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ABSTRACT

This paper examines the reasons for the declining path of inflation since the 1970s. In particular, it focusses on the role of globalization – covering both changes in the global market structure and technical and structural developments in trade and production. In addition, the paper deals with changes in the basic transmission mechanisms of price and wage inflation. The paper makes use of different data from individual countries and panel of countries. These data show that the dispersion of inflation and the behavior of relative prices follow a pattern that is consistent with several globalization indicators. Also estimation results show that these indicators are useful in tracing the developments of trend inflation after the 1960s. Moreover, it is shown that the basic relationships between prices and costs are nonlinear depending on the level of inflation.

JEL Classification: E31, E52, E58, F02, F41, F42, F62

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1. Introduction

In 2021 most countries experienced a sharp increase in inflation which shows no signs of dying soon. To large extent this surge was unexpected at least if we rely on various surveys on inflation expectations not to speak of inflation expectations derived from asset prices. These developments questioned the standard ways of analyzing inflation and specifying the respective behavioral equations. In particular, this is true with inflation expectations, which for more than fifty years have been the key ingredient of the Phillips curve -based of interpretation of inflation. In a recent paper Jeremy Rudd (2021) criticized the current state of art and pointed out that many observed regularities are not consistent with this standard specification. Moreover, he pointed out that many behavioral patterns are state-dependent, which means that the transmission of costs may well depend on the specific regime of excess demand. Similar points have been put forward in the recent BIS annual report (BIS 2022).[2]

In this analysis we do basically bypass inflation expectations, and do not take any stand on their usefulness and role vis-a-vis the observed trend behavior of inflation. True, the prevailing view is that the slowdown of inflation is mainly due to change inflation expectations. Thus e.g. Hazell et al. (2020) conclude that the reason for low inflation after the 1980s is simply the fact that inflation expectations have become more firmly anchored over time. Obviously, we cannot refute this hypothesis because the formation of inflation expectations, in particular their relationship with actual inflation, is still an open issue.[3] Even if the assumption of inflation expectations' decisive role was true, it might not be the whole story and some relevant structural factors like globalization would deserve closer scrutiny. Also if we consider differences in inflation rates over countries we face some problems because the dispersion of inflation rates seems quite different from the dispersion of inflation expectations not to speak of central banks' inflation targets.

In this paper, we try to find out whether these factors are indeed relevant. Thus, instead re-estimating the Phillips's curve we focus on the mapping between prices and costs. In practical terms, we scrutinize the pass-through of wages (and other costs) to prices and also look at the other side of coin by examining the way in which inflation affects wage formation. The idea is to see whether these basic underlying relationships have changed due changes in the market

[2] Low-inflation regimes turn out to be very different from high-inflation ones.1 When inflation settles at a low level, it mainly reflects changes in sector-specific prices and exhibits certain self-equilibrating properties. Changes in inflation become less sensitive to relative price shocks, and wage and price dynamics are less closely linked. Moreover, there is evidence that the impact of changes in the monetary policy stance becomes less powerful (p 42).

[3] The anatomy of inflation expectations has been considered in several recent analysis e.g., in Reis (2021),Whelan (2022) and Blanchard (2022). Blanchard hints to an interesting possibility that with a high-enough inflation, inflation expectations just reduce to lagged values of inflation and inflation follows a random walk, which makes anti-inflation policies much more challenging. This issue is shortly evaluated in Appendix 4 and it turns out that the data rather strongly support this notion.

structure which in turn could reflect changes in global production and trade, information technology and labor market institutions.

In the analysis, we make use of several data sets from different countries and a panel of countries. In particular, we utilize Finnish data which cover a relative long period of time. Similar data are derived for the Euro Area (which is somewhat shorter) and the United States. Finally, we make use of data from cross-country panel of (principally) all World countries which cover the period 1970-2020.

We find that transmission of costs to prices have changed a lot during the last 20+ year period in the way that prices reflect costs much less than in the 1970s and 1980s. In fact, this is consistent with recent findings of Kolaches and Moessner (2021). Furthermore, we find that wages are much less sensitive to inflation developments. This seems to follow the predictions of Rudd (2021) who argues that the "reaction function" of wages to inflation is nonlinear in inflation in the sense that wages do not react to low inflation.

An interesting question is of course, what is behind these developments. We agree with Kohlscheen and Moessner (2021) that much of can be explained by profound changes in the world economy. Call these changes "globalization". With this term we understand the massive increase in potential supply of output by the fact that China and many other developing countries as well the previous Soviet planned economy bloc in Eastern Europe have become key players in production and trade. At the same trade barriers have come down in the form of lower tariffs, transportation costs and in the form of new information technologies which all have changed the closed-economy type environments in Europe and North America. In the analysis we make several attempts to model these changes with several proxies of trade and technology. Opposite to the previous literature which mainly uses conventional trade openness measures (i.e., trade to GDP ratios) we employ measures which may better reflect new forms of trade and production. The "problem" with traditional trade openness measure is the fact that it stops changing in 2007/2008 suggesting that after that there is no increase in globalization even if most other indicators keep changing more or less in the same way as earlier (see Figure(s) 3). The paper by Heise et al (2020) does, hoerver, find that also the import penetration has kept affecting the wage pass-through in the United states (together with market concentration. Of course, we do not ex ante know what is the proper measure but subsequent empirical analyses suggest that these "other measure" help us much more to explain the changes in the inflation rate over time.

The role of globalization in price and wage setting is generally recognized, the question is only of the magnitude of the effect (see Schnabel 2022 for the current view). A number of studies have tried to quantify the eventual effects (see e.g., Pain et al. (2008) and ECB (2021)). See also the summary paper of European Parliament (2015). The results have been rather diverse and one cannot really find one which would have provided very strong evidence on the behalf of the idea that globalization is of prime importance in terms of inflation.[4] Thus, also the above-mentioned

[4] Perhaps the strongest effects comes out in the study of Amiti et al (2018), which focusses on the effect China's WTO membership on US prices. A useful source is also Bernhofe et al. (2013) which studies the effects of container revolution on trade. According to their study, the effects of this technical change are much larger than the effects of free trade agreements or the GATT.

OECD (i.e., Pain et al. 2008) and ECB studies end up with rather marginal globalization-induced inflation effects. They, and the paper they cite, provide evidence of a rather strong effect on import prices but the consumer price inflation effect appears to be of the magnitude of a couple of decimals of CPI percentage only. Our results do, however, provide a quite different conclusion.

As for the contents of the paper, we explain the basic framework and the data in section 2. In section 3, we present the main results, and in section 4 some concluding remarks.

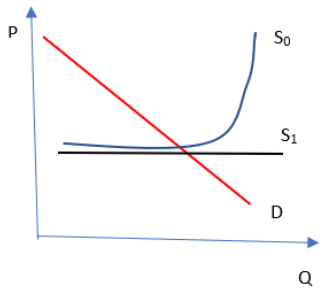
2. Analytical framework and the data

2.1 The effects of globalization

After WWII, there was some moderate inflation in the 1950's ad early 1960s' but after that inflation started to accelerate. The peak of inflation took place at the early 1980s after which slow acceleration took place until the late 1990s. After that, inflation stayed almost constant (constant compared with the 1960-1980 values) but started again to accelerate after the Convid-19 epidemic. The question is what caused the slowdown of inflation. Was it policy change, or changes in political institutions, or was it a change in the market structure in Western economies?

As for the market structure hypothesis, it is almost entirely related to changes in supply. More precisely, the idea is that globalization in its different forms has caused the aggregate supply facing demand in a country x to become (almost) infinitely elastic after being (almost) completely inelastic (graph below) due to capacity constraints and market inefficiencies.

Graph 1 Supply curve before and after globalization



The idea of the figure is simple. In the immediate post WWII period induvial countries' supply was largely constrained by the productive capacity of the domestic economy. That is because of the following reasons:

- the level of foreign trade was smaller than nowadays
- there was important trade barriers

- transportation costs were significantly larger than nowadays
- there were limited possibilities to the FDI
- in isolated countries different monopolies in both product and labor market had much more power
- information technology was taking the first steps
- transaction systems and means were less sophisticated

A big change took place starting in the early 1980s when China abandoned the old-style communist economic system and provided seemingly unlimited amount of cheap labor for domestic and international entrepreneurs[5]. In Charles Goodhart's (2020) words China's wage rate become some sort of labor supply curve for the global economy. In the early 1990 also the Eastern European countries followed the suit further pushing the capacity frontier further away from previous single country levels.

At the same capital controls were largely abolished and several steps were taken to lower tariffs and other foreign trade obstacles. A huge increase in the FDI took place. Several free trade areas were formed (most importantly EU, EFTA, NAFTA) which further intensified trade between countries. Huge changes took place also in logistics (containerization), information technology (Internet) and so on. Now buyers were no more facing a monopoly in the home country but could find a supplier from the whole global production network. Also price-setting experienced huge changes because in the new environment it was possible to search the lowest price with almost zero cost. All of that shows up in huge increase in outsourcing, new ways of selling products and new payment media, which all lower transaction costs and eventually consumption prices. So, referring to Figure 1, it is easy to predict that demand shocks in country x do not necessarily cause any price reaction. Of course, this is only true with goods while services are still largely nontradeables. But also with services, borders do not matter in the same way as earlier and also with services new trade and distribution models have been created. Moreover, in the labor market, big manufacturing sector unions, which traditionally set the tone in wage movements, have lost much of their bargaining power due to globalization. Service sectors' unions have not increased their power in an offsetting and hence the overall power in the labor market shas shifted away from labor unions.

These considerations give a way for the following testable hypotheses:

- rate of inflation will be lower than in the 1960s and 1970s because country-specific demand shocks do not translate to inflation due to global supply opportunities
- cross-country differences in inflation rate will decease because all countries face the same global supply curve
- cross-country dispersion of inflation rates is not related to cross-country dispersion of output growth rates because country-specific demand shocks show up only in output
- price increases will be substantially smaller with tradeable commodities than with all nontradeables

[5] In 1979 Deng Xiaoping became de facto leader of China. Right away, he started reforms and normalized relations with the U.S.

- globalization indicators are negatively correlated with inflation
- traditional wage-price linkages are time-variant so that the key parameters depend on the rate of inflation.

What follows next is a set of empirical analyses which try to show how well international data is consistent with these predictions first by scrutinizing the data and then by estimating some basic relationships between various price and cost components as well as indicators of cyclical situation and globalization.

2.2 The data

Our analyses make use of time series from some individual countries and a panel of countries. The (individual) countries are Finland, USA and the Euro area. The cross-country panel consist of 197 countries. The data series cover the period 1965-2021 but when we experiment with some globalization and tariff measures we have data only for the 1991-2021 period. For practical reasons, we concentrate on using quarterly data although some of the data are available on monthly basis. See Figure 1 for further details.

Inflation is measured by the Consumer Price Index (CPI). Some illustrations also utilize the private consumption deflators. We also make use of price indexes of some sub-categories which would correspond to a difference between tradeable and non-tradeable commodities, which in practice boils down to the difference between goods and services, or durable goods, nondurable goods and services. One could hypothesize that these differences can be instrumental in analyzing the effects of globalization[6].

As for wages, we only consider the wage – inflation link. The only additional variable (in addition to those for the dynamic specification) is a measure for trade union membership share (denoted by TU and displayed as Figure 5). With wages, we use not only a linear model but also threshold models to take into account the possible nonlinear feedback effect of inflation on wage formation. This analysis is largely motivated by Rudd's (2021) suggestion that wages do not react to small values of inflation but with high inflation some form of inflation indexation is demanded.

As for the costs elements, we have the following variables: producer prices (PPI), the wage rate (W) and import prices (IMP). Output gap (g) is constructed using the HP filter for log real output. Inflation is measured by the CPI. With quarterly data, four-quarter log differences are used as a rule for all relevant price variables. The details of these data and data sources are listed in the Data Appendix.

2.3 Some observations from the data

[6] It turned out to be very difficult to construct long series of the subcategories for the Euro area. Hence, for time being we use just data for Finland and the United States. In the global cross-country panel data, we have CPI data from 197 countries but all four relevant times series only for 110 countries. Graphs for both samples are presented in Figure 1.

Next we turn to scrutinize the data and try see whether we can find some features in the cross-country development of inflation that would corroborate our ideas of the role of globalization. In our view, globalization is much more than increased trade shares which are usually used as measures of globalization. Thus, globalization is interpreted as both (1) increased **production opportunities** in the World and (2) introduction of **new** worldwide trade and payment **technologies**. In some cases, it is a bit hard to draw a clear line between these two sets of factors affecting aggregate supply. Increased production opportunities mean that domestic demand and supply can be very different and also that domestic saving and investment do not need to be equal. So, globalization means a long step from a closed economy to genuinely open economy which means that the supply curve facing domestic demand is much more elastic than before because less binding supply constraints and more competitive world market environment.

Obviously we cannot see the slope of the supply curve but if we look at the dispersion in global inflation rates (Figure 1) we find that after early 1990 there has been dramatic decrease in the cross-section variance in inflation rates which continued until the pre-financial crisis years 2008-9. It is worth noticing that the variance did not go down in the early 1980s (i.e., right after "Volcker") but much later. In fact, also inflation rates continued to stay high until the mid-1990s (as pointed out by Rudd 2022). After 2003, or so, the cross-section variance has been almost constant - even during the Convid-19 year 2020. Most clearly the slowdown in dispersion shows in the OECD data where we have less countries but the time series basically cover the whole sample period for all countries. There the slowdown is really very smooth, almost trend-like which would best correspond the ideas of globalization effects.

It is worth noticing that the slowdown of dispersion shows up in all inflation series (i.e., also in producer prices and energy prices) as well as in private consumption deflators. Moreover, we find that this dispersion is only very weakly related to the dispersion of output growth over countries. The dispersion of output growth is almost constant over time, as show in Figure 1. In other words, it looks like output shocks are not indeed the main drivers of inflation. Not only does cross-county dispersion of inflation decrease over time but so does also the variability of inflation over time at the country level. This shows up if we compute the square root of the squared forecast error of inflation from a simple AR(1) model (plus fixed effects)) and compare that with actual inflation. With the absolute error (cpi-pie), correlation is 0.746 and with the relative error $(cpi-cpi^e)/cpi^e$ 0.301. This converge of inflation rates over countries and the slowdown of inflation variability over time are both consistent with the idea that the supply curve facing a single country has become more elastic and that has dampened the price effects of eventual country-specific demand shocks.

One way of testing this story is to look the price developments of tradeable and nontradeable goods. The most convenient way of doing it is to focus on consumer prices for goods, on the one hand and prices of services on the other hand. This is in fact done in Figure 2. In most countries there is a clear difference between the first years of the sample, say 1970-1990 and the period after that. In the first part, the growth rate of prices for services is quite close to that of commodities but over time these two growth rates start to deviate more and more from each other. If we think that most of services are nontradeables and commodities become more and

more tradeables, and globalization is the key element in this process we may claim that the growing difference between these to time series is at least some degree due to globalization. These casual observations are also re-enforced by empirical analyses which are reported in Table 2.

The globalization effect on relative prices could perhaps traced by comparing the import share of different commodities with the corresponding relative prices. For the U.S. we have data on the share of imported consumption goods out of consumption for different commodity groups (see Appendix 1 for details). The striking feature in the time series is the very strong growth of durables' imports (compared with nondurable goods' imports). One at least speculate that this increased supply of imported (durable) goods has exerted pressure on prices. Usually, we interpret the negative trend of durable goods' prices as an indication of quality improvements (and corresponding price adjustments made by statistical offices) but it might well be that the contribution of globalization is equally, it not of greater importance.

It is interesting that also the dispersion of inflation rates differ between goods and services. In both series, we can uncover a volatile part for the before mid-1990s (with goods the volatile period ends already earlier, about 1990). After that the dispersion of services' inflation is almost nonexistent while some movement can be uncovered with goods.

To describe globalization, we use various indicators. In the first place, we derive the market shares of South-East Asian countries (of World exports). In fact, the pattern of all these series come close to the market share of China. It is interesting that this market share has continued to increase strongly also during the first decades of the 2000 opposite to traditional market openness measures (foreign trade to GDP ratio) of developed countries which in many cased to ceased to increase after the early 2000[7]. One has to keep in mind that the key ingredient in globalization is its effect via contestable markets which has become increasingly relevant due to new innovations in information technology and payment media. A continuous fall in transportation costs has also contributed to the same end. So, the potential supply effect can equally important than the realized values of supply and trade (see useful discussion in Auer et al. (2017))[8]. Hence, data on actual transactions may not tell the whole story. The second set indicators that we use reflect new ways of ordering things, making payments and distributing goods and services. This set includes the following indicators:

- goods delivered by postal services
- goods/orders pay paid electric payment methods
- goods ordered by the Internet

[7] See Figure 3 for World trade in relation World industrial production which seems to stay almost constant for the last 15 years. Similarly, the U.S. imports/GDP ratio (Appendix 2) grows steadily until the financial crisis but levels off after that. For the last two decades, these graphs give a completely different message compared with "our" globalization indicators.

[8] It is perhaps useful to cite the comment on contestable markets in Auer et al (2017) "The global view suggests that trade in final goods and services is an important, but incomplete, measure of openness and of the strength of the forces that make domestic markets contestable. For example, for a given level of exports and imports, greater global competition at each stage of production would result in more substitutability of factor inputs and outputs and hence raise the influence of global slack conditions at the expense of domestic ones. In this sense, trends in intermediate trade may be more informative about trends in global competition than the conventional measure based on the sum of all exports and imports".

- the KOF index of globalization[9]
- FDI data[10]

The corresponding data are displayed in Figure 3. The data mainly cover nonfinancial indicators because of data reasons (too short sample periods, in particular), We also have data on average tariff rates for different commodities and countries (Figure 4). Even though the data cover only the last 30 years we can see that a major reduction in tariff rates took place during the 1990s, exactly at the same time as the major fall in inflation rates over the globe took place. On top of that, we have several indicators of freight costs (airborne & shipping) which all indicate that these costs decreased quite a lot after 1970s (which is consistent with the findings of Bernhofe et al. (2013)).[11]

Given the nature of globalization, it is clear that none of these time series represents a perfect indicator of globalization. By experimenting with some competing indicators, we may anyway get some important insights of the importance of this phenomenon from the point of view of inflation. Of course, we have to keep in mind that there are not only direct effects of globalization (say, via supply opportunities) but also indirect effects via institutions. Thus, we may observe that there has been huge changes in the labor market such as growth of part-time work as well as self-employment opportunities and remote working. One striking change in the downfall of the unionization rate in practically all industrialized countries (Figure 5). Of course, there can well be other reasons for the downfall but it is hard to deny that globalization is anyway one of the reasons which has weakened the negotiation power of trade unions. Because globalization affects all countries roughly in the same way, it is difficult to separate the globalization effect from other factors, On the other hand, the fact that unionization rates have decreased in all countries in the same way suggests that the reason must be something which in its generality resembles globalization.

3 Estimation results

In the subsequent empirical analysis, we use of the two sets of estimating equations, an equation the transmission of costs to consumer prices and a wage equation which reflect the relationship between wages and inflation (in a sense a reaction function for wages). We will also make use of a VAR model which includes all four relevant variables. In this model, the set of variables consist of g, W, PPI, and CPI. Identification is done by the Cholesky decomposition; the ordering did not make much difference but the above-mentioned ordering of variables is used in the final reported specification.

As for the "inflation equation" we do not follow the customary Phillips curve tradition but use much simpler "cost accounting" equation which just assumes that the various cost elements, like wages, are predetermined for consumer prices. True, we also introduce the output gap variable to control

[9] The KOF Swiss Economic Institute globalization index measures the economic, social and political dimensions of globalization. The KOF (2021) database provides indexes for large sample of countries for 1970-2019. Here we use the economic composite index. Results with the aggregate index are very similar even though less precise.
[10] The KOF indexes already make use of the stock of FDI but we rather use the inflow values (relative to GDP) because the stock values very much reflect global asset prices and not so much real activity.
[11] See Akinci et al (2022) for the very recent data and the observed deglobalization effects on inflation rates.

the cyclical environment but otherwise we leave aside financial and fiscal variables. The only exception deals with proxies for globalization which are included into the final estimating specification.

3.1 Consumer prices and pass-through of costs

Estimation results are displayed in the following way; estimates for the inflation equation are reported in Tables 1-3. In Table 1 we consider the aggregate CPI while in Table 2 we have the main sub-categories of CPI. In Table 3 we report inflation equation estimates with additional tariff and freight cost variables. Wage equation estimates are reported in Table 4. In Table 5, we report parameter values for different sample periods and for different inflation regimes (using the threshold models). To facilitate comparisons over time and over countries. we use the simplest possible dynamic specification. We did also used error-correction models but they did not provide any qualitatively different results and therefore they are not reported here. This comment also applies to estimates with are obtained from quarterly differences of the data (in Table 1, we report a set if estimates also using these one-quarter log differenced data).

The estimating equation for CPI inflation takes the following form:

$$cpi_t = a_0 + a_1 ppi_t + a_2 w_t + a_3 imp_t + a_4 g_t + a_5 cpi_{t-1} + u_t, \quad (1)$$

where the lower-case letter denote four-quarter log differences of the respective variable. g is the output gap and u the error term. We also add some addition control variables for globalization and tariffs to the final specifications. The respective estimation results in Table 1 do not represent any choking news because long-run price parities guarantee that the sum of long-run coefficients of the RHS terms add (roughly) up to unity (after considering the Koyck lag structure implied by the lagged dependent variable). Only with the global panel data, the sum of price term coefficients clearly fails to come close to unity but that seems to depend on estimator. With the GMM estimator, the sum is roughly one.

As for other variables, the performance of the output-gap is rather sensitive to sample periods and set of countries. The latter result is not so surprising given recent analyses (see in particular Stock and Watson (2021)) which point to a weakening relationship between inflation and the cyclical situation over time.[12] At the same time, there is increasing evidence on inflation persistence from the 1970s to the early 2000s (see e.g., O'Reilly and Whelan (2005))

If we move to a VAR representation, we find that the results make sense for all variables: both consumer price and wage inflation reflect price and costs shocks and are positively related to the output gap. The outcome of the VAR results is almost identical for all (sets of) countries (see the last lines in Figure 6) for space reasons we present more detailed results only for Finland (two first sets of results in Figure 6). The impulse responses indicate that the producer prices are important for the determination of both consumer prices and wages. So, in both cases they represents some form

[12] We had a brief look at the relationship between the change in the inflation rate (Δcpi) and the growth rate of industrial production (ip) (see the data in Figure 1) with global cross-country data. It turned out that the relationship for the whole period 1958M1-2021M12 was very weak, the R^2 for a fixed effects' regression being only 0.008. We also found that the coefficient of ip declined towards the end of the sample period.

of transmission mechanism presumably reflecting the relevant mark-ups between consumer prices and various cost components. Also the historical decomposition underlines the key role of producer price. By contrast, the role of output gap (or alternatively output growth) is rather weak and hardly statistically significant.

If the VAR model is estimated for different subsamples of the data, it turns out that it is very difficult to get statistically significant results for the most recent sample period 1995-2021 (Figure 6). Thus, the confidence intervals of the IRFs include zero for almost all periods. Only for the first quarters significant values can be detected. The results probably reflect the fact in an almost constant low-inflation regime we cannot properly identify the transmission mechanism of cost to prices nor other details of the system. As for the wage effects, we find that they are particularly small for the 1995-2020 period (being consistent with the findings of Peneva and Rudd 2015).

The interesting thing is the behavior of estimated coefficients over time. The results reported for single equation estimation in Table 5 indicate that in particular the coefficient estimates of the wage growth variable in the price inflation equation have in all cases decreased over time. Thus, while the pass-through values for the early period was somewhat between 0.5 and 1.0, the value for the latter part of the sample was only around 0.5. Similar result emerges it we scrutinize recursive estimates of the relevant parameter. Also, the coefficients of the other cost components behave in the similar way.

In Table 2 we focus on main different commodity groups with the idea that commodity price developments with tradeables and non-tradeables ought to be different at least from the point of globalization – as already shown in Figure 2. In this table we focus on both Finnish annual data and US quarterly data[13]. The results seem to follow the same logic for both countries: Globalization only affects (durable) goods, not services' prices. Price inflation for services depends much more on wages and producer prices as well as on the output gap than inflation for commodities[14]. In fact, we can see traces of the distinction between open and closed economy and the effects of foreign trade. Of course, we have to keep in mind that these crude classifications do not exactly correspond to tradeable/non-tradeables' distinction and this distinction has surely changed over time in the way Figures 2 suggests. Perhaps the most striking result in Table 2 is the difference between the coefficients for durable goods and services concerning wage and producer prices' growth in particular.

3.2 Effects of globalization

But what about globalization. We consider this issue only in the context of (price) inflation and, as you can see from Table 1, the results strongly suggest that globalization in its different form has a dampening effect on inflation. It is only that we cannot really discriminate between different indicators because the data cover so different sample periods. Anyway, we can say that huge growth of Chinas' export seems to have a clear negative effect on inflation irrespectively of the specification and countries or group of countries. The KOF globalization index generates almost identical results. As for other globalization measures, the indicator for internet sales shares seems to

[13] The Euro area data for different price categories could not be constructed.

[14] Also Stock and Watson (2021) point out in their recent study on cyclical sensitivity of inflation in the U.S. that "different components of inflation have very different cyclical properties - goods that are traded in international markets tend to have little cyclical variability".

be the most reliable even though all corresponding measures are highly correlated and provide similar results.

Also, the tariff indicators as well our transportation cost indicators point to the same direction (see Table 3[15]). So, the more there are various transaction costs in foreign trade, the higher is the rate of inflation and the more these costs decrease, the lower is inflation. In a sense this is consistent with the ideas of put forward by Obstfeld and Rogoff in their "six major puzzles in international macroeconomics article" from 2001 that transactions cost – however small they may appear – may have a profound effect on many macroeconomic variables.

If we scrutinize the numerical values of the estimated coefficients, we find differences in terms of the countries, sample periods and time aggregation. A lot depends also on the set of right-hand variables. For instance, we have to consider whether wages or import prices are independent of globalization,. Thus, for instance, in the case of the first equation/column in Table 1, the (semi) elasticity of the China variable is 0.12 if all other price/cost terms are included but 0.57 is they are not (when computing the long-.run elasticity at the annual level). Given that this variable (China, which is the export market share of China) has increased by more than 13 per centage points during the sample period, the resulting the inflation effect not completely negligible. With global data, the range of (semi)elasticities is 0.3 and 0.6, which come quite close to these estimates from Finnish data.

3.3 Effects of inflation on wage growth

Finally, turn to wages. In the same way as with consumption prices, we make use of a simple specification of the following form:

$$w_t = b_0 + b_1 cpi_{t-1} + b_2 g_t + a_3 w_{t-1} + v_t, \qquad (2)$$

where notation is basically the same as with equation (1). With this equation, we use the trade union participation rate TU as an additional control variable. In addition to this linear specification, we use a nonlinear (threshold) model, where the coefficient b_1 depends the (lagged) rate of inflation in such a way that we have instead of $b_1 cpi_{t-1}$ an expression $b_{11} cpi_{t-1} | cpi_{t-1} < \theta + b_{12} cpi_{t-1} | cpi_{t-1} \geq \theta$, where θ denotes a fixed (estimated) threshold parameter. Alternatively, we use logistic expression for the coefficient b_1 to get a smooth threshold proposed by Granger and Teräsvirta (1993). When estimating (2) we find similar instabilities as with consumer prices (Tables 4 and 5). It is interesting that instability is tightly related to the values of the inflation rate. Thus, in all cases, a linear model is outperformed by a nonlinear threshold model. The magnitudes of the threshold shows up in Table 5 where the coefficients of the lagged cpi – for both below and above the threshold – are displayed, and also the graphs of the smoothed (logistic) threshold weight function (see Figure 7). The message is clear – and well consistent with proposition of Rudd (2021) – saying that wages do not react to low inflation. So, if we are below, say 2 – 3 per cent at annual level – the reaction coefficient is either zero or rather small – much smaller than with high inflation. With high inflation, we approach unity. It is also interesting that the output gap variable has very low explanatory power in a linear model as well in the nonlinear model where only the inflation rate variable is in a nonlinear form. If also the output gap is allowed to enter the equation in a nonlinear threshold form, its coefficient is negative in the low inflation regime for all countries. So, it appears as the Phipps curve for wages is L-shaped where wages react very little to output and inflation in a

[15] Unfortunately, the tariff data only goes back to 1988 (and for Finland the data are even shorter). Even then the results clearly point to the direction of a higher rate of inflation for the high tariff periods.

low inflation (low output) regime but react very strongly to inflation and also output in the high-inflation regime.

This is not the first time that nonlinearities and found in wage formation or in the pass-through of wages to prices. Hahn (2020) also found that the relationships are nonlinear but she focused on the output growth, not inflation regime. Her analysis was based on VAR model, that is of the same structure as the one that we use in our paper (see the analysis dealing with the CPI inflation). Although wages (or all other prices) may depend in the cyclical situation in a nonlinear way we are tempted to think that nonlinearities are more important from the point of inflation or globalization regimes. Stability tests with linear wage equations suggests the parameters are not stable and that the timing of a breakdown for all countries take place rather early (in the early 1980s). With the threshold model, stability (Cusum) tests do not show a similar failure (see Appendix 4).

Because we have both high ja low inflation regimes on the data it is no surprise that the coefficients of the linear wage growth equation are different fort different regimes. Thus, low inflation periods are characterized by low values of the lagged inflation coefficient. This is also consistent with the observed fact that wage indexation has been of secondary importance in recent years, at least in Europe (see Kroester and Grapow 2021).

4 Concluding remarks

The recent surge of inflation is not necessarily a surprise if we consider the back-steps that have been taken in globalization meaning that the global supply curve is getting less horizontal. Even though the steps in the form of supply chain disturbances and movements to bring production back to home and increase tariff-protection are not so striking they anyway mean that the contribution of globalization is no more alleviating price increases. Future developments will show whether labor market reactions strengthen this course of events. Our estimates strongly suggest that when inflation goes over some critical level wages start reacting to inflation in a more aggressive way thus prolonging the high-inflation regime.

Although it is not easy to proof that globalization has been “the” reason for slowdown of inflation for the last 50 years, the time paths of cross-county inflation dispersion and the behavior of relative prices strongly suggests that some global factors are behind the observed patterns. On top of that we find that some nonlinearities in wage formation operate as multipliers when inflation rates exceed low levels. Thus, we have to follow closely both the global supply factors and the domestic responses to these factors not forgetting domestic demand shocks.

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Table 1 Inflation equation estimates for different sets of countries

	Finland	Finland	Finland	Euro area[a)]	Euro area[a)]	Euro area[a)]	Euro area[b)]	USA	USA	USA	USA	World	World	World[c)]	World[d)]
c	.244 (2.65)	.612 (2.52)	.432 (0.68)	.228 (2.76)	1.602 (4.08)	0.528 (1.25)	.055 (1.71)	1.670 (4.34)	.322 (1.89)	.013 (4.70)	1.544 (4.76)	2.985 (12.03)	7.480 (11.14)	13.652 (15.03)	
ppi	.219 (4.41)	.285 (6.25)	.091 (3.47)	.149 (4.92)	.177 (5.67)	.098 (6.38)	.234 (11.06)	,283 (19.26)	.112 (7.72)	.154 (7.06)	.155 (7.29)	.316 (12.68)	.327 (13.11)	.266 (4.61)	.573 (29.27)
w	.155 (5.38)	.141 (6.01)	.099 (2.94)	.300 (4.20)	.248 (3.82)	.214 (5.00)	.182 (2.95)	.298 (2.03)	.124 (2.20)	.175 (2.02)	.135 (2.15)				
imp	.005 (0.17)	-.035 (1.63)	.005 (0.38)									.283 (10.54)	.275 (10.48)	.236 (9.87)	.395 (21.76)
g	.006 (0.39)	.009 (0.50)	.030 (1.36)	.012 (0.67)	.043 (3.34)	.053 (2.79)	.018 (0.60)	.055 (1.63)	.094 (2.83)	.052 (3.12)	.098 (2.41)	-.052 (2.04)	-.045 (1.69)	-.107 (3.68)	-.195 (6.32)
global	-.034 (2.64	-.015 (3.33)	-.006 (0.87)	-.021 (2.61)	-.031 (4.21)	-.008[e)] (1.60)	-.006 (2.71)	-.023 (4.16)	-.029[f)] (1.86)	-.052 (3.12)	-.062 (3.17)	-.130 (7.31)	-.102 (9.49)	-.201 (14.29)	-.203 (3.62)
cpi_{-1}	.450 (8,11)	.370 (7.55)	.774 (22.17)	.296 (3.58)	.216 (2.87)	.634 (12.70)	-.009 (1.16)	.008 (0.09)	.720 (11.14)	.178 (1.63)	.167 (1.54)	.032 (1.16)	.030 (1.17)	.025 (1.27)	-.001 (1.62)
R^2	0.789	0.819	0.985	0.719	0.746	0.984	0.825	0.687	0.949	0.824	0.828	0.714	0.725	0.798	0.404
SEE	0.532	0.512	0.535	0.355	0.335	0.293	0.363	0.549	0.641	0.481	0.475	3.471	3.414	2.994	6.040
DW	2.224	2.249	1.635	2.282	2.269	1.012	0.558	1.937	1.705	1.310	1.308	0.986	1.024	1.141	,,
sample	64q2-21q2	70q1-19q4	70q1 19q4	80q2-20q4	80q2-20q4	80q2-20q4	96q1-21q2	70q1-19q4	65q1-20q4	92q1-21q2	92q1-20q4	1970-2020	1970-2019	1970-2020	1971-2018
global	China	KOF	KOF	China	KOF	KOF	Euronet	KOF	China	elect	post	China	KOF	KOF	KOF
Difference	q1	q1	q4	q1	q1	q4	q4	q1	q4	q4	q4	year	year	year	year

The dependent variable is the CPI inflation. Numbers inside parentheses are robust t-values. a) Euro area consists here of France, Germany, Italy and Spain only. b) In column 7 it corresponds to the whole Euro area. In the second last column for global data, fixed country effects are included. d) in the last column, GMM estimates with first differences are reported. The P value of J-statistic is 0.175. [e)] If KOF is replaced the FDI inflow//GDP for the Euro are, the coefficient is -.039 (3.01) [f)] Similarly, if China is replaced by the KOF index, the respective coefficient is -.026 (2.88) and if is replaced by the FDI inflow to GDP for the whole world it is -.186(3.16) China denotes the world market share of China and KOF the KOF economic globalization index for each country.

Table 2 Inflation equations for different commodity groups

	durables	semidur.	goods	services	USA: g	USA: s	USA: g	USA: s
c	.258	.054	-.004	.011	.123	1.125	.339	1.513
	(4.77)	(1.47)	(0.16)	(0.31)	(1.01)	(0.85)	(1.42)	(1.48)
ppi	.108	.162	.406	.094	.350	.037	.346	.036
	(2.43)	(2.11)	(5.78)	(1.97)	(7.04)	(3.41)	(7.07)	(3.31)
w	-.364	.259	.179	.363	.236^{p}	.071^{m}	.211^{p}	.059^{m}
	(3.67)	(2.41)	(1.42)	(3.17)	(2.54)	(1.31)	(2.71)	(1.18)
g	-.150	-.176	.124	.058	0.019	.146	.026	.146
	(1.52)	(1.34)	(1.00)	(0.51)	(0.30)	(3.84)	(0.42)	(3.99)
global	-.033	-.008	.006	-.001	-.032	-.011	-.065	-.001
	(4.80)	(1.65)	(0.19)	(0.33)	(3.01)	(0.99)	(2.68)	(0.99)
lagged p_i	.176	.337	.419	.410	.310	.939	.313	.896
	(1.25)	(1.48)	(5.15)	(4.85)	(2.54)	(8,97)	(2.53)	(17.91)
R^2	0.847	0.899	0.804	0.571	0.897	0.950	0.900	0.951
SEE	1.613	1.117	1.699	1.136	1.057	0.630	1.011	0.610
DW	1.748	2.149	2.459	2.591	1.367	1.895	1.401	1.919
global	KOF	KOF	KOF	KOF	China	China	China	China
sample	1975-2020	1975-2020	1975-2020	1975-2020	65q1-20q4	65q1-20q4	59q4-20q4	59q4-20q4

Numbers inside parentheses are robust t-values. The Finnish classification is durables, semi-durables, other goods (= food, beverages, alcohol & tobacco) and services. The US classification is goods (G) and Services (S). Superscript **p** denotes private sector wages and **m** manufacturing wages, KOF denote the KOF economic globalization index (here) for Finland

Table 3 Inflation equation estimates with an additional tariff variable

	World	Euro area[)]	USA	USA	USA	USA
c	1.191	--033	.132	-.298	-.122	1.041
	(4.12	(1.87)	(1.81)	(0.36)	(0.18)	(0.70)
ppi	.308	.095	.167	.130	.128	,140
	(13.97)	(8.27)	(7.61)	(5.81)	(5.76)	(6.03)
w		.176	.088	.117	.093	.179
		(3.28)	(1.06)	(2.15)	(1.77)	(1.56)
imp	.331					
	(13.27)					
g	-.949	.068	.189	.139	.137	.082
	(1.17)	(3.07)	(3.50)	(3.41)	(3.78)	(1.29)
global	-.032	.037	-.064	-.082	-.087	-.075
	(1.65)	(0.02)	(2.16)	(3.91)	(4.25)	(3.05)
tariff	.114	.090	.163			.034
	(5.59)	(2.31)	(1.76)			(2.03)
freight				.031	.027	.037
				(2.41)	(2.71)	(2.06)
lagged cpi	.019	.588	.066	.266	.318	.232
	(1.02)	(11.97)	(0.61)	(1.85)	(2.46)	(1.71)
R^2	0.751	0.900	0.861	0.824	0.830	0. 828
SEE	2.915	0.259	0.431	0.523	0.526	0.520
DW	1.020	1.985	1.291	1.307	1.485	1.230
sample	88Q2-21Q2	91Q1-20Q4	91Q1-21Q2	90Q3-20Q4	90Q1-20Q4	90Q3-20Q4
global	China	China	China	China	China	China
tariff	all	manuf.	manuf.	none	none	all
freight	none	none	none	airborne	Harper	airborne

Numbers inside parentheses are robust t-values. Freight costs are measured with by the airborne freight price (to USA) or by the Harper freight index. Tariff measure "all" denotes the World Bank measure of the average tariff rate while "manuf" denotes the UNCTAD measure for manufacturing goods.

Table 4 Estimates for a linear wage equation

	Finland	Euro area	USA1	USA2
c	3.370	.314	.448’	-.552
	(8.83)	(1.99)	(1.20)	(1.48)
cpi_{-1}	.752	1.004	.360	.547
	(7.63)	(19.04)	(7.21)	(9.25)
$log(w/cpi)_{-1}$	-.042	-.041		
	(4.29)	(8.49)		
g	.231	.043	-.005	-.011
	(1.91)	(0.71)	(0.05)	(0.14)
TU	.139	.964	.130	.140
	(0.93)	(2.67)	(4.97)	(4.84)
R2	0.832	0.880	0.724	0.770
SEE	1.857	1.292	0.974	1.112
DW	0.571	0.657	0.247	0.357
data	65Q1-21Q2	81Q1-20Q4	65Q4-20Q4 Private w	61Q1-20Q4 Manufacturing w

Numbers inside parentheses are robust t-values. With US, we have either the private sector wage rate (wp) or the manufacturing industry wage rate (wm).

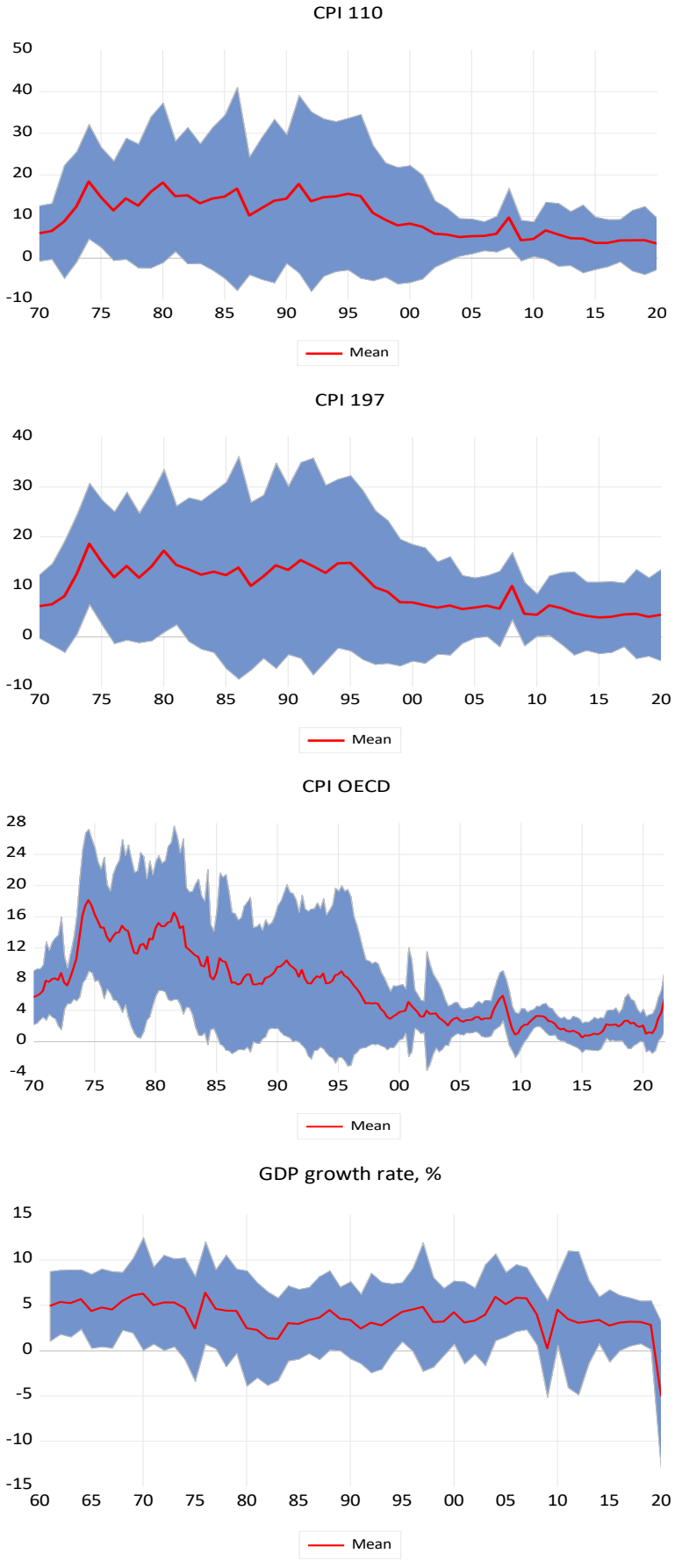
Table 5 Regime changes in parameters

pass-through coefficients w→cpi	1960-1998 sample	1999-2020 sample
Finland	.789 (25.21)	.599 (2.17*)
Euro area	.643 (6.24)	.571 (0.86*)
USA	1.004 (6.29)	.647 (3.99*)
World	.426 (9.78)	.263 (4.36*)
Reaction of wages to cpi_{t-1}; threshold model estimates	Thresholds in terms of the cpi_{t-1} variable	Coefficient estimates of cpi_{t-1} below and above the threshold
Finland	2.72 %	.001 (0.02) .705 (6.52)
Euro area	3.87 %	.391 (4.10) .884 (25.41)
USA	4.37 %	.101 (1.57) .319 (10.89)

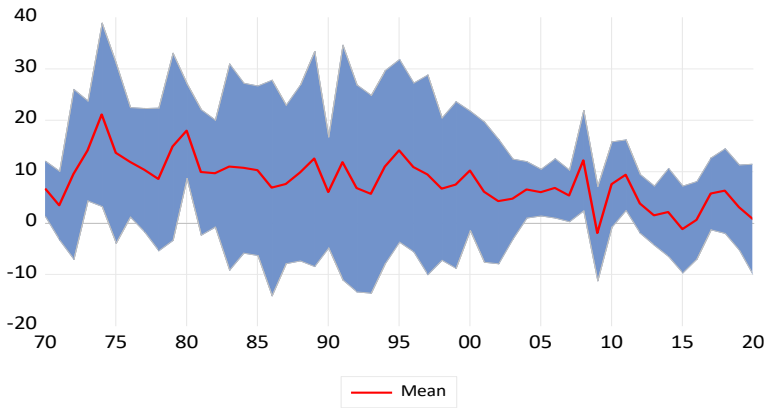
First four lines illustrate to the pass-through of wage growth to inflation in the inflation equation. The last 3 lines illustrate the effect of past (quarterly) inflation on wage growth in the nonlinear (threshold) wage equation. Numbers in parentheses are robust t-values. *These t-values are for the coefficient of the dum*π variable, where dum is an indicator variable with value one for year>1998. The estimating equation for the threshold model is the same as in Table 4 but the coefficient of cpi_{-1} is nonlinear with two regimes where the regimes depend on the values of cpi_{-1}. The weight functions for the smoothed threshold models are displayed in Figure 7.

Figure 1 Features of inflation in the Global panel data

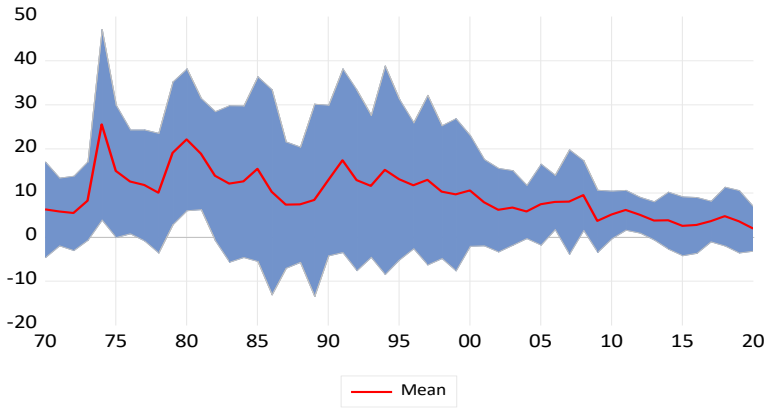
CPI denotes the consumer price index, PPI the produce prices index, and EPI energy prices, numbers indicate the number of countries.



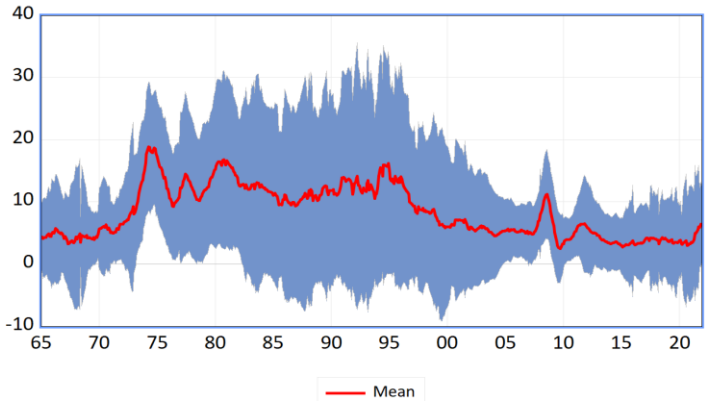
PPI



EPI



Consumer price inflation, %, monthly, 178 countries



Growth rate of industrial production, y/y, %

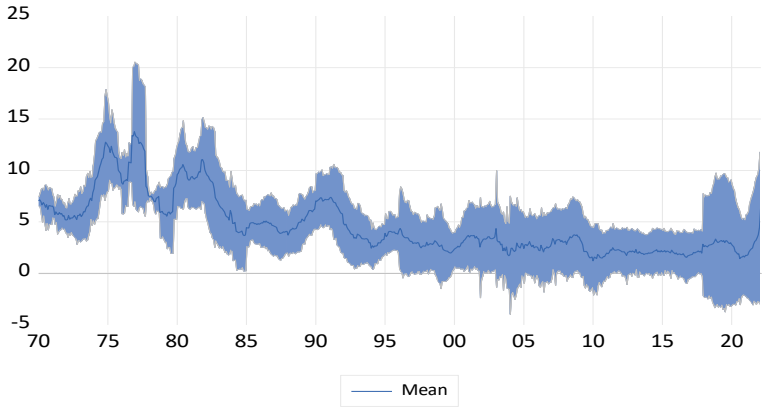
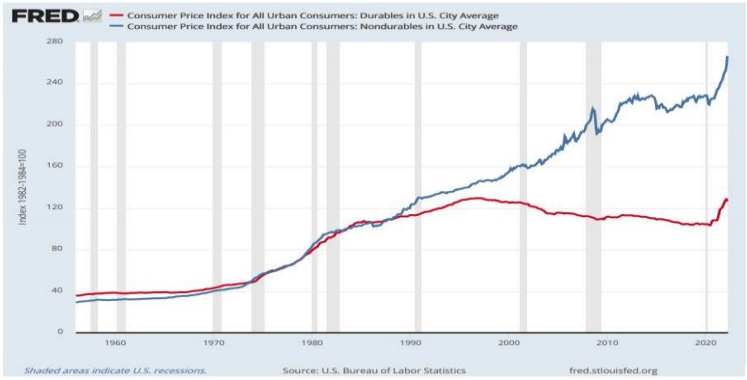


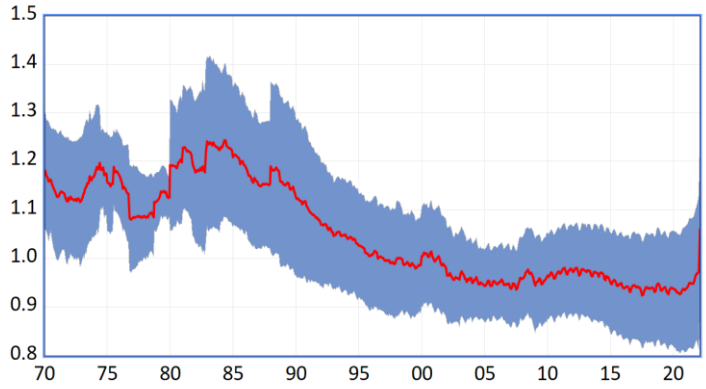
Figure 2 Comparison of prices for goods and services

Comparison of several country indexes.

US data on prices durables and nondurables

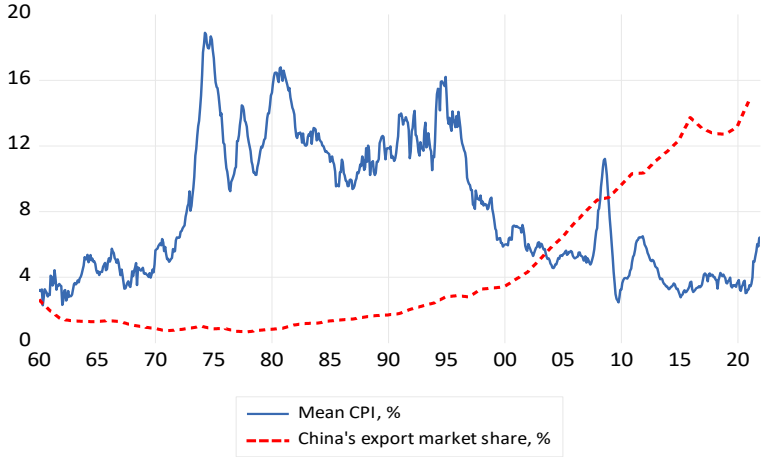


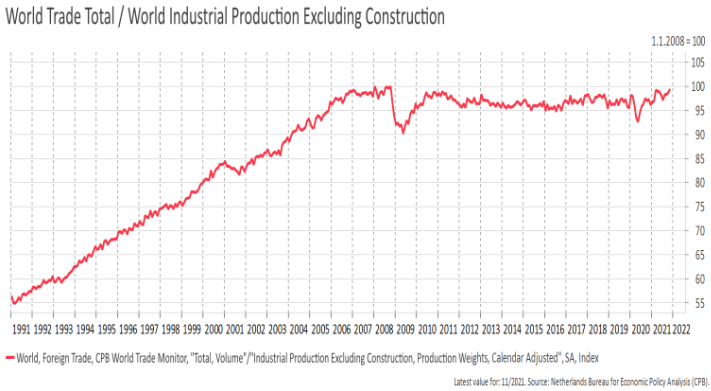
Cross-country mean values of the ratio between prices of goods and services

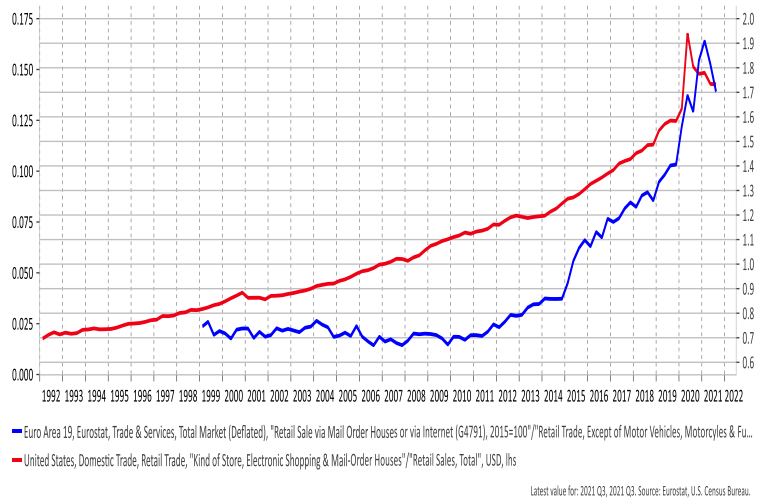


The country price indexes have been demeaned. The data come from 39 countries. The mean level stays constant until 1989 and starts falling after that. An increase starts at 2020M6.

Figure 3 Indicators of globalization







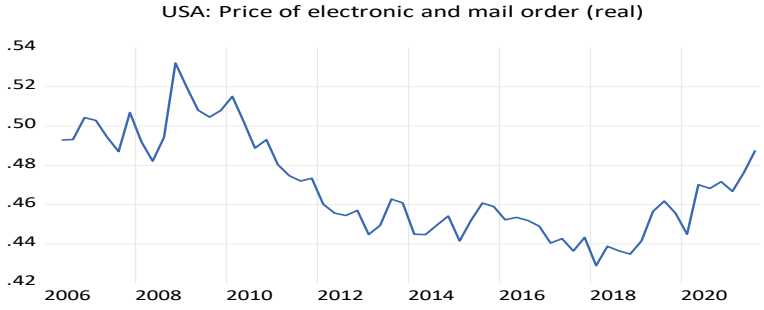
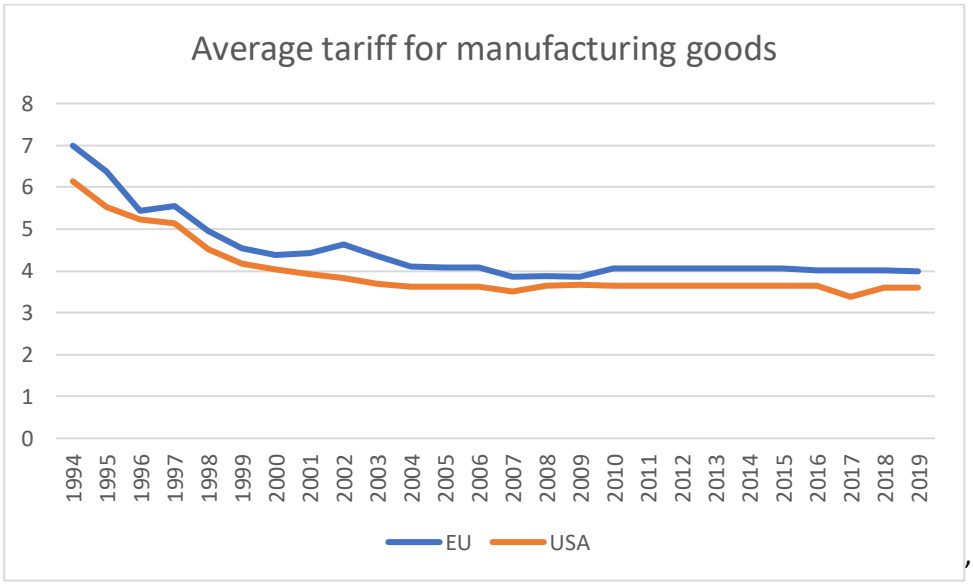
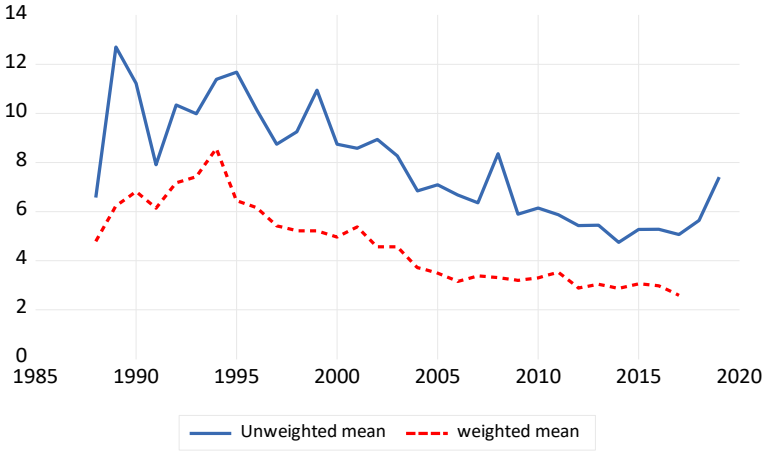


Figure 4 Tarif rates for selected countries (UNCTAD)



,

Average global tariff rate (all products)



Source: World Bank

Figure 5 Development of trade union membership in different countries

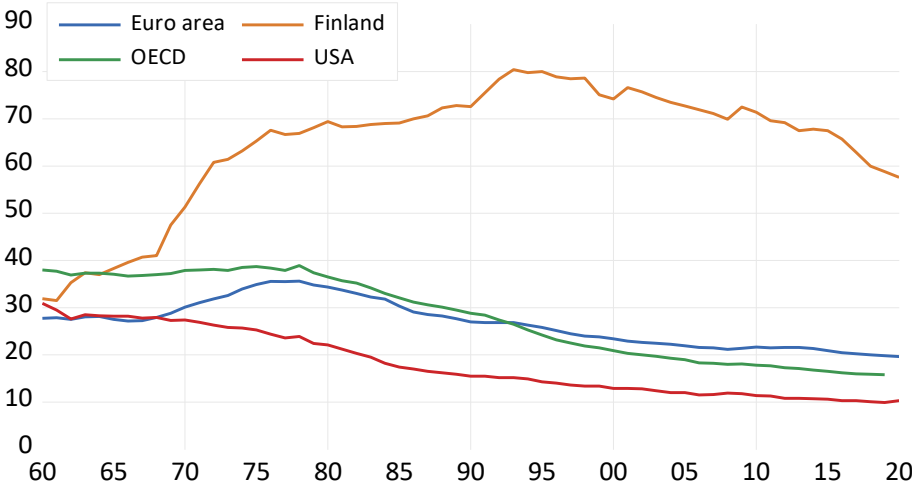
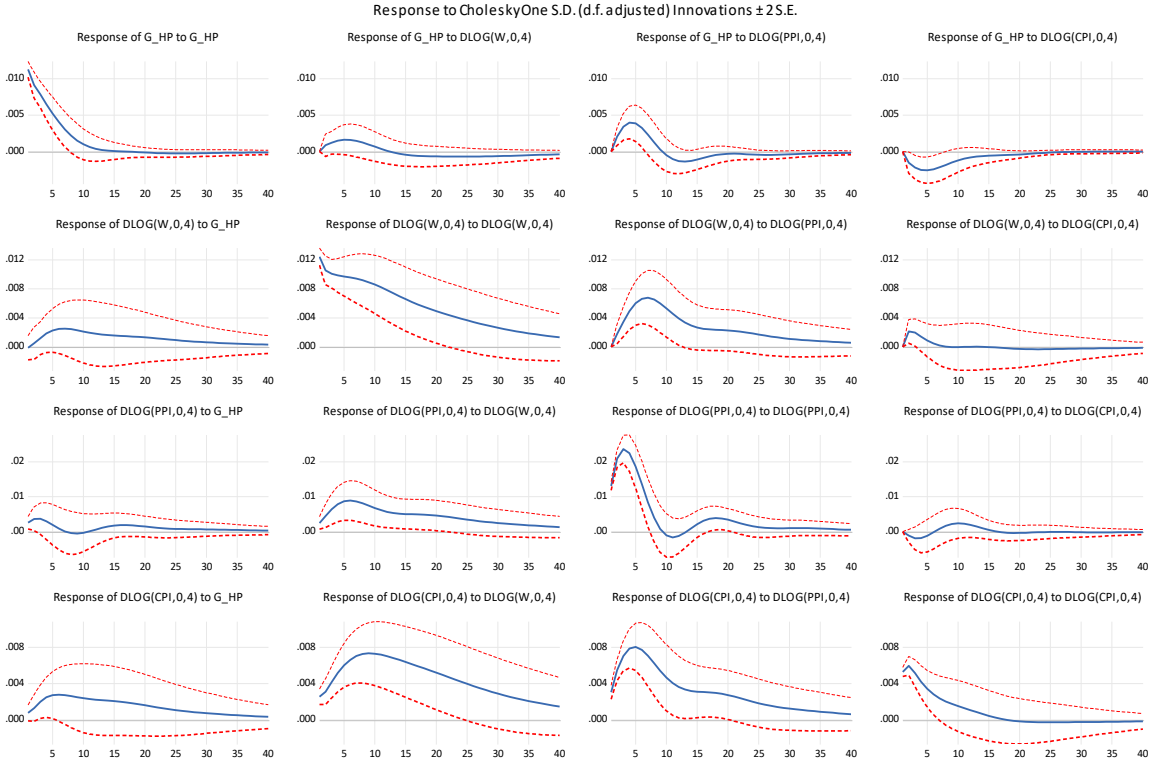
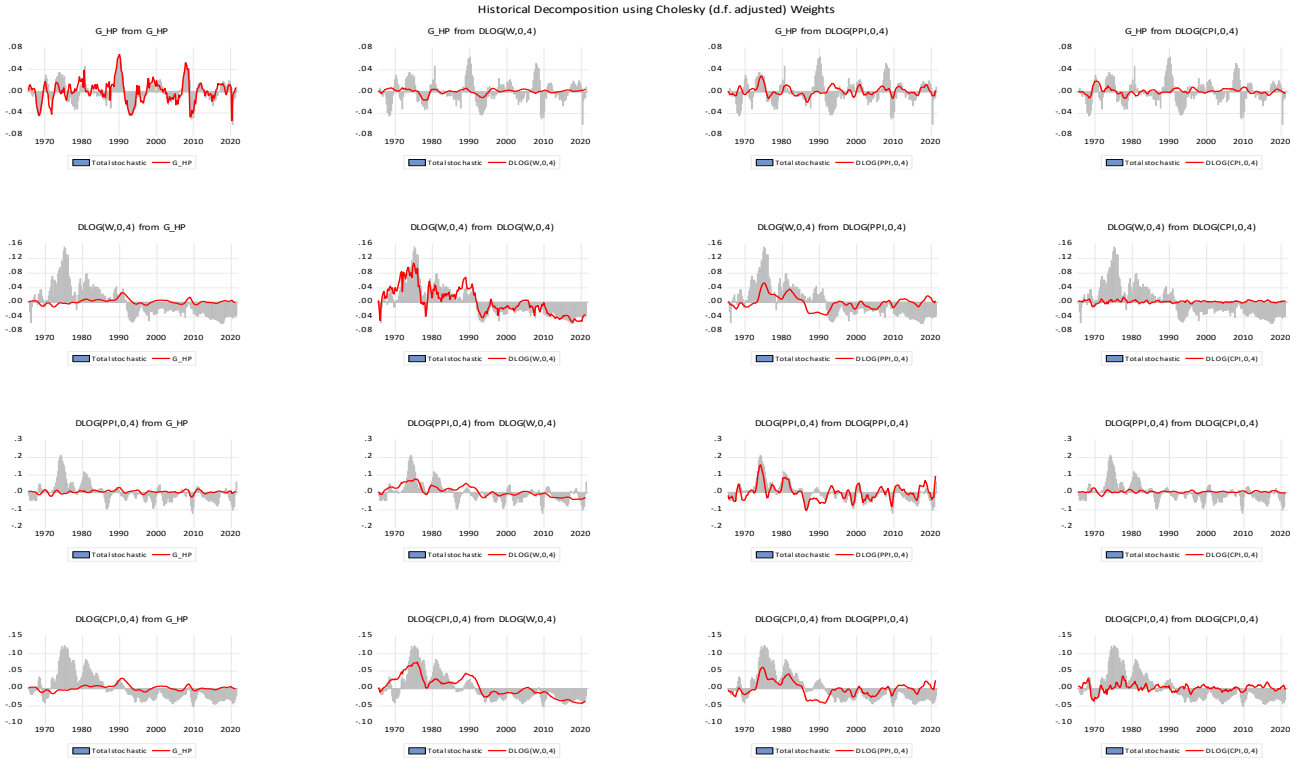


Figure 6 Impulse responses from the four-variable VAR model

IRF for Finland

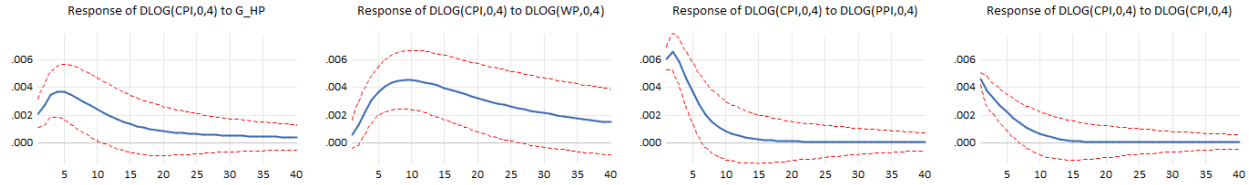


Historical VAR decomposition for Finland

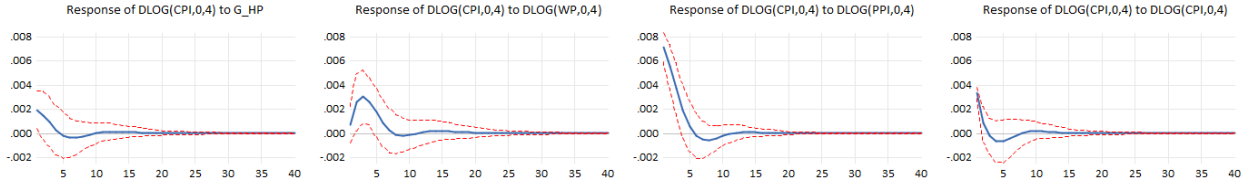


Comparison of CPI IRFs for full sample and 1995-2021 sample for different countries

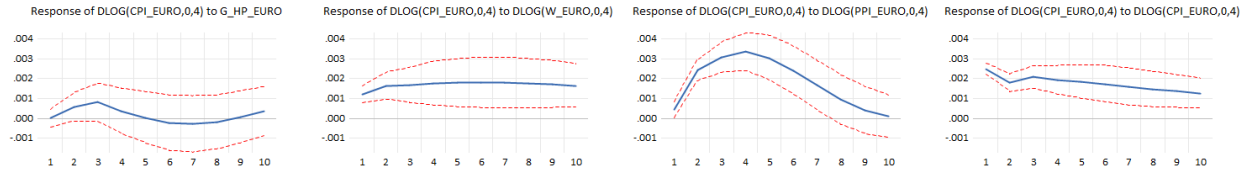
USA 1965q1-21Q3



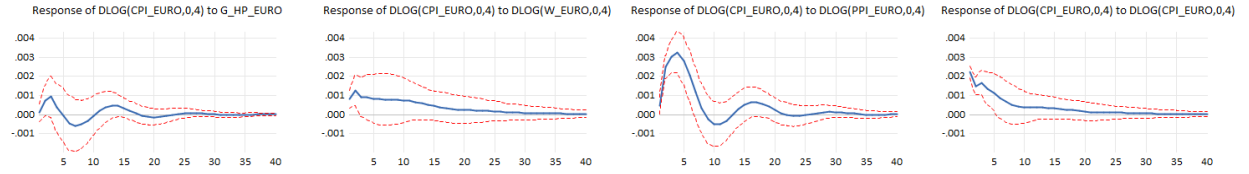
USA 1995q1-21Q3



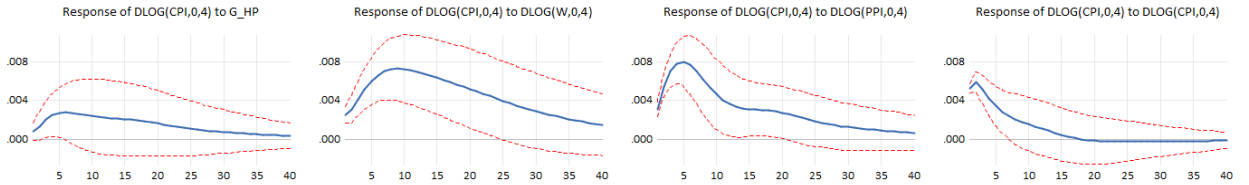
Euro area 60Q1 20Q4



Euro area 95Q1 20Q4



Finland 65Q3 21Q2



Finland 95Q1 20Q4

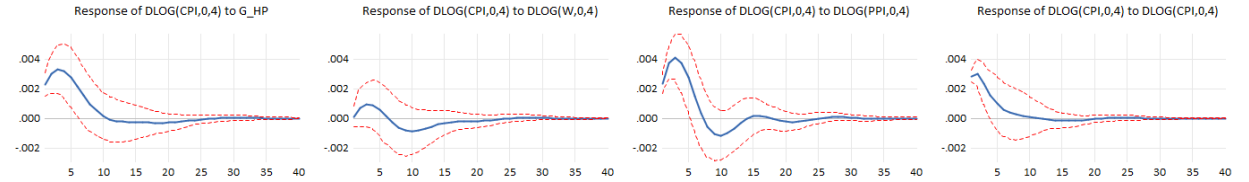
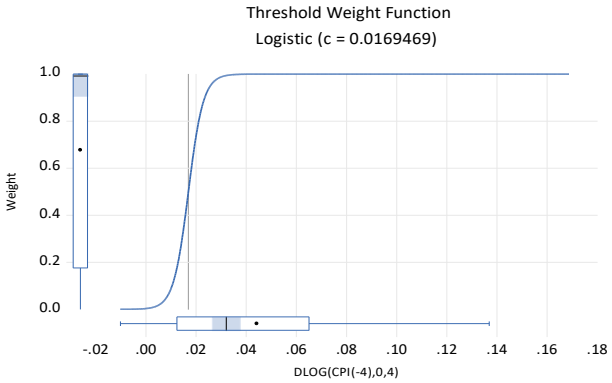
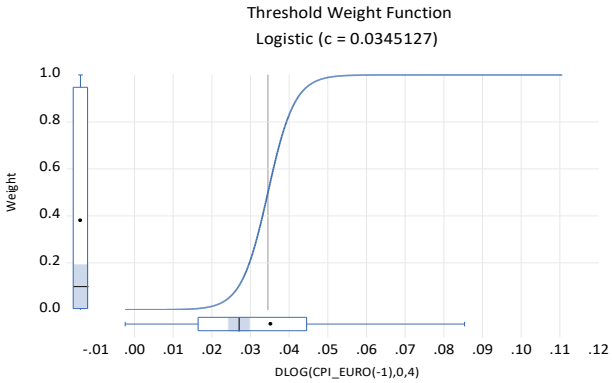


Figure 7 Smooth Threshold estimates for the threshold coefficient in the wage equation

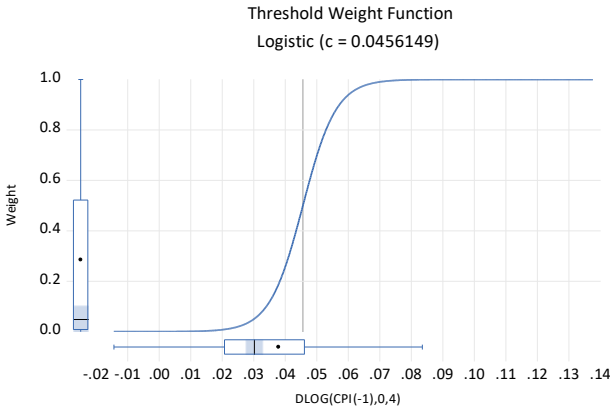
Finland



Euro area

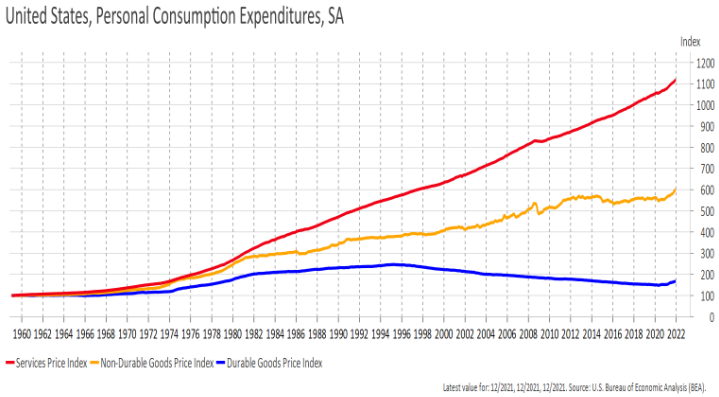


USA



A1 Relative prices and import shares (USA)

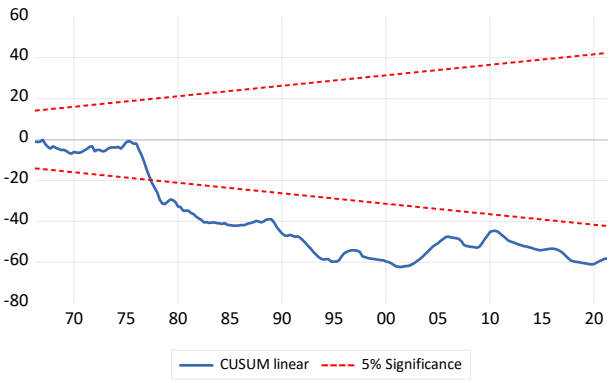
Prices for durables, non-durables and services for the U.S.

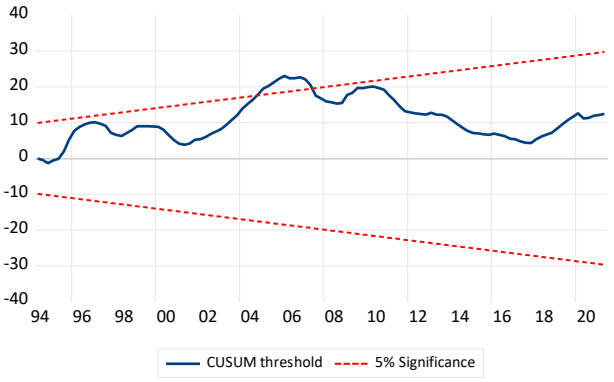


A2 Openness indicators

USA Imports of goods and services in relation to GDP, %

A3 Cusum stability tests for the Finnish wage equation





Appendix 4

Survey data and adaptive expectations

This appendix considers the point put forward by Blanchard (2022) which says that in absence of anchoring of inflation expectations, inflation is simply determined by lagged inflation (with the coefficient equal to one) on addition to the unemployment gap and the mark-up in pricing consumer goods. Here we just test this hypothesis by arranging some sort of horse race test where several variables for survey expectations are introduced into an inflation equation which includes lagged inflation and the unemployment rate (or change rate of oil prices). Both U.S. and Euro area data are used. The results are reported in Table A1.

Quite clearly, measured (survey) expectations have only a secondary role in the determination of inflation in both the Euro are and the USA. This is not so surprising because the time paths of all survey expectations (see the graphs A4.1 and A4.2 below) are almost constant over time and react only weakly to changes in actual inflation. With long-term inflation expectations (not reported) this is even more true. Thus, the coefficients of the corresponding SPF values for USA and the Euro fail to be statistically significant. Only in the Michigan survey's case, the coefficient is significant but with much lower value. It is also interesting that in a high-inflation regime (determined by using a simple threshold model specification), the coefficients of the lagged inflation term come close to one while a clearly lower value is obtained for a low inflation regime. The role of expected inflation goes generally in the opposite way, particularly when lower frequency data are used. The value of the threshold comes close to 2 per cent (see graph A4.3) which may suggest that when inflation exceeds 2 per cent less emphasis is paid to central bank's policies or future prospects in general compared with recent experiences in prices changes. Finally, the role of unemployment is very marginal.

One way of rationalizing Blanchard's idea to refer to Turnovsky's (1969) derivation of the adaptive expectations' parameter from a rational sampling procedure. It turns out that the parameter is in general time-varying reflecting the evolution of the dispersion of relative prices. Then it is well possible the adaptive expectations reduce to static expectations in the way proposed by Blanchard (2022). We try also to see if this kind of change has happened with the U.S. given the standard adaptive expectations model. Thus we fit the following equation into the data: $\Delta exp_t = \lambda(cpi_t - exp_{t-1})$ where cpi denotes actual inflation and exp expected inflation one year ahead. When doing this, we found that the estimate of the λ parameter for the whole sample with the Michigan one-year inflation expectations was 0.368 (17.23). Recursive estimation (see graph A4.4 below) suggested, however, that the parameter is much bigger for the first part of the sample period. If we estimate this equation with threshold model, the following values for low and high inflation are detected: for cpi < 2.105, $\lambda = 0.236$ ("t" = 8.20) and for cpi $\geq$ 2.105, $\lambda =$ 0.505 (17.22). In other words; with low inflation, actual inflation has little impact on inflation expectations while high inflation shows up much more in expectations formation. All that means that the relevant parameters in the price and wage equations may not be constant but change along with the inflation regime.

Table A1 Additional estimates with survey forecast values for USA and the Euro area

	Euro1	Euro2	USA1	USA2	USA3	USA4	USA5	USA6	USA7	USA8	USA9	USA10
CPI_{-1}	.842 (8.30)	.759 (7.68)	.891 (49.97)	.752 (8.41)	.614 (12.21)	.934 (26.17)	.950 (50.78)					
$CPI_{-1}^{(-)}$								.757 (10.90)	328 (4.41)	.300 (4.11)	.741 (8.84)	.787 (12.03)
$CPI_{-1}^{(+)}$								.834 (39.07)	.840 (8.31)	.657 (16.40)	.974 (12.12)	.860 (27.48)
EXP	.203 (2.04)	.266 (1.31)	.175 (7.39)	.302 (2.66)	.380 (8.21)	.068 (1.70)	.078 (3.40)			.		
$EXP^{(-)}$								.168 (3.78)	.306 (2.83)	.454 (6.24)	.145 (2.38)	.104 (2.79)
$EXP^{(+)}$								.234 (8.71)	.159 (1.53)	.311 (7.95)	.020 (0.55)	.161 (5.73)
OIL		.009 (4.68)										
UN		-.013 (0.61)	-.040 (5.03)	-.040 (1.21)	.009 (0.76)	-.004 (0.36)	-.041 (2.28)	-.028 (3.78)	.007 (0.01)	.034 (2.66)	.005 (0.40)	-.046 (3.03)
Threshold								2.157	1.996	1.996	2.157	2.157
R^2	0.777	0.888	0.980	0.757	0.941	0.931	0.926	0.983	0.855	0.957	0.937	0.938
SEE	0.481	0.345	0.361	0.684	0.537	0.379	0.378	0.339	0.626	0.477	0.361	0.345
DW	1.112	1.351	1.131	1.374	2.304	1.091	1.127	1.124	1.178	2.221	1.046	1.061
def. exp.	SPF	SPF	Mich	Phil	Liv	Clev.	CB	Mich1	Phil	Liv	Clev.	CB
Sample	99q1-22q1	99q1-22q1	78m1-22m2	81q3-22q1	80S1-21S1	82m1-22m1	87m8-22m1	78m1-22m2	81q3-22q1	80S1-21S1	82m1-22m1	87m8-22m1

Numbers inside parentheses are robust t-values. exp denotes one year CPI expectations. Superscript (+) denotes values above the threshold and (-) values below the threshold. SPF denotes ECB Survey of Professional Forecasters' forecast. Accordingly, Mich denotes the Michigan Survey's forecast, Phil the Philadelphia FED SPF forecast., Liv the Livingston survey forecast, Clev. the Cleveland FED forecast and CB the Conference Board forecast. oil stands for the growth rate of Brent oil prices and un the unemployment rate.

Figure A4.1 Data for the Euro area

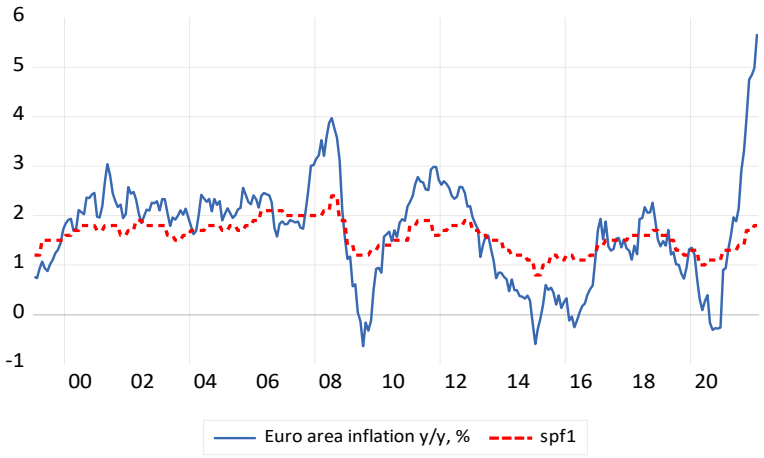


Figure A4.2 Data for the U.S.

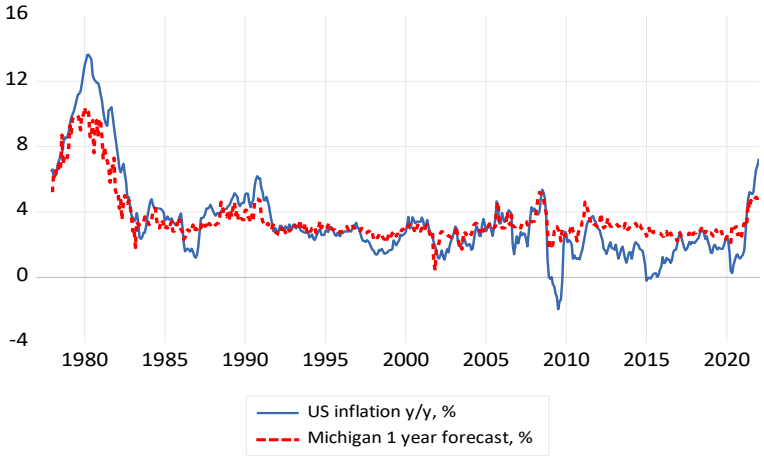


Figure A4.3 Threshold weight function from equation USA6

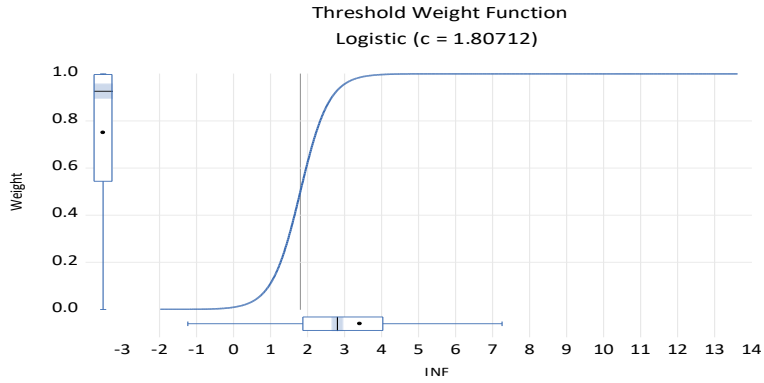
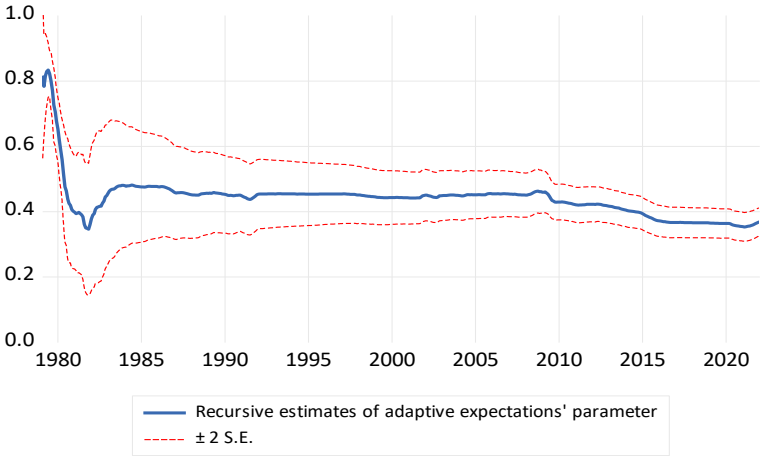


Figure A4.4 Adaptive expectations parameter for Michigan 1-year inflation expectations

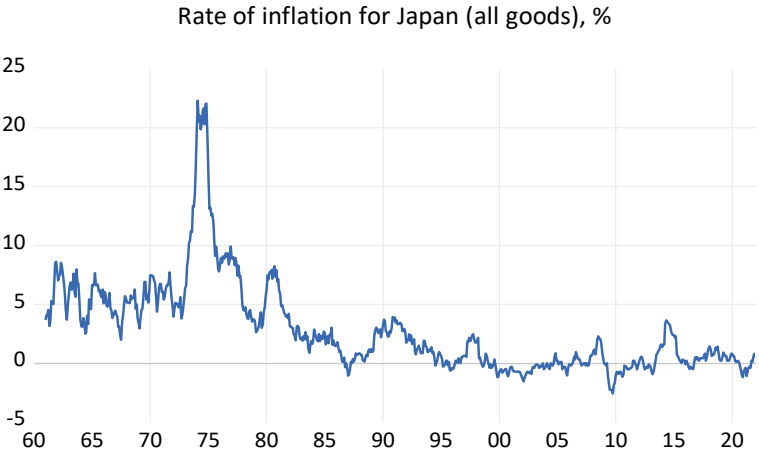


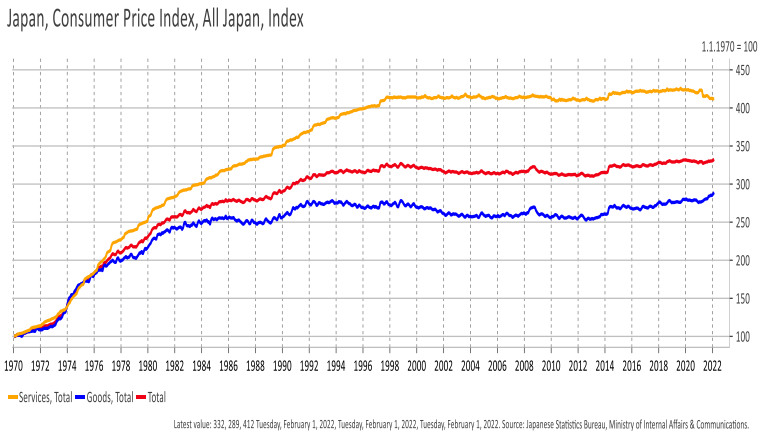
Appendix 5 The case of Japan

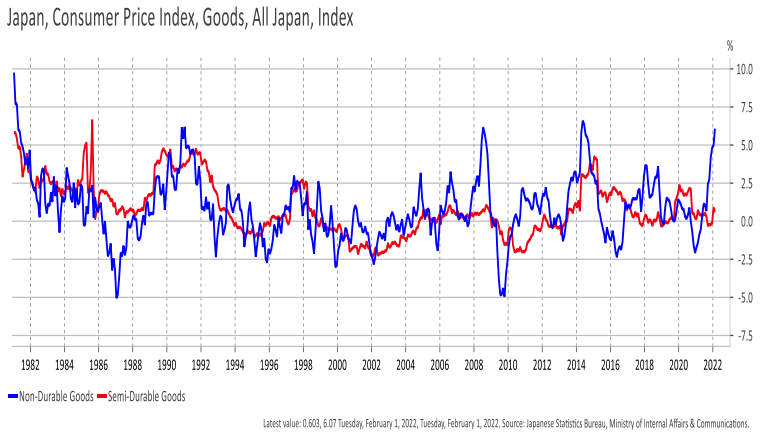
Japan is an interesting case because the price level has been almost constant for the last three decades. Japan had high inflation in the 1970s (the peak was above 20 per cent) but inflation faded away quite quickly after the second oil shock in the early 1980s. The rate fell below 2 per cent already in mid-1982. Opposite to most other countries, inflation did not surge in 2021, the latest observation (February 2022) is 0.9 per cent.

In the same way as in other countries, we find that for the high inflation period, prices of goods and services developed more or less in the way but after that the price of services continued to increase while the price of goods levelled off already in the early 1980s. That was much before similar developments took place in other countries. An open question is whether this was due to more rapid development of globalization or other macro factors.

Real wages have grown very slowly over the whole disinflation period. This is probably not due to labor market institutions: it seems that e.g. unionization rates has largely followed the OECD average values. True, the decline in unionization took place earlier than in most other countries in the 1980s. As for wage formation, we can detect the same nonlinear behavior as in all other sample countries. Thus, wage growth w reacts to lagged unemployment ur and inflation cpi_{-1} in the following way (robust t-values inside parentheses): w = 2.587(4.91) - .469(3.30)ur - .071(3.11)China -.243(1.47)cpi_{-1}^{-} + .235(3.32)cpi_{-1}^{+} + 578(6.94)w_{-1}^{-} + .721(16,62)w_{-1}^{+}, R^2 = 0.863, SEE 2.496, DW 2.314, 374/340 obs. The value of threshold for lagged inflation = 1.958 (see the graph below for the smoothed value of the threshold weight function) . In other words, with low inflation, inflation does not affect wage growth while with "high" inflation the effect is significant, the long run effect being close to one. The effect of China's trade share (globalization) is negative in the same way as in other countries.






Japan, Consumer Price Index, Goods, All Japan, Index
%
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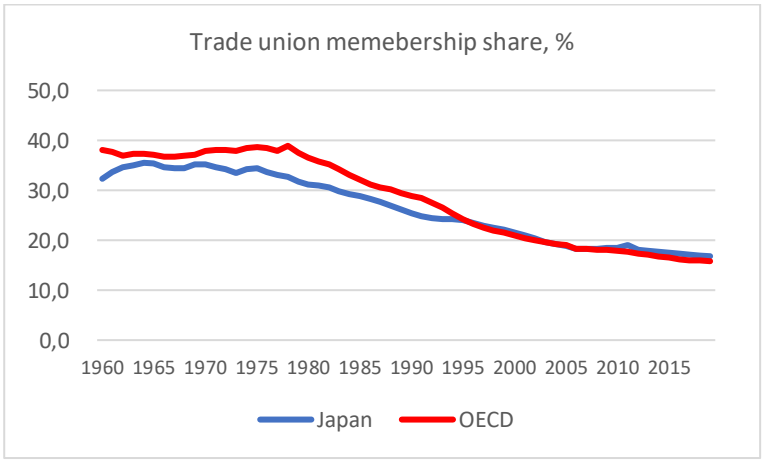
7.5
5.0
2.5
0.0
-2.5
-5.0
-7.5
1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022
Non-Durable Goods
Semi-Durable Goods
Latest value: 0.603, 6.07 Tuesday, February 1, 2022, Tuesday, February 1, 2022. Source: Japanese Statistics Bureau, Ministry of Internal Affairs & Communications.


Trade union memebership share, %
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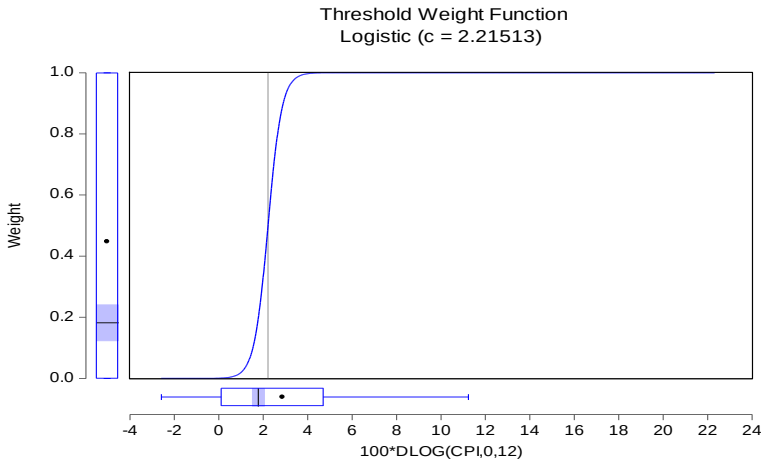
40,0
30,0
20,0
10,0
0,0
1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015
Japan
OECD


Threshold Weight Function
Logistic (c = 2.21513)
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0.8
0.6
0.4
0.2
0.0
-4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24
100*DLOG(CPI,0,12)

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