

Factors influencing relative price of goods and services sectors in Turkey: An econometric analysis

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Abstract

Upon difficulties faced by the Central Bank of Turkey (CBT) in attaining inflation targets, diverging movements in goods and services sectors prices, two components of the CPI basket, have drawn particular attention. However, studies on this issue have remained rather limited in developing as well as advanced countries. The present study is an attempt, despite limited availability of studies in the relevant literature and scant data relating to the sector of services, to clarify the issue by a VEC model. Relative price movements were explained by economic factors including inter-sectoral productivity differences, transmission from exchange rate, exposure to global competition and higher income elasticity of services sector. Our empirical study concluded that there is a long-term relationship between relative price series and economic factors recognized in literature. It was found that exchange rate and differences in productivity levels have significant share in accounting for relative price movements.

Keywords: Services Sector, Relative Prices, Time Series Models

JEL Classification: C32, E31

Özet. Türkiye’de mal ve hizmet sektörleri görelî fiyatını etkileyen faktörler: Ekonometrik bir analiz

Türkiye Cumhuriyet Merkez Bankası’nın (TCMB) enflasyon hedeflerini yakalamada güçlük çekmeye başlamasıyla birlikte, tüketici fiyatları sepetinin iki alt kalemi olan hizmet ve mal sektörleri fiyatlarının izledikleri farklı seyir dikkat çekici hale gelmiştir. Konuya ilişkin çalışmalar gelişmekte olan ülkelerde olduğu gibi gelişmiş ülkelerde de sınırlı kalmıştır. Bu çalışma, literatürdeki kısıtlı sayıdaki araştırmaya ve hizmet sektörüne ilişkin veri darlığına rağmen konuyu VECM modeli yardımıyla açıklamayı amaçlamıştır. Çalışmada görelî fiyat hareketleri iki sektör arasındaki verimlilik farklarına, kur gelişmelerine, küresel rekabete ve son olarak hizmet sektörünün daha yüksek gelir esnekliğine sahip olması gibi iktisadi faktörlere bağlanarak açıklanmaya çalışılmıştır. Ampirik çalışmamız sonucunda görelî fiyat serisi ile literatürde kabul edilen iktisadi faktörler arasında uzun dönemli bir ilişki olduğu sonucuna ulaşırken, özellikle kur ve sektörler arası verimlilik farklarının görelî fiyat hareketini açıklamada büyük pay sahibi olduğu saptanmıştır.

Keywords: Hizmetler Sektörü, Görelî Fiyatlar, Zaman Serisi Modelleri

JEL Classification: C32, E31

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1. Introduction

The financial crisis striking Turkey hard in February 2001 led to the collapse of the stability and disinflation programme, which had been designed by the IMF on the basis of crawling-peg exchange rate regime, implemented starting from the end of 1999. Along with crisis, exchange rate was left to float and the policy of (implicit) inflation targeting was phased-in later upon the achievement of some stability. The Central Bank of Turkey (CBT), suffering significant loss in credibility in the wake of the crisis, then had to hit its targets to shape the expectations of economic agents and regain its credibility. While targets were rather easily attained until 2005, persistence in the services sector inflation not only distorted relative prices but also compelled the CBT to behave more conservatively. In the period following 2005, the failure in fully grasping the drivers of diverging price dynamics between the components of the CPI basket obscured the path of the CBT engaged in inflation targeting and made its decision making process even more difficult. Though constituting an apparent problem for the CBT starting from 2005, the difference between the rates of inflation in goods and services sectors had actually become discernible starting from 2003. In June 2004, for instance, while the annual rate of inflation in goods sector was 4.9%, it turned out as 18.1% in services sector and hence the difference in-between was as high as 13.2 percentage points.

The distortion in relative prices does point out to a remarkable issue and exploring the causes of this divergence is indeed important for a central bank engaged in inflation targeting. In practice, inflation-targeting central banks use inflation forecasts as intermediate targets, and they consider all the available information that directly or indirectly affects inflation (Svensson, 1999). Private agents form their expectations, which shape their pricing behaviors and their consumption and investment preferences, by considering inflation targets set by the central bank (King, 2000). A central bank constantly failing to hit its targets may find itself with limited credibility, leading inflation expectations to drag away from the target level, further weakening the odds of hitting the target. It is obvious that forecasting and projecting inflation accurately is crucial for a central bank engaged in inflation-targeting¹.

Scant data available for services sector leads to limited academic study on this specific sector. In earlier studies, divergent price movements in these two sectors and their causes were covered only by partial analyses. Here, in this study, we tried to construct an overall framework by combining these earlier and partial analyses. To be more specific, we tried to explain the divergence by considering several factors including level of productivity in respective sectors (Baumol, 1967; Baumol and Bowen, 1965; Nordhaus 2006; Bosworth and

¹ For extensive studies about inflation targeting in Turkey: Ersel and Ozatay (2008), Kara (2006), Telli, Voyvoda and Yeldan (2008)

Triplet, 2003; Gust and Marquez, 2000), openness to foreign trade (Rogoff, 2003; Romer, 1993), transmission from exchange rate to prices (Kara et al., 2005; Clark, 2004), and finally rising demand for services sector along with improvements in the level of welfare (McLachnan et al., 2002; Fuchs, 1968). Moreover, taking into account its possible impact on the pricing behaviour of respective sectors, price rigidities that play crucial role in the neo-Keynesian analysis were also visited in literature review (Smets, Gali et al., 2006; Gali and Gertler, 1999; Metin-Özcan, Berument and Neyaptı, 2004) . In addition to partial analyses that can be found in the earlier literature, we assume that our integrated framework makes this study more important than others. As far as we know, there is no earlier attempt to explain pricing behaviours in the two series with an integrated approach. As for studies that elaborate the difference between inflationary dynamics of the two sectors, we can say that these studies have focused on statistical methods rather than using econometric models (Peach, Rich and Antoniadis, 2004; Esteve, Gil-Pareja, Martinez-Serrano and Llorca-Vivero, 2006) . In spite of such constraints as limited research available in the literature, limited observations and the necessity of deriving some important variables on the basis of specific assumptions, the present study insisted on an econometric model and, differing from earlier studies in the same field, used the VEC model instead of statistical techniques . It is the first time in this study that the relationship among these macroeconomic variables has been analyzed by an econometric model.

As to the structure of the study, developments taking place in Turkish economy after 2001 are addressed in the second section of the paper. Section three addresses some salient features regarding inflation patterns in the sectors of goods and services. Section four is devoted to a visit to the relevant literature. Here, referring to the findings of empirical studies conducted in other countries in addition to theoretical explanations, an effort was made to provide a basis for analyzing the Turkish economy. Section five contains the empirical study. Following an introduction to economic series used, variables that are thought to be accounting for distortion of relative prices are analyzed empirically by using data from Turkey. The relationship between the difference in price levels in the sectors concerned and explanatory variables is estimated by using the vector error-correction model (VEC). In the last section, findings are revisited together with policy suggestions.

2. Turkish Economy over the Inflation-Targeting Regime

With its main features designed by the International Monetary Fund (IMF) the stabilization and disinflation program adopted in Turkey towards the late 1999 came to an end upon the financial crisis broke out in February 2001. At the end of 2001 GDP shrank by 5.7%, Consumer Prices Index (CPI) rose by

68.5%, domestic currency depreciated by 112% against the US dollar and the exchange rate reached the level 1 US\$=1.44 Turkish lira. Furthermore, interest rate which had receded to low 20% (annual average) in July 2000 saw four-digit figures following the crisis. Despite falling down from these extreme values, it still turned out as 59% at the end of 2001.

With the letter of intent dated 18 January 2002² a road map of economic policies for Turkey in the period 2002-2004 was drawn together with some identified priorities for the economy. Upon the approval of this letter, the 18th stand-by agreement between the Fund and Turkey took effect. The new stand-by agreement had its basic objectives as laying the ground for a non-inflationary growth and reducing the fragility of the economy in the face of crises. These basic objectives, in turn, called for the following: Improving public debt position with envisaged surplus in public sector; adapting inflation targeting to push down rates of inflation; restructuring in the banking and public sector; maintaining floating exchange rate regime; considering inflation in incomes policy, and strict adherence to structural reforms launched during the earlier program. The programme set the target of increasing the proportion of public sector surplus in GDP up to 6.5% and specified measures needed to attain this target. With regard to monetary policy, the program underlined the need to adopt inflation targeting upon the realization of its pre-conditions. Prior to the inflation targeting it was agreed that developments in monetary policy would be tracked through performance criteria based on monetary base and net international reserves and also through indicative target set on the net domestic assets. While floating exchange rate was accepted as a fundamental element in attaining monetary policy targets, incomes policy, also focusing on inflation targets, was assigned a supporting role. In the context of restructuring the banking sector, the plan was for strengthening sector surveillance and enhancing the efficiency of public banks. Also stressed were measures to be adopted in order to enable the sector to better perform its function as a financial intermediary.

The 19th stand-by agreement with the IMF took place upon the letter of intent dated 26 April 2005³. This agreement which was the continuation of the earlier one in its main features focused on consolidating economic successes and strengthening the process of convergence to the EU countries. With the new agreement, a commitment was made to officially pursue inflation targeting starting from 2006 while, differing from the earlier agreement, it was also stated that measures would be taken for the sustainability of current deficit.

² http://www.hazine.gov.tr/standby/mektup/mektup11/nmektub_tr.htm

³ http://www.hazine.gov.tr/Standby/9GGNM/9ggnm_tr.htm

Table 1. Turkish Economy: Basic Indicators

	2001	2002	2003	2004	2005	2006	2007
GDP (% change)	-5,7	6,2	5,3	9,4	8,4	6,9	4,5
Gross Fixed Capital Formation (% change)	-30,0	14,7	14,2	28,4	17,4	13,3	3,3
Current Balance (billion \$US)	3,4	-1,5	-8,0	-14,4	-22,1	-31,9	-37,8
Portfolio Investments (billion \$US)	-4,5	-0,6	2,5	8,0	13,4	7,4	0,7
Direct Foreign Capital (billion \$US)	2,9	1,0	1,3	2,0	8,7	19,1	20,1
Other Investments (billion \$US)	-12,9	0,8	3,5	7,7	21,1	16,3	27,8
CPI (% change)	68,5	29,7	18,4	9,4	7,7	9,7	8,4
External Debt (billion \$US)	113,6	130,2	144,3	160,8	168,5	205,3	247,1
EMBI+ Turkey (bp)	889,1	762,5	628,5	354,0	270,6	207,0	239,0
Reel Effective Exchange Rate Index	116,3	125,4	140,6	143,2	171,4	160,1	190,3
Overall Budget Balance (% GSMH)	-16,5	-14,6	-11,3	-7,1	-1,6	-0,6	-1,7
Rate of Unemployment	8,3	10,3	10,5	10,3	10,2	10,5	10,6
M2 Growth Exceeding Nominal GDP (1999=100)	104,8	96,1	98,8	108,0	128,8	135,2	144,0
Reel Household Credit Index (1996=100)	189,4	194,8	326,6	631,4	999,9	1.349,5	1.688,5
Reel Commercial Credit Index (1996=100)	87,6	65,0	76,3	101,7	138,2	172,3	190,1

Taking a look at the Turkish economy following the 2001 crisis, it is observed that realizations run parallel to the experience of other developing countries. In the period after the crisis, while the economy displayed rapid and stable growth, significant gains were also achieved against the long-lasting problem of chronic inflation. In addition to prudential domestic policies, favourable global developments have also contributed to macroeconomic stability in the economy. Compared to many developing countries with significant levels of current surplus due to soaring commodity prices and mercantilist policies, Turkey continued to run current deficit as many developing Eastern and Central European countries with which she is assessed together. While low level of domestic saving led Turkey to be dependent on foreign savings, abundant global liquidity had their positive impact on growth dynamics. As a matter of fact, after the deterioration in

global liquidity conditions, slowdown in such fundamental variables as growth and investment suggests that Turkey's dependence to global conditions is still strong.

Examining basic economic indicators of Turkey after 2001 (Table 1) it is remarkable that the country has, after the crisis, enjoyed a rather stable growth of 6.8% annually as an average figure. Average annual increase of 15.2% in gross fixed capital formation is another salient feature which brings along significant productivity gains. Further, these gains mitigated the adverse effect on exporting performance of evaluating exchange rate which resulted from intensive capital inflows. Current deficit, exacerbated also by increases in global commodity prices, however, remained as one of the most important weaknesses of the economy. In spite of discernible increase in net direct investment, it is observed that the item of "other investments" reflecting credit use from foreign sources plays an important role in financing current deficit. In the light of these developments, significant increases in foreign debt stock stand out as another element that feeds country risk. Significant excess of surplus balances in capital items over current deficit provided the Central Bank opportunities to build its reserves, but at the expense of making liquidity management more difficult than earlier. It is observed that expansion in money supply after 2001 was significantly above nominal GDP growth and that this expansion laid the ground for larger credit volumes, which in turn contributed to growth. One important feature emerging in Turkish economy in this period is the discipline ensured in the field of public finance. In the stand-by agreement with the IMF, raising the share of primary surplus up to 6.5% in GDP was established as a performance criterion and these targets were easily attained thanks to high growth rates and accelerated privatizations⁴. Together with fall in real interest rates which can be attributed to lower country risk premium, primary surplus was the main factor keeping the general budget almost in balance.

In spite of macroeconomic stability, current account deficit, growing external debt and high rates of unemployment even with high growth rates have come to the fore as the major weaknesses of the period. Yet, there were some counter developments to take place: devaluing exchange rate as a result of 2006 turbulence in international financial markets, rising international prices of energy and food as became salient in 2007 and their implications on internal prices which yielded higher rates of inflation than targeted and brought about credibility loss to the Central Bank as well as slow down in growth all started to threaten macroeconomic stability. Despite some positive macroeconomic developments, Turkey remained as one of the countries most sensitive to international capital movements as stressed by Goldberg (2005).

⁴ For a detailed study on this issue: Voyvoda and Yeldan (2005).

3.Price Dynamics of Goods and Services Sectors

In tracing price dynamics of goods and services sectors for a period exceeding a decade, the first significant point to observe is the period of disinflation which started in February 1998 and continued until the 2001 crisis. In the period mentioned, the gap between the inflation levels of the two sectors became more and more prominent and developments in the services sector pushed the headline index up. Another important feature of this period is the persistence in housing services (rent) prices which increased overall persistence in services sector. Indeed, if this single item (rent) is left out, the emerging index is closer to the rate of inflation in goods sector. In this period, inflation (as annual average) in services sector is 15.7 percentage points higher than that that in goods sector; when rent is excluded, this figure drops to 11.7 percentage points. Following the crisis in February 2001, inflation displayed a rising trend until January 2002 with the impact of floating exchange rate while inflation in goods sector was well above that in services. As of January 2002, the annual rate of inflation in goods sector was 92.0% against 58.2% in services.

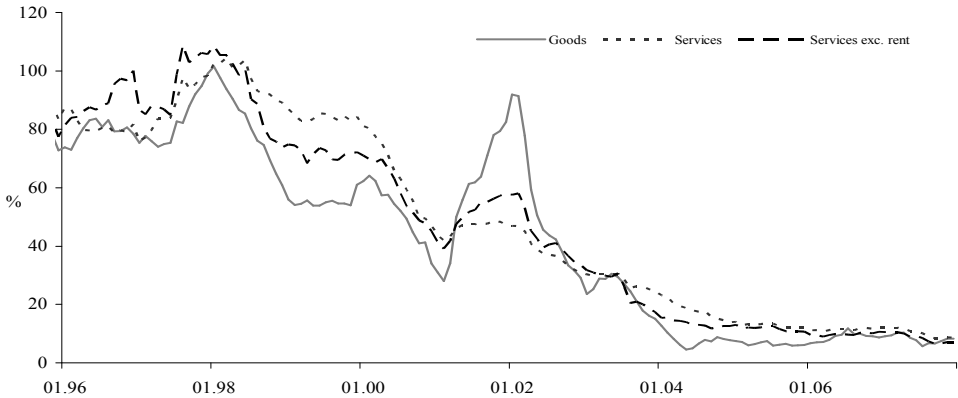


Chart 1. Annual Inflation in the Sectors of Goods and Services

The disinflation period re-started from February the same year on as a consequence of measures adopted immediately following the crisis. Sharp fall in inflation continued till mid-2004 and then stabilized in a relatively narrow band. During this period, the services sector inflation was at higher levels than that of goods sector just as in the period 1998-2001, which slowed down the rate of fall in overall inflation. In June 2004, for instance, annual rate of headline inflation index was 7.1%, whereas inflation in the services sector was high at 18.1% compared to 4.9 % in goods sector. Once more in this period too, the

rate of inflation in the housing item was the factor which pushed the rate in the services sector sub-index upward. It is worth noting that excluding the rent item, the figure 18.1% recedes back to 12.9%. The feature common to both disinflation periods is that the rate of inflation in services sector was above that in the goods sector and the some of the difference in-between could be accounted for by the housing sector in specific. Starting from July 2004, while the headline index followed a relatively stable trend, relative prices continued to change. While inflation in the goods sector at first started to display a mild increase, this movement became stronger following the turbulence emerging in international markets in May 2006 and subsequent worldwide increase in commodity prices. The services sector inflation, on the other hand, maintained its mildly falling trend in spite of halting of fall in the headline index. As a result, while the annual CPI inflation turned out as 9.7% as of December 2007, the difference between inflation rates of goods and services sectors further narrowed and fell to almost nil with 0.3 percentage points.

4. Literature Review

This section is devoted to academic studies⁵ focusing on factors that are thought to account for the fact that inflation in services sector moves above that in the goods sector and through which dynamics these factors exert their influence differently on respective sectors. Going over the literature, we see that differences in productivity, different degrees of transmission from exchange rate to sector inflations, escalating global competition and increasing demand for services sector are cited as factors explaining different inflation dynamics in these two sectors. Since gap between sectoral inflations may also arise due to different levels of persistence, the last part of this section is devoted specifically to the persistence literature.

a. Openness of goods sector to productivity gains

Baumol (1967) analyzed the impact of productivity differentials among sectors on costs and prices, total output, employment and wages. This analysis of Baumol is based on a closed economy model with two sectors, one is open to technological innovations and the other is not (services). It is assumed that firms are engaged in mark-up pricing. As a result of technological advances, important productivity gains occur in manufacturing industry and these gains allow for higher real wages without any effect on profit margins. On the other hand, in services sector which is more labour intensive and also less exposed to technological innovation, productivity gains will remain limited and this, in turn, will widen the difference between wage levels in two sectors. In a

⁵ Some studies, in Turkish, investigating the dynamics of inflation in Turkey may be of interest for those who seeks for further reading: Uygur (2003), Süslü and Baydur (2004), Demirci (1998).

situation where productivity gains stem from manufacturing industry, wage increases in manufacturing industry precede those in services sector and, where labour force is mobile, rising wages in manufacturing industry attracts labour to this sector from others (Prud'homme and Kostenbauer, 1997). In order to stop labour force outflow, wages in services sector have to rise; but different from manufacturing industry, wage increases in services sector are not supported by gains in productivity. In this case, price increase in services sector is inevitable.

In the empirical part of his study, Nordhaus (2006) executed a long-run analysis for the period 1948-2001 using US data and concluded that differences in productivity had their direct reflection on relative prices. Bosworth and Triplett (2003), on the other hand, maintain that parallel to advances in the information technology, productivity gains in services sector went beyond those in manufacturing industry. According to the calculations of authors, annual productivity increase in manufacturing industry in the US from 1987 to 1995 was 1.8%, then rising to 2.3% in the period 1995-2001 whereas increase in the services sector was from 0.7% in the period 1987-1995 to 2.6% in the period following 1995. On the basis of aggregated data, Bosworth and Triplett point out to significant productivity gains in services sector while drawing attention to considerable differences on sub-sector basis. As a matter of fact while intermediary institutions and financial services stand out as sub-sectors with highest productivity gains, productivity trends went downward in other sub-sectors including accommodation, recreation-entertainment and education.

b. Transmission from exchange rate

Products of services sector differ from goods in that they are not subject to foreign trade or their trade volume is rather limited. It is therefore expected that appreciation of the exchange rate would, contrary to services sector, constrain price increases in goods sector both directly by depressing the value of imported goods and indirectly through competitive pressures emerging from the importation. Transmission, however, may remain limited due to such factors as possibly temporary nature of exchange rate fluctuations, costs of price adjustments and existence of other costs independent from exchange rate fluctuations.

In developing countries where financial dollarization is high, it is observed that exchange rates determine prices in both trading and non-trading sectors through indexing behaviour or by influencing expectations. In addition to the fact that exchange rate is a variable with instant responses to macro economic developments and changes in a country's risk status, easiness in its being followed by economic agents further strengthens this influence. For the

period August 1995- July 2004, for Turkish data, Kara et. al. (2005) estimated coefficients of transmission from exchange rate to headline inflation as well as to both tradable and non-tradable sectors inflation by employing Kalman Filter. This study revealed, prior to February 2001 when exchange rate was left to float, that transmission coefficient was around 30% for tradable sectors and 40% in non-tradable sectors. Upon change in exchange rate policy, transmission coefficients fell in both sectors. It is found that these coefficients for tradable and non-tradable sectors stabilized around 15% and 10-15%, respectively. It should also be noted that the coefficient for non-tradable sector further decreased after 2004. It is possible to explain this situation with the disappearance of indexing behaviour together with the start of floating rate regime. Nevertheless, outcomes of the analysis must be taken cautiously since the analysis period coincides with a period in which TL tended to gain value vis-à-vis major currencies due to major capital inflows brought about by abundant global liquidity. Clark (2004) points out that the gaps between price increases in goods and services sectors were quite harmonious with exchange rate movements that took place in the US, United Kingdom and the Eurozone. According to Clark, most stable and pronounced differences in price increases took place in the US and Great Britain where domestic currencies enjoyed highest levels of appreciation.

c. Escalating Global Competition

Further and tighter integration of world markets and emergence of developing countries as more and more active players constitute another pressure on prices of tradable products. In a time perspective, it is observed that while the world economy grew by 5% in 2006, growth in the volume of total world trade in the same year was 9%. For the year 2007, it is estimated that the figures will turn out as 4.9 % and 6.8 %, respectively (IMF, 2008). Since the same source calculates, for the period 2000-2009, a rate of growth of 6.7% for both total trade volume and volume of trade in goods, it can be inferred that trade in goods and services sectors displayed similar growth trends in the period in question. In spite of this similar trend, the difference between trade volumes throws light upon why sectors are affected differently from international competition. Data from the same publication points out that in 2007, while the world trade volume was around 13.7 trillion US\$, the volume of trade in services was 3.3 trillion US\$. It is necessary at this point, however, to stress that the World Trade Organization adopts a broader definition of trade in services sector. Under this definition, trade in services are classified as i) trans-boundary supply; ii) consumption abroad; iii) commercial presence and, iv) presence of private persons. Coming to goods sector, on the other hand, only the first two items are included in the scope of trade. Cases

where a services sector institution (for instance, in banking) enjoys returns by acquiring a firm in another country through direct investment, and where a private person is engaged in a trade activity in the sector of services in another country (for instance, consultancy) are both recognized as “international trade in services”. Although different definition scopes make comparison difficult, it can easily be inferred that, as commonly expected, goods sector is more exposed to foreign competition than services sector.

Besides the dominant role of trade in goods in international trade, another apparent point is that the rate of openness to trade of developing countries has been increasing faster than that of industrialized countries for the last two decades (IMF, 2008). Since developing countries have low-cost opportunities, their exported goods exert a downward pressure on prices in importing countries. Meanwhile, expanding trade among countries with similar factor endowments further put pressure on conditions of competition, also reducing or putting a limit to the growth of profit margins. In his study examining the relationship between globalization and worldwide disinflation, Rogoff (2003) defines price pressures originating from developing countries, including Asian countries in the first place, as “direct impact”. Rogoff further argues that globalization narrows profit margins by boosting competition either through trade or deregulation and labels this as “indirect impact.” While stressing the impact of deregulation, Rogoff uses some profit margin estimates given in the World Economic Outlook published by the IMF (IMF, 2003). According to this source, while profit margins are around 15% in the US and Great Britain, they are as high as 40% in the continental Europe where there are some legal restrictions and obstacles to entrepreneurial initiatives. Rogoff also maintains that in developing countries opening up to foreign trade, this development leads to narrowing profit margins for domestic firms.

d. Rising Demand for the Services Sector

It is recognized that there is strong correlation between countries’ progress in welfare level and increasing share of services sector in domestic product. As the level of development goes up, changes in demographic structure and life styles as well as the fact that enterprises seeking to concentrate on their mainstream activities prefer outsourcing some items which require high level of specialization becomes more widespread. McLachnan et. al. (2002) explains the growing share of services in total household spending by the relative shrinkage of the share of basic necessities. For the US and the period 1927-1965, Fuchs (1968) estimated income elasticity in the sectors of services and goods as 1.12 and 0.93, respectively. Another explanation regarding the swelling share of services sector in national product is the desire of firms to concentrate in their specific fields of activity while outsourcing some basic services. It is argued

that this tendency boosts efficiency and brings in advantages in terms of costs. As companies grow and gain more complex features, their need for services requiring higher levels of specialization also increases and there emerges a tendency to turn towards technical background or markets abroad. This rising demand originating from the corporate world contributes to the further growth of services sector. According to a 1997 study by the US-based Outsourcing Institute (OECD, 2000) the share of outsourced services by companies with annual turnover of over 80 million US\$ grew by 26% and reached 85 billion US\$ in 1997. At the top of the list of outsourced services we see informatics (30%), human resources (16%) and marketing-sales services (14%).

Increasing demand for services sector also supported by tendencies mentioned above holds true for all OECD countries rather than being valid for a limited number of countries. As a matter of fact, the share of services sector in OECD countries which was 54% in 1975 rose to 66% in 1999. In 1997, in 10 of 29 OECD countries the share of this sector was over 70% (OECD, 2000).

e. Persistence Literature

The persistence that services sector displays, particularly in periods of disinflation, makes it worthwhile to briefly visit the relevant literature. Relatively higher importance of persistence factors in services rather than goods sector may be helpful in explaining the dynamics of the inflation gap between these two sectors. In explaining inflation, Gali and Gertler (1999) expound that in addition to output gap and expected inflation; past inflation could exist and act as a persistence factor. It was in this particular context that studies conducted by Smets, Gali et. al. (2005) under the Inflation Persistence Network (IPN) established jointly by the European Central Bank (ECB) and national central banks constituting the Euro System gained importance. The first of the three factors of persistence is the external persistence. Authors accept that firms operate in monopolistically competitive markets, engaged in mark-up pricing and maintain that there is an inverse relation between output gap and level of mark-up. Hence, by putting mark-up in place of output deficit in the Philips Curve, it becomes possible to establish a relationship between inflation and mark-up. Then, maintaining that there will emerge a difference between desired and actual mark-up in cases of demand or cost shocks due to nominal rigidities in the economy, the authors argue that this situation will lead to persistence in inflation. The second factor of persistence is internal, which reflects relation of inflation with its own lagged values. In the pricing behaviour of some firms, taking consideration into past inflation values or engagement in indexation to past inflation will bring inflation to closer ties with its lagged values and thus increase persistence. The last persistence factor is based on expectations. This situation will emerge when economic

actors drift away from rational expectations. Cases such as economic agents' lack of full information concerning shocks to the economy, ambiguity on the part of central banks regarding inflation targets or gaps of credibility again in this regard will cause lagged adjustments in expectations about inflation and thus lead to its persistence.

5. Empirical Analysis

a. Data

The VEC model (Johansen, 1988) was used in order to figure out why prices in goods and services sectors diverge and determine which explanatory factors cited in literature are more relevant for the Turkish economy. The model incorporates productivity differences, exchange rate and foreign competition data together with relative price series. The analysis excludes increased demand for the services sector on the ground that this increase is the outcome of structural transformation taking place in the economy, which extends over a rather long period of time. Admittedly, concern regarding degrees of freedom in the model was another factor leading us to leave this series aside. The analysis used quarterly, seasonally adjusted data including 52 observations for the period 1995-2007⁶.

The relative price series (relp) were obtained as the difference of the price index of services than that of goods sectors in natural logarithmic terms. However, since CPI figures are not officially announced as disaggregated by goods and services sectors, data used in the study are indices produced from 5-digit items in the CPI basket by the Research and Monetary Policy Department of the Central Bank of Turkey. The method used in linking two series is reweighting the sub-indices (5-digit items) in the old basket with the newly assigned ones. Since there is no historical data for the items first time included in the 2003-based CPI basket, such as mobile phones, tuition of private universities etc., our index casts out these items. Homeowners' equivalent rent item is one important item, dropped from the 1994-based series when linking, for the same concerns.

The productivity differential variable (prod) was calculated as the ratio of goods sector productivity series, obtained by dividing industrial output by employment, to services sector productivity series obtained through the same method. Yet, since employment figures pertaining to the period before 2000 were made public in every six months, the series were transformed to quarterly frequency through the Fernandez method (1981) by using quarterly labour force remuneration series deflated by CPI data.

⁶ Seasonal adjustment was conducted by Tramo-Seats. In the case of derived series, firstly base series are seasonally adjusted and then necessary computation is made.

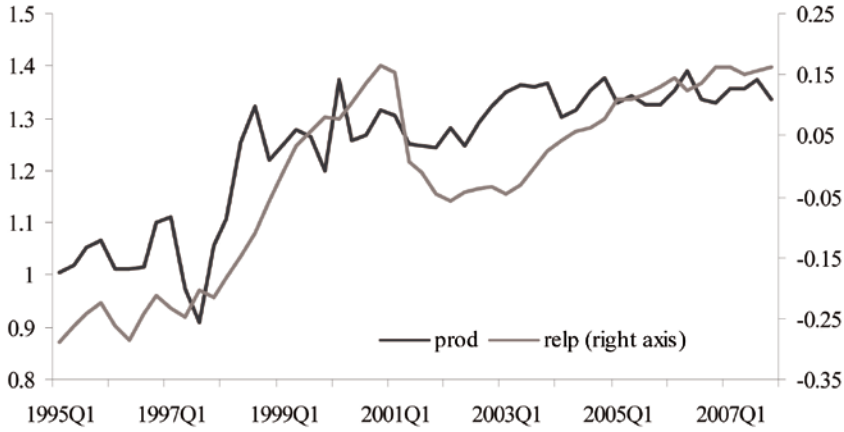


Chart 2. Productivity and Relative Price Level Series

The productivity variable, as defined above, is displayed in Chart 2 with the relative price level. It also needs to be mentioned that productivity series is indexed to “1” as of the last quarter of 1994, just prior to the analysis period. As the model outcomes will suggest, productivity data will play important role in explaining the relative price dynamics.

In order to measure foreign competition pressure (comp) on the goods sector, import to output ratio of manufacturing sector is used. Finally, as exchange rate variable (exc), interbank quarterly average US dollar quotations from Bloomberg were included. Descriptive statistics of the data used in the model are presented in Table 2.

Table 2. Descriptive Statistics

	average	st. deviation	maximum obs.	minimum obs.	median
Relp	-0.019	0.149	0.166	-0.289	0.003
Exc	0.869	0.596	1.647	0.041	1.183
Comp	0.929	0.281	1.351	0.468	0.937
Prod	1.242	0.131	1.392	0.910	1.288

Orders of integration of the data used in the model were examined through the Augmented Dickey Fuller test and test statistics were compared to % 5 critical values⁷. The ADF test yielded that all variables included in the analysis were $I(1)$ (see, Table 3).

⁷ Unit root tests were applied to seasonally adjusted data.

Table 3. Augmented Dickey Fuller Test (ADF test)

	trend plus intercept		Intercept		None	
	test statis- tic	critical value	test statis- tic	critical value	test statis- tic	critical value
Relp	-1.99	-3.50	-1.38	-2.92	-1.52	-1.95
Exc	-0.75		-1.39		0.17	
Comp	-3.28		-0.86		2.00	
Prod	-3.00		-2.08		0.57	

b. Model

Prior to unrestricted VAR model, by which we are going to decide whether variables are cointegrated and select the appropriate specification if they are, estimated in the analysis by using four macroeconomic series, appropriate lag figure was investigated. Having examined this, which allowed at most for 5 lags, it was found that the AIC criterion suggested 2 lags while SC and HQ suggested single lag. In the light of these findings, it was preferred to estimate the model by two lags in line with the AIC criterion (see, Table a1 in appendix).

As for the error term results of the VAR model used in selecting the number of lags before the VEC model estimation, it was found that null hypotheses related to autocorrelation and normality could not be rejected; in other words, there was no problem of autocorrelation in the model and error terms satisfied the conditions of normality (Tables a2, a3 in appendix).

Table 4. Co-integration test

	intercept in CE		intercept in CE		intercept and trend in CE	
	no intercept, trend in VAR		intercept in VAR		intercept in VAR	
	statistic	cv (.05)	statistic	cv (.05)	statistic	cv (.05)
<i>Trace</i>						
None	69.88	54.08	61.95	47.86	82.31	63.88
At most 1	35.10	35.19	27.62	29.80	47.29	42.91
At most 2	10.62	20.26	8.09	15.49	17.44	25.87
<i>Max-Eigenvalue Test</i>						
None	34.78	28.59	34.33	27.58	35.03	32.12
At most 1	24.48	22.30	19.53	21.13	29.85	25.82
At most 2	7.07	15.89	5.57	14.26	14.59	19.39

In order to determine whether variables are cointegrated and the specification if they are, ‘trace’ and ‘max-eigenvalue’ test results were brought together in Table 4 for 3 different specifications. These are: i) there is no intercept term but trend variable in the VAR equation while there is intercept term in cointegrating vector, ii) There is intercept term in both VAR equation and cointegrating vector, iii) There is both intercept term and trend in VAR equation and there is intercept term in cointegrating vector. The decision on which specification is appropriate was taken on the basis of the Pantula Principle (see, Asteriou and Hall (2007)). The Pantula Principle is based on ranking different specifications from the most to least restrained one and stopping at the point where the null hypothesis pointing out to the number of cointegrating relations cannot be rejected. On the basis of the ‘trace’ test, while the existence of a cointegrating relationship is ascertained, this relationship includes an intercept but no trend in cointegrating equation and includes neither intercept term nor trend in VAR equation. While the results of the ‘maximum eigenvalue’ test too point out to the existence of a single co-integrating relationship in the model, the appropriate model is the one which includes constant term in both co-integrating relationship and VAR equation. The results of the ‘trace’ test and ‘maximum eigenvalue’ test point out to different models. The ‘trace’ test rejects the first model by a marginal difference. Considering this and the fact that the structure of error terms was sounder in the second one of two different VEC models questioned, estimation was made by preferring the model suggested by ‘maximum eigenvalue’ test, which included only intercept in co-integrating relationship and VAR equation.

In the model estimation obtained, it was observed that signs of variables in co-integrating relationship were in expected directions and with expected values. According to the model, the long term relationship between price differential and other variables are as follows:

$$relp = -2.36 + 0.25comp + 1.92prod - 0.31exc$$

According to the estimation outcomes, as expected, the depreciation of Turkish lira narrows price differential between two sectors (lowers the relative price), increase in productivity differential series and in external competition, on the contrary, widens this gap. According to impulse response analysis, shocks of 1 standard deviation to exchange rate, competition, productivity differential and relative price series respond by -1.3, 0.3, 0.9 and 2.4 percent, respectively, for the first quarter. At the end of the 10th quarter, cumulative level of responses turn out as -29.0, 12.9, 27.7 and 24.4 percent, again respectively. As can be inferred from Chart 3, the relative prices give the strongest response to shocks to exchange rate and productivity.

Variance decomposition analysis, conducted in order to supplement the

outcomes of impulse response analysis, points out to similar results (see, Table a4 in appendix). According to this analysis, given a time perspective of 10 quarters, the variance of forecast error in relative prices can be accounted for mainly by the variables exchange rate (38.5%) and productivity differential (33.0%). While the exchange rate variable explains error variance from the very first period, productivity differential variable makes its influence salient starting from the second quarter.

What is noteworthy in both impulse-response and variance decomposition analyses are the rather strong relationship between the relative price levels data and its own lags, even at the end of analysis horizon. This finding supports our proposition that the two sectors differ in terms of their respective persistence. Once there is a sudden change in price level of one sector, the fact that the other fails to respond at the same speed leads to further divergence between sectors. To be more specific, it seems that the model supports the idea that, especially in disinflation periods, the services sector can keep pace with falling inflation in the goods sector only after rather long lags⁸.

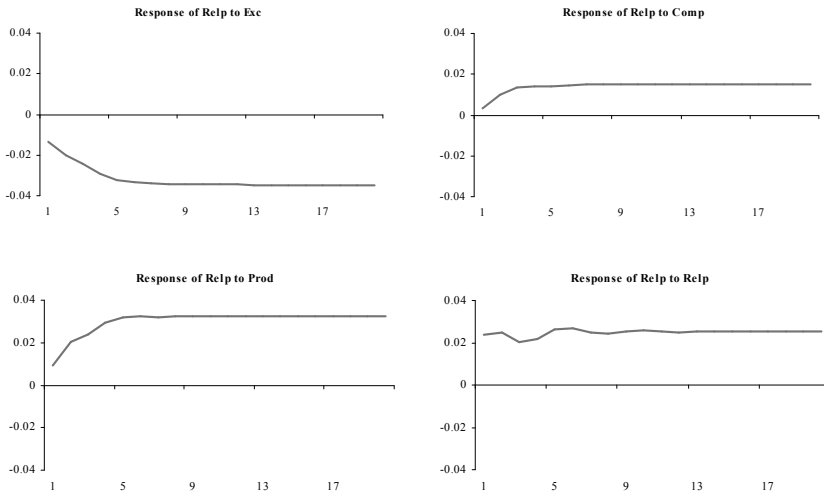


Chart 3. Impulse- Response Analysis

⁸ Housing market has sector-specific properties that may differ from services sector considerably. As we mentioned several times throughout the paper, rent item is the basic factor increasing persistence in the services sector. Additionally, it may not be true to claim that there is room for productivity gains in this sector. For this reason we repeated our VEC estimation by employing a new relative price series which excludes housing data. Comparison of variance decomposition analyses of the two series yield striking outcomes (see Table a7 in the appendix). First finding is that when housing data is excluded, as a part of the series with high persistence left out, the importance of relative price in explaining the total variance diminishes considerably. Contrarily, the importance of relative productivity increases, which lead us to conclude that housing data blurred our analysis at the first place. (Please compare Table A4 with Table A7 in the appendix for exact figures).

Having examined the error term in the VEC model, it is found that null hypotheses related to auto-correlation and normality cannot be rejected (see, Table a5,a6 in appendix)⁹.

However, before moving forward, caveats of the empirical study need to be brought into attention for accurateness. The first issue is with regard to the exclusion of the demand for the services sector variable. One other factor forcing us to leave out this variable from the estimation process, in addition to our structural change argument, is the degrees of freedom concern given the data limitations. If this study is repeated in the future with more observations, it should be admitted that inclusion of this variable may alter the empirical findings. The second issue is related to the affects of the severe financial crisis of 2001. That models estimated with crisis dummies brought about autocorrelation problems led us to ignore this variable as well. This should also be taken into account when interpreting the findings.

5. Conclusion

After leaving behind the effects of the financial crisis of 2001 disinflation resumed in Turkey, however over this period the persistence displayed by services sector inflation appeared as a risk factor. The limited nature of data and academic literature pertaining to this sector has placed policy makers in a rather difficult position. Persistence of inflation in services sector over disinflation periods suggests that there may be some structural problems in pricing behaviour in this specific sector. An explanation might be that agents in this sector create nominal rigidity by entering into contracts and/or they focus on past inflation figures while adjusting their prices and setting their expectations.

Reminding once more that it is the limited availability of academic studies on the issue that motivated us to take it up, the objective of the present study is to focus on the experience of the Turkish economy, to go over the literature to bring relevant studies together and to share the findings which were obtained through empirical model estimation. We hope that these findings will be of use to and considered by actors engaged in inflation projections including monetary policy makers who additionally make commitments for inflation targets. Indeed, the fact that the relative prices exhibit a long-term relationship with other variables suggests that it would be more appropriate to focus on sector-based inflations rather than headline inflation in inflation forecasts.

Our empirical study suggests that differences in productivity levels deriving from productivity gains in manufacturing industry and exchange rate movements are of paramount importance. Productivity gains in manufacturing

⁹ Though results are not presented, it was observed that there was no heteroskedasticity problem in error terms.

sector keep the rise in overall level of prices limited by creating a downward pressure on inflation in the goods sector while, at the same time, causing a wider divergence in goods and services sectors prices. On the other hand, increases in exchange rate, pushing prices in the goods sector up, not only contributed to the increase in headline inflation but also deteriorated relative prices.

Addressing the impacts of findings obtained in this study, we find, firstly, the possibility of re-emerging persistence of services sector inflation in disinflation periods as a point which needs particular attention. While it is important per se for monetary policy makers to consider this possibility, it is also important to eliminate those elements of rigidity that are considered to be the causes of persistence and to engage in more active management of expectations by better informing actors about the policies of the Central Bank and its inflation targets. Given the finding of the quantitative analysis that divergence in productivity levels triggered by productivity gains in manufacturing sector is an important factor explaining divergent inflation dynamics, there is need to take into account technological leaps that bring along productivity gains or long-term stagnancy. Furthermore, any hindrance to new investments due to shrinking credit opportunities or rising costs will reduce the positive contribution of the sector of industry to inflation. Any disruption in global liquidity conditions will have its bearing on headline inflation via goods sector both due to depreciating exchange rate and falling productivity gains brought about by investments.

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Appendix

Table a1. Criterion for Selecting the Number of Lags

VAR Lag Order Selection Criteria			
Included observations: 47			
Lag	AIC	SC	HQ
0	-4.57	-4.41	-4.51
1	-12.52	-11.73*	-12.23*
2	-12.55*	-11.14	-12.02
3	-12.35	-10.30	-11.58
4	-12.27	-9.59	-11.26
5	-12.41	-9.11	-11.17

Table a2. VAR Error Term Autocorrelation LM Test

Null: no serial correlation at lag order h		
Lags	LM-Stat	Prob
1	15.58	0.48
2	15.29	0.50
3	19.02	0.27
4	16.62	0.41
5	27.10	0.04
6	15.51	0.49
7	7.83	0.95
8	12.63	0.70
9	18.38	0.30
10	10.89	0.82
11	10.73	0.83
12	21.04	0.18

Table a3. VAR Error Term Normality Test

Orthogonalization: Cholesky (Lutkepohl)			
Null Hypothesis: residuals are multivariate normal			
Component	Jarque-Bera	Df	Prob
1	4.24	2	0.12
2	3.65	2	0.16
3	2.86	2	0.24
4	2.46	2	0.29
Joint	13.21	8	0.10

Table a4. Variance Decomposition Analysis

Period	S.E.	Exc	Comp	Prod	Relp
1	0.098	21.004	1.416	9.847	67.733
2	0.163	24.394	4.508	20.808	50.290
3	0.214	28.360	7.089	25.918	38.632
4	0.259	31.187	7.434	29.797	31.582
5	0.299	32.516	7.134	31.356	28.994
6	0.335	33.424	7.035	31.985	27.556
7	0.368	34.287	7.122	32.356	26.235
8	0.399	34.975	7.184	32.665	25.176
9	0.428	35.447	7.187	32.856	24.510
10	0.455	35.796	7.187	32.957	24.059

Table a5. VECM Error Term Auto-Correlation LM Test

VEC Residual Serial Correlation LM Tests		
Null: no serial correlation at lag order h		
Included observations: 49		
Lags	LM-Stat	Prob
1	17.82	0.33
2	16.70	0.41
3	12.66	0.70
4	24.72	0.07
5	21.70	0.15
6	21.58	0.16
7	6.87	0.98
8	21.39	0.16
9	21.12	0.17
10	9.20	0.91
11	12.01	0.74
12	23.90	0.09

Table a6. VECM Error Term Normality Test

VEC Residual Normality Tests			
Orthogonalization: Cholesky (Lutkepohl)			
Null Hypothesis: residuals are multivariate normal			
Included observations: 49			
Component	Jarque-Bera	df	Prob.
1	1.941673	2	0.3788
2	3.093667	2	0.2129
3	3.217651	2	0.2001
4	0.886733	2	0.6419
Joint	9.139724	8	0.3306

Table a7. Variance Decomposition Analysis (with relative price series excluding housing)

Period	S.E.	Exc	Comp	Prod	Relp - exh
1	0.097	12.344	0.023	19.132	68.501
2	0.163	22.432	2.626	21.655	53.288
3	0.213	26.872	4.370	26.780	41.978
4	0.258	30.794	5.302	34.028	29.875
5	0.299	32.558	4.956	37.460	25.026
6	0.336	34.144	4.796	39.327	21.732
7	0.369	35.047	4.731	39.930	20.292
8	0.400	35.769	4.789	40.592	18.850
9	0.428	36.220	4.808	41.071	17.902
10	0.455	36.600	4.810	41.527	17.063