Chief Assist. Prof. Stella Raleva, PhD

COST PUSH FACTORS OF BULGARIAN INFLATION

The paper studies the behavior of nominal and real wages, average labor productivity, the exchange rate of Bulgarian lev against the dollar, and the world price of oil. It examines the specific parameters of their change in the periods of high and moderate inflation, and outlines the peculiarities of their effects on price fluctuations. It is concluded that an increase in wages serves as a booster of inflation in both periods because of their faster growth rates compared to an increase in the average labor productivity. The second major conclusion drawn is that the depreciation of Bulgarian lev against the dollar is also a source of both high and moderate inflation, and its role is particularly important in extremely high inflation episodes and relatively limited in the period after mid-1997. On the other hand changes in oil prices are manifested as a factor of inflation mainly in the second period, although their effect is sporadic and comparatively smaller than the respective contribution of rising wages and decreasing exchange rate.

The cost push explanation of inflation focuses on assessing the role of *wage growth* for the overall price dynamics and its relationship with *labor productivity*, the rise in *key commodities prices*, and in the case of a floating exchange rate – of *national currency depreciation* as well. As a rule, the mechanics of the latter two groups of factors is not subject to detailed interpretation as by character they are closer to exogenous shock effects, which cannot be directly influenced through macroeconomic policy. Influencing exchange rate dynamics however is possible within the amount of international foreign exchange reserves held by a central bank although a decrease in these reserves is usually induced by pro-inflationary pressures from national currency depreciation other than in relation to rise in domestic prices of imported goods. As far as a rise in key commodities imports is concerned, this is an entirely exogenous source of internal inflationary process, while the increase in prices of domestic commodities in the administrative sector could still be an object of certain macroeconomic regulations. In all cases, however, national currency depreciation and a rise in international prices of commodities affect the internal inflation, and the more a national economy relies on the import of particular groups of goods, the stronger the impact. At the same time, it should be taken into account that perceiving wages and exchange rate as affecting production costs is somewhat conventional as their pro-inflationary impact is much more complex and is implemented simultaneously and by way of changes in aggregate demand.

A rise in wages acts as an inflationary factor if not accompanied by a counteracting increase in *average labor productivity.* A cyclical component, usually explained with the Phillips curve, forms within the wage structure, and a second component reflecting the contractual relationships between workers and employers. It is exactly in employment agreements of definite duration that *Ch. Schultze, G. Kahn*

and J. Trevithick see the reason for a downward inflexibility of nominal wage, which however could prove to be quite flexible to upward movements under a strong pressure from syndicates.[1] Thus, inflation manifests as contingent on the behavior of syndicates in the labor markets and the stronger their provisional position in collective bargaining, the higher the upward pressure on production costs.

Nominal wage dynamics itself is also seen as influenced by labor productivity developments and expected *inflation rate*. The second source by some degree of analogy to expectations-adjusted Phillips curve brings in some inertness in the process of moderate inflation. According to *J. Tobin* it is partly conditioned by the existence of long-term employment contracts of fixed duration and wage, where current inflation can only have an impact at the point of negotiating the wage for the next period.[2] This peculiarity is the reason for the relative stability of average labor costs over the duration of the employment contract, with the upward pressure on wage after its expiry stemming from the workers' desire to keep their relative position in the distribution of income. Besides, according to *J. Tobin,* internal price dynamics reflects exogenous shocks as well, which constitute the most variable part of inflation. The peculiar thing about this case is that inflationary pressures from shock sources are perceived not only directly, but also indirectly through their impact on claims for pay increase. In the above manner *inflation comes to include an inertial component as a consequence of supply-driven adjustments in wages and external shocks.* In a moderate inflation environment the frequency of price and wage adjustment is *relatively* small and therefore turns into a precondition for preserving and maintaining those rates.

In a *high inflation* environment wage setting is based on an *indexation mechanism*, which implies current pay adjustments. In particular, a modification in theoretical views for the purpose of identifying sources of high inflation requires three *additional conditions* to be introduced. *The first one* involves replacing nominal wage-setting arrangements with wage indexation agreements linked to *past inflation rates*. If high inflation accelerates over time and given that the indexation interval remains unchanged, the above transformation leads to validation of *A. Alchian and R. Kessel's* hypothesis of the fall in real wages[3]. *The second condition* relates to allowing for *shortening of the wage indexation interval* and premising of subsequent higher and more volatile inflation rates, as well as further pressure towards shortening the length of the interval. The evolution of

---

[1] *Schultze, Ch.* Macroeconomic Efficiency and Nominal Wage Stickiness. - American Economic Review, 1975, 75(1), p. 1-15; *Kahn, G.* International Differences in Wage Behavior: Real, Nominal and Exaggerated. - American Economic Review, 1984, 74(2), p. 155-159; *Trevithick, J.* Money Wage Inflexibility and the Keynesian Labor Supply Function. - The Economic Journal, 1976, 86, p. 327-332.

[2] *Tobin, J.* Inflation: Monetary and Structural Causes and Cures. – In: Tobin, J. (ed.). Inflation through the Ages. Clarengton Press, 1983, p. 7-9.

[3] *Kessel, R., A. Alchian.* The Meaning and Validity of the Inflation-Induced Lag of Wages Behind Prices. - American Economic Review, 1960, 50, p. 43-66.

this process over time results in extremely high inflation with current prices and wages losing any connection with its lag values. With the *third condition,* the frequency of wage adjustment is perceived as endogenous variable which depends on inflation and leads to its further acceleration.

The more sophisticated and advanced model structures which present high inflation as a function of cost factors assume both *openness of the economy and variability of the wage indexation and payment intervals.* Then, in line with the *first* assumption, the rate of growth of *imported commodities prices* is added to the inflation modeling as an independent variable, or this role is assumed by foreign currency-denominated world prices or foreign exchange rate dynamics which are reflected in that rate. *The second* assumption makes allowance for the generation, in an environment of high and volatile inflation, of a pressure towards *shortening the length of the wage indexation interval*, to which the firms react in order to avoid labor conflicts and labor productivity problems arising from the fall in real wages. Shortening the indexation interval leads in turn to even higher and more volatile values of the inertial component of aggregate inflation rate. Besides, the effects on the inertial component according to *R. Barro* will be even more significant if such a shortening is also applied to wage payments.[4] Thus, *assuming an open economy and a variable wage indexation and payment interval, inflation is perceived as contingent on the properties of the inertial inflation rate and the exchange rate and world prices dynamics.*

The price dynamics as measured through the consumer price index (CPI) in Bulgaria in the period after their initial liberation was associated with *two major periods in the development of the inflationary process* (see Figure 1).

During the *first period,* which extends to mid-1997, inflation was *high* and volatile reaching two and three-digit annual rates. Its persistence was the result of powerful and self-generating inflationary hot spots in the economy, whose uneven activation and subsiding resulted in upward or downward movements in its annual values. In *the second period,* beginning with the introduction of the currency board principles, inflation turned *moderate* while still remaining uneven. Achieving it was as a result of eliminating the primary sources of high inflation within the context of the new currency board arrangement. At the same time, the evolution of the inflationary process, albeit at a lower rate, is indicative of the functioning of various causes of moderate price dynamics in the economy. The extent to which the different types of inflation in Bulgaria depend on the operation of cost push factors can be judged by the behavior of the nominal and real wage, the average labor productivity, the lev v/s U.S. dollar and the U.S. dollar-denominated world price of oil.

---

[4] *Barro, R.* Inflation, the Payment Periods and the Demand for Money. - Journal of Political Economy, 1970, 78, p. 1228-1263; *Barro, R.* Inflationary Finance and the Welfare Cost of Inflation. - Journal of Political Economy, 1972, 80, p. 978-1001.

Figure 1

Annual inflation rates in Bulgaria

Source: http://www.nsi.bg and additional NSI data.
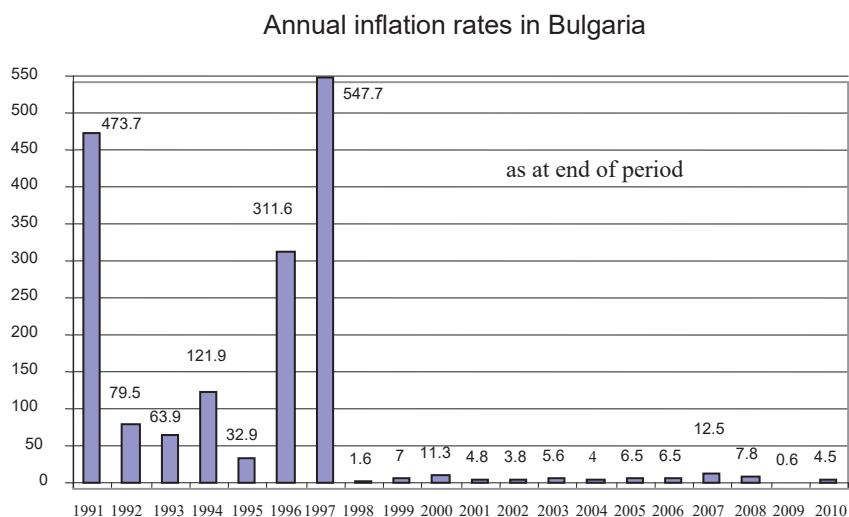
Annual average values					
1991	*338.4*	1998	*18.7*	2005	*5*
1992	*82*	1999	*2.6*	2006	*7.3*
1993	*72.4*	2000	*10.3*	2007	*8.4*
1994	*96*	2001	*7.4*	2008	*12.3*
1995	*62.1*	2002	*5.8*	2009	*2.8*
1996	*121.6*	2003	*2.3*	2010	*2.4*
1997	*1058.4*	2004	*6.1*		

In *the period of high inflation nominal wages* in the public sector registered continuous increase.[5] From 1992 to 1995 this increase was at double-digit annual rates, which were relatively stable with a maximum deviation of 16.5 percentage points (see Table 1). In 1996 and the first half of 1997 the growth of the basic labor income picked up considerably reaching three-digit values. In the first case nominal wage registered an almost two-fold increase, while in the second case it picked up by more than five times in the course of six months only.

---

[5] The wage dynamics in the public sector here is used as an approximator of the wage dynamics in economy as a whole. This is due to the lack of data on the wages in the private sector covering the whole 1992 – 1997 period.

Table 1

Nominal and real wage, and average labor productivity growth rates,
1992 – June 1997 (%)

Year	Nominal wage (end of period)	Real wage (end of period)	Real wage (annual average)	Labor productivity
1992	59.8	-11.0	11.6	-9.6
1993	45.9	-10.6	-8.7	1.8
1994	59	-28.3	-21.7	8.5
1995	43.3	7.6	-5.5	-6.2
1996	188.6	-29.8	-14.5	-5.6
June 1997	509.4	4.4	n.a.	n.a.

Source: Calculated by the author based on: NSI. Statistical Yearbook, 1995, p. 88, 99, 150; 1997, p. 89; 1998, p. 88; NSI. Basic Macroeconomic Indicators, 1998, p. 1, 11; BNB. Monthly Bulletin, 1999, 6, p. 24.

The comparison of nominal wage dynamics in the public sector at the end of the period with the rate of increase of the overall price level broadly confirms the theoretical conclusion of the *stimulating* effect which this component of production costs has on inflation (see Table 1 and Figure 1). After 1991, the pickup in prices outpaced the increase in wages with the ratio between their growth rates being 1.36 in average. This interdependence was most evident in 1995 and the first half of 1997 when inflation lagged behind wage growth in the public sector by 10.2 and 25.4 percentage points respectively. The ratio between their changes picked up 2.1-fold and 1.7-fold in 1994 and 1996, respectively, which signals a partial and weaker dependence of inflation on the growth of basic labor income than in the above two years.

Nominal wage increase in that period was not a consequence of demand and supply developments in the labor market, but mainly the result of the high inflation-induced *indexation mechanism* and the efforts to reduce the negative social effects of inflation. Moreover, indexation was linked to the lag inflation rate as evidenced by the negative rates of *real wage* growth and the considerable discrepancies between the rates of nominal and real wage changes. The concrete data point to a relatively limited impact on inflation from fluctuations in wages calculated at fixed prices as at the end of the period, in 1995, and the beginning of 1997. As regards real wage annual average values, similar impact was observed only in 1992. Most of the period however was characterized by a fall in real wages, which allows for its interpretation as a *stabilizing factor* rather than as a destabilizing one.

The average labor productivity, which is calculated here as a ratio between real gross value added (GVA) in the public sector and the annual average number of employed in this sector varied over time with manifold implications on inflation. Initially it declined to a maximum – by nearly 10% in 1992, which was followed by a

relatively moderate, and in 1994, by accelerated growth. At the end of the period GVA per person employed registered a further drop, which was relatively stable and more moderate as compared to its initial point.

A comparison between the developments in annual average real wage and average labor productivity shows that they are not closely related (see Table 1).[6] The highest (in absolute value) negative rates of growth of average labor productivity in 1992 and 1995 were realized in a single positive and the lowest (in absolute value) negative rate of wage growth, respectively, at fixed prices. By contrast, in the rest of the years the positive or lower in absolute terms negative rates of growth of labor productivity were coupled with a continuous decline in real wage. The opposite developments registered in the two indicators show that real wage dynamics in the public sector depends insignificantly on the changes in labor productivity. It is predetermined to a much-higher degree by the growth rate of prices and the negotiated (including under pressure from syndicates) increases in nominal wages. This way, *the nominal wage increase turns into a specific mechanism of transmission of past inflation rate to its current level.*

The strength of pro-inflationary influence of the above factor is predetermined by the *percentage of indexation of wages* to the preceding inflation rate. It is also a function of the *length of the interval of indexation and payment of wages*. The income indexation scheme applied in Bulgaria is to less than 100% of lag inflation, which in episodes of price dynamic acceleration results in the above analyzed falls in real wages. The indexation interval for most of the period is three months and premises an existing causality in a direction from *inflation in the previous quarter* to its current rate. Shortening of the indexation interval was observed only in February and in March 1997 as a response to pressure set off by extremely high and volatile rises in aggregate price level registered in the first two months of the year. At the same time, the interval of wage payment was also shortened with the frequency of payments ranging between 2 to 4 times monthly. Reducing the length of the two types of intervals was triggered by price dynamics while also contributing to even higher and more volatile values of the inertial component of inflation and its overall rate. Thus the examined interdependence leads to the conclusion that the *high inflation in Bulgaria depends on lagged inflation whose properties change with shortening the wage indexation and payment intervals and is influenced insignificantly by changes in real wage.*

The period of *currency board* operation is characterized by continuous increase in *nominal wages* at rates much lower than in the previous period (see Figure 2). They peaked in 2000 and in 2007 – 2008, with the highest level of 23.7%

---

[6] Including also annual averages of public sector wages here is dictated by the understanding of the higher degree of accuracy when using these data in parallel with the data on GVA at basic prices and those on the number of employed in the public sector which are annual average values. This argument is the reason to obtain real GVA at basic prices based on data about the index of the physical volume of GVA in the public sector, and real wage – through deflating nominal wage with annual average CPI.

being reached in 2007. Wage in current prices grew more evenly only in 1998; thereafter its growth was higher and most of the years exceeding 10%.

Unlike most of the time period until June 1997, nominal wage growth in the economy as a whole outpaced the growth of the overall price level and *real wage* picked up. As regards the values of the variable calculated *vis-à-vis* the end of the period, this rule was broken only in 2002 when the variable registered its only decrease and in 2005 when it hit its lowest rate of growth. A more substantial increase in real labor income was observed in the period from 2006 to 2009 after which it became commensurate with the level observed in 2003. Real wage dynamics broadly followed the changes in nominal wage with the departures between rates reaching their highest during the years of nominal wage peak growth.

Figure 2

Nominal and real wage growth rates (as at end of period), 1998 – 2010
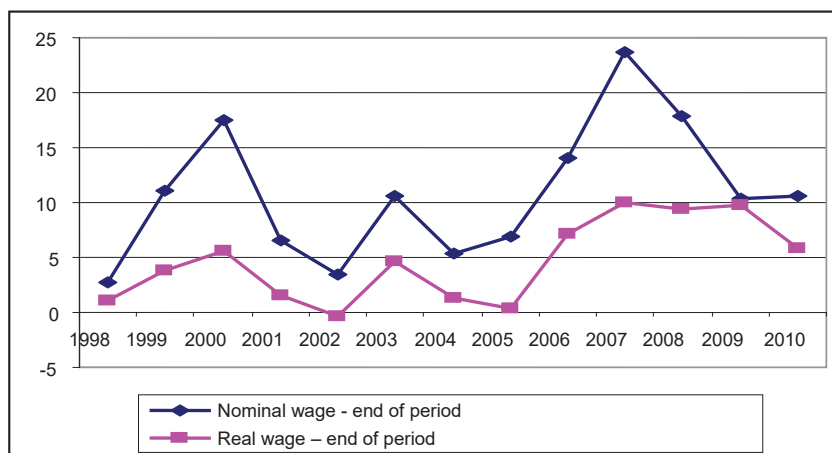
Source: Calculated by the author based on: BNB. Information Bulletin, 2000, 5, p. 91; 2001, 1, p. 65; 2002, 2, p. 83; 2003, 1, p. 112; BNB. Annual Report, 2004.p. 99-100; http://www.nsi.bg/; http://www.econ.bg/.

The above described upward developments in nominal and real incomes however cannot be assumed *apriori* as boosters of inflation. The reason is to be found in the typical of that period positive dynamics of *average labor productivity,* calculated as a quotient of real gross value added and the average number of employed in the economy as a whole (see Figure 3). Exception from this general trend was observed only in 2009 during which productivity fell by 0.6%. In the rest of the years it increased at relatively stable rates, which moved within a much narrower band than the wage fluctuations. A relatively more substantial increase was registered in 2002 and 2010 as a result of a rising GVA at about the same employment and a sharp cut in the number of employed (by *circa* 6%) at almost unchanged level of gross value added (GVA).

The more accelerated pace of growth of average labor productivity at a given wage growth acts as a moderator of prices as it has a moderating effect on average production costs. In this sense the rise in wages causes inflation only to the extent to which it outpaces the increase in average labor productivity. When applying annual average values of the variables, a similar effect is *observed* in most of the period of moderate inflation (see Figure 3). It is most evident in 1998 when the highest nominal wage increase after 1997 was by 12.5-fold higher than the increase in labor productivity. The changes in real wage exceeded almost 5-fold the changes in labor productivity and this indicates that real income growth basically depends on inflation and pay increase negotiations unlinked to productivity. The substantial differences between wage growth and real GVA per person employed also contributed to the maximum annual average inflation of 18.7% registered during the year (see Figure 1 and Figure 3). At the same time, the fluctuations in productivity and real wage calculated *vis-à-vis* the end of the year were almost parity, implying that the 1.6% inflation rate relative to the end of the preceding year remained almost neutral in comparison with the dynamics of incomes.

Figure 3

Labor productivity, average nominal and real wage growth rates,
1998 – 2010
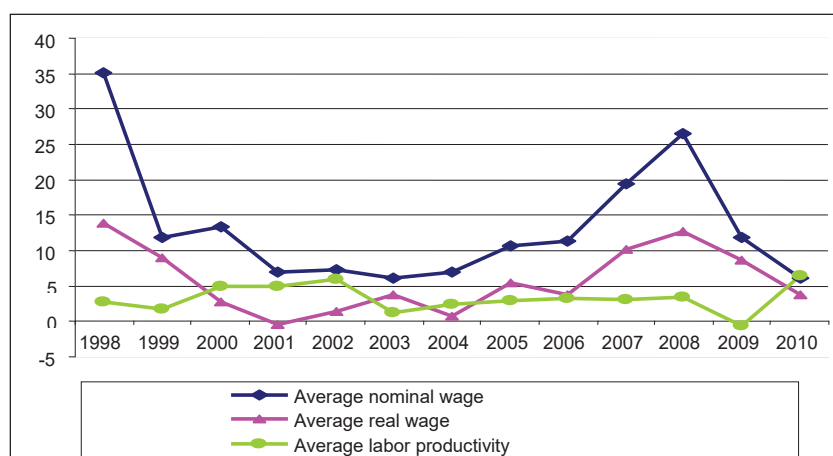
Source: Calculated by the author based on: http://www.nsi.bg

Unidirectional, yet different in terms of quantity, disparities between the annual average values were also typical for 1999, 2003, and 2005 – 2006. During these years however there were no signs of a strong pro-inflationary pressure from the higher nominal and real wage growth, with annual average inflation rates registering only just 2.6%, 2.3%, and 5%. Such indications were observed once again in 2007 and 2008 when the rise in nominal wage exceeded the growth of real

GVA per employed person 6.3-fold and 7.6-fold, respectively. As regards annual average real wage, the rates of increase were 3.3-fold and 3.7-fold, respectively, reflecting on the relatively high for the period 12-month inflation rate averages at 8.4% and 12.3%. By contrast, in 2009 the differences between the basic labor income and the labor productivity rates of growth further widened with nominal and real wage going up by 11.7% and 8.7%, respectively at a negative productivity growth, while the annual average inflation was only 2.8%. As regards the values at the end of the period, the nominal wage in 2003, 2007, and 2008 grew at accelerated rates *vis-à-vis* its average annual increase, in the first two years also as a result of the higher inflation at the end of the period relative to the annual average inflation. The maximum slowdown of the nominal wage rate of growth at the end of the period *vis-à-vis* its annual average rate in 2008 was in turn associated with the second high positive difference between the annual average inflation and the inflation at the end of the period of 4.5 percentage points.

In 2006 real wage growth was almost at par with the average labor productivity growth which had a moderating effect on price dynamics. At the same time, the nominal wage grew by 7% continuing to place, albeit somewhat less significant, pressure on prices. Labor productivity growth *versus* wage growth ratio at constant prices in the sub-period 2000 – 2002 acted as a moderator of inflation, while the pro-inflationary potential of the nominal labor income registered initially steeper and subsequently more even decrease. A marked negative impact on inflation from the rise in average labor productivity was observed in 2010 when it exceeded the growth not only of real wages but also of nominal wages by 2.8 and 0.3 percentage points, respectively. Such stabilizing effect in the values *vis-à-vis* end of period was observed in 2002 when real labor income declined, productivity per employed outpaced the nominal wage growth by 2.6 percentage points, and inflation was below its average for the period 1998 – 2010.

The above analyzed interdependences evidence that moderate inflation in Bulgaria is influenced by the existing disparities between nominal and real wage growth, and average labor productivity growth. The lack of close dependence between real wage and labor productivity dynamics particularly in the second half of the period is largely on account of higher labor demand and lower unemployment inducing upward adjustments in nominal wage. This is also contributed by the rise in wages in the budgetary area triggering increase in incomes in the economy as a whole. Thus in effect the initial reason for this increase in most cases comes from *aggregate demand* and is largely associated with the GDP split. Inasmuch this reason leads to wage increase and is thence reflected on production costs, it is materialized as a pro-inflationary factor on the part of aggregate supply.

Foreign exchange movements reflect on production costs and from there on prices though their reflection on domestic prices of imported commodities. This mainly applies to domestic prices of strategic commodities such as minerals and fuels. A prerequisite for this effect to materialize is the comparatively high relative share of this group in total imports, the average value of which *for the period 1991*

– *1996* stood at 39.1% and was higher than the relative weights of the rest of the commodities groups.[7] The above group is characterized by inelastic demand as evidenced by the relative stability and even increase in their import in dollar terms in the years of peak depreciation of the lev such as 1996. The inelastic demand creates a possibility for transmission of impulses from the exchange rate depreciation of the lev to producers' costs and on to consumer prices.

The mechanism described is only one of the channels of influencing inflation through national currency depreciation along with an increase in the foreign exchange component of the internal credit to the government and non-financial state enterprises, and a rise in domestic prices of imported consumer goods. Unlike the other two transmission mechanisms, which can be measured based on existing approximators, the concrete implications realized through the increase in production costs cannot be directly captured. Therefore, with some measure of conventionality, an indirect indicator for estimating this mechanism could be the comparison between the foreign exchange dynamics and the producer price index (PPI) behavior (see Figure 4).

Figure 4

Rate of depreciation of the lev v/s USD and PPI rate of growth,
1991 – June 1997
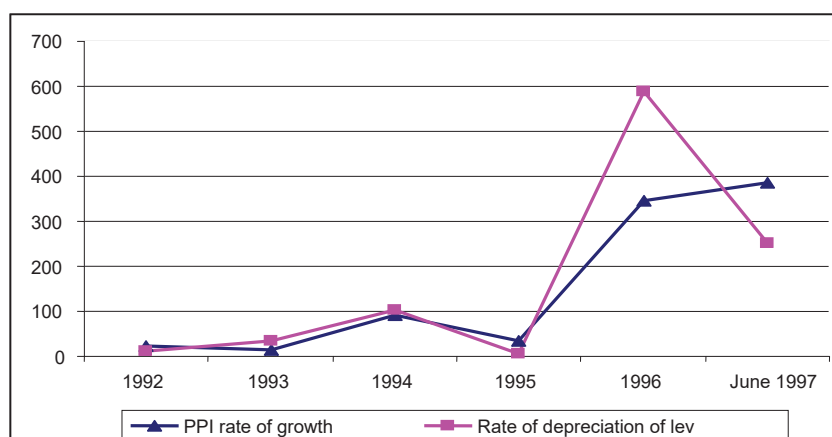
Source: BNB. Monthly Bulletin, 6, p. 33; http://www.nsi.bg; http://www.bnb.bg, additional NSI data and author's calculations.
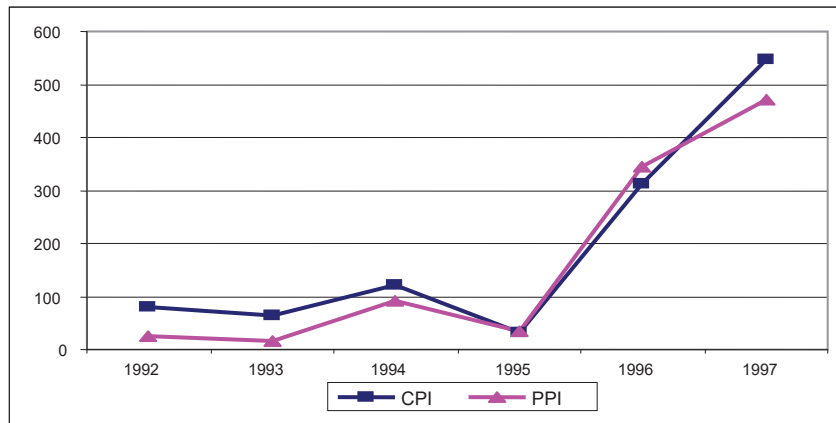
Until 1995 the exchange rate fluctuations were quite similar to the PPI movements with some outpacing of the rate of the national currency depreciation in 1993 and 1994. At the same time, the production costs growth was reflected in

---

[7] This relative share is obtained as the arithmetic mean of the annual relative shares of the minerals and fuels group in the commodity structure of imports based on data from: BNB. Annual Report, 1992, p. 142-143; 1994, p. 119; 1995, p. 135, and 1996, p. 137.

inflation to somewhat lesser degree in comparison with the other factors as indicated by the slower PPI growth *vis-à-vis* the CPI growth (see Figure 5).
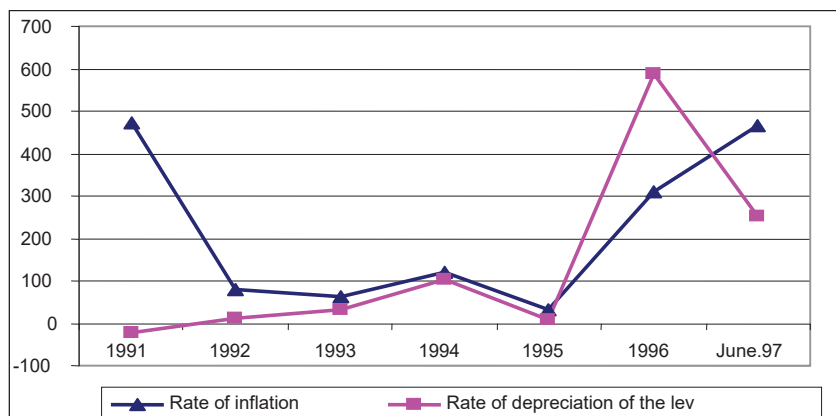
Figure 5

CPI and PPI growth rates, 1992-1997

Source: http://www.nsi.bg, additional NSI data and author's calculations.

The comparison between the above two dynamics clearly shows that over the time interval through 1995 the increase in the domestic price level was subject to a limited impact from the exchange rate via production costs, which partially explains the divergence between inflation and lev depreciation in Figure 6.

Figure 6

Inflation rate and rate of depreciation of the lev v/s USD, 1991 – June 1997

Source: http://www.nsi.bg, *BNB*, Monthly Bulletin, 6, p. 33 and author's calculations.

This trend discontinued in 1996 with the outpacing decline of the exchange rate *vis-à-vis* PPI and its stronger reflection on the production costs growth. The fact that this was the only year from the first period in which PPI growth was higher than the rise in consumer prices leads to the conclusion about a relatively significant stimulating effect of the domestic prices of dollar-denominated imported commodities on inflation. This is also one of the reasons for the maximum divergence registered during the same year between national currency depreciation and inflation in favor of lev depreciation (see Figure 6). The interdependence was once again broken during the first half of 1997 when the smaller dependence of inflation on the lev depreciation was predetermined by the multidirectional movements in the foreign exchange rate and producer prices, as well as by a more subdued CPI growth as compared to PPI growth. From the empirical analysis it follows that the *described transmission mechanism of the foreign exchange rate in high inflation setting is manifested as significant only in a year of extremely high dynamics of prices such as 1996, while during the rest of the years its contribution is relatively small.*

After the introduction of the currency board arrangement the lev/dollar exchange rate varied within a much narrower band entirely depending on exogenous factors. By contrast to the preceding period, now intervals of depreciation and appreciation of the lev followed each other in succession, which became a prerequisite for triggering or counteracting, respectively, an upward price dynamics (see Figure 7).

Figure 7

Inflation rate and rate of depreciation of the lev *v/s* the USD, 1998 – 2010
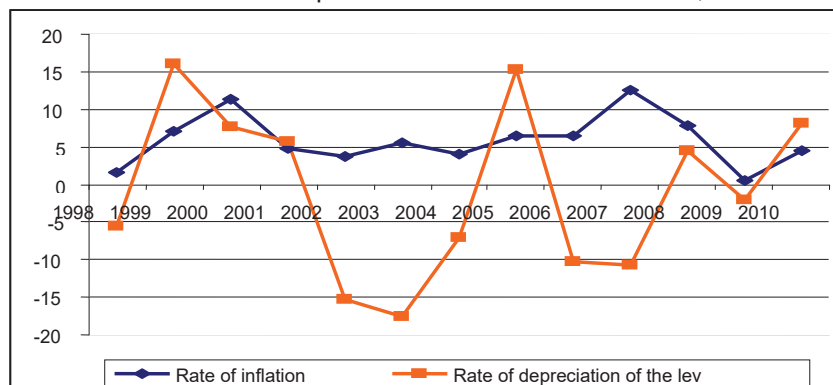
*Source:* http://www.nsi.bg/; http://www.bnb.bg and author's calculations.

Inflation booster effect from the nominal depreciation of the lev was observed in the period 1999 – 2001, during which the euro depreciated *vis-à-vis* the dollar and this resulted in relatively high for the new monetary regime inflation rates. The causality in a direction from exchange rate to production costs, and on to prices, was most evident in 1999 when the lev depreciation contributed to PPI outpacing CPI growth (see Figure 9). Due to the stronger depreciation of the lev in the last months of the year and the longer lag effects, which are typical of moderate inflation, one of the inflation rate peaks

in 2000 could also be assumed as partially triggered by the indirect impact of foreign exchange movements through production costs.

From 2002 to 2004 the lev appreciated against the U.S. dollar at a maximum rate of 17.6% in 2003. This in turn had a moderating effect on inflation, which registered some of its lowest values over the period. An evidence of such an effect caused by production costs was the decline and slower growth of PPI on the domestic market and of the overall PPI, respectively. In 2002 symptoms of more substantial inflation pressure from costs were noticeable which however were not associated with the depreciation of the lev (see Figure 7, 8 and 9).
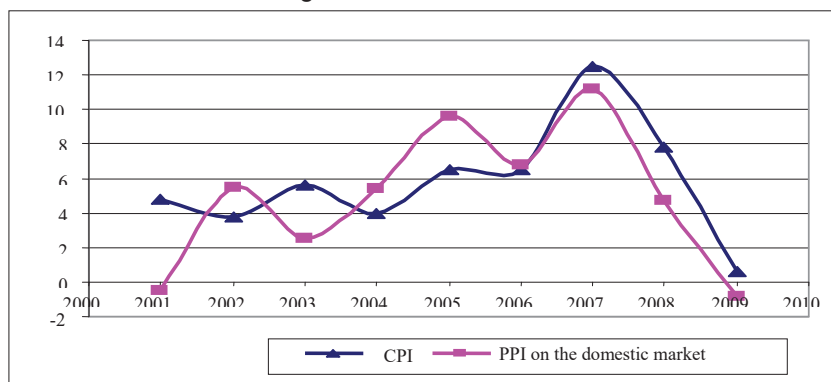
Figure 8

Rate of depreciation of the lev *v/s* the USD and rate of growth of PPI on the domestic market, 2001 – 2010
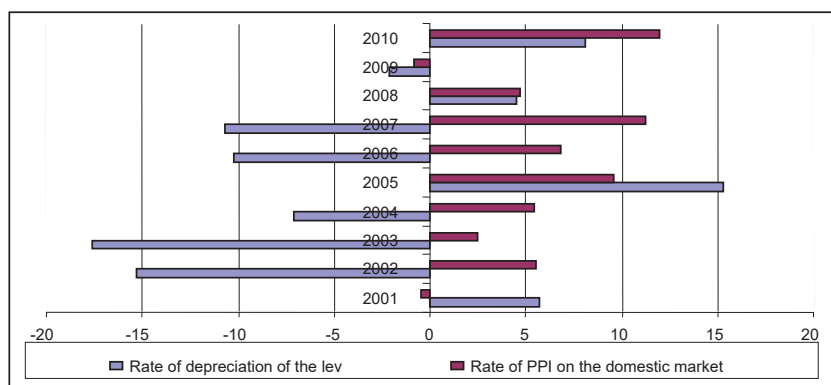
Source: http://www.bnb.bg, http://www.nsi.bg and author's calculations.

Figure 9

CPI and PPI rates of growth on the domestic market, 2001-2010

Source: http://www.nsi.bg, additional NSI data and author's calculations.

The year 2005 was characterized by a maximum decline in the national currency exchange rate, which was positively associated with consumer price dynamics. This positive relationship was largely due to the exchange rate reflection on production costs, as illustrated by the sharp increase in overall PPI and PPI on the domestic market. Secondly, it stemmed from the clearly noticeable transfer of higher production costs to consumer prices, as indicated by the higher increase of PPI in both its versions *vis-à-vis* CPI growth.

The situation in the period 2006 – 2007 was analogical to that of the time interval 2002 – 2004 in the sense that exchange rate fluctuations acted as a stabilizing factor. They however could not make up for the significant increase in other components of production costs, and in the noncompetitive sector – for the mark-up on average costs. Signs of limited empirical significance of this channel of transferring exchange rate effects to overall price level dynamics were observed in 2008 and 2009 as well, when the movements in the lev/dollar exchange rate varied and inflation continued to be more conditioned by factors outside producer costs. This channel resumed somewhat its role in 2010 when national currency depreciation partly contributed to the relatively high inflation pressure coming from costs.

Factual data provide grounds for assuming that *the exchange rate during some of the years in the period after 1997 is reflected on inflation through the domestic prices of imported commodities. Although the capacity of this channel of influence diminishes over time in parallel with the gradual decline in the relative share of dollar-denominated imports, it still remains in position to generate relatively higher price dynamics at times of sharp depreciation of the euro in the international foreign exchange market.*

This paper uses *the world price of oil* in U.S. dollars to stand for production costs as a determinant of inflation too.[8] Using this indicator rather than the lev equivalence alternative is done in view of presenting it clear of any influence from the exchange rate dynamics. The idea is to create the possibility to examine the influence of the price of oil on domestic prices of fuels, and thence on inflation, in isolation from other influences and in particular from the exchange rate influence on these prices.

As shown in Figure 10, the high inflation in Bulgaria is not a function of oil price changes. Until 1994 the price of oil tended to decline at highest rates of 15.7% in 1991 and 11.8% in 1993. A moderate increase was observed in 1995, however insufficient to seriously impact the lowest price dynamics experienced throughout the period. The world price of oil surged in 1996 by 18.4%, which, coupled with the depreciation of the lev, reflected in higher producer costs, and thence in higher consumer prices. At the same time, this rise in the price of oil was at insignificant rates as compared to the increase in overall PPI, which is indicative
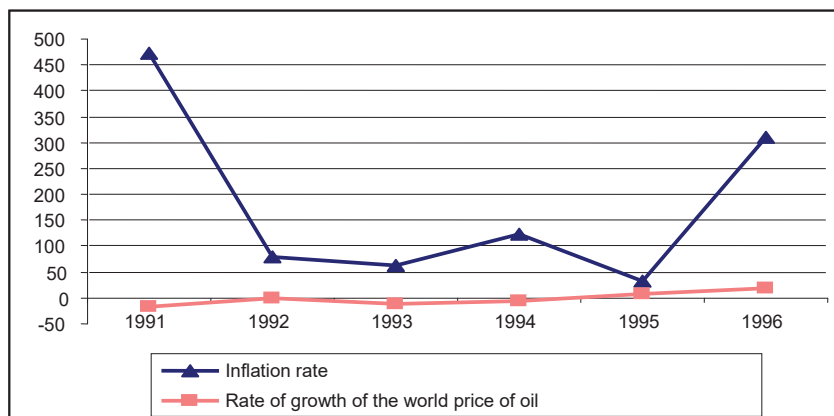
---

[8] This Paper uses data on the world price of oil determined after the IMF's methodology as weighted average, the price of oil at the London Stock Exchange, in Dubai and West Texas.

of its rather modest contribution to production costs and inflation growth (see Figure 11).
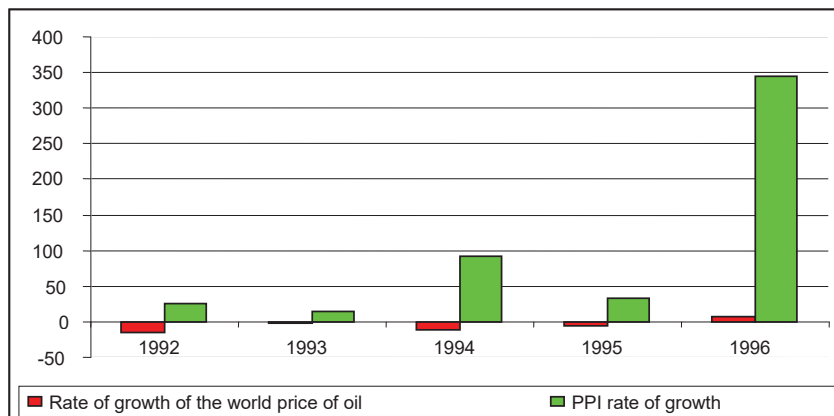
Figure 10

Inflation rate and world oil price rate of growth, 1991 – 1996

Source: http://www.nsi.bg, http://www.imf.org and author's calculations.

Figure 11

Rates of growth of world oil price and PPI, 1991 – June 1997


Source: http://www.nsi.bg, http://www.imf.org, additional NSI data and author's calculations.

In the post mid-1997 period the world price of oil fluctuated with very sharp swings back and forth (see Figure 12). In 1998 prices of oil fell by 32.1%, while consumer prices increased just 1.6%. The fact that overall PPI growth over the same year was half the CPI growth indicates that inflation is not significantly

influenced by production costs fluctuations.[9] Similar dependencies were observed in 2001 and 2009 when the drop in oil prices by 13.8% and the record 36.2%, respectively, was coupled with the only negative PPI rates of growth in the domestic market for the period at 0.5% and 0.8% (see Figure 9 and 12).

Figure 12

Rate of inflation and rate of growth of world oil price, 1998 – 2010
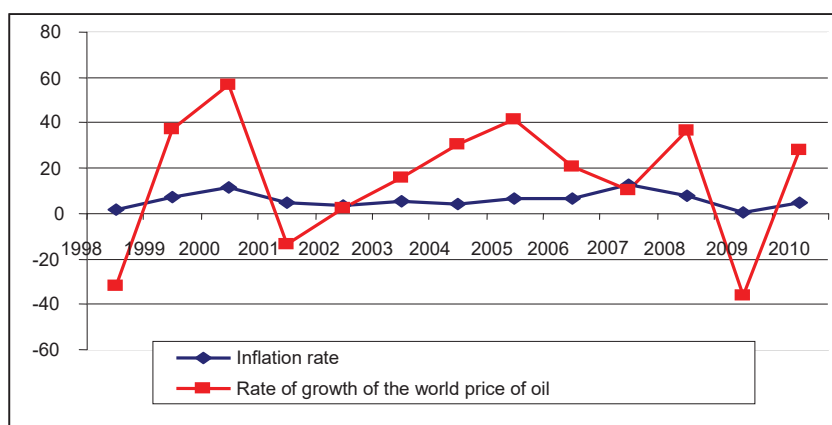
In 2002 and 2007 the price of oil grew at rates very close to those of inflation, while this was also associated with diametrically different ratios between CPI and PPI on the domestic market (see Figure 9). In the *first* case the production costs dynamics has a definite impact on inflation, but the dynamics itself is only insignificantly influenced by the price of the energy commodity. This is evidenced by the equal increases in domestic PPI registered in 2002 and 2004 at a 12-fold difference between the rates of increase in oil prices. In the *second* case, the minimal role of oil prices for producer costs growth is coupled with the lower sensitivity of inflation to these costs. The assessment itself only of the minimum role of this factor is made based on a comparison with 2005, during which the 4-fold surge in oil prices was coupled with even lower growth of PPI on the domestic market.

Some degree of *analogy* in the behavior of oil prices and PPI on the domestic market is observed only in the sub-period 2003 – 2006, which was the only period registering a rise in this commodity for three years in a row. The similarity is to be found in the unidirectional movement of the respective rates, and not in terms of their quantity. As can be seen in Figure 13, the almost even increase in the price of oil in the first three years was accompanied by lower, yet almost even rise in producer prices in the domestic market and *vice versa* – the

---

[9] Calculated by the author based on NSI data.

weaker increase in the price of oil in 2006 was combined with a more subdued growth of that index. To the extent higher production costs reflect on consumer prices, they also transfer some of the increase to the price of oil. Symptoms of such a closer relationship were noticeable in 2003 and 2004 given the outpacing growth of domestic PPI over CPI growth, and in 2003 and 2005 – also in view of the inflation relative to previous years.

Figure 13

Rates of growth of world oil price and PPI on the domestic market, 1998 – 2010
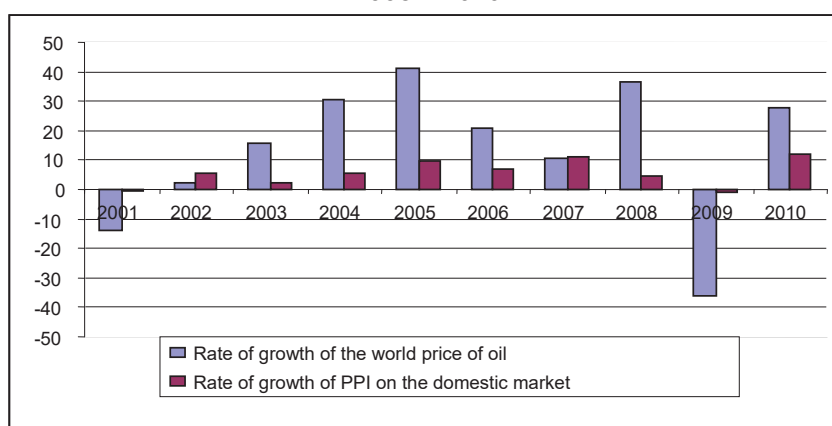
Source: http://www.nsi.bg, http://www.imf.org and author's calculations.

The analyzed dependencies between the changes in the price of oil and PPI relate to *one of the possibilities* for pro-inflationary influence of the energy price on production costs. Given the content of the index, this possibility relates to the effect on industrial producer costs. Another pro-inflationary effect from oil price growth is via the increase in the *price of transport services*, which is transmitted to a relatively high degree and relatively quickly to end prices. As this increase also affects costs while only partly reflects on PPI and PPI on the domestic market, the above analysis reflects only in part the effect of the rise in oil prices on production costs for the economy as whole. It means that the pressure on costs is much higher than the one illustrated in Figure 13, and particularly in the period 2003 - 2006 it had a considerable contribution to consumer price growth.

The factual analysis confirms the theoretical principle that oil price fluctuations have mainly *sporadic and shock effect* on consumer price dynamics. The quantitative difference between them is due to the dynamics of other cost-related factors such as wage and exchange rate. This shows that *the rise in the price of oil contributes less to the increase in production costs than the wage and exchange rate dynamics, and that inflation is also conditioned by factors unrelated to production costs.* At the same time, it should be taken into account that the

higher price of the energy commodity normally has a lag effect on consumer prices and when its price hikes in the last months of the year this reflects on inflation in the next year. Furthermore, the rise in the price of oil affects inflation not only through producer costs but also through the rise in prices of transport services for the public and imported consumer goods.

*

According to the cost-push inflation rationale of price dynamics, inflation in Bulgaria is conditioned by a rise in nominal wages, which throughout the period after the beginning of the 1990s was not linked to average productivity growth. In episodes of high inflation the rise in wages is mainly due to the applied mechanism of income indexation to lagged inflation, which is traditionally regarded as a means of curbing its adverse effects and the resulting social tension. By analogy to theoretical models, the inertial component of inflation changes materially its characteristics in extremely high inflation, which provokes these changes by shortening the intervals of indexation and payment of wages. In episodes of moderate inflation, nominal wages grow at much lower rates relative to the preceding period, with real wages also going up. Although the rates of growth of average labor productivity are positive, they fall behind the dynamics of the basic labor income, which has a boosting effect on inflation. The rise in wages is associated with both the higher GVA per person employed and the pressure from syndicates, while in the second half of the period – also with higher labor demand and lower unemployment.

The inflation in Bulgaria is a function of the changes in the lev exchange rate, which reflect in domestic prices of imported commodities. Over the greater part of the period until mid-1997, the power of this transmission mechanism of pro-inflationary effect of the exchange rate was fairly limited, while in some of the years in the second period inflation was positively linked to the growth of production costs, which in turn reflected the exchange rate fluctuations, albeit weaker compared to those in the preceding period.

High inflation was not triggered by serious changes in the world price of oil, which over most of the period demonstrated a descending trend. In individual years after mid-1997 the rise in the price of oil led to higher industrial production costs with the ultimate effect on inflation being determined by the extent to which it depended on producer costs. At the same time, the developments in the world prices of oil were reflected in consumer prices also through the rise in transport prices and through prices of imported consumer goods.

6.XII.2011