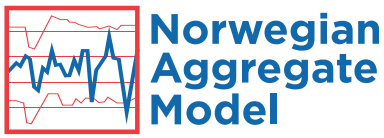
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Report

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WAGE HIKES AND THE PRICE LEVEL WITH PATTERN WAGE BARGAINING IN NATIONAL WAGE SETTING

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Wage increases are often simply classified as inflationary, and therefore as problematic or even harmful. However, a wage hike can mean more than one thing. A given wage increase can have quite different effects on prices and on the real economy, depending on its underlying cause and on the markets and institutions that define how wage hikes are propagated.

In this report stylized wage shocks are analysed using NAM and the framework of main course theory.

1 Introduction

Wage increases are often, and simply, classified as inflationary and therefore as problematic verging on harmful. However, a wage hike can mean more than one thing. A given wage increase can have quite different effects on prices and on the real economy, depending on its underlying cause and rationalization. Also of importance is the markets and institutions that define how wage hikes are propagated.

While this point is general, it is particularly topical in national wage setting systems of the pattern wage bargaining (PWB) type. Common features include broadly regulated wage formation, the predominance of sectoral bargaining, minimal direct government intervention, and coordination through wage-setting norms established by key sectors, Calmfors (2025).

One hallmark of functional PWB systems is that price and productivity growth in the internationally exposed (tradables) sector serve as an operational definition of the scope or room for wage adjustments in the sheltered (non-tradables) sector. Hence the terminology of Wage-Leading and Wage-Following sectors.

NAM integrates a model of the Norwegian variant of PWB. Hence, it represents a particular special case of what some authors refer to as a positive theory of PWB, Calmfors (2025). In the Norwegian context the framework is known as main course theory after the seminal paper by Aukrust (1977).[1] NAM can be simulated to give dynamic model responses to different types of wage shock and hikes, within the chosen modelling framework (and hence its limits).

Since the variables of the model, like in the economy, have multiple connections, NAM will generate numerous responses to nearly any type of shock. However, as a simplification and as an aid in the interpretation of the responses, we can use the flow chart in Figure 1.

The flow chart gives a stylized representation of a system of national wage setting with pattern wage bargaining. In the diagram there are two nodes for wage:[2] *L-wage*, for the wage leading sector, and *F-wage* for wage following sector. The arrow between the two nodes indicates the wage setting pattern, negotiations in the follower sector being conditioned by the settlement in the wage norm setting sector.

The main link between the wage level and the price level of the economy, represented by the *GDP-price* and *CPI* nodes, is the price setting in the "wage-following" part of the system, as firms there, to some extent, are able to roll higher wage costs on to the prices of their products and services (*F-price* node), which has a large weight in the CPI. The chart has a dashed line between the *CPI* node and the *L-wage* node. This represents the considerations of cost-of-living, of the buying power of the nominal wage, which typically is a factor in the annual rounds of wage negotiations. It serves a reminder that although the chart indicates "one way traffic", from the *L-wage* and the factors behind it (*L-prod* and *L-price*), it is not so simple — not in the model, and certainly not in the real world. As we review the different types of wage hikes, we will get opportunity to mention a couple of them, and how they are represented in the model.

[1] Bårdsen et al. (2005, Ch. 3) reviewed the origins of the theory in earlier publication in Norwegian, its relationship to the *Scandian Model of Inflation*, from which it stood out by its clear conceptual distinction between short-run and long-run wage relationships, and its modern interpretation within the cointegration framework. Calmfors (2025) gives an assessment of operational PWB systems, in the Nordic countries and elsewhere.

[2] Wage level is measured as wage costs per hour worked.

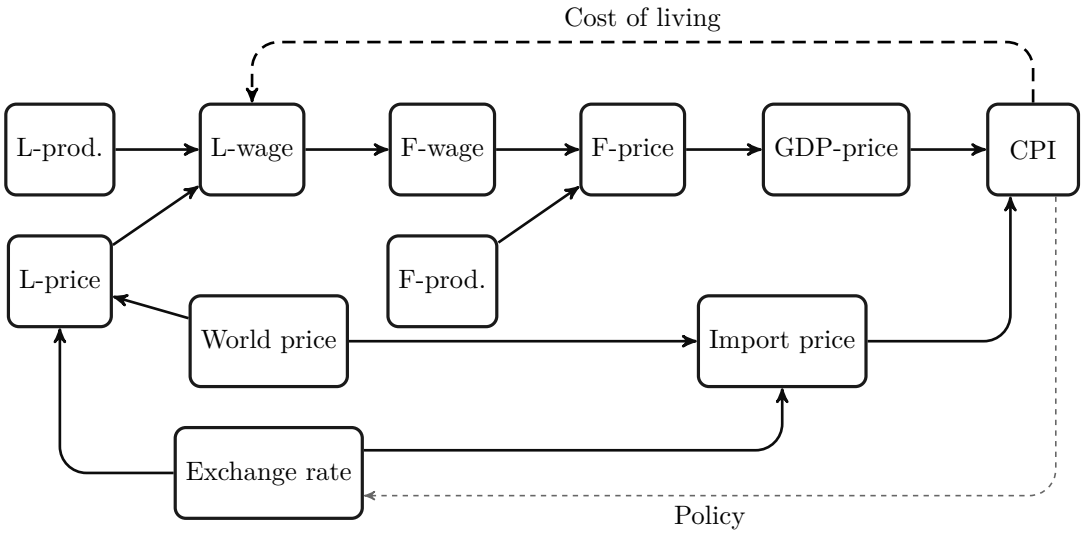


Figure 1 Flow-chart of main elements in a stylized PWB-system.[3]

Another caveat is that Figure 1 omits other well-known wage inflation factors, notably the rate of unemployment or other indicators of labour market tightness. That relationship is, however, present in NAM, which also includes the joint relationships between wages and e.g., the rate of unemployment.

However, as econometric studies of wages have shown, on different sample periods and for different countries, unemployment can change considerably without any noticeable effects on wages and prices at the macro level. On Norwegian data, a convex wage curve has been the preferred functional form in empirical macro econometric modelling. Johansen (1995) estimated a "L-shaped" curve,[4] which was flat for higher rates above 3 %, but very steep at levels in the narrow range between 1 and 2. In NAM, the less dramatic logarithmic function is used. But the implication is the same, namely that for many initial conditions, the unemployment channel is secondary to the channels that the figure represents.

Finally, before we get to the analysis of wage hikes, the *Exchange rate* node requires a comment. PWB systems originating in the era of fixed exchange-rate regimes and it was an explicit assumption in the formulation of main course theory. However, in Norway in particular, PWB as a framework for actual wage formation has been both resilient and adaptive with respect to the change in regime in 2001, from fixed to floating exchange rates and inflation targeting. A plausible explanation may be that since the exchange rate is very volatile and difficult to forecast, wage setters can sensibly regard it as exogenous (outside their control). Hence, with regard to the exchange rate in particular, the arguments and premises used in the bargaining may more driven by data than by forecasts.

[3] Adapted from Aukrust's (1977, p. 113) "sketch" of a system where, based on the characteristic properties of sheltered and exposed industries, the long-term movement of wages and prices in the economy are subject to strong price impulses from abroad. Other adaptations are found in e.g., Bjørnstad and Nymoen (2015), Nymoen and Svarstad (2025, Ch. 3).

[4] See Forder (2014, Ch. 1) for the historical context of the "L-shaped" wage and price theory.

However, more recently, episodes of currency depreciation and high inflation during the pandemic era have re-kindled arguments about Norway's system of PWB and that it may be poorly aligned with inflation-targeting monetary policy. Nymoen (2025) reviews the critique mentioned above and show that Norway's effective nominal exchange rate exhibits the same linear time-series properties as other floating exchange rates. This motivates a modelling approach in which the nominal exchange rate is one of several factors in the inflation-generating process, and where exchange-rate pass-through does not necessarily lead to dynamic instability in wage–price dynamics.

In the version of NAM that we simulate in this report, both the monetary policy rate and the exchange rate are endogenous in the model. This implies that even though the policy target in the inflation rate, the changes in the policy instrument affect the market interest rate, which will make nominal exchange rate respond. It is this "policy consequence" (or more optimistically, "policy channel") which is indicated by the second dashed line in Figure 1, between the *CPI* and *Exchange rate* nodes.

2 A wage hike, unsustained by productivity or price changes

The first experiment, we can imagine, takes place in the *L-wage* node. Technically, we increase the wage in the leading sector by one percent in the first quarter of the first year of the simulation exercise. In Table 1, the labels in the header row are the same as the nodes in the flow chart. In the second row the corresponding NAM-variables are listed. Specifically, `WFP1` denotes wage per hour worked in manufacturing and mining, which therefore represents the wage leading sector (as a crude approximation).[5]

Table 1 Responses to a wage shock (1 percent increase) in the wage leading sector. Percent deviation from baseline simulation.

	L-wage `WFP1`	*L-price* `PYFP1`	*L-prod* `ZYFP1`	*F-wage* `WFP3`	*GDP-price* `PYF`	*CPI* `CPI`	*Ex. rate* `CPIVAL`	*Import price* `PB`
Q0	1.00	0.00	0.10	0.79	0.22	0.03	0.00	0.00
Y0	0.58	0.00	0.14	0.43	0.12	0.03	0.00	0.00
Y1	0.10	0.00	0.12	0.17	0.09	0.04	0.01	0.01
Y2	0.13	0.01	0.08	0.15	0.07	0.05	0.01	0.01
Y3	0.10	0.01	0.06	0.12	0.04	0.04	0.03	0.00

In the first column of the table, Q0 denotes the quarter when the wage shock occurs, hence *L-wage* is increased by 1 % in that quarter compared to the baseline (without a shock). The other rows give the responses as annual averages (of the quarterly percentage deviations). Y0 denotes the year of shock. Y1 denotes the first year after the year of shock, and so forth.

The *L-price* column shows that the product price in the wage-leading sector is unresponsive to the shock. This is consistent with Figure 1, which shows a picture where *L-price* is driven by

[5] For precise definitions of model variables used, estimation results and modelling methodology we refer to the NAM documentation.

world prices of manufactures (valued in foreign currency) and the exchange rate. In NAMthere is no direct feedback from *L-wage* to *L-price*: This is consistent with main course theory and explains the nearly zero responses in the *L-price* column. The largest and most immediate responses in the table are in the *F-wage* column, a reflection of wage following behaviour. Of the two price indices representing price level, *GDP-price* shows the strongest response, which reflects the relationship between *F-wage* and *F-price* in Figure 1. The CPI-response is more muted. This is because *Import price* is practically unaffected by the *L-wage* hike, and imported goods has large weight in the CPI-index. A second reason is that CPI adjusts relatively slowly to changes in the GDP price index. This implies that a temporary price rise, such that we see in the *GDP-price* column, becomes absorbed in the gross margins of retail sector firms.

An interesting detail in Table 1 is the positive response of *L-prod*, productivity in the wage-leading sector. This is a system effect, reflecting that adjustment of value-added production and working hours is not one-to-one, but is affected by other responses, in employment, capital formation etc.

Jointly, the responses shown in the three columns *L-wage*, *L-price* and *L-prod* imply that the initial increase in the wage share in manufacturing fades as we move away from the time of the shock. Hence, for example, if the wage shareis 80 % initially (in the baseline), it increases to 80.7 % in Q0. However, the average wage sharein the year of the shock, Y0, would be 80.4 %, and in the other years it would be very close to where it was before the shock occurred.

As a variant of the first simulation, we can go one step "behind" the *L-wage* node in Figure 1 and consider a 1 % shock in *L-price* in the first quarter of the analysis. The Q0 row in Table 2 shows that *L-wage* increased by 0.14 % in that quarter. This shows, as a model property, imperfect *pass-through* from product prices to wages in the wage-leading sector. Prices on Norwegian manufactured products are volatile, and gradual adjustment of the wage level may be a sensible way to buy time to learn about the degree of permanency of a price shock.

Since we model a system with PWB, the *F-wage* inherits the response of the *L-wage*. The price level of the economy is therefore increased temporarily. Note that in this case, price increases in both the *L-price* and the *F-price* node of Figure 1 contributed to the increase in GDP-price.

Table 2 Responses to a temporary price shock (1 percent increase) in the wage leading sector. Percent deviation from baseline simulation.

	L-wage WFP1	*L-price* PYFP1	*L-prod* ZYFP1	*F-wage* WFP3	*GDP-price* PYF	*CPI* CPI	*Ex. rate* CPIVAL	*Import price* PB
Q0	0.14	1.00	−0.10	0.11	0.17	0.02	0.00	0.00
Y0	0.06	0.49	−0.13	0.04	0.09	0.02	−0.01	0.00
Y1	0.08	0.10	−0.08	0.07	0.04	0.02	−0.01	0.00
Y2	0.06	0.08	−0.04	0.07	0.04	0.02	−0.01	0.00
Y3	0.05	0.06	−0.03	0.06	0.03	0.02	−0.01	0.00

3 A wage rise, sustained by productivity or price changes

We now follow the chain one step further back and consider wage rises that are sustained by permanent changes in the two factors that jointly define the sustainable wage-scope, in the Norwegian context known as the *main course* of wage evolution, Aukrust (1977).

In Figure 1 there are two nodes that can be associated with such shocks to the system, namely *L-prod* and *World price*. The two NAM series that represent these nodes can be interpreted as random walks with drift, meaning that they are upward moving trends with huge volatility. For these variables, a temporary shock generates a permanent increase in levels compared to the baseline. Compared to the previous analyses, what triggers the rise in the wage of the leading sector is now quite different: Permanently higher labour productivity, or a world price hike which leads to higher product prices, permanently. Both these give room for the wage level to increase without disrupting the functional income distribution (e.g., wage-share) in the wage leading (norm setting) sector of the economy.

We consider the *World price* shock first. Technically we implement the shock by increasing the NAM variable that represents the *World price* node in Figure 1 by 1 % for the length of the simulation period.

Table 3 Responses to a 1 percent permanent increase in *World price*. Percent deviation from baseline simulation.

	L-wage WFP1	*L-price* PYFP1	*L-prod* ZYFP1	*F-wage* WFP3	*GDP-price* PYF	*CPI* CPI	*Ex. rate* CPIVAL	*Import price* PB
Q0	0.14	1.00	−0.08	0.11	0.34	0.10	0.03	0.67
Y0	0.15	0.97	−0.16	0.12	0.29	0.17	0.03	0.66
Y1	0.31	0.87	−0.24	0.25	0.42	0.35	−0.13	0.69
Y2	0.39	0.76	−0.22	0.34	0.39	0.42	−0.33	0.61
Y3	0.41	0.67	−0.18	0.39	0.37	0.42	−0.44	0.53

Table 3 shows that the immediate response in *L-price* is a 1 % increase, the same as in Table 2, and therefore the responses of *L-wage* and *F-wage* are also the same. However, as increased *World price* affects *Import price* already in Q0, both GDP-price and CPI increase more than in Table 2.

As could be expected in this simulation, the annual averages for *L-wage* and *F-wage* increase throughout the length of the simulation period. However, the increases are smaller than 1 %. This has to do with the dampening of the *L-price* deviation, from 1 % in Q0 to 0.67 % in Y3. In its turn, that development can be related to the appreciation of the nominal exchange rate, which gains momentum in the second year of the period (Y1 row in the table). As noted above, the NAM version we simulate has the policy interest rate as endogenous. Since inflation is higher than in the baseline interest rates are also higher, which explains the exchange rate appreciation.

Returning to the wage-leading sector, we note that the *L-price* and *L-prod* columns imply a 0.49 % increase in the wage scope in Y3. In the same row, the *L-wage* increase is 0.41 %, which indicates that most of the adjustment has been accomplished by the end of the simulation

period.

To implement a permanently higher productivity level in the wage leading sector, we have increased value added in the sector (without shocking hours worked or anything else) by the amount necessary to increase *L-prod* by approximately 1 % in all quarters of the simulation period. Table 4 shows the responses for the same variables as above.

For the impact quarter, Q0, the wage responses are nearly the same as for the world price shock. However, the responses of the price level variables are different. As *Import price* is not responding, the price increase is smaller than in Table 3. Note therefore that the rise in *GDP-price* "comes from" the productivity rise, which rationalized the higher *L-wage*, which then gives higher *GDP-price* after adjustment of *F-wage*. The paradox that higher productivity in the wage-leading sector puts upward pressure on the national price level is of course as old as the hills.[6]

Table 4 Responses to a 1 percent permanent productivity increase in the wage leading sector, *L-prod*. Percent deviations from baseline simulation.

	L-wage WFP1	*L-price* PYFP1	*L-prod* ZYFP1	*F-wage* WFP3	*GDP-price* PYF	*CPI* CPI	*Ex. rate* CPIVAL	*Import price* PB
Q0	0.15	0.00	1.00	0.12	0.04	0.00	0.00	0.00
Y0	0.15	0.00	1.00	0.11	0.03	0.01	−0.01	0.00
Y1	0.33	−0.01	0.99	0.27	0.08	0.02	−0.02	−0.01
Y2	0.46	−0.01	0.99	0.40	0.13	0.04	−0.03	−0.01
Y3	0.57	−0.02	0.99	0.51	0.17	0.07	−0.03	0.00

4 An exchange rate shock

For the sake of completeness, we can also consider a shock in the *Ex. rate* node of Figure 1. In the data, this series is different from *L-price* and *L-prod* in that the nominal rate of change has a mean which is insignificantly different from zero. Hence while it also has random-walk properties, the exchange rate does not have a clear drift (trend to the eye).

However, this does not change the fact that a temporary shock to the exchange rate affects the level permanently, all other things equal.

In NAM, as mentioned, the exchange rate equation includes variables that are affected by monetary policy, namely certain interest rate differences between Norway and abroad. In the simulations, we have allowed those variables to change endogenously, which is why in the *Ex. rate* column in Table 5, the depreciation is 1 % initially, but then falls back somewhat, to 0.8 %.

As Table 5 shows, the depreciation has an immediate impact on the levels of *Import price* and *L-price*. Because of the *L-price* response, *L-wage* is also increased, but in the short term not nearly enough to hinder that the wage share becomes reduced. In fact, in this simulation the wage scope is 0.51 % above the baseline in Y3, while *L-wage* is 0.31 % above its baseline.

[6] Rødseth (2000, Ch. 7.6) showed that, in one interpretation, it is a Balassa–Samuelson effect.

Table 5 Responses to a 1 percent shock to the effective nominal exchange rate, *Ex. rate*. Percent deviations from baseline simulation.

	L-wage WFP1	*L-price* PYFP1	*L-prod* ZYFP1	*F-wage* WFP3	*GDP-price* PYF	*CPI* CPI	*Ex. rate* CPIVAL	*Import price* PB
Q0	0.08	0.59	−0.04	0.07	0.10	0.05	1.00	0.49
Y0	0.08	0.49	−0.06	0.06	0.09	0.10	0.96	0.49
Y1	0.18	0.52	−0.09	0.15	0.13	0.20	0.88	0.58
Y2	0.25	0.57	−0.10	0.22	0.17	0.27	0.83	0.60
Y3	0.31	0.61	−0.10	0.28	0.21	0.32	0.82	0.61

5 Concluding remarks — what if strife instead of coordination?

The simulations above are meant as "experiments" relevant for a situation when the system of wage formation is in good shape, e.g., the balance of power between the parties has not been disrupted and the institutionalized system of coordination is well functioning.

Clearly, more radical shocks are imaginable. For example, instead of the temporary shock in wage setting which we considered first, we could shock the model so that the wage level increased by a given percent for the length of the simulation period. A possible motivation for such a change of wage policy by the unions, could be to increase the wage share of the value-added of the economy "once and for all". The consequence, in the model simulation, is straight forward: The price level of the economy then grows markedly more than in Table 1,[7] interest rates are increased relative to baseline simulation, and employment becomes reduced. This type of wage hike would not have a grounding in the value of labour productivity. It can be interpreted as a step towards strife in wage setting, and away from coordination. However, the system of wage setting could start cracking up in such a scenario, and analyzing it would take us outside the scope of this report.

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[7] In the version of the model simulated above, PYF increases by 0.37 % and CPI by 0.21 %.

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This report is part of the NAM project documentation. The numerical results reported can change in future model versions.

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