OECD COUNTRIES BETWEEN CRISES

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Abstract

In 2020, the crisis associated with the COVID-19 pandemic and the associated restrictions affected the economy of the entire world. The energy crisis and the associated inflation crisis followed almost seamlessly in the fall of 2021, and the refugee crisis associated with the war in Ukraine joined in February 2022. The entire sequence of crises negatively affected the economies of virtually all countries in the world. The aim of this paper is to quantify the impact of the sequence of these crises on the development of the average annual wage in OECD member countries and also to compare this effect with the impact of the financial crisis that began in 2008, later bridged by the economic crisis, on the development of the same indicator. The data come from the OECD website, the time series examined is the average annual wage in USD converted to purchasing power parity, in constant prices with a base in 2023. The subject of the research is the analysis of the development of this indicator in the period from 2000 to 2023. It includes predictions of the development of this indicator for the period 2024–2025, assuming unchanged conditions. Exponential smoothing was used for this purpose.

Key words: Average annual wage, OECD member countries, time series analysis, exponential smoothing, time series forecast

JEL Codes: C22, E24, E32

Introduction

The data for this research come from the ifficial OECD website, the time series examined is the average annual wage in USD converted to purchasing power parity, in constant prices with a base in 2023. This dataset contains data on average annual wages per employee in full-time equivalent unit in the total economy. Average annual wages per full-time equivalent dependent employee are obtained by dividing the national-accounts-based total wage bill by the average number of employees in the total economy, which is then converted in full-time equivalent unit by applying the ratio of average usual weekly hours per full-time employee to

that of all employees. The subject of the research is the analysis of the development of this indicator in the period from 2000 to 2023 including the predistions for the period 2024–2025 assuming unchanged conditions. Exponential smoothing was used for this purpose.

Crises in the mentioned period were the subject of research by a number of scientists. The consequences of the crisis associated with the COVID-19 pandemic are addressed in the publications Fernandez & Shaw (2020), Jones (2020) and Ritter & Pedersen (2020). This crisis was closely followed by the energy crisis, which is the subject of research of Asghar, Sulaiman, Mustaffa, Ullah & Hassan (2023), Emiliozzi, Ferriani & Gazzani (2025), Farghali et al. (2023), Gârdan, Micu, Paștiu, Micu & Gârdan (2023) and Xu, Akhtar, Muhammad, Abban & Taghizadeh-Hesary (2022). The rise in energy and fuel prices has also triggered a rise in the prices of other commodities and a financial crisis is emerging, see Fratto & Uhlig (2020), Gong & Qian (2022), Jałtuszyk (2022) or Wen, Zhang & Gong (2021). On Thursday, February 24, 2022, in the early hours of the morning, the war in Ukraine began, and in this context, many war refugees left Ukraine, not only to countries directly neighboring Ukraine. A refugee crisis arose, which is the topic of publications by Jaroszewicz, Grzymski & Krępa (2022), Roman, Zouny & Perlina (2020) or Sajjad (2022). War refugees have gradually begun to integrate into the labour markets of their countries, which is why this crisis is gradually subsiding, but in most countries the economy has not yet managed to return to the performance of 2019.

1 Theory and Methods

1.1 Database

The data come from the official website of the Organization for Economic Cooperation and Development (OECD). This dataset contains data on average annual wages per employee in full-time equivalent unit in the total economy. Average annual wages per full-time equivalent dependent employee are obtained by dividing the national-accounts-based total wage bill by the average number of employees in the total economy, which is then converted in full-time equivalent unit by applying the ratio of average usual weekly hours per full-time employee to that of all employees. The data are available in 2022 constant prices in US dollars converted to purchasing power parity (PPP) during 2000–2023 with predictions for the years 2024–2026 assuming unchanged conditions. The aforementioned analysis was conducted for selected OECD countries: Germany as a representative of developed Western European countries, Spain as a representative of Southern European countries, Estonia as a representative of Baltic

countries, Czechia as a representative of the former satellite countries of the then Soviet Union in Central Europe, Luxembourg as a representative of the Benelux countries, Norway as a representative of the Nordic countries, Greece as a representative of the Balkan countries, the United Kingdom of Great Britain and Northern Ireland (United Kungdom) as a representative of the European Anglo-Saxon countries, the United States of America (USA) as a representative of North American countries, Chile as a representative of Latin American countries, Japan as a representative of East Asian countries and Australia as a representative of Oceania.

1.2 Exponential Smoothing

Exponential smoothing is a simple method for smoothing and short-term prediction of time series. The principle is that the weight of a data point for the prediction value decreases exponentially with the time distance from the prediction. Exponential smoothing is divided into simple, double and triple, depending on the smoothing curve used. Simple exponential smoothing is the basic method used for time series without trend and seasonality. Double exponential smoothing takes into account the linear trend in the data. Triple exponential smoothing, also known as Holt-Winters, then takes into account seasonality. The appropriate exponential smoothing was selected based on interpolation criteria. The suitability of the chosen exponential smoothing was subsequently verified using the sample autocorrelation function, the sample partial autocorrelation function and the Durbin–Watson statistic.

Tab. 1: Best-fit exponential smoothing models

Country	Exponential smoothing
OECD	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0518
Australia	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0973
Chile	Brown's linear exponential smoothing with alpha = 0,6830
Czechia	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0459
Estonia	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0526
Germany	Brown's linear exponential smoothing with alpha = 0,7401
Greece	Brown's linear exponential smoothing with alpha = 0,8822
Japan	Brown's quadratic exponential. smoothing with alpha = 0,0200
Luxemburg	Holt's linear exponential smoothing with alpha = 0,6547 and beta = 0,1197
Norway	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0682
Spain	Holt's linear exponential smoothing with alpha = 0,9999 and beta = 0,0239
United Kingdom	Brown's linear exponential smoothing with alpha = 0,6767
United States	Holt's linear exponential smoothing with alpha = 0,9966 and beta = 0,0276

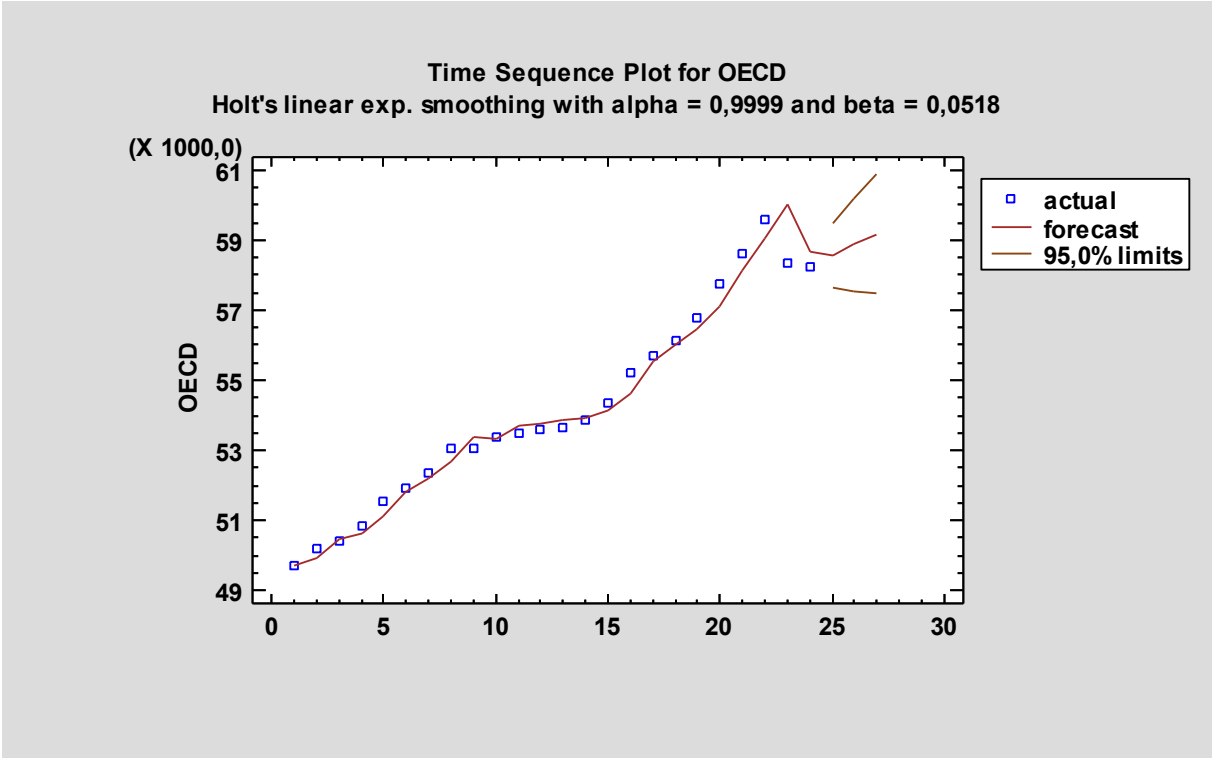
Source: Own research

Tab. 2: Prediction for 2024–2026

Country	Prediction		
	2024	2025	2026
OECD	58,550	58,867	59,185
Australia	67,394	67,687	67,979
Chile	37,613	37,846	38,078
Czechia	37,809	38,252	38,695
Estonia	38,169	38,933	39,697
Germany	65,198	64,718	64,237
Greece	30,198	30,167	30,136
Japan	47,609	47,620	47,631
Luxemburg	89,946	90,927	91,908
Norway	72,693	73,413	74,133
Spain	51,562	51,788	52,014
United Kingdom	57,540	57,500	57,461
United States	80,710	81,305	81,899

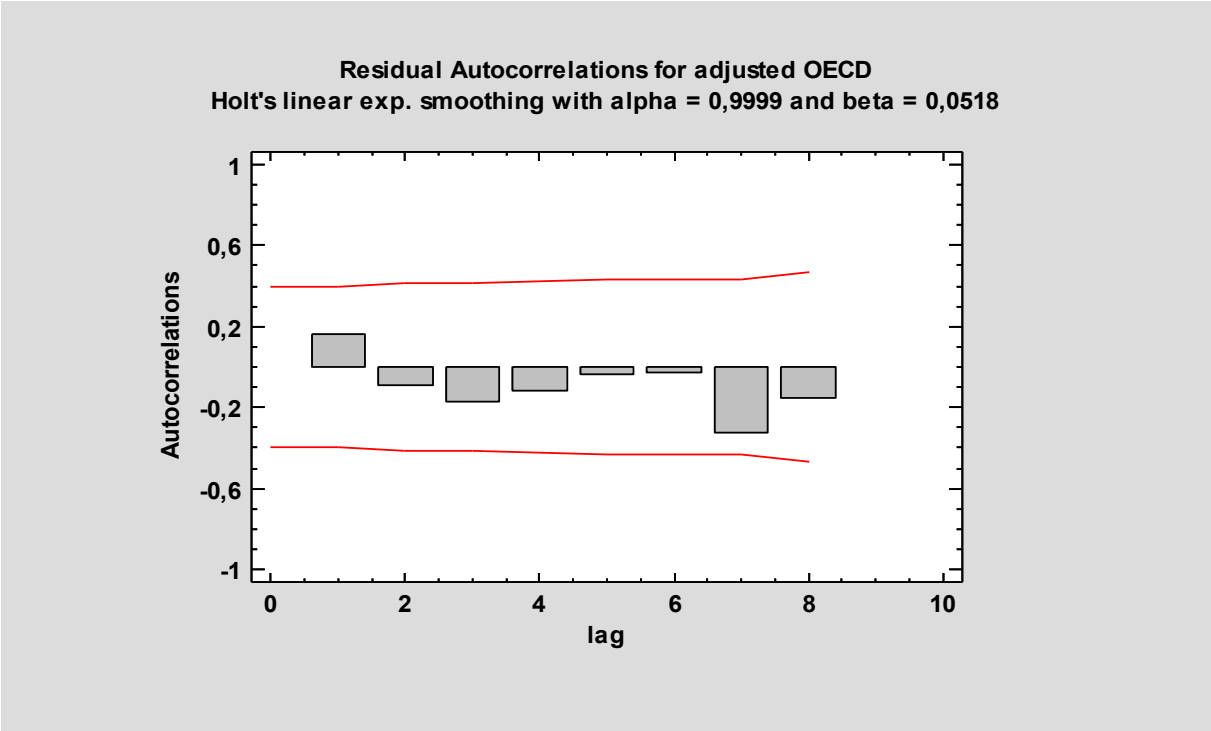
Source: Own research

Fig. 1: Exponential smoothing of time series for the OECD as a whole including predictions



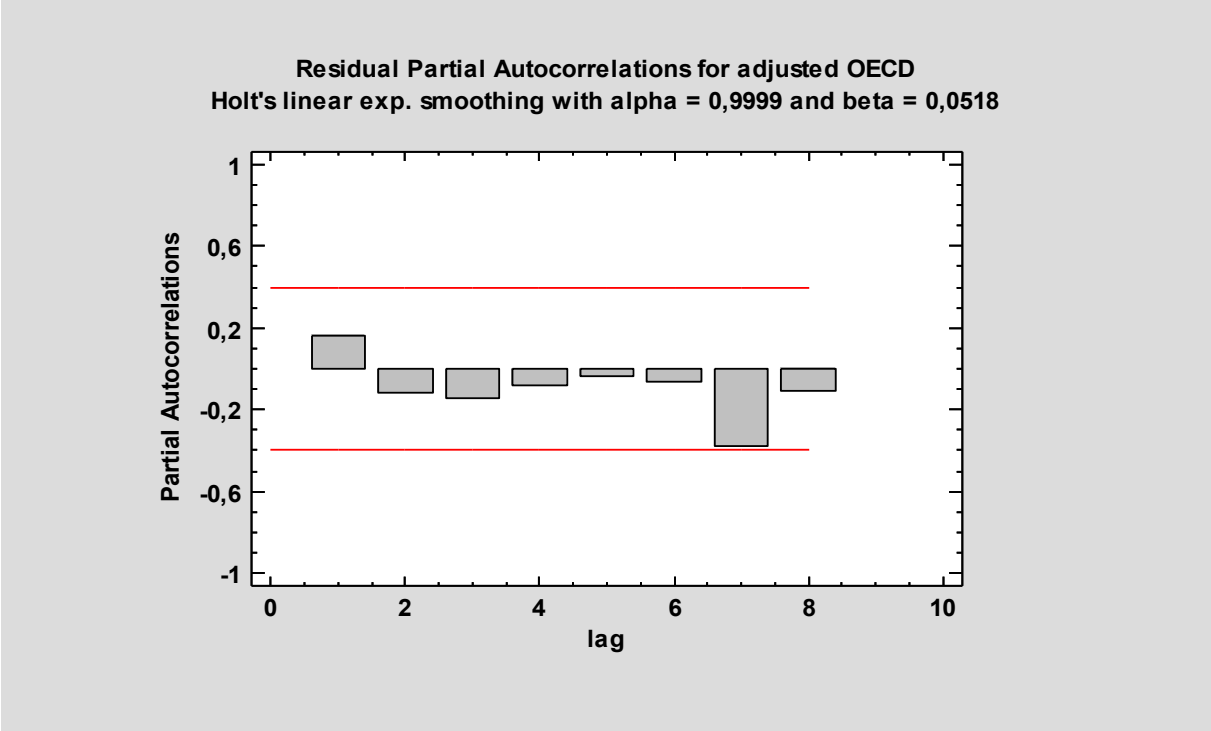
Source: Own research

Fig. 2: Exponential smoothing of time series for the OECD as a whole including predictions



Source: Own research

Fig. 3: Exponential smoothing of time series for the OECD as a whole including predictions



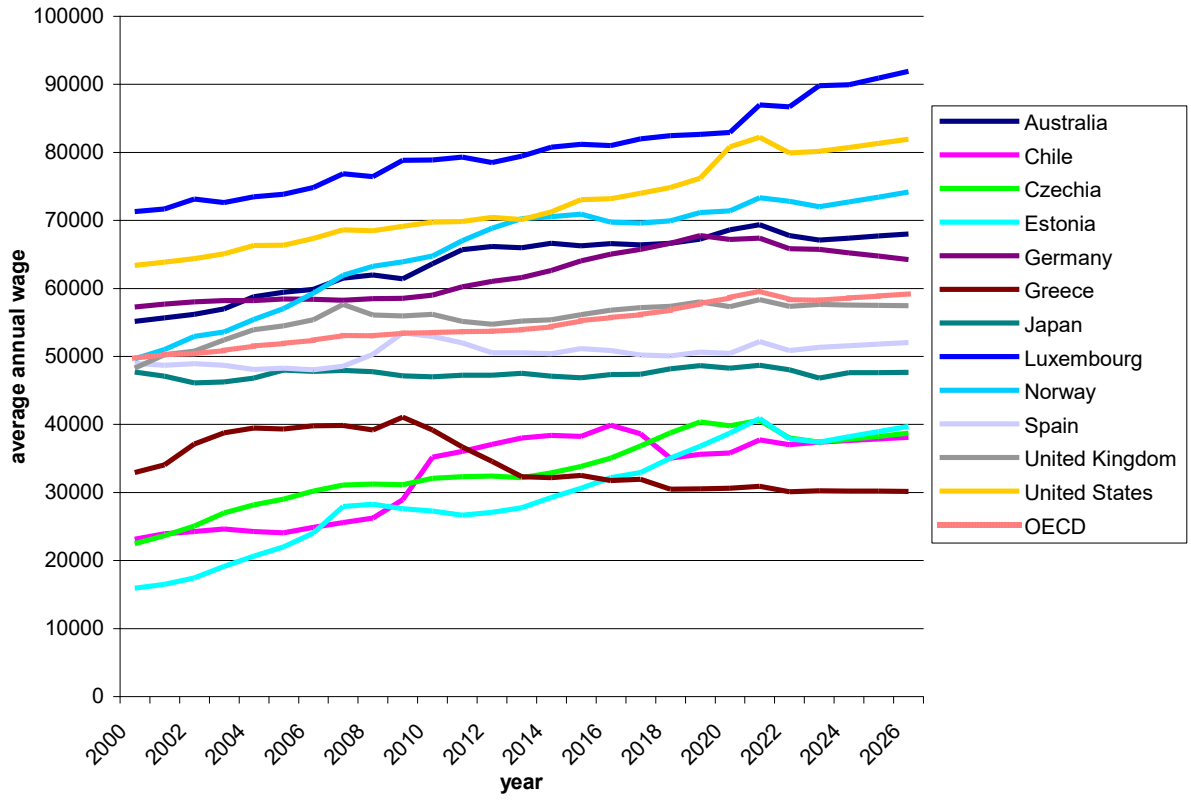
Source: Own research

Thus, Holt's linear exponential smoothing was selected as the best fit in eight cases, i.e. for the time series of average annual wage for all OECD countries as a whole and for the time series of Australia, Czechia, Estonia, Luxembourg, Norway, Spain and the United States. Brown's linear exponential smoothing was evaluated as the best fit in four cases, i.e. for the time series of average annual wage for Chile, Germany, Greece and the United Kingdom. Brown's quadratic exponential smoothing was the best fit only for the time series of average annual wage for Japan, see Table 1. Table 2 presents the predictions of the examined time series of the average annual wage for the following three years. An illustrative example of the model construction is presented in Figures 1–3.

2 Results

Figure 4 presents the development of average annual wage in the period 2000–2003 for the OECD as a whole and in selected countries, including predictions for the years 2024–2026.

Fig. 4: Development of average annual wage in the period 2000–2003 for the OECD as a whole and in selected countries, including predictions for the years 2024–2026



Source: Own research

The average annual wage in OECD countries (in purchasing power parity – USD PPP) increased by around 17% between 2000 and 2023, which represents a relatively modest growth, on average around 0.7% per year. Growth has not been linear, with a significant slowdown, especially after 2020, due to the COVID-19 pandemic, subsequent high inflation and geopolitical uncertainties. In some countries, real wages have even fallen despite nominal wage growth. Forecasts for 2024–2026 point to a further slow pace of wage growth. For the OECD as a whole, wage growth is expected to be only 3–4% over three years, which is practically stagnation, especially if inflation continues to be marginal.

2.1 Developments in individual selected countries

Australia has consistently outperformed the OECD average and has shown steady growth. Wages have increased by more than 21% since 2000, and forecasts suggest this trend will continue.

Chile is an example of a rapidly developing economy, with wages increasing by more than 60% between 2000 and 2023. Growth is slowing, but the positive trend continues. Chile still has room to catch up with advanced OECD economies.

Czechia has seen very significant wage growth, up to 66% between 2000 and 2023. However, this growth is based on a lower starting level. After 2020, growth slowed down, and the forecast until 2026 suggests stabilization. However, Czechia is approaching the OECD average, which indicates successful economic convergence.

Estonia is the fastest growing country in this group, with wages having more than doubled (+135%) since 2000. This is due to rapid economic growth, digitalization and gradual convergence with the West after joining the European Union. The forecasts also show continued strong growth until 2026.

Germany had relatively decent growth until 2019, but then experienced a real wage decline due to high inflation and weak productivity growth. A slight nominal wage decline is expected from 2023 onwards, which is exceptional and indicates structural problems (e.g. demographics, industrial stagnation).

Greece is a notable negative case. Wages fell by more than 8% between 2000 and 2023, a consequence of the economic crisis and subsequent austerity measures. The predictions for 2026 also remain pessimistic, with no signs of recovery.

Japan is an example of long-term wage stagnation. The average wage in 2023 was lower than in 2000. Even predictions up to 2026 show only a cosmetic increase. Reasons include an aging population, a rigid labor market, and low inflation in previous decades.

Luxembourg has the highest average wages in the OECD. Between 2000 and 2023, they grew by almost 26%, which is above average. Growth is expected to continue, albeit at a slower pace, given the high level already achieved.

Norway is among the countries with the highest living standards. Wages have increased by 45% since 2000, and predictions show continued moderate growth. High wages reflect the role of the oil sector, the welfare state, and low unemployment.

Spain is on the opposite end of the spectrum, with wages rising by just under 5% in 23 years, which is very little. Economic crises and high unemployment have caused long-term stagnation. The outlook is bleak.

The United Kingdom has seen wage growth of 19% since 2000. However, after 2016 (Brexit), the growth rate slowed down. In recent years, wages have practically stagnated and the outlook for 2026 is not very optimistic.

The United States has shown steady wage growth over the long term. There was a 26% increase between 2000 and 2023, with a further 2% expected by 2026. The US maintains one of the highest average wages in the OECD. Despite inflation, purchasing power is recovering faster here than in Europe.

Conclusion

The OECD as a whole is experiencing moderate growth, but this is not evenly distributed. Advanced Western economies (e.g. Germany, UK, Japan) face problems with inflation, aging populations and low productivity. Transition economies (Czech Republic, Estonia, Chile) are experiencing faster wage growth, but from a lower base. Rather moderate wage growth is expected until 2026, mainly in connection with lower inflation and cautious wage policies of employers. The key factor for the growth of real wages will be the development of inflation and labor productivity.

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