BOX 3

Constructing a GDP deflator for Liechtenstein

by Andreas Brunhart

Economic activity is commonly measured in real values to eliminate the effects of nominal price changes. Nominal aggregates, such as nominal GDP, can fluctuate due to variations in both the quantities of transactions (e.g. the number or volume of goods and services exchanged) and price levels. To accurately assess economic dynamics, it is crucial to adjust nominal variables for price changes using price indices. This adjustment helps isolate and remove the impact of price fluctuations, allowing for the calculation of real variables that better reflect changes in quantity. This approach is particularly important for long-term comparisons, where price effects can accumulate and obscure the volume changes that are central to understanding economic growth.

Unfortunately, Liechtenstein's national accounts only provide nominal figures, and there are no official deflators, such as consumer, producer, or export / import price indices, available. To adjust for price changes and obtain real data, Swiss price indices, such as the consumer price index or the total GDP deflator, are typically used in economic analyses of Liechtenstein. This method is justifiable due to Liechtenstein's integration with the Swiss currency and customs area, as well as the partially shared taxation and import duties (e.g. value-added tax). Additionally, the similarities in living standards, economic development, and economic structure between the two countries support this approach. It is assumed that price developments in Liechtenstein closely mirror those in Switzerland, much like the variations among Swiss cantons for which no separate price indices are collected. The Liechtenstein Office of Statistics publishes the Swiss consumer price index on its website, highlighting its relevance for Liechtenstein.

At the same time, Swiss price indices, particularly the Swiss GDP deflator, do not fully capture the sectoral composition of the Liechtenstein economy. To address this issue, Swiss disaggregated price indices can be adjusted to reflect Liechtenstein's sectoral composition. In a preliminary research project, the Liechtenstein Institute has developed a reweighted GDP deflator for Liechtenstein using sectoral gross value-added data and Swiss sectoral price data. Nominal national accounts data for Liechtenstein are available from 1998 to 2022, with detailed sectoral gross value-added data for 34 NACE sub-sectors from 2016 to 2021. For the years 1998 – 2015, data are available only for four broad sectors: agriculture, industry, financial services, and other services. For years beyond this range, only aggregated GDP figures are available, with data for the year 2022 provided by the Office of Statistics and data for the years 1972 – 1997 and 2023 by the Liechtenstein Institute. To create Liechtenstein GDP deflators, implicit sub-sectoral deflators are first calculated using the difference between nominal and real figures from Swiss gross value-added data provided by the Swiss Federal Statistical Office. The Swiss price data series, which includes 59 sub-sectors, are then mapped to Liechtenstein's 34 sub-sectors. These sub-sectoral price indices are reweighted to match Liechtenstein's economic structure by deflating each sub-sector's gross value-added series separately and summing them to obtain the aggregated gross value-added and GDP. The resulting GDP deflator is then rescaled to a reference year. This approach not only produces GDP deflators specific to Liechtenstein but also generates individual deflators for each sector within Liechtenstein.

The dynamic pattern of Liechtenstein's real GDP is broadly consistent across different deflators, although year-on-year growth rates can vary significantly in some years. Figure B3.1 illustrates Liechtenstein's real GDP using three different deflators: the GDP deflator constructed from 34 sub-sectors, the GDP deflator from 4 broad sectors, and the total Swiss

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GDP deflator. The long-term trends in the real GDP series are very similar and the growth rates are highly correlated and generally of comparable magnitude, regardless of the deflation method. However, differences in real GDP growth rates can be notable depending on the deflator used. For example, in 2021, the real GDP growth rate calculated using the 4-sector deflator was 1.1 percentage points higher, and using the 34-sector deflator was 3.2 percentage points higher compared to the total Swiss GDP deflator. This discrepancy occurred because price developments varied significantly across sub-sectors that are crucial to Liechtenstein's economy, diverging from the overall price trends observed in Switzerland.

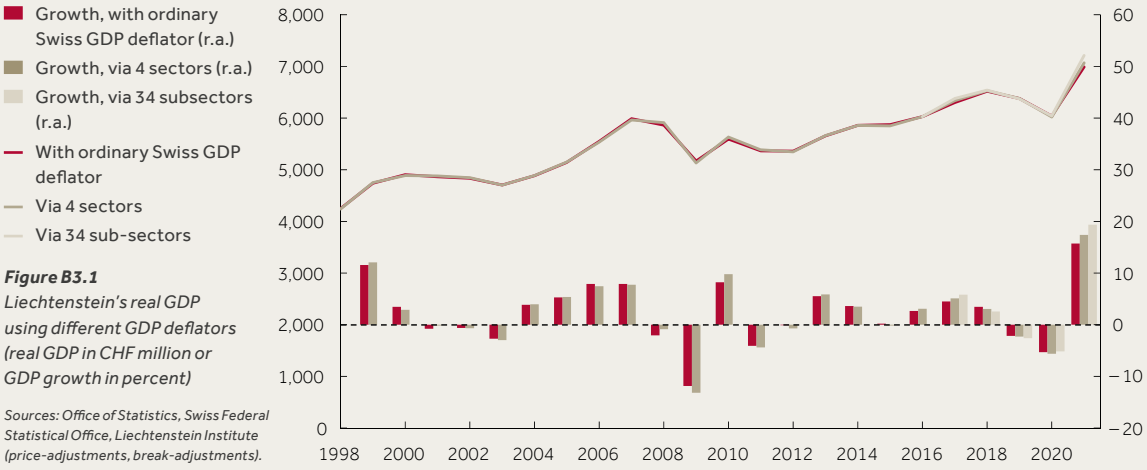


Figure B3.1
Liechtenstein's real GDP using different GDP deflators (real GDP in CHF million or GDP growth in percent)

Sources: Office of Statistics, Swiss Federal Statistical Office, Liechtenstein Institute (price-adjustments, break-adjustments).

Applying Swiss sub-sectoral price deflators to develop more accurate price deflators for Liechtenstein's sectoral gross value added and GDP presents several challenges, some of which warrant further investigation. First, practical implementation is complicated by the lack of consistent time series. To address this issue, a hybrid GDP deflator time series must be constructed by linking the total Swiss GDP deflator (1972 – 1998), the reweighted sectoral GDP deflator (4 sectors, 1998 – 2016), and the reweighted sub-sectoral GDP deflator (34 sub-sectors, 2016 – 2021). Second, the publication lag of nearly two years for both Liechtenstein's nominal gross value-added data and Swiss real sub-sectoral data means that the reweighting process cannot be performed for the most recent two years. During this period, only GDP estimates (provided by the Office of Statistics and Liechtenstein Institute) are available, not national accounts data. Using the Swiss total GDP deflator for these two years, where a Liechtenstein-specific deflator cannot be constructed, would likely exacerbate the already high revision sensitivity of Liechtenstein's GDP (similar issues apply to quarterly GDP estimates by the Liechtenstein Institute). Third, the procedure is computationally demanding, particularly due to the non-additivity of chain-linked price deflators, which are standard in international practice. Chain-linked sub-sectoral price deflators mean that disaggregated real values cannot be directly summed to obtain aggregated real gross value-added. Rebalancing formulas must be applied to address this issue (see also Nierhaus, 2007). Fourth, just as the Swiss sub-aggregates do not precisely sum to the total aggregated real gross value-added and GDP, the same applies to the derived sectoral and sub-sectoral real figures for Liechtenstein, when Swiss sub-sectoral prices are used to construct a new GDP deflator.

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The method used here does not replace the need for official real national accounts data, as it cannot fully account for potential differences within sub-sectors – both with respect to composition and price dynamics between Liechtenstein and Switzerland. It remains uncertain whether the Office of Statistics, as recommended by IMF experts during Liechtenstein's IMF accession process, will eventually publish official real figures, and if so, what methodologies they will employ. Even if real official data becomes available in the future, the preliminary calculations and methodological discussions presented here will still be relevant. They will provide a basis for historical estimations and help in constructing comparable real national accounts time series for the past.

References

Nierhaus, W. (2007): "Vorjahrespreisbasis: Aggregation und Verkettungsdifferenz". Ifo Schnelldienst, 6 / 2007: pp. 29 – 33.