the debate about potential wage-price spiral in a high inflation regime (e.g., Boissay et al., 2022, Alvarez et al., 2022).

3.   **This episode exposed the limitations of automatic wage indexation (AWI), especially in the context of supply shocks.** With inflation pressure heightening in 2022, applying the mechanism would have entailed several rounds of indexation in a short time span, potentially harming competitiveness. In response, the Luxembourgish authorities have undertaken several measures to mitigate the impact on the economy in a context of AWI. Initially, the government has postponed the index tranche while compensating workers for losses in purchasing power. Then, with mounting pressure to let the wage indexation mechanism operate normally, a Tripartite agreed in

September 2022 to tackle directly inflationary pressures through additional price controls and subsidies as well as temporary and partial compensatory measures to firms to compensate for the cost of the indexation.

Figure 1. Luxembourg: Average Annual Domestic Inflation
(Percent, 1949–2022)

Sources: STATEC; and IMF staff calculations.

4.   Against this background, the note analyzes potential drawbacks of Luxembourg's AWI and proposes a few avenues for reform. The note discusses conjunctural concerns, drawing on the extensive literature about the cyclical properties of AWI schemes and the recent decisions taken by the Government to mitigate wage-price spiral and competitiveness risks by transferring some of the cost to public finances (e.g., introducing price caps and partially covering for the cost impact of indexation on firms). Structural issues with AWI are explored in the context of long-term productivity and real wage trends at the sectoral level. Taking stock of the shortcomings of AWI, the analysis proposes three avenues for reform to enhance its socio-economic outcomes and the resilience of the country, especially in the context of supply shocks. First, changing the inflation benchmark from headline to core inflation, notably excluding volatile components such as energy prices. Second, introducing progressive considerations in the functioning of AWI. Third, adopting a rules-based suspension of the indexation, to replace the ad-hoc suspensions used extensively in the last couple of decades.

B.   Background and Cross-country Comparison

Luxembourg's Automatic Wage Indexation System

5.   Automatic wage indexation, also known as "Den Index," is a long-standing labor market institution in Luxembourg. First introduced for some categories of workers in the 1920s,

AWI was expanded, and its application made universal, in 1975. Since then, the system has remained in place, and it has become a cornerstone of the labor market institutions in the country. Similar systems used to be in place in many European countries, especially during the 1980s, but have since then been either removed or reformed.

6.   **The system is simple, transparent, and based on the national CPI (NICP).** It prescribes wages be increased by 2.5 percent in the month after the 6-month moving average of the price index exceeds by 2.5 percent the threshold (*cote d'échéance)*. Two indexes are used to keep track of the triggering of indexations and of the evolution of salaries. These are known as *cote d'échéance* and *cote d'application*. The former determines when the inflation benchmark is exceeded and an index tranche is due, while the latter documents when the tranche is applied and wages adjusted.[1] Compared to the harmonized index of consumer prices (HICP), the NICP notably downweighs transportation as well as alcoholic beverages and tobacco because it focuses exclusively on residents' consumption basket.[2]

7.   **Automatic indexation is far reaching and applies to a wide range of payments.** Automatic indexation applies to salaries and wages in both private and public sectors except for workers posted to Luxembourg. Pensions and minimum wages are automatically indexed as well, but also separately increased to keep track of real wages. Many social benefits are automatically indexed to inflation, including notably family benefits (*allocations familiales*). While the law does not prescribe indexation to apply to prices of goods or services, or to hourly rates of professionals and self-employed individuals, it is indeed the case that many of those are indexed.[3]
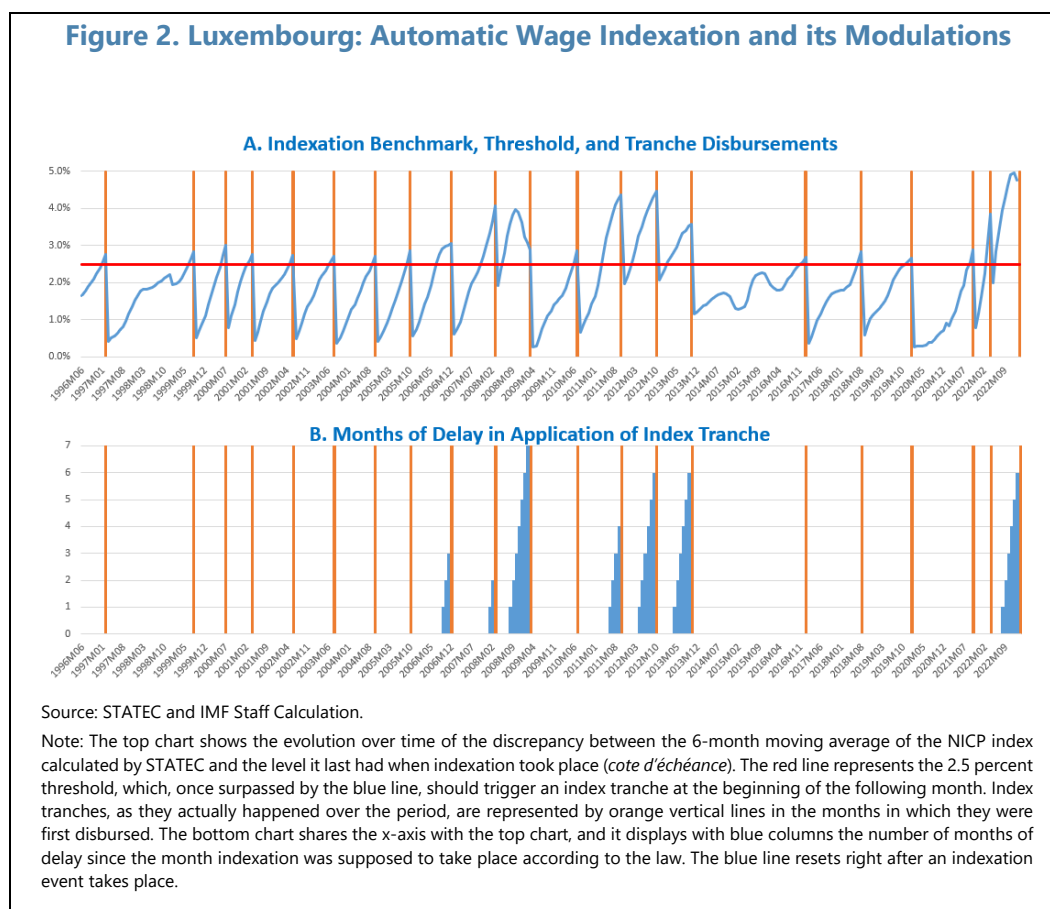
8.   **Modulations of indexation have been consistently applied during times of uncertainty or economic slowdowns, implying, *de facto*, a higher degree of flexibility.** Modulations of automatic indexation were first enacted during the 1980s, when some of the wage adjustments compensated less than fully for inflation or were altogether skipped. In the period running up to 2005, the indexation system was applied rather consistently, with tranches being paid in the month immediately after the benchmark index surpassed the threshold. However, possibly due to concerns with high oil prices (Allegrezza et al, 2010), indexation tranches were postponed in the period 2006-2009. This resulted in several months of delay between the triggering and the disbursement, effectively resulting in a pay cut, relative to the expected evolution of nominal wages. The system was again modulated in the period 2010-2013, when only one indexation per year was allowed, again resulting in several months of uncompensated delay. Finally, most recently, the Tripartite agreement of March 2022 included a provision to postpone the second indexation tranche for 2022

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[1] This formulation allows flexibility in application. For example, it could be envisaged that an index tranche adjusts wages less than fully for the loss of purchasing power. In that case, the *cote d'application* would only be adjusted by the rate of salary increase, while the *cote d'échéance* signals when the next indexation would be due (i.e., when the cumulative inflation reaches 2.5 percent since the last trigger). In addition, the two separate indices can keep track of the separate evolution of triggers and actual salary increases when modulations of the index are enacted.

[2] The average NICP inflation rate has been substantially lower than the HICP inflation rate since the early-2000s. Both indexes are compiled by STATEC.

[3] An example is the rates of medical consultations, which are indexed automatically.

to April 2023. Figure 2 shows the modulations by portraying the benchmarks and the number of months of delay in disbursement of tranches.
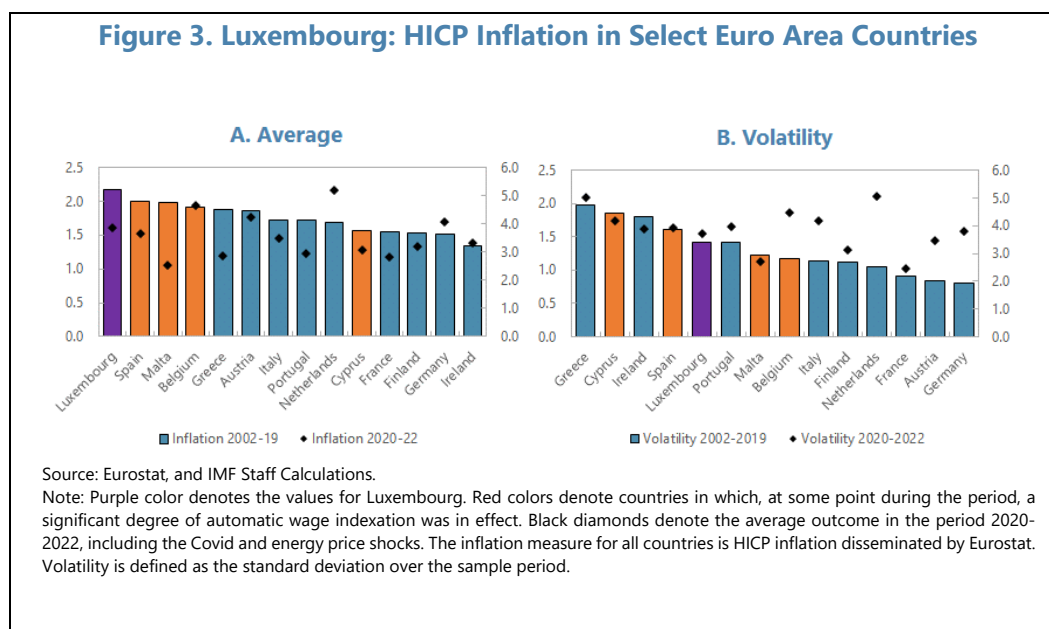
Figure 2. Luxembourg: Automatic Wage Indexation and its Modulations

A. Indexation Benchmark, Threshold, and Tranche Disbursements

B. Months of Delay in Application of Index Tranche

Source: STATEC and IMF Staff Calculation.

Note: The top chart shows the evolution over time of the discrepancy between the 6-month moving average of the NICP index calculated by STATEC and the level it last had when indexation took place (*cote d'échéance*). The red line represents the 2.5 percent threshold, which, once surpassed by the blue line, should trigger an index tranche at the beginning of the following month. Index tranches, as they actually happened over the period, are represented by orange vertical lines in the months in which they were first disbursed. The bottom chart shares the x-axis with the top chart, and it displays with blue columns the number of months of delay since the month indexation was supposed to take place according to the law. The blue line resets right after an indexation event takes place.

Comparison to Euro Area Countries and Recent Trends

9.   Across euro area countries, indexation is most prevalent for pensions, while less common for private and public sector wages. Public pensions in the euro area are adjusted for inflation over time to preserve their purchasing power. In some countries, like Luxembourg, pensions are also additionally linked to changes in real wages. Focusing on wages in the public and private sector, only Luxembourg, Belgium, Cyprus, and Malta, have some form of automatic indexation. In Luxembourg and Belgium, the system awards a proportional increase in wages that fully compensates for inflation. In Cyprus, the wages are only automatically increased by 50% of the rate of inflation in any given year. Finally, in Malta the inflation adjustment is paid out as a fixed Euro amount for all workers, regardless of the income level. Indexation for minimum wages, either to price inflation or to evolutions in average wages (e.g., the Netherlands) is generally more common (see Checherita-Westphal, 2022, and ECB, 2021).

10.   In recent years, the proportion of employees covered by automatic indexation schemes in the euro area has fallen. This is the result of reforms undertaken in the aftermath of the global financial crisis (GFC). Other notable developments are towards the exclusion of volatile

components from the inflation benchmark, for instance, energy prices; and, towards the exclusion of backward-looking inflation benchmarks in favor of relatively more forward-looking ones.

Figure 3. Luxembourg: HICP Inflation in Select Euro Area Countries

A. Average

B. Volatility

Inflation 2002-19 ◆ Inflation 2020-22

Volatility 2002-2019 ◆ Volatility 2020-2022

Source: Eurostat, and IMF Staff Calculations.
Note: Purple color denotes the values for Luxembourg. Red colors denote countries in which, at some point during the period, a significant degree of automatic wage indexation was in effect. Black diamonds denote the average outcome in the period 2020-2022, including the Covid and energy price shocks. The inflation measure for all countries is HICP inflation disseminated by Eurostat. Volatility is defined as the standard deviation over the sample period.

11.   Despite the recent trends, significant heterogeneity regarding wage indexation remains across countries in the euro area. In some countries, including Germany, Ireland, and Portugal, indexation is not practiced. While some quantities, such as minimum wages can and are indeed revised frequently, this is not necessarily tied to inflation rates. In other countries, like Italy and Spain, indexation only plays a role in setting the starting point for wage negotiations, with some heterogeneity across sectors in the degree of stringency.[4] Finally, as discussed above, in Belgium, Luxembourg, Cyprus, and Malta there are provisions for automatically indexing wages and/or pensions to inflation/cost of living, albeit with some differences in application.

12.   Inflation level and volatility tend to be higher in countries that adopt some degree of automatic indexation across the euro area. Figure 3.A shows the average HICP inflation rate in select advanced euro area countries, while Figure 3.B ranks their inflation volatility. Considering the relatively deep recessions that involved Greece, Ireland, and Portugal during and after the GFC, these charts show that, over the two decades since the euro was rolled out, inflation and its volatility tended to be higher in countries with some degree of automatic wage indexation.[5] Clearly, this observation should be taken as merely suggestive of a correlation rather than of a causal link between indexation and inflation outcomes. However, as discussed in the next section, this evidence

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[4] According to ECB analyses, in 2008 about 68 percent of private sector employees used to be covered by an automatic wage indexation provision. In 2022, according to a survey of country teams in the European Department of the IMF, only 25 percent of employees in Spain are covered by bargaining processes in which inflation plays an explicit role for wage setting.

[5] The conclusion would remain broadly the same using the NICP instead of the HICP index for Luxembourg. Specifically, the average NICP inflation was 1.9 percent and its volatility about 1.0 percent during 2002-2019, compared with 3.2 percent inflation with 2.5 percent volatility during 2020-2022.

is consistent with the main results of the theoretical literature on the effect of indexation on inflation.

C. Universal Automatic Indexation and its Potential Drawbacks

Wage Rigidity, Wage-price Spirals and Second-round Effects

13.   In Luxembourg, there is evidence of a high degree of downward real wage rigidity as opposed to the more common across countries downward nominal wage rigidity. Based on microdata on wage changes in Luxembourg for the period 2001-2006, Lunnemann and Wintr (2009) found that in those years in which an indexation tranche took place, there is a spike of wage changes exactly at 2.5 percent, while in those years in which no indexation tranche happened, the spike is at 0 percent. This translates to an almost full degree of downward real wage rigidity for Luxembourg, which could imply that firms are more likely to adjust labor inputs (headcount, hours worked) during downturns.
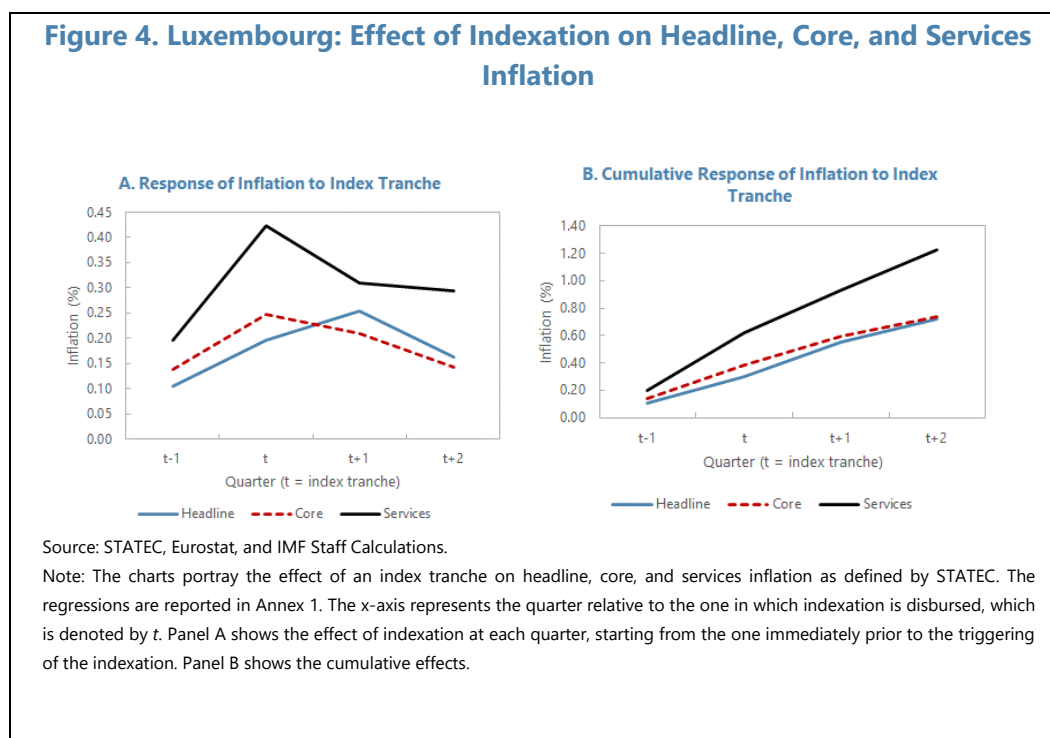
14.   As shown in the literature, the effect of indexation is to amplify the volatility of supply-side shocks, for which inflation and real wages should respond in opposite ways. In New-Keynesian models, indexation to current or past inflation generates a difference in the way the economy reacts to a given shock.[6] Specifically, if the shock is on the demand side, such that real wages and inflation endogenously react by moving in the same direction, then indexation can lower the volatility of inflation in response to the shock. Conversely, if the shock is on the supply side, for example, of the kind observed during the 2022 energy crisis, then, in equilibrium, real wages and inflation react in opposite ways and indexation generally increases the volatility of the economy following the shock (see for example the discussion in Banque Nationale de Belgique,2012).

15.   The impact of wage indexation on inflation is found to be moderate in Luxembourg. Considering both lead and lagged effects of an indexation event, our estimates suggest that each tranche would generate an additional 0.7 percentage points in headline inflation[7] (1.2 percentage point for inflation in services, see Figure 4 and Annex 1 for more details). Put differently, if price signals were allowed to fully operate in 2022-23 leading to 4-5 indexation tranches, the additional impact on inflation ranges between 2.8-3.5 percentage points. It is worth noting that the impact

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[6] New Keynesian, dynamic general equilibrium models have been used extensively since the 1990s to capture relationships between aggregate economic variables in a manner that is consistent with the Lucas critique. The key innovation of these models over the earlier real business cycle ones is to introduce some degree of price stickiness that generates a role for monetary policy and leads to the emergence of a Phillips curve, that is, a tradeoff between output and unemployment in the short run. In these models, indexation can be added as a component of wage-setting behavior for optimizing workers and firms, often in conjunction with a formal central bank inflation target. For a discussion focused on indexation, see, among others, Banque Nationale de Belgique (2012).

[7] STATEC undertook an insightful analysis of the second-round effects of indexation events on inflation (STATEC, 2017) and found a much smaller impact of 0.2 percentage point for each indexation tranche. The analysis explored the effect of indexation on inflation using either a so-called "bottom-up" approach, where monthly price indices for individual components of the consumption basket were regressed on an indexation dummy (and its lags), and then aggregated to a NICP-wide effect, or a "top-down" approach consisting of a single equation model for NICP inflation with the same indexation dummy and several control variables.

could be larger in a high inflation environment and that the pass-through of wage increases to prices is likely to be positively correlated with the increase in personnel costs for firms.


Figure 4. Luxembourg: Effect of Indexation on Headline, Core, and Services Inflation

Source: STATEC, Eurostat, and IMF Staff Calculations.

Note: The charts portray the effect of an index tranche on headline, core, and services inflation as defined by STATEC. The regressions are reported in Annex 1. The x-axis represents the quarter relative to the one in which indexation is disbursed, which is denoted by *t*. Panel A shows the effect of indexation at each quarter, starting from the one immediately prior to the triggering of the indexation. Panel B shows the cumulative effects.

Distributional Impact

16.   While a key aim of indexation is to preserve purchasing power, this is not necessarily the case in practice for all households. Supply shocks of the kind observed in the aftermath of the war in Ukraine are generally concentrated on a few internationally traded commodities, such as oil, gas, or food. Given that the consumption basket of households varies along the income distribution (see Figure 5.A), the impact of the shock will also be heterogeneous across the income distribution. For the specific energy price shock of 2022, despite the price control measures taken by the March 2022 Tripartite, households in lower income quintiles have been disproportionately impacted (see Figure 5.B).

17.   From a consumption equity perspective, high income individuals and households are likely to benefit relatively more from indexation than middle-class earners. Given their tendency to have higher propensity to save (that is, lower marginal propensity to consume), higher income households are compensated more for the loss of purchasing power than lower and middle-income households. In addition, the personal income tax rises relatively quickly to top marginal tax rates. Accordingly, for most households in the middle class, the marginal tax rate is approximately the same as that applying to those at the very top of the income distribution (Table 1). In turn, this may, after a few rounds of indexation, put further pressure on real estate and other assets.

Table 1. Luxembourg: Before and After Tax Salary Increase Following an Indexation Event
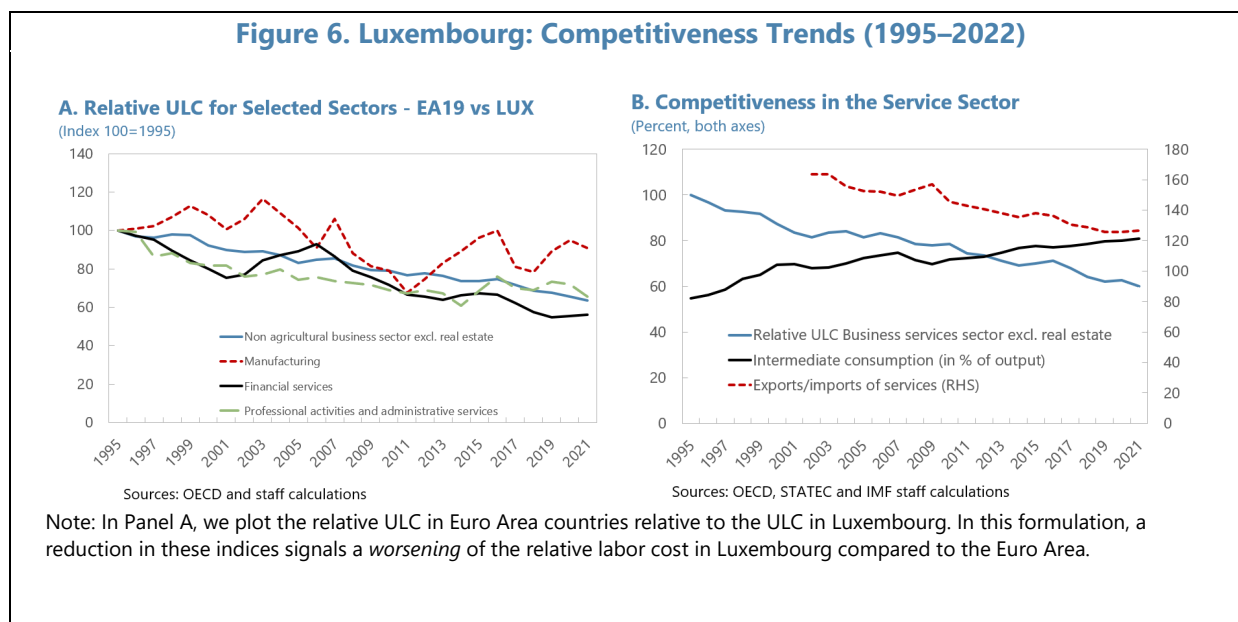
Income	Marginal tax rate	Gross index	Net index	Effective index
€ 20,000.00	12%	€ 500.00	€ 440.00	2.20%
€ 38,700.00	32%	€ 967.50	€ 657.90	1.70%
€ 58,000.00	39%	€ 1,450.00	€ 884.50	1.53%
€ 116,000.00	40%	€ 2,900.00	€ 1,740.00	1.50%
€ 155,000.00	41%	€ 3,875.00	€ 2,286.25	1.48%
€ 205,000.00	42%	€ 5,125.00	€ 2,972.50	1.45%

Figure 5. Luxembourg: Inflation and Income Distribution

Source: STATEC, Eurostat, and IMF Staff Calculations.
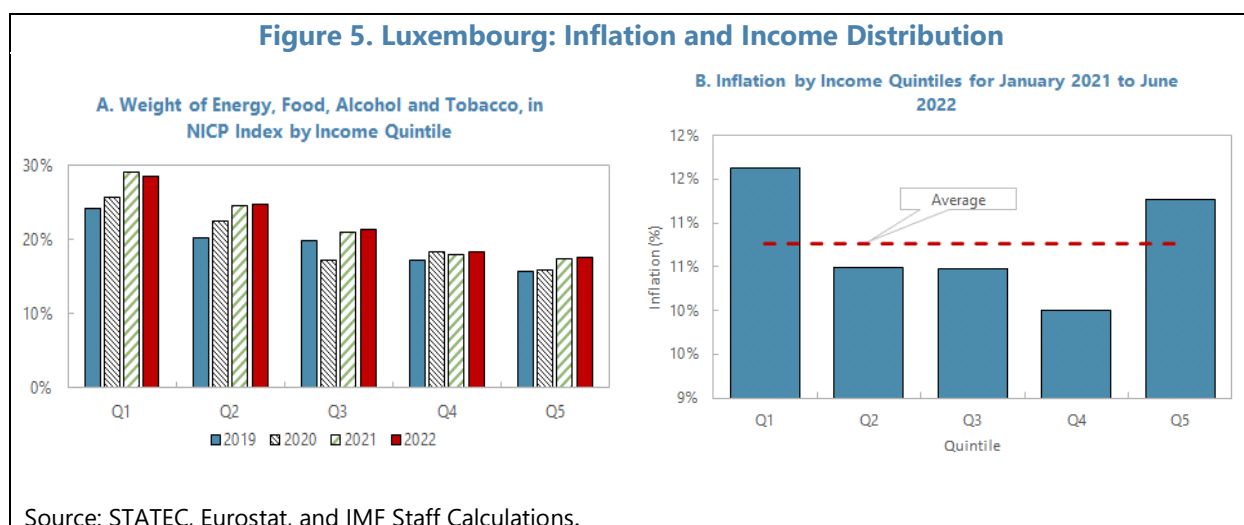
Structural Impacts

18.   Labor productivity, albeit at high levels compared to other countries, has been stagnating. Luxembourg enjoys very high levels of labor productivity in some sectors of the economy, in which it compares very favorably with neighboring countries. These high levels of productivity are ultimately the reason for the high income that most of the population enjoys. However, since the global financial crisis (GFC), apparent labor productivity has stagnated relative to main trading partners, including France, Germany, and the United States.

19.   Relative unit labor costs in Luxembourg have worsened over the last few decades, especially in the services sector. As shown in Figure 6.A, relative ULCs compared to the euro area have worsened over time in the last three decades, particularly in financial services and in professional activities, though the labor force has continued to grow consistently. As can be seen on the in Figure 6.B, these trends were also accompanied by an increase in the share of intermediate consumption of gross output. This development could signal a deeper integration of services activities in global value chains and possibly outsourcing by some firms.

**Figure 6. Luxembourg: Competitiveness Trends (1995–2022)**

A. Relative ULC for Selected Sectors - EA19 vs LUX
(Index 100=1995)

- Non agricultural business sector excl. real estate
- Manufacturing
- Financial services
- Professional activities and administrative services

Sources: OECD and staff calculations

B. Competitiveness in the Service Sector
(Percent, both axes)

- Relative ULC Business services sector excl. real estate
- Intermediate consumption (in % of output)
- Exports/imports of services (RHS)

Sources: OECD, STATEC and IMF staff calculations

Note: In Panel A, we plot the relative ULC in Euro Area countries relative to the ULC in Luxembourg. In this formulation, a reduction in these indices signals a *worsening* of the relative labor cost in Luxembourg compared to the Euro Area.

20. **Universal AWI could lead to suboptimal outcomes in terms of employment and investment and could have allocative consequences.** Over prolonged periods, the economy naturally reallocates resources as new business lines become more profitable, and others recede following changes in technology or in the international competitive landscape. A key concern with a universal indexation system, and particularly so in the private sector, is that by forcing the same nominal wage increase to all workers in the economy, regardless of the cyclical or secular trends in each sector, AWI may lead to increased pressures in some key sectors. In Figure 7, we calculate the discrepancy between the annualized rate of growth of compensation per hour worked and value added per hour worked in a few key sectors of Luxembourg's economy. On aggregate, real hourly compensation broadly matched productivity during 1995-2021, but over the past decade (2010-2021), compensation outpaced productivity growth. This trend was even more pronounced for the services sector, while in a few sectors the reverse could be observed–notably manufacturing, construction, and transportation. While this evidence should not be interpreted as a causal relationship between indexation and the compensation-productivity divergence, it could indicate a differential risk that a universal indexation system poses to different sector of the economy.[8]

21. **Firms, across sectors, react to indexation by adjusting along other margins.** Using data on total employee compensation, it is possible to calculate the decomposition of total change due to base pay change, variable pay change, employment change, and a component that captures the effect of indexation. The latter is the same across all sectors. In Figure 8, we plot the simple correlation between the indexation contribution and the other components of total employee compensation, calculated in the time series using annual data for 2010-2021. We can see how, in general, indexation events tend to be associated to lower employment or base/variable pay growth,

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[8] For example, the survey analyzed in Matha (2016) shows that for many firms in Luxembourg, during and after the GFC, labor costs represented a relevant issue for a sizable share of firms that experienced a negative shock, and firms adjusted their labor costs mostly by reducing employment, but also by cutting flexible wage components.

but also that some sectors react in different ways. For example, manufacturing, construction, and administrative and support services tend to exhibit slower employment growth, while some domestically oriented sectors, such as retail trade, may even see gains. This evidence could be relevant in the current environment, given clear signs of slowdown in the construction sector and several index tranches expected over the period 2022-2024 which could raise base pay by up to 12.5 percent, if left unmodulated.

Figure 7. Luxembourg: Difference Between Real Hourly Compensation Growth and Productivity Growth
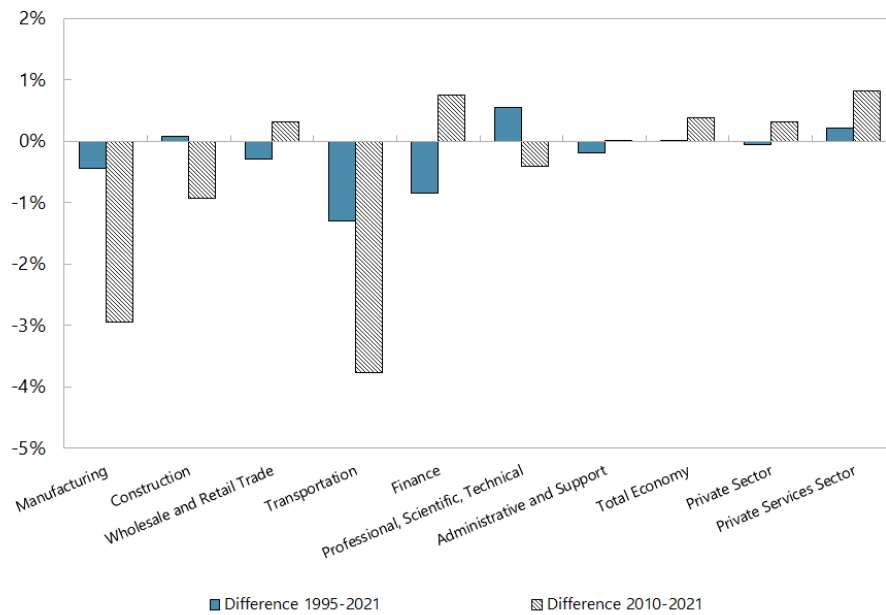
Sources: STATEC; and IMF staff calculations.

Figure 8. Luxembourg: Correlation between Wage Change due to Indexation and Other Drivers of Total Compensation Change
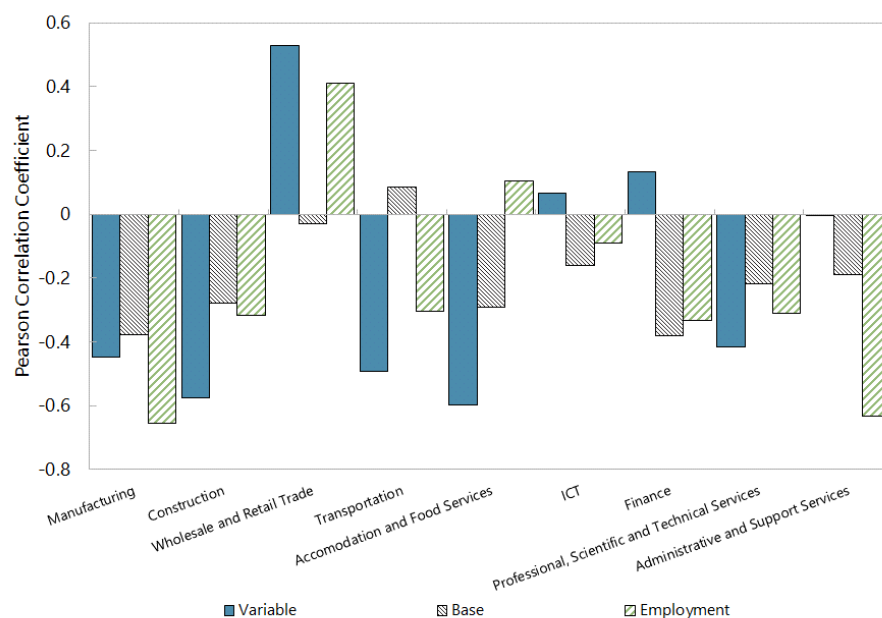
Sources: STATEC; and IMF staff calculations.

The Costs of a Flexible Approach

22. **Modulations of AWI in Luxembourg lower the magnitude of second-round effects and the likelihood of a wage-price spiral.** As discussed in the previous section, AWI was applied with significant flexibility in the last two decades. If the system had been allowed to operate fully automatically, it would have possibly raised firms' inflation expectations and thus incentive to raise prices. From the point of view of a statistical assessment, then, a higher second-round effect would have been observed. In addition, as seen in the previous section, the endogenous response of firms may also lead to muted outcomes in terms of headline inflation, but not necessarily to no impacts on employment outcomes.

23. **However, the lack of rules about the suspension of indexation could increase uncertainty.** During supply-side shocks, there is a high political pressure to neutralize the adverse effects of wage indexation (e.g., on inflation or firms' competitiveness), either by modulating the scheme or by compensating for its effects though fiscal measures. While authorities in Luxembourg enjoy a high level of credibility, notwithstanding coordination with social partners, the mere fact that

ad-hoc action has to be taken during crises is a source of uncertainty which makes it harder for businesses and households to plan.[9]

24.   Luxembourg's practical implementation of the automatic wage indexation hinges on the availability of political will and could erode the country's fiscal space. In addition to the uncertainty associated with the modulation of the system, there has been a clear trend that more costly fiscal measures have been enacted to compensate households and firms for the more recent modulations of the index. Given the large cost of aging population going forward, such development poses fiscal risk which should not be underestimated.

D.   Directions for Reform

A Measure of Core Inflation as a More Resilient Benchmark

25.   Most automatic indexation systems rely on less volatile benchmark than headline inflation. As discussed in the previous sections, backward-looking automatic indexation can increase the volatility of inflation, especially in the aftermath of supply shocks. To reduce the volatility of inflation, many systems currently in place exclude volatile components from the inflation benchmark used for indexation–both in the automatic system, such as in Belgium, and in the bargaining system, such as in Italy. In the former case, Belgium relies on the so-called Health Index, a measure of inflation that excludes alcohol, tobacco, and energy. In the latter case, Italy uses an inflation projection for up to 3 years which excludes energy products as a benchmark for wage negotiations, which occur periodically between employers, unions, and the Government at the time of renegotiation of national contracts. The main purpose of these measures is to reduce the volatility of the inflation benchmark, or to make it forward-looking instead of backward looking.

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[9] For example, since February 2022, three Tripartite meetings have been held. The main theme was how to cope with the energy price shock in a context of automatic indexation which could generate many rounds of indexation in quick succession. The upcoming election cycle in the second half of 2023 further increased the pressure to enact swift measures to neutralize these risks (mostly untargeted price caps/controls for energy goods, a postponement of the second round of indexation for 2022 to April 2023, and a subsidy to pay for the cost of a second indexation for 2023). While the energy price caps are projected to contain the inflation rate for 2023 and 2024, the additional fiscal stimulus is largely procyclical and could end up entrenching core inflation.

Figure 9. Luxembourg: NICP Inflation and Core Inflation in Luxembourg (2002–2023)
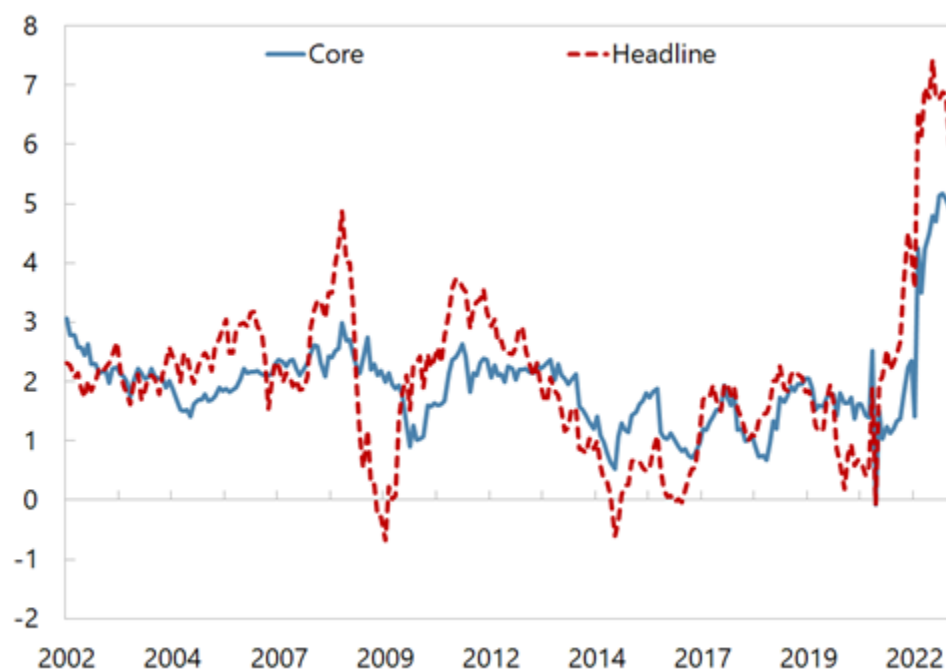
Sources: STATEC; and IMF staff calculations.

26.   Luxembourg could adopt a less volatile inflation measure as benchmark for automatic indexation (see for example Banque Centrale du Luxembourg, 2010). For illustrative purposes, Figure 9 portrays the national definitions of headline and core inflation over the period 2002-2023. Long-term averages of headline and core inflation is broadly the same, while volatility of core inflation is much lower (roughly half that of headline inflation).[10] The higher volatility of headline inflation is explained primarily by the very high volatility of energy components, which mostly follow developments in international commodities markets. Therefore, adopting core inflation as a benchmark suggests that, in the long run, the same number of indexation tranches would be paid out, albeit with a more consistent timing given the much smaller swings in core compared to headline. Clearly, establishing a suitable benchmark has distributional ramifications that need to be carefully balanced. In general, excluding more volatile components, perhaps also food items or other commodities, could further increase the benefit in terms of predictability and stabilization, but would come at the cost of potentially worse distributional effects that need to be tackled using separate policy instruments (see below).

27.   Indexing to core inflation would reduce the likelihood of an additional indexation taking place following an energy price shock, with correspondingly lower second-round

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[10] Headline inflation averaged 2.1 percent with a standard deviation of 1.4, while core inflation averaged 1.9 percent with a standard deviation of 0.8 during 2002M1-2023M1. If the Covid-19 shock and the energy shocks are excluded, that is, between 2002M1-2019M12, headline and core inflation averages are closer about 1.9 and 1.8 percent, respectively, with core's standard deviation half that of headline inflation (0.5 versus 1.0).

effects. We simulated a small open economy dynamic stochastic general equilibrium (DSGE) model, based on Gali and Monacelli (2016), with downward nominal wage rigidity on top of wage formation as in Calvo (1983).[11] The shock is a persistent increase in the price of the imported goods, which are interpreted as imported energy goods that are used to produce the domestic good. Accordingly, the model can distinguish between a core measure of inflation, which captures the domestic price of domestically produced goods, and headline inflation, which captures the domestic price of the composite final good which is both consumed by households and exported. We model the indexation similarly to what is done in practice in Luxembourg, namely, all wages are increased by 2.5 percent in nominal terms as soon as the lagged cumulative inflation exceeds 2.5 percent since the last indexation event took place. The only difference between the two cases is the choice of the benchmark index. In the main exercise, we illustrate that, for the same shock size, indexing to core inflation does not lead to an index tranche, while indexing to headline does. As it can be seen in Figure 10 below, in the short run, both core and headline inflation end up being much lower because of the missing index tranche. However, in the long run, the effect is much smaller, and more in line with relatively small empirical estimates of STATEC (2017) for second round effects of indexation. Overall, these estimates suggest that, following a surprise supply shock, indexing to core inflation leads to a relatively lower probability of an index tranche taking place, with measurably smaller second round effects in the short run.

28.   **Distributional effects due to the exclusion of components that weigh heavily on cost of living of lower-income households could be compensated.** As the previous section has shown (Figure 5.A), the weight of food, energy, alcohol, and tobacco is significantly higher for lower income quintiles. In case of large supply shocks, changing the benchmark from headline to core inflation could have non negligible distributional effect, at least immediately after the shock—as the 2022 supply shocks have illustrated. Therefore, ad-hoc targeted and temporary support measures may have to be implemented to shelter poorer households from the increase in the cost of living. Importantly, however, the associated fiscal cost would be much lower than broad-based measures applied to mitigate the impact of AWI on competitiveness, as highlighted during the recent shock.

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[11] See Annex 2 for more details about the model.

Figure 10. Luxembourg: Cumulative Difference of IRFs in Inflation Response to an Energy Shock
(Headline vs. Core Indexing Rules; In percent of Steady State)
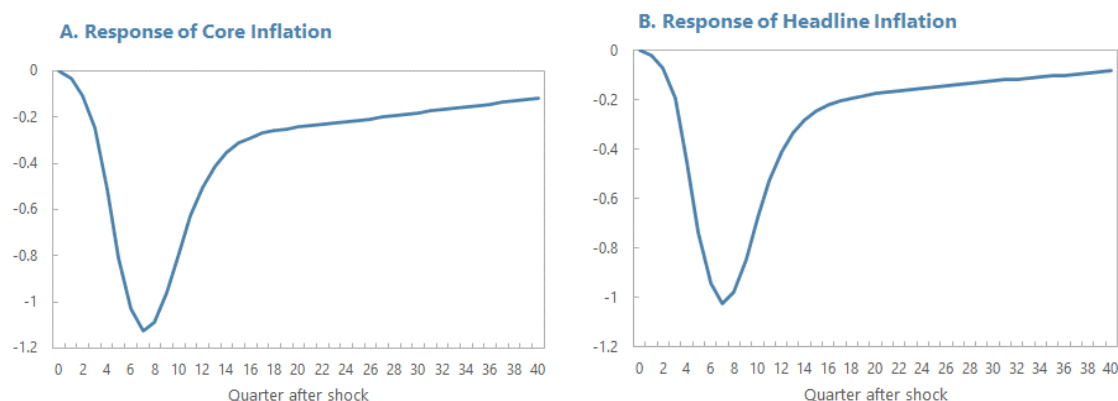
Source: IMF Staff Calculations.

Note: The charts depict the difference between the cumulative impulse response in 2 scenarios of both core (panel A) and headline (panel B) inflation to a 27 percent impact shock in the price of the imported energy good. The first scenario assumes an indexation to core inflation while the second refers to and indexation to headline inflation. The simulation is performed in perfect foresight back to the steady state, and the size of the shock is chosen to showcase a situation in which, for the same size of the shock, a rule that indexes to headline inflation leads to an index tranche taking place, while a rule that uses core inflation as benchmark does not lead to an index tranche taking place.
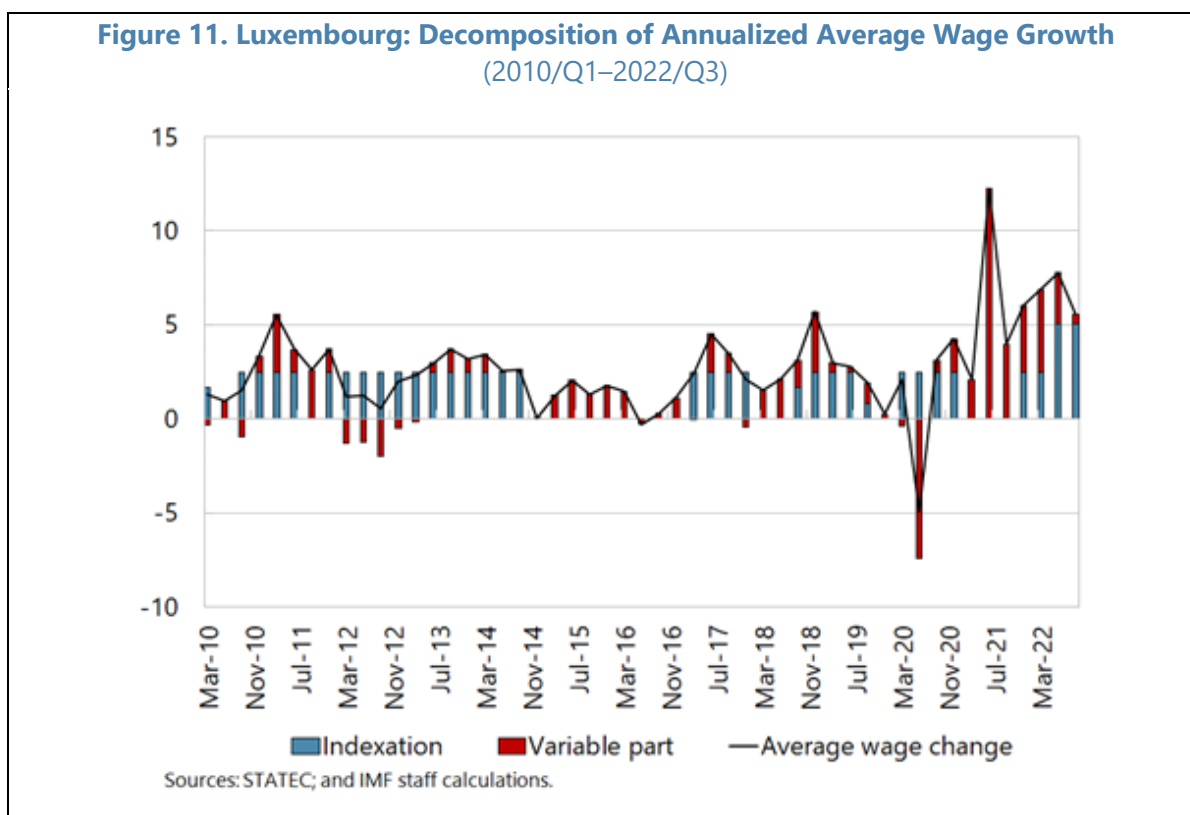
Introducing Progressivity of Wage Adjustments

29.   Introducing progressive considerations in the application of AWI would improve consumption equity. A practical way to implement a more progressive system would be to set a threshold above which the implied wage change less than fully matches inflation. For example, after setting a certain income threshold, the system may require all individuals below that level to receive a proportional compensation that fully matches the inflation rate (for instance, the 2.5 percent currently implemented at the triggering of the index tranche), while all individuals above the threshold would receive a wage increase equal to 2.5 percent of the threshold itself.[12] Accordingly, the system would be fully compensating individuals below the threshold and only partially compensating those above. Such a system would have some complexities to be dealt with, for example, whether such a threshold applies to individual wages, or to total household income, given that most households file taxes jointly. Additionally, the decision of where to set the threshold for the tapering of the indexation is inherently political and it will require adequate distributional analysis to better appraise the impact.

30.   While a concern with a progressive system is that this could lead to undue wage compression, it is important to recognize that indexation is but one of the drivers of wage

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[12] A similar system exists in Malta, where a cost-of-living allowance (COLA) is automatically implemented each year in the form of a fixed monetary benefit given in equal measure to all workers. The proposed system for Luxembourg would mix features of Malta's system with those of the current AWI system as it is currently implemented.

growth. In a progressive indexation system, a key concern is that the impact of wage costs will be different and potentially lead to a compression of the wage distribution. However, in Figure 11 we decompose the annualized growth rate of average wages in Luxembourg into the component that is due to indexation and a residual. The decomposition shows that the variable part of wage changes routinely occurs in addition to indexation, and, notably, can be both positive or negative. If AWI were to be reformed in a more progressive sense, this would not necessarily negate wage changes for those high-income earners who would see their automatic benefit reduced. However, it would possibly lead those individuals to bargain for higher wages with their employers, easing the cost of automatic indexation on firms.

Figure 11. Luxembourg: Decomposition of Annualized Average Wage Growth
(2010/Q1–2022/Q3)

Sources: STATEC; and IMF staff calculations.

A Rules-based and Sectoral Approach to Modulations

31.   Moving towards a rule-based suspension of indexation could reduce uncertainty. Authorities may consider implementing explicit quantitative criteria for the triggering the wage indexation. If the underlying concern that led to postponement or suspension of indexation is grounded on the risk of wage-price spirals, a system prescribing the maximum allowed number of indexations that take place in a certain period could be envisaged. Such a system would specify that, for example, only a certain number of indexation tranches can be triggered in a certain interval of time, with those in excess automatically postponed. If, instead, the concern is found to be mostly with the competitiveness of firms in Luxembourg compared to neighboring nations, then the system could include the tracking of quantitative measures of cost-competitiveness, which, when exceeded,

would automatically trigger a suspension and/or talks between unions and employers (e.g., as in Belgium).

32.   Given Luxembourg's diversified economy, some decentralization of wage-setting could be beneficial. A striking feature of Luxembourg's automatic indexation system, as discussed in previous sections, is its universal nature. When applied, it benefits all workers, pensioners, and recipients of public benefits that are also automatically adjusted for inflation. A reform that could be considered is to define suitable competitiveness benchmarks, measured for instance in neighboring countries and across several sectors of the economy, and to use those to continually evaluate whether Luxembourg is losing competitiveness. In case the benchmarks are crossed, automatic wage indexation would be suspended and instead a more decentralized bargaining would be triggered. This could have several benefits. For example, it would lessen competitiveness concerns at the national level, which often induce the suspension of the system for all, and it would give more leeway for unions and employers to agree on the most sustainable way to split the costs of shocks, which in turn could save jobs.

E.   Conclusions

33.   Automatic wage indexation is a distinctive feature of Luxembourg's labor market institutions, but recent events suggest that its resilience to shocks could be improved. Despite the support it enjoys, the system is routinely suspended during times of high inflation or economic slowdowns. This has happened a few times during the past two decades, and most recently in 2022, when the second index tranche was postponed to April 2023. Suspension of the system is often decided on competitiveness grounds (e.g., to avoid multiple rounds of potentially costly wage increases for Luxembourgish firms) or concerns about wage-price spirals. These political economy considerations have sometimes led to increased fiscal spending to mitigate the cost of indexation to firms, as observed the 2022 and 2023 Tripartite agreements. Finally, our analysis shows that suspension of the indexation may not only increase uncertainty, but also disproportionally hurt the most vulnerable parts of the population. For example, notwithstanding the compensatory measures implemented by the Government, the recent energy price shock affected disproportionally households and individuals in lower income quantiles, given the higher weight of these goods in their consumption basket.

34.   Possible reform options to strengthen the system include:

i)   *Indexing to core inflation rather than to headline*. Model-based analyses show that, in the face of a supply shock, changing the indexation rule to inflation excluding volatile components leads to a relatively lower probability of an indexation event taking place, with correspondingly lower second round effects and less volatility. At the same time, targeted compensatory measures can be envisaged to ensure that the most vulnerable are not disproportionally affected by the relatively less frequent indexations.

ii)   *Reforming the scheme to make it more progressive*. This could be achieved by tapering the wage increase or excluding higher quantiles of the income distribution from a proportional

adjustment of the wage, could not only improve consumption equity, but also reduce its cost impact for both the Government and for firms.

iii) *Greater decentralization of wage bargaining*, including by implementing explicit provisions to automatically suspend the indexation in some sectors exposed to heightened pressures could be a further avenue for reform to make the system more resilient.

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Annex I. Effect of Indexation on Inflation Outcomes

1.   We explored the effect of indexation tranches on inflation by a regression analysis of headline, core, and services inflation (quarter-on-quarter, seasonally adjusted), as defined by STATEC. We complemented the analysis performed in STATEC (2017) by changing the specifications and running them on the period 2000–21. We defined the key variable of interest as a dummy that takes value 1 if in a particular quarter an indexation event took place, while 0 otherwise. In addition, we gathered data on GDP, inflation of petroleum products, euro area inflation. All variables were seasonally adjusted using Census X-12 multiplicative procedure.

Table I.1. Luxembourg: Regression Analysis of the Effect of Indexation on Inflation

	Headline	Core	Services
Index tranche (+1)	0.11**	0.14***	0.20***
Index tranche	0.20***	0.25***	0.42***
Index tranche (-1)	0.25***	0.21***	0.31***
Index tranche (-2)	0.16***	0.14***	0.29***
EA Inflation	0.52***	0.19***	0.25***
Output Gap (-3)	0.01	0.01	...
2015Q1	0.52***	0.74***	0.65***
Petroleum Products	0.03***	...	...
Petroleum Products (-4)	...	0.00	...
AR(1)	...	0.07	0.19*
AR(2)	...	0.16**	...
Constant	0.10***	0.13**	0.14**
N	88	88	88
R-squared	0.88	0.61	0.48
DW	2.00	2.12	2.15

Source: STATEC, Eurostat, and IMF Staff Calculations.
Note: ***, **, * represent statistical significance at, respectively, 1 percent, 5 percent, and 10 percent level. All variable, except dummies, have been defined in percentage terms. A parenthesis close to the variable denotes the lead (if positive) or the lag (if negative), measured in quarters relative to any period t in the sample.

Annex II. Small Open Economy DSGE Model

A. Description of the Model and of the Simulation Exercise

1.   We simulated a DSGE model for a small open economy by drawing extensively on the work of Gali and Monacelli (2016). Specifically, this is a relatively standard medium-scale New Keynesian model of a small open economy in a monetary union. The main characteristics of the model are that it features both price and wage rigidity à la Calvo (1983) with indexation to past inflation, and imperfect passthrough of imported inflation. The calibration was performed by leveraging the methodology in the original paper and adjusting some of the key parameters to reflect key features of Luxembourg's economy.

2.   We changed the formulation of the model to incorporate two features that we see as key to better account for the dynamic response of the economy to an import price shock. First, we interpret the imported good as a generic energy commodity whose price is the main shock. Second, we tweaked the equations to: i) incorporate downward nominal wage rigidity (a simple rule that specifies that nominal salaries cannot fall if they are not allowed to be renegotiated) and ii) have an indexation rule that reflects as closely as possible how the system works in Luxembourg.[1,2]

3.   Importantly, we distinguish between a headline and a core indexation rule by cumulating either the price index of the final good consumed by the representative household (which we take to be the NICP index) or the price index of the good produced by domestic firms (which we take to be our measure of core inflation). We then perform a perfect-foresight simulation following a shock to the price of the imported good. We run the simulation for many shock sizes, to confirm that in no case an indexation is triggered when indexing to core but is not triggered when indexing to headline inflation for the same shocks size. We then select a realistic value for the shock size (given the observed magnitude of the energy price shock of 2022) and calculate the impulse response function for a case in which indexation happens when indexing to headline but not when indexing to core inflation.

B. Impulse Response Functions

4.   In Figure II.1 below we depict the impulse response functions of key variables of interest for the benchmark case reported in the main text. The shock is simulated by an increase in the error term of the AR(1) process for the price of the imported energy good (bottom-right

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[1] An important point to keep in mind is that the staggered way in which indexation happens in practice in Luxembourg makes it impossible to have steady state inflation in the model, and to simulate it stochastically, that is, solve for policy functions in the case of random shocks.

[2] Specifically, all workers who are not allowed to reset their wages optimally must adjust their wage according to the previous quarter inflation rate, scaled by an indexation parameter which takes value between 0 and 1 and reflects the importance of past inflation in determining the change in wages. We substitute the past realized inflation rate with an ad-hoc rule such that the wage is adjusted by 2.5 percent only when the lagged cumulated inflation rate exceeds 2.5 percent, upon which the cumulated inflation variable is reset.

quadrant of the figure). As a result of the shock, the overall reduction in the present discounted value of income for the representative household (the economy is poorer), leads to a reduction of investment. Given the relatively high capital stock in place, employment increases in the short term, as the higher price of the domestic good spurs additional domestic production. In terms of inflation, headline increases significantly more than core inflation. After about 6 quarters, the initial response gives way to the medium-term adjustment, where investment recovers, and inflation abates.

5.   **The key difference between indexing to core inflation (red lines) and indexing to headline inflation (blue lines) is the occurrence of the indexation event in the latter case, but not in the former.** Given that the economy is simulated in perfect foresight, the additional increase in wages weighs on the short-term response of the variables, most notably consumption and investment. Core inflation, owing to the higher wage costs when indexing to headline inflation, spikes significantly within 8 quarters, but over the medium-to long term there is little impact of the indexation rule on core inflation. Headline inflation increases significantly under both indexation rules, but somewhat more when headline inflation indexing is applied.

Figure II.1. Luxembourg: Impulse Response Functions of Key Endogenous Variables and Path of the Shock

Source: IMF Staff Calculations