Inflation dynamics and
its implications for monetary policy*

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August 2003

*The views expressed in this paper are those of the authors
and do not necessarily represent those of the BOT.*

Abstract

Since May 2000, the Bank of Thailand adopted inflation targeting as its monetary framework, making price stability the overriding policy objective. Understanding the inflation transmission mechanism is therefore crucial in policy assessment and decision-making. Of particular concern are the key determinants of inflation in Thailand and their relative importance over time. Given the pervasive influence of the exchange rate in the economy, the paper employs econometric models to measure the pass-through of exchange rate movements to domestic prices. In doing so, it evaluates whether the degree of pass-through varies across sectors. Reasons that explain the weak exchange rate pass-through include: 1) changes in firms' pricing strategy, 2) lower inflation expectations, 3) shifts in housing market structure, and 4) prevalence of administered price measures. The low pass-through has provided more room for manoeuvre in monetary policy. As the pass-through depends on not only the share of import content but also the exchange rate volatility, large fluctuations in the exchange rate can still pose a threat to the inflation target.

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1. Introduction

Thailand achieved a remarkable record of low inflation over the past three decades, with the exception of the oil shock periods that generated temporary high inflation worldwide. The currency devaluations that accompanied the economic crisis in Thailand and regional economies in the mid-1990s did lead to an increase in domestic consumer prices, although the impact was somewhat limited in terms of magnitude and time lag. In recent years, low and stable inflation has been witnessed in both industrial and emerging market economies. Inflation of Thailand's major trading partners stayed under 1.5 per cent during the last four years. Similarly, annual headline inflation in Thailand averaged just one per cent over the same period. Indeed, core inflation has remained below 0.5 per cent for 15 consecutive months up to the middle of 2003. Inflation projections by the Bank of Thailand in its July 2003 *Inflation Report* indicate that the disinflationary trend is likely to continue for the next two years. These periods of low inflation are generally welcome, but policymakers must be prepared for unanticipated shocks that might trigger another bout of inflation.

Central bankers recognize the importance of price stability in supporting sustainable economic growth. Since May 2000, the Bank of Thailand adopted inflation targeting as its monetary framework, making price stability the overriding policy objective. Understanding the inflation transmission mechanism is therefore crucial in policy assessment and decision-making. Of particular concern are the key determinants of inflation and their relative importance over time. The inflation process in Thailand is best represented by the Bank of Thailand's macroeconomic model (BOTMM), which is the central bank's main economic forecasting tool. While external factors like world commodity prices still contribute to inflationary pressure, domestic factors such as average earnings have become more influential. As Thailand now operates under a flexible exchange rate system, movements in the exchange rate have undoubtedly assumed a greater role in determining consumer prices. Indeed, the exchange rate features widely in BOTMM, having considerable impact on the future path of inflation. The main channel through which movements in the exchange rate are transmitted to inflation is the direct effect on the costs of imported goods, ranging from oil to manufactured products. Exchange rate fluctuations also have second-round effects on product and labour markets via changes in the composition of demand.

Policymakers care about the exchange rate not only because it affects the economy's external competitiveness but also because it is an indispensable cog in the dynamics of inflation. The exchange rate also influences inflation expectations, which have an important bearing on the central bank's credibility especially in inflation targeting countries. This paper attempts to measure the influence of exchange rate changes on domestic prices or what is commonly known as the "exchange rate pass-through". To assess the magnitude and speed of exchange rate pass-through, a VAR model is introduced to analyse the effects along the distribution chain of pricing from importers to producers, and finally to consumers. The finding of a weak pass-through suggests that Thailand has become more resilient to external shocks. In fact, there are a number of reasons that might explain the low pass-through, all of which have implications for the conduct of monetary policy.

The paper is organized as follows. Section 2 reviews the recent inflation developments in Thailand and outlines the underlying reasons for the commendable inflation performance. It also provides a brief overview of the measurement and components of the consumer price index (CPI) in Thailand, and discusses the relationship between consumer and producer prices. Section 3 identifies the factors determining inflation and assesses the channels through which these factors affect domestic consumer prices in the context of BOTMM. Section 4 presents results from our VAR analysis on the degree of exchange rate pass-through and evaluates whether pass-through varies across sectors. In light of the relatively low inflation in Thailand, explanations for the low pass-through are documented in Section 5. Section 6 offers guidelines for the conduct of monetary policy in response to external shocks, while Section 7 concludes. Technical details to the analysis used in the paper are provided in the appendices.

2. Recent inflation developments in Thailand

For most of the past three decades, Thailand managed to keep inflation to single digits as illustrated in **Figure 2.1**. There were several episodes of high inflation, but these were exceptional and consistent with worldwide trend. Average annual inflation for the period

Figure 2.1: Headline inflation in Thailand
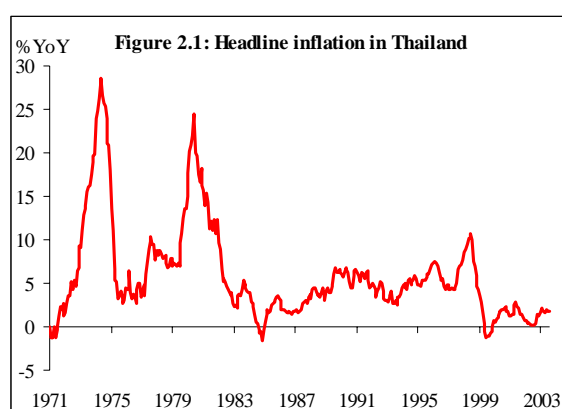
1970-2002 was 5.8 per cent, lower than those experienced in most developing countries including the Asian region and comparable to those in industrial countries. Barring the oil shocks of the 1970s, the only occasions that Thailand saw double-digit inflation over this entire period, inflation averaged just 4.1 per cent. Surprisingly, the inflationary impact of the currency devaluation during the Asian economic crisis was limited and short-lived. **Table 2.1** presents the average inflation rates in selected regions in consecutive ten-year periods. A striking feature of the table is that inflation has declined steadily across the board, with the sharpest fall occurring from 2000 onwards. In Thailand, there was a marked improvement in inflation performance, with inflation dropping from an average of around 5-8 per cent between 1970-1990 to less than one per cent in 2002, a rate not seen since 1984. Inflation has also become more stable over time, noticeably in the 1990s. Since the advent of inflation targeting in May 2000, core inflation (and incidentally headline inflation) has remained within the target band of 0-3.5 per cent. In the first half of 2003, headline inflation stood at a comfortable rate of 1.8 per cent, while core inflation was marginally above the target floor at 0.2 per cent.

Table 2.1: Cross-country inflation rates and inflation variability

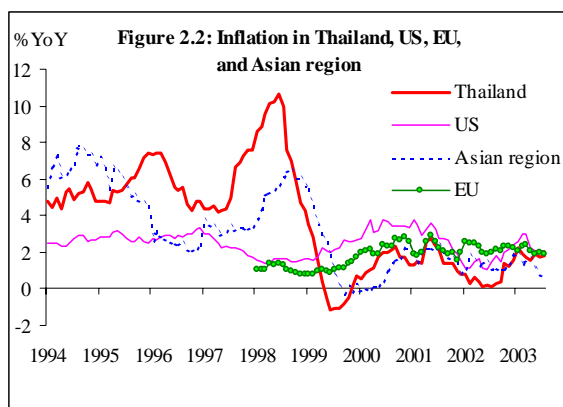| (%YoY)	1970s	1980s	1990s	2000	2001	2002	2003*
Advanced economies	8.5	6.3	2.9	2.3	2.2	1.5	1.9
Developing countries	14.7	39.7	32.4	5.8	5.8	5.4	5.8
Asian NIEs**	11.7	6.5	4.8	1.1	1.9	1.0	1.8
Thailand	*8.0*	*5.8*	*5.0*	*1.6*	*1.6*	*0.7*	*1.8*
(Standard deviation)	*7.3*	*5.9*	*2.1*				

Source : World Economic Outlook (WEO), IMF
* 2003 forecast from WEO (April 2003), January-July 2003 for Thailand
** Newly industrialized Asian economies (Hong Kong SAR, Korea, Singapore, and Taiwan Province of China)

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Overall, the exemplary inflation record in Thailand can be attributed to a number of factors. First, sound macroeconomic management with counter-cyclical monetary policy and a conservative fiscal stance, notably during the economic boom that lasted several years beginning in the late 1980s, was mainly responsible for restraining inflation.[1] Moreover, as the baht was pegged to the US dollar during 1984-1997 and did not vary much over this period, Thailand had an effective nominal anchor for inflation and was partially insulated from external shocks. Second, given the abundant workforce and a lack of strong organized labour unions, there was little pressure from the labour market as evidenced by the modest rise in the minimum wage, a key driver of average earnings growth. Wage costs have increased by only five per cent on average between 1980-2003 and by even less following the crisis at one per cent between 1997-2003.[2] Third, the period following the oil crisis of the early 1980s saw relatively moderate supply shocks emanating from volatilities in world commodity markets. More recently, disturbances in world oil and agricultural product markets have been less persistent - and sometimes offsetting one another - with limited impact on domestic inflation, while declining trends in prices of manufactured goods and non-fuel commodities have even contributed to the downward price pressure.

Comparing inflation performance across selected regions, **Figure 2.2** shows that while inflation in the US was relatively low and stable during the 1990s, the record in Asia was not too impressive, being plagued by high and volatile inflation especially during the crisis years.[3] Thailand seemed to have fared worse, posting persistently higher inflation compared to the Asian region's average and an inflation differential of up to five percentage points in certain periods. From 1999 onwards, however, Thailand's inflation has converged with those of other Asian countries and has been maintained at rates even below those witnessed in the US and EU. In fact, there has been an overall tendency for inflation to cluster at a low level in the last few years despite unfavourable supply shocks such as the recent oil price hikes, suggesting that Thailand and other countries may have become more resilient to foreign and domestic shocks and that the inflation process may have undergone structural changes.

Figure 2.2: Inflation in Thailand, US, EU, and Asian region

A whole range of arguments has been put forward to explain the current global trend of low inflation. The large and persistent negative output gaps that emerged as a result of weak domestic demand and excess capacity, especially in many Asian economies following

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[1] For a review of Thailand's inflation developments in the pre-crisis era and policy measures - some of which entailed adjustments in bank maximum lending rates and imposition of price controls on certain commodities - that were taken to counter inflationary pressures, see Bank of Thailand Economic Focus (1996).

[2] The increase in wages was estimated using the average growth rate of the minimum wage in Bangkok, although minimum wages in other areas of Thailand had risen at similar rates.

[3] Inflation in EU refers to the annual percentage change in harmonized CPI of EU-12 economies. Inflation in the Asian region is computed as the weighted average (using 2002 export weights) of annual inflation rates in China, Hong Kong SAR, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Taiwan Province of China. See Seng (1996) for a complete review of inflation developments in the Asian region.

the economic crisis in 1997, is probably the principal reason for the slowdown in inflation.[4] On the cost side, the age of globalization that enabled more rapid transfers of technology, coupled with increasing competition in product and labour markets spurred by trade liberalization policies in a world of overcapacity, has reduced the potential for excessive margins by firms. The decline in the pricing power of firms in the face of intensified competition and lower world commodity prices, exacerbated by the global economic downturn, helped to stabilize prices. In addition, technological progress and the associated productivity gains have boosted supply and increased the rates at which economies can grow without encountering inflationary pressures.

As central banks in many countries have increasingly moved away from targeting money supply and exchange rates and placed more focus on price stability, the credibility of monetary policy has been enhanced and inflation expectations have become more firmly anchored. While this is likely to be the case for countries that have explicitly adopted inflation targets in the regime shift from intermediate targets to ultimate targets, low and stable inflation has been far-reaching regardless of policy frameworks. This development implies that prolonged periods of benign inflation are self-fulfilling - with positive conditioning effects on the expectations of the persistence of price and cost changes. In other words, even when the economy is faced with strong demand pressures, consumers expect deviations of inflation to be temporary, while firms perceive cost changes to be less persistent.

While the above factors may be relevant for the recent low inflation environment observed in many countries, there are additional reasons more specific to the case of Thailand. First, the baht strengthened steadily relative to the US dollar during the last two years, providing a buffer against fluctuations in import prices, especially the price of oil that reached historically high levels as a result of geopolitical uncertainties. At the same time, until recently food prices have been contained in line with the downward trend in world agricultural prices. Second, since the beginning of 2000, changing patterns in the housing market have prompted a continuous fall in rental cost. Given its large share of household expenditure, housing rent has become a major contributing factor in keeping inflation low. Finally, goods and services in the CPI that are subject to administered price measures, including basic utilities, education, healthcare, and public transportation, have seen relatively small incremental increases in charges. These issues will be discussed in more depth in Section 5.

The steady decline in prices has raised concern in a number of central banks over deflationary risks.[5] Prices in Japan and Hong Kong have been falling for more than 56 months up to June 2003, while China, Taiwan, and Singapore have all encountered bouts of negative inflation over the past several years. Apart from a brief spell of negative inflation in

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[4] A more thorough discussion of the sources of downward price pressures in Asian economies can be found in Disyatat (2003).

[5] For the purposes of this paper, deflation is defined as two or more consecutive quarters of negative year-on-year inflation rates and is distinct from disinflation which refers to a reduction in the rate of inflation. It is sometimes, though not inevitably, accompanied by declines in output and employment. The Bank of Thailand first brought attention to deflation in its October 2002 *Inflation Report*, and subsequently provided an assessment of deflationary risks in the July 2003 issue. Based on the methodology developed by the IMF in Kumar et al. (2003), Thailand is found to have a moderate risk of deflation in the first half of 2003.

1999 owing to the reduction in the value added tax rate, Thailand had never come close to experiencing deflation in its economic history. Nevertheless, inflation rates have been consistently low in recent periods, with levels of capacity utilization below normal and the exchange rate progressively gaining strength against the US dollar. Headline inflation decreased to an average of below two per cent during the last four years, while core inflation has remained under 0.5 per cent every month starting in May 2002. Indeed, core inflation rates are now at their lowest level ever recorded.[6]

2.1 Inflation measurement and trends

In order to fully appreciate the dynamics of the inflation process, it is important to grasp the main characteristics of the Thai CPI, including its measurement, components, and nature of adjustment. The primary objective of the consumer price index (CPI) is to reflect as closely as possible the cost of living of the general public. As a barometer of the economy, the CPI measures the changes in the general level of prices charged for goods and services bought by the great majority of consumers. Before the CPI came into existence in 1962, the cost of living was measured by a combination of the cost of living index and the retail price index.[7] The former was derived from prices of 21 products surveyed in the Bangkok area, while the latter was composed of 58 products. The Thai CPI was formally introduced in 1962 and, having undergone several stages of development in terms of product and geographical coverage, currently contains 326 product items (123 food items and 203 non-food items) and spans over the Bangkok metropolitan area and all four regions of Thailand.[8]

The formula used to generate the CPI is Laspeyres, an index number whose weights are derived from values (quantity of goods purchased) in a particular base year. The Ministry of Commerce (MOC), the agency responsible for the CPI, collects data by surveying prevailing market prices of goods and services and weighing the prices according to their relative importance in the representative consumption basket.[9] The choice of products and their respective weights - representative of spending patterns of average households - is deduced from the socio-economic survey conducted by the National Statistical Office (NSO). Households that qualify for the survey must meet the following criteria: (1) residing in urban areas of Bangkok and four other regions[10]; (2)

Table 2.2: Developments in CPI

(Weights in CPI)	1990	1994	1998
Food and beverages	39.3	35.3	38.5
Clothing and footwear	5.4	5.6	3.6
Housing	25.7	24.0	25.8
Personal and medical care	5.8	6.3	5.6
Transportation and communicatic	12.4	17.5	16.2
Recreation and education	7.6	7.8	6.7
Tobacco and alcoholic beverages	4.0	3.5	3.5

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[6] The Ministry of Commerce publishes core CPI series dating back to 1985, which became available in 2000 in support of the inflation targeting regime.

[7] Both price series were released for the first time in 1943. While the cost of living index was transformed into the present-day consumer price index, the retail price index was discontinued in 1962.

[8] For details of the construction of the CPI, see the Ministry of Commerce's publication *Consumer Price Index: CPI* (in Thai only) and web site (www.moc.go.th).

[9] A product is selected for the CPI basket if its share of total expenditure is greater than one per cent. In addition, the product must have distinct characteristics and be widely traded in the market.

[10] Bangkok metropolitan area received the largest weight, followed by Central, Northeast, South, and North regions in order of decreasing weight.

having 2-6 family members; (3) earning total income between 6,000 and 43,000 baht per month; and (4) receiving in-kind income (such as medical benefits and housing subsidies) of no more than 30 per cent of total income. The consumption basket is updated every four years with the most recent revision being made in 1998. **Table 2.2** shows the changes in consumers' spending patterns over the last decade, where an increasing proportion of income has been allocated to food, housing, and transportation and less on clothing and footwear. The components of the current CPI basket are illustrated in **Figure 2.3**.

Figure 2.3: Composition of CPI

Food & beverages (38.5%)
Clothing & footwear (3.6%)
Housing (25.8%)
Personal & medical care (5.6%)
Transportation & communication (16.2%)
Recreation & education (6.7%)
Tobacco & alcoholic beverages (3.5%)

6.7% 3.5% 16.2% 38.5% 5.6% 25.8% 3.6%

Figure 2.4: Headline and core inflation

% YoY

Headline inflation (Mean=4.0, S.D.=2.4)
Core inflation (Mean=3.9, S.D.=2.1)

1986 1988 1990 1992 1994 1996 1998 2000 2002

Figure 2.5: Raw food and energy prices

% YoY

Raw food price (Mean=4.6, S.D.=5.3)
Energy price (Mean=2.8, S.D.=8.5)

1986 1988 1990 1992 1994 1996 1998 2000 2002

As a measure of underlying inflation, the core consumer price index removes raw food and energy components from the CPI basket since these are subject to volatile price movements and - as they are heavily influenced by exogenous factors - are not within direct control of monetary policy.[11] As core CPI comprises a total of 235 items, which constitute three-quarters of the basket, a substantial amount of information about consumption patterns is still retained. **Figure 2.4** reveals that although core inflation and headline inflation are practically identical with means of around four per cent during 1986-2002, core inflation is somewhat less volatile than headline inflation, judging from the former's lower standard deviation. By definition, deviations of headline inflation from the underlying trend are attributable to fluctuations in raw food and energy prices as depicted in **Figure 2.5**. During the past few years, the steep rise in oil prices and, more recently, food prices has been responsible for most of the divergence between headline and core inflation.

Apart from the standard disaggregation of CPI products into food and non-food categories, the CPI basket can be broken down in various other ways. This has proved to be a convenient tool in identifying the sources of price pressures as well as indicating the changing composition of the CPI basket over time, which often has important implications for policy. Observing price changes over time

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[11] Food prices are often influenced by seasonal factors such as weather conditions and the impact of agricultural policies, while energy prices are driven by global oil conditions. Raw food items in the Thai CPI (85 in total) consist of rice and cereal products; meat, poultry and fish; vegetables and fruits; and eggs and milk products. Energy items (nine in total) comprise gasoline, electricity, and cooking gas.

in different sectors helps determine the extent to which policy has effective control. For example, if the bulk of the rising inflation stems from increases in administered charges, which have a short-run effect on the price level and do not often reflect demand pressures, then it should not be offset by monetary policy. Similarly, when the cost of services as opposed to goods rises, the price pressure is more likely to be directly related to a tightening of the labour market than to higher costs of raw materials. The policy response should thus consider the effects on real wages and labour demand, rather than attempting to counteract the overall price pressure *per se*.

To facilitate the ensuing discussion in this paper, especially the exchange rate pass-through analysis in Section 4, it is useful at this point to define our four classifications of goods in the CPI. Based on standard definitions, we attempt for the first time to categorize all 326 items in the CPI into goods and services, tradables and non-tradables, domestic and imported goods, and administered and non-administered items. Details of the CPI item code and classification are provided in Appendix A. **Figure 2.6** exhibits the weights of each group in the overall CPI basket in the base year (1998). The following definitions are commonly found in economic literature and are generally employed by central banks in evaluating inflation:

Figure 2.6: Classifications of CPI goods
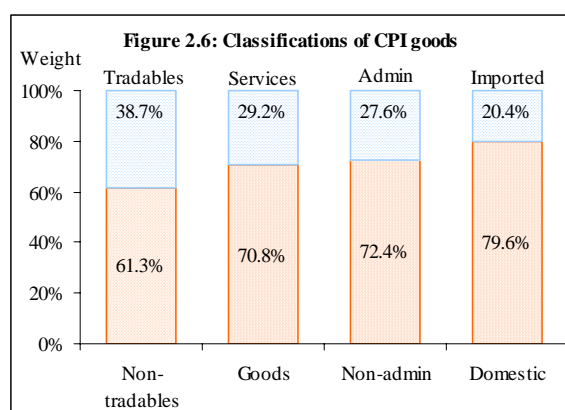
1) *Goods and services*: Goods are defined as all tangible items but also include water, electricity, and cooking gas, while services are intangible and usually associated with labour charges and professional fees such as medical, education and transportation fees, as well as vehicle registration and insurance fees. In addition, rent represents a flow of housing services and accounts for a large portion of services in the CPI. Altogether, services make up nearly 30 per cent of the consumption basket.

2) *Tradables and non-tradables*: Tradables are consumer goods whose prices are affected by external market conditions and exchange rate movements, and therefore compete with prices of imported products. Nearly 40 per cent of goods in the CPI are tradables, including all types of fuel. Non-tradables are goods whose prices are mainly determined by domestic market conditions and have no close tradable substitutes. These goods include perishable foods such as fruits and vegetables, as well as services, which by definition are non-tradable. However, agricultural products that Thailand exports and imports in large quantities are classified as tradables, while consumable food, seasonings, and beverages are grouped as non-tradables.[12]

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[12] Some agricultural products are not strictly non-tradable since their prices can be indirectly affected by world market conditions. For example, adverse weather conditions in major rice-exporting countries would reduce world rice supply and raise the price of rice both in the world market and in Thailand. An increase in world demand for certain food products such as shrimps in Thailand would also increase their domestic prices. In our classification, tradable foods include rice, chicken, shrimps, and milk products, which sum to six per cent of the CPI basket.

3) *Domestic and imported goods*: Consumer price inflation is affected by a combination of imported and domestically generated inflationary factors. Changes in exchange rates and world commodity prices are likely to have greater impact on goods with higher import content. The import content of each CPI product can be derived from the NESDB's Input-Output Table of Thailand. The methodology employed to determine the direct and indirect imported inputs in the production of a good is outlined in Appendix B. Domestic goods in this paper are defined as goods whose import content is less than or equal to 30 per cent, whereas imported goods have import content of over 30 per cent. It is not surprising that only a fifth of consumer goods can be considered as imported goods, given the substantial weight of food and services in the CPI. Indeed, the total import content of CPI goods amounts to less than 20 per cent.

4) *Administered and non-administered items*: Prices of administered items are influenced by central authorities and are not adjusted frequently, while prices of non-administered items are driven by market forces. The term "administered" has broad meaning, associated with varying degrees of state control and intervention. For the purposes of this paper, administered prices include centrally determined ceiling prices such as sugar, prices monitored on a cost-plus basis (items whose prices reflect economically justified costs plus a reasonable margin) under government control measures, and administratively fixed fees such as electricity and water charges, fees at state hospitals and schools, and public transportation fees.[13] Despite the government's commitment to deregulation and privatization as part of its open trade policy, administered items still claim 30 per cent of the CPI basket.

2.2 Relationship between consumer and producer prices

In addition to closely following developments in the CPI, policymakers monitor the producer price index (PPI) since it is an important indicator of pressures stemming from the costs of production that are inevitably passed on to consumers through changes in retail price.[14] Given the higher share of traded goods in the PPI, variations in the exchange rate and world commodity prices tend to affect producer prices more directly and with greater magnitude than consumer prices. **Figure 2.7** shows that manufactured products account for 85 per cent of the current PPI basket, most of which contain some amount of imported inputs. Based on calculations using data in the Input-Output Table of Thailand, the PPI basket
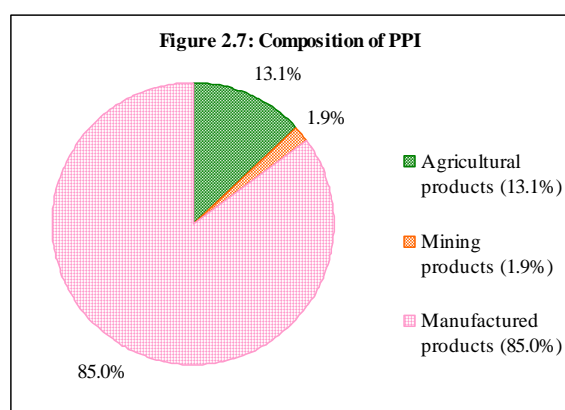
Figure 2.7: Composition of PPI
- Agricultural products (13.1%)
- Mining products (1.9%)
- Manufactured products (85.0%)

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[13] A unique case of an administered item in the CPI is cigarettes, whose price is determined by the state. The state-owned Thailand Tobacco Monopoly is the sole producer of cigarettes under the Tobacco Monopoly Act 1943.

[14] The producer price index (base year 1995) is based on prices from producers rather than from wholesalers and replaced the wholesale price index since January 2000. Currently, the PPI consists of 494 items, with 1,365 product samples from 763 producers across the country.

has higher import content than the CPI basket at around 30 per cent. While there exists some overlap between goods in the CPI and PPI baskets, the relationship between CPI and PPI also depends on the producers' mark-up behaviour and the degree of market competition, together with prevailing demand conditions. These factors are instrumental in explaining the persistent divergence between producer and consumer prices, which will be analysed in Section 5.

The trends of CPI and PPI, as apparent in **Figure 2.8**, tend to move in similar direction, although PPI exhibits larger and more frequent swings in response to fluctuations in world prices of commodities.[15] For the period 1990-2002, CPI and PPI measured on an annual growth basis are strongly correlated with a correlation coefficient of 0.72, with higher correlation in the contemporaneous period. Over this period, producer price inflation averaged 3.5 per cent, slightly less than headline inflation of 4.1 per cent. In contrast, the standard deviation of PPI was twice as much as that of CPI, suggesting that PPI changes were much more volatile. For most of the 1990s, producer price inflation often undershot consumer price inflation for prolonged periods. However, during the past three years, PPI has been continuously above CPI, with the main contribution coming from rising agricultural and petroleum product prices.

Figure 2.8: Headline inflation and producer price inflation
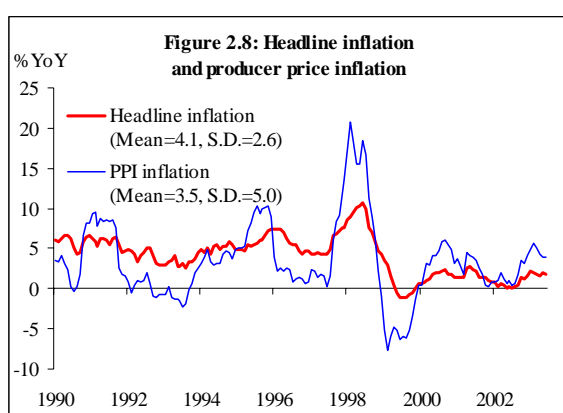
When producers are faced with rising production costs, *ceteris paribus*, they usually shift the burden to consumers in the form of higher prices of final goods and services in an attempt to protect their profit levels. As consumer prices have also been slow to adjust, this implies that producers have had to bear most of the increase in input costs. Moreover, in light of menu costs, the price adjustment process may not take place immediately. Looking at **Figure 2.8**, it is still plausible that changes in PPI lead changes in CPI. To examine whether there is a causal relationship between CPI and PPI, a series of Granger causality tests are performed. The hypothesis that PPI inflation does not cause CPI inflation is rejected and at first it appears that PPI leads CPI by around two months. However, the result is not robust in specifications with more than two lags, indicating that CPI and PPI tend to move together contemporaneously.[16] This may not come as a surprise since certain supply shocks such as a hike in fuel prices often have immediate impact on both CPI and PPI. At the same time, prices of consumer goods do not necessarily change with a specific lag following an increase in producer price, but are adjusted at different intervals depending on the individual firm's pricing strategy and market conditions. We will explore these issues in Section 5.

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[15] As the PPI series are available only from 1995 onwards, the WPI series are used as a proxy for PPI in earlier periods.
[16] Similar statistical results are obtained with levels and quarterly changes in CPI and PPI.

3. Determinants of inflation in Thailand

Consumer price inflation in Thailand is affected by domestic factors such as excess demand and wages as well as external factors such as world oil and non-fuel commodity prices. The extent to which demand pressures command a change in consumer prices depends heavily on the existing gap between actual and potential output. While wages still contribute to inflation pressure, their impact has diminished compared to the pre-crisis period when wage adjustments were more frequent and in larger increments. Since Thailand adopted a flexible exchange rate system in 1997, the exchange rate has played an important role in determining prices through its effect on the domestic currency price of imported goods as well as on the country's investment position and external competitiveness. Finally, as monetary policy has become more geared to producing low and stable inflation - particularly under the inflation targeting regime - while uncertainty about inflation has lessened, inflation expectations have stabilized and become closely aligned with rates in the target range. The way inflation expectations are formed has significant impact on the public perception of real interest rates which, in turn, influences consumption and investment decisions.

3.1 Transmission mechanism of inflation in BOTMM

The inflation process in Thailand is best represented by a set of equations that form part of the Bank of Thailand's macroeconomic model (BOTMM). In order to make use of all available information, BOTMM employs the error correction specification in explaining the dynamics of inflation. Since price variables – like most other economic variables - have short- and long-run relationships, the error correction model embodies both short-run dynamics among variables in first differences and long-run relationships between variables in levels. The advantage of the error correction model is that long-run economic relationships are identified based on theoretical foundations rather than relying only on past behaviour of variables. It also allows for a generous lag structure in the specification and short-term deviations with eventual adjustment to a stable long-run equilibrium.

Figure 3.1 depicts the key determinants of inflation in BOTMM and the stages through which different factors work their way to inflation. As the model is regularly revised using the latest data, these relationships best reflect the current inflation dynamics in Thailand, supported by economic theory and statistical tests. The variables in boxes are exogenous to the model, while those in circles are endogenous. Linkages between variables are specified using the abbreviations SR for short run and LR for long run, and some variables may be related in both the short and long runs. On the whole, domestic inflation is influenced by world commodity prices, exchange rate, wage, output gap, and inflation expectations of the private sector. Headline inflation encompasses all of these elements, although their individual impacts are of varying degrees, as will be discussed below. It is interesting to note that despite their exclusion from the core CPI measurement, food and fuel prices have indirect effects on core inflation, since these components are intermediate inputs in the production of goods in the core CPI basket.

Figure 3.1: Transmission mechanism of inflation
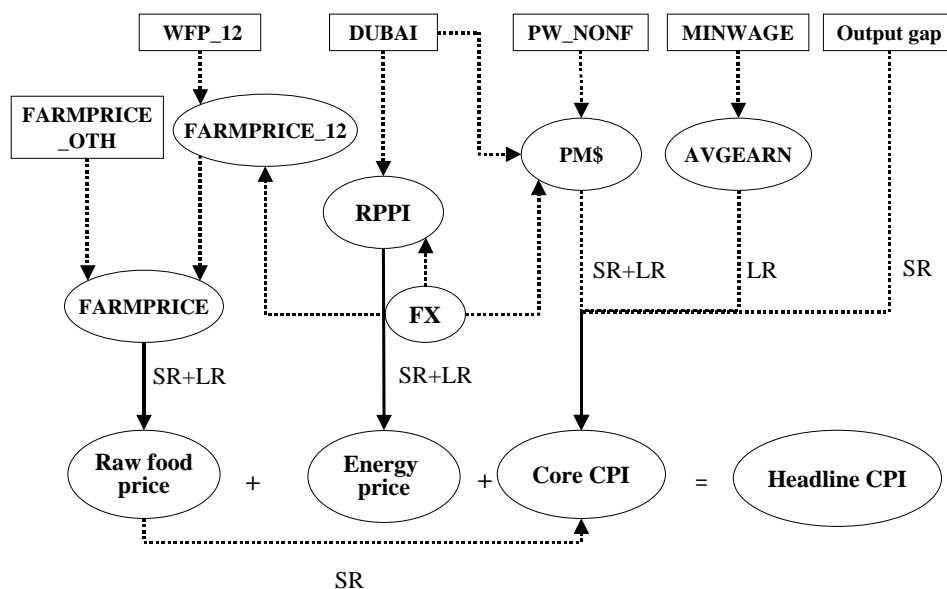
This section lists the set of equations that determine consumer prices in BOTMM, estimated from quarterly data between 1993Q1 and 2003Q1.[17] Abbreviations are used throughout the model: *sa* denotes seasonally adjusted series, *ln* denotes natural logarithms, and *ecm* denotes error correction terms. The symbol Δ indicates that variables are in first difference form which measures quarterly changes in the variables, and the number in parentheses immediately following the variables specifies the lag period. Where the error correction term appears in the equation, the accompanying long-run equation is also provided. The error correction specification features a speed of adjustment parameter that reflects the speed with which a variable responds to disequilibrium in the long-run relationship. Statistical results include t-statistics below each coefficient, adjusted R-squared values, and equation standard errors. LM(2) denotes the Breusch-Godfrey LM test for second-order serial correlation in the residuals, and both the LM statistic and its probability value are given for each equation. Descriptions of the variables and data sources can be found in Appendix C.

(1) Headline consumer price index

Headline consumer price is the weighted sum of core (CORE), raw food price (CPIRFOOD) and energy price (CPIEN), each estimated by separate equations. The weights for components of the CPI (WRFOOD and WEN) are derived from the socio-economic

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[17] The remaining equations of BOTMM are updated and listed in every edition of the quarterly *Inflation Report*. Sample periods in the estimation may differ depending on availability of data in each equation, but start at 1990Q1 at the earliest.

survey. For base year 1998, raw food and energy items account for 16.2 and 8.4 per cent of the CPI basket respectively.[18]

CPI = (1 − WEN − WRFOOD)*CORE + (WEN*CPIEN) + (WRFOOD*CPIRFOOD)

(2) Core consumer price index

Core CPI (CORE) is modelled as a variant of the "accelerationist" Phillips curve, where inflation depends on lagged inflation, output gap, import price (PM$), exchange rate (FX88), and raw food price. With lagged inflation in the specification, the adjustment of inflation to demand and supply shocks is protracted, implying that there is a considerable degree of inflation persistence. In addition, inertia in the inflation process is apparent, judging from the large coefficient on lagged inflation and the sluggish speed of adjustment of around eight quarters implicit in the error correction term. The substantial inertial component may arise from the slow adjustment of inflation expectations or the existence of staggered wage contracts (Loungani and Swagel (2001)).[19] In the long run, core CPI is determined by average earnings (AVGEARN) and import price. The elasticity of core CPI with respect to average earnings is close to 60 per cent, while that to import prices is only nine per cent, suggesting that domestic factors are more important in determining inflation in the long run.

The output gap (GDPRsa*100/GDPR_HSM) is the difference between actual output (GDPRsa) and potential output (GDPR_HSM). Potential output is estimated by the Hodrick-Prescott (HP) filter applied separately on two sub-periods (1993Q1-1998Q2 and 1998Q2-2003Q1), with the break representing the sharp drop in output following the economic crisis. After adjusting the trend of the second sub-period at 1998Q2 to account for the structural break, exponential smoothing procedure is then used to combine the two HP trends.[20] The weak sensitivity of inflation to the output gap may be a result of the data sample that covers the economic crisis period, during which there was a switch in the exchange rate regime. As shown in **Figure 3.2**, an inverse relationship was found where high inflation from the currency devaluation coincided with the severe economic downturn. At any rate, the low coefficient on the output gap does not necessarily mute the role of demand factors in the determination of inflation, but rather point to difficulties associated with measuring potential output, particularly with the lack of reliable estimates on capital accumulation and labour productivity growth.
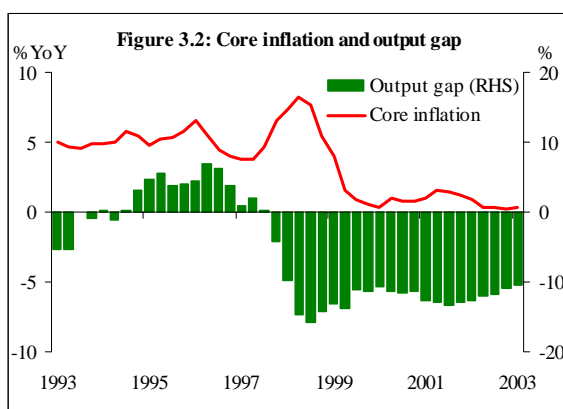
Figure 3.2: Core inflation and output gap

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[18] Over the past decade, the proportion of raw food in the CPI basket has been decreasing, while higher fuel costs have increased the weight of the energy component.

[19] The theoretical foundations of staggered wage contracts and prices can be found in Calvo (1983) and Taylor (1980).

[20] Alternative measures of the output gap that rely less on trending procedures are currently under review at the Bank of Thailand.

Given that imports of goods and services in Thailand amounts to around half of real GDP, the influence of changes in import prices on prices of domestic products is not negligible. With import substitutes not readily available, the demand for many types of imports such as raw materials and machinery is highly inelastic, so that increased import costs are likely to be rapidly passed through into higher prices paid by final consumers. When import prices are expressed in domestic currency terms, they reflect a number of influences, including average world export prices in local currency, firms' profit margin on exports to Thailand relative to exports to other markets, and the baht-US dollar exchange rate. The exchange rate can sometimes act as a buffer to exogenous shocks and help to contain the domestic price of imported goods. As we shall see in the next section, the magnitude and speed in which costs and benefits associated with exchange rate variations are passed on to consumer prices will depend on the share of imported goods in the CPI basket.

Although excluded from core inflation by definition, prices of raw food and energy items also play a role through its second-round effects on goods and services in the core CPI basket. The pass-through of changes in food and energy prices to core inflation is exhibited in **Figure 3.3**, which shows the contribution of price changes in each sector (excluding non-core items) to core inflation. Prices of certain categories of goods appear to be sensitive to supply factors. For instance, when prices of raw food such as fish and vegetables increase due to supply shocks, prices of food products that are processed from these goods will eventually rise and feed through into inflation. The relatively high elasticity found for raw food compared to other factors is not totally unexpected given that the food component in the core CPI basket is as large as 30 per cent. Similarly, because energy constitutes a sizeable part of production costs, especially for energy-intensive industries, with spillovers on wages and other prices, its effect on core consumer prices is through changes in import prices.

Figure 3.3: Pass-through of food and energy prices to core inflation

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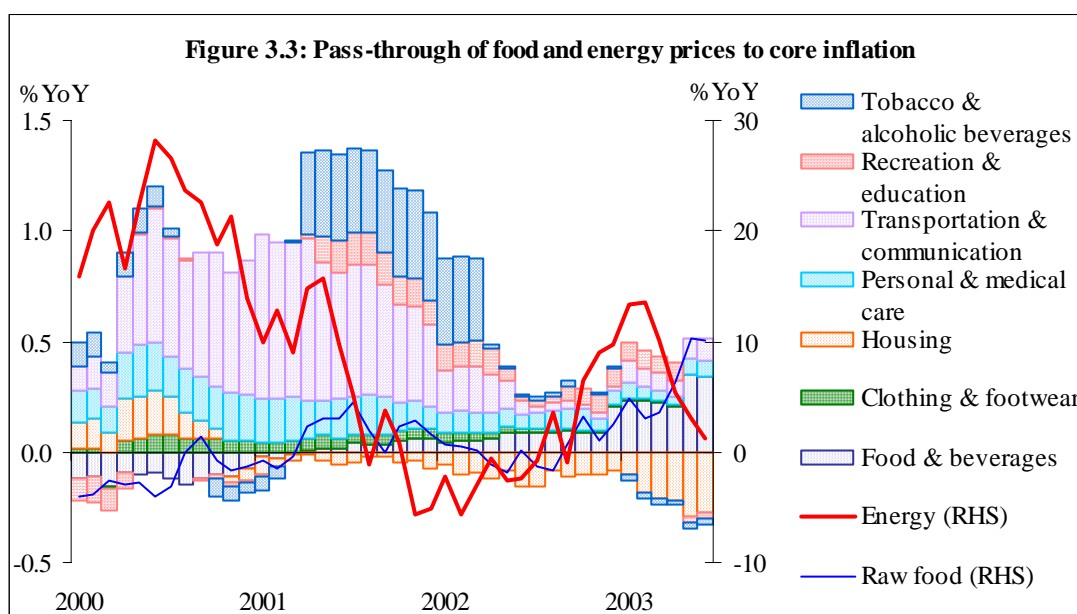
Finally, direct tax effects on inflation, which can be significant when tax adjustments are substantial, are not explicitly introduced in the equation, but are evaluated on a case-by-case basis. The reason is that tax changes are irregular and have a temporary impact on the rate of inflation. For instance, in **Figure 3.3**, the inflationary impact of an increase in excise tax on tobacco and alcoholic beverages lasted for just one year from April 2001. Furthermore, the effect of an increase in value added tax (VAT) or excise tax differs depending on the range of goods that forms the tax base. Since some goods and services are exempt from VAT, such as housing rent and medical charges, the rise in the VAT rate does alter the prices of most goods in the economy but affects approximately one-third of goods in the CPI basket. In determining the contribution of tax changes on the future path of inflation, the estimated tax effect is simply imposed in the relevant price equations.

$$\Delta\ln(COREsa) = 0.005 + 0.385*\Delta\ln(COREsa(-1)) + 0.022*\ln(GDPRsa/GDPR\_HSM)$$
$$(4.02) \quad (3.75) \qquad\qquad (3.01)$$
$$+ 0.026*\Delta\ln(PM\$sa*FX88) + 0.076*\Delta\ln(CPIRFOODsa(-1))$$
$$(3.36) \qquad\qquad (2.85)$$
$$- 0.119*ecmCORE(-1)$$
$$(-2.92)$$

Adjusted R-Squared = 0.81   S.E. of regression = 0.0030   LM(2): 0.15(0.86)

$$ecmCORE = \ln(COREsa) - (-1.404 + 0.087*\ln(PM\$sa*FX88) + 0.587*\ln(AVGEARNsa))$$

(3) Import price index in US dollars

Due to the small size of its market relative to the world market, Thailand is a price-taker for most of the goods it imports; so the country's import price is primarily driven by world non-fuel commodity price (PW_NONF).[21] Dubai crude oil price (DUBAI), which serves as a proxy for global oil prices, affects import prices but only in the long run. Although Thailand imports around 90 per cent of its oil consumption, oil makes up less than ten per cent of the total import value. It is therefore not surprising that the price of oil has marginal influence on import prices. While it is true that Thailand imports from various countries, import prices are usually quoted in US dollars and are thus converted into local currency using the bilateral baht-US dollar exchange rate index (FX88).

$$\Delta\ln(PM\$sa) = 0.407*\Delta\ln(PW\_NONFsa) - 0.499*ecmPM\$(-1)$$
$$(2.39) \qquad\qquad (-3.41)$$

Adjusted R-Squared = 0.26   S.E. of regression = 0.0335   LM(2): 1.05(0.36)

$$ecmPM\$ = \ln(PM\$sa) - (2.403 + 0.518*\ln(PW\_NONFsa) + 0.041*\ln(DUBAIsa(-2)))$$

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[21] According to IMF classification, non-fuel commodities comprise food, beverages, agricultural raw materials, metals, fertilizer, and timber.

(4) Average earnings

Average earnings are determined by its value in the previous period and also by adjustments in the minimum wage (MINWAGE). In general, cost pressures from the labour market depend on productivity as well as earnings. However, as labour statistics on a quarterly basis are available only from 1998, it was not possible to model the effects of productivity on wage settlements, which would better reflect conditions in the labour market.

$$\ln(AVGEARNsa) = 0.540 + 0.274*\ln(MINWAGE) + 0.780*\ln(AVGEARNsa(-1))$$
$$(4.30) \quad (2.56) \quad\quad\quad (11.32)$$

Adjusted R-Squared = 0.99   S.E. of regression = 0.0137   LM(2): 0.06(0.94)

(5) Energy price index

Energy price is determined by domestic retail petroleum price (RPPI) in the short and long runs. The relationship is directly proportional because energy price in the CPI basket also includes electricity and cooking gas whose prices are administered by the state and do not move in exact proportion to changes in oil prices. Energy prices contribute significantly to the variation in headline inflation especially in light of uncertainties in the global oil market in recent periods.

$$\Delta\ln(CPIENsa) = 0.490*\Delta\ln(RPPIsa) + 0.092*\Delta\ln(RPPIsa(-1)) - 0.214*ecmCPIEN(-1)$$
$$(11.22) \quad\quad\quad (1.94) \quad\quad\quad (-2.40)$$

Adjusted R-Squared = 0.78   S.E. of regression = 0.0153   LM(2): 0.20(0.82)

$$ecmCPIEN = \ln(CPIENsa) - (1.003 + 0.742*\ln(RPPIsa))$$

(6) Retail petroleum price index

Retail petroleum price is a function of Dubai crude oil price and exchange rate (FX).

Figure 3.4: Global and domestic oil prices
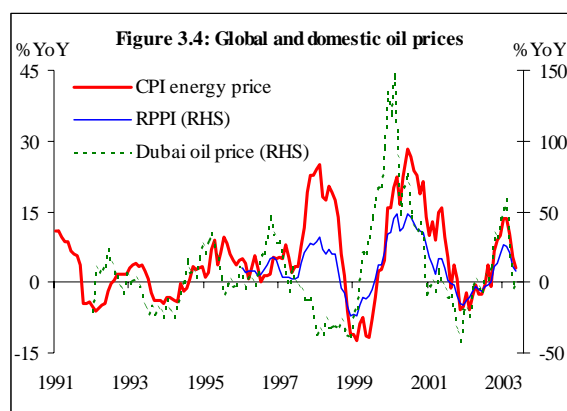
As evident in **Figure 3.4**, prices of domestic fuel may not necessarily reflect global trends given that they are generally set in line with those of the petroleum state enterprise (PTTEP) and are still administered to a certain extent.[22] Since the baht was floated, exchange rate movements have become influential in determining the domestic price of oil. The exchange rate level can either amplify or, conversely, offset the impact of global oil price changes on domestic cost and price levels. For example, an increase in the price of oil amid a

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[22] Although mainly determined by prices at oil refineries, which are sensitive to global oil market conditions, domestic retail petroleum prices also vary with taxes, contributions to oil fund and energy conservation fund, as well as the marketing margin.

concurrent depreciation of the baht will generate higher domestic fuel price and higher inflation than if the exchange rate were to remain stable.

The role of oil prices in fuelling inflation is more apparent in an economy strongly dependent on oil imports. Oil prices pass through into domestic inflation both directly and indirectly. Oil prices are reflected directly - and almost immediately - in domestic fuel prices. Since the share of fuel items (gasoline only) in the CPI is around five per cent, a ten per cent rise in fuel prices following an increase in oil prices implies a 0.5 percentage point rise in inflation. After a longer time lag, prices of related products that make use of oil in the various stages of production will also adjust, though not necessarily to the same degree. The full impact of oil price changes on prices of final consumer goods is difficult to quantify exactly because price adjustments also take into account other factors such as the phase of the business cycle, market competition, and the capacity for firms to absorb costs.[23]

$$\Delta \ln(RPPIsa) = 0.317 * \Delta \ln(DUBAIsa) + 0.465 * \Delta \ln(FX) + 0.172 * \Delta \ln(RPPIsa(-1))$$

$$(8.20) \qquad\qquad (6.92) \qquad\quad (2.17)$$

$$- 0.463 * ecmRPPI(-1)$$

$$(-4.14)$$

Adjusted R-Squared = 0.77   S.E. of regression = 0.0265   LM(2): 2.21(0.12)

$$ecmRPPI = \ln(RPPIsa) - (0.814 + 0.447 * \ln(DUBAIsa) + 0.763 * \ln(FX))$$

(7) Raw food price index

Raw food price is solely influenced by domestic farm price (FARMPRICE), with a one-to-one relationship in the long run. In **Figure 3.5**, the farm price index has wider fluctuations since it covers a broader range of agricultural products than that represented in the raw food component of the CPI. With a weight of 16 per cent in the CPI, volatilities in food prices due to the influence of weather conditions and world export markets have a significant role in determining the level and variability of inflation. This is consistent with the finding by Klau and Mohanty (2001) that agricultural shocks are the most common inflation factor in emerging market economies due to the relatively large share of food in their CPI.

Figure 3.5: Farm price and CPI raw food price

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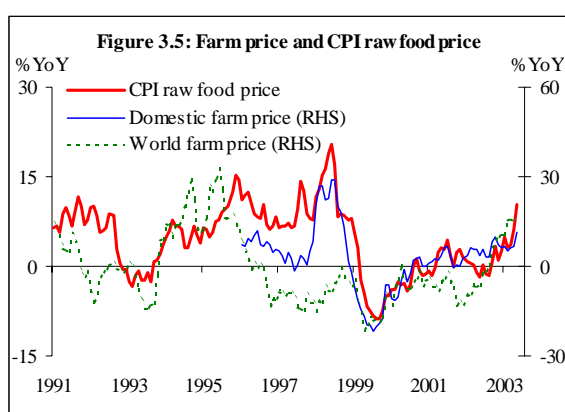
[23] In its assessment of the impact of oil prices on the UK economy, the Bank of England *Inflation Report* (November 2000) asserts that higher fuel prices dampen consumer demand through its effects on lowering real incomes and may lead to higher inflation expectations that, in turn, may exert pressure on wages as workers attempt to protect their real incomes.

Δln(CPIRFOODsa) = 0.007 + 0.266*Δln(FARMPRICEsa) + 0.131*Δln(FARMPRICEsa(-1))
       (3.21) (4.46)   (1.92)
       - 0.134*ecmCPIRFOOD(-1)
       (-2.94)

Adjusted R-Squared = 0.50 S.E. of regression = 0.0150 LM(2): 1.14(0.33)

ecmCPIRFOOD = ln(CPIRFOODsa) - (-0.512 + 1.062*ln(FARMPRICEsa))

(8) Farm price index

Domestic farm price is represented by an identity that combines the farm price index of 12 Thai main agricultural products traded on the world market (FARMPRICE_12) and other farm prices (FARMPRICE_OTH), with weights that represent the composition of the Thai agricultural sector. Agricultural products whose prices are determined by world market conditions account for around two-fifths of the farm price index, while the remaining three-fifths of farm prices are driven by local conditions.

FARMPRICE = (WFARMPRICE_12*FARMPRICE_12) + (WFARMPRICE_OTH*FARMPRICE_OTH)

(9) Farm price index (12 main products)

Farm prices of 12 main products of Thailand respond to movements in world farm price (WFP_12) and the exchange rate. The world farm price is selected so that it captures only prices of those products that Thailand trades in the world market. As with oil prices, the exchange rate can attenuate or exacerbate the effects of fluctuations in world markets on domestic food prices.

Δln(FARMPRICE_12sa) = 0.837*Δln(WFP_12sa) + 0.606*Δln(FX)
        (5.43)   (6.92)
       - 0.440*ecmFARMPRICE(-1)
       (-3.60)

Adjusted R-Squared = 0.67 S.E. of regression = 0.0352 LM(2): 1.38(0.27)

ecmFARMPRICE_12 = ln(FARMPRICE_12sa) - (-2.669 + 0.965*ln(WFP_12sa) + 0.889*ln(FX))

(10) Inflation expectations

The modelling of core inflation expectations (CINFEX) embodies both forward- and backward-looking elements. Individuals are assumed to form expectations of inflation by drawing equally from future information (perfect foresight) and available data. Where the core inflation rate (CINFLAT) is not yet realized, the forecast of inflation generated by the model is used to proxy expectations. As the inflation targeting regime is likely to influence expectations, expected inflation at the terminal periods is set at 1.75 per cent, the mid-point of the target band.

CINFEX = 0.25*CINFLAT(-1) + 0.25*CINFLAT + 0.50*CINFLAT(4)

3.2 Dynamic responses of the economy to shocks

The equations listed in the previous section constitute an essential part of BOTMM, by identifying the sources of inflation and emphasizing the role of the exchange rate in determining prices. Apart from its direct effect on the domestic price of imported goods, the exchange rate influences the level of investment as an indicator of confidence in the economy and the current account position through subsequent changes in the composition of demand for domestic and imported goods. By simulating BOTMM as a whole to see how different shocks affect the economy, it is possible to gauge the relative importance of various sources of inflation.

Table 3.1 traces out the dynamic responses of inflation and GDP growth to a one per cent permanent increase in individual price shocks over a horizon of eight quarters. Based on the simulation results, the effect of exchange rate shocks on inflation and GDP growth is immediate and more prominent compared to other shocks in the contemporaneous period.

Table 3.1: Dynamic responses to shocks

Per cent deviation from base	Forecast horizon		
	1	4	8
(a) 1 per cent depreciation in exchange rate			
GDP growth	0.11	0.25	0.37
Headline inflation	0.05	0.15	0.20
Core inflation	0.03	0.09	0.14
(b) 1 per cent increase in crude oil price			
GDP growth	-0.01	-0.01	0.00
Headline inflation	0.02	0.03	0.04
Core inflation	0.00	0.01	0.01
(c) 1 per cent increase in world farm price			
GDP growth	0.00	0.00	0.00
Headline inflation	0.01	0.05	0.07
Core inflation	0.00	0.02	0.02
(d) 1 per cent increase in world non-fuel commodity price			
GDP growth	0.04	0.09	0.12
Headline inflation	0.01	0.03	0.05
Core inflation	0.01	0.04	0.06
(e) 1 per cent increase in minimum wage			
GDP growth	0.01	0.06	0.04
Headline inflation	0.00	0.09	0.31
Core inflation	0.00	0.12	0.39

Over the long run, an exchange rate depreciation of one per cent would add 0.20 percentage point to headline inflation and 0.14 percentage point to core inflation. At the end of two years, adjustments in the minimum wage appear to have the greatest impact on inflation, raising core inflation by 0.39 percentage point. Fluctuations in commodity prices exert limited pressure on headline inflation and even less for core inflation since the latter is, by definition, more insulated from exogenous shocks. A rise in commodity prices contributes less than one percentage point to both headline and core inflation, even after two years. Nevertheless, when accompanied by large exchange rate depreciations, the effects of an increase in commodity prices on both measures of inflation are likely to be more pronounced. With this in mind, we now proceed to a detailed analysis of the speed and magnitude of exchange rate pass-through in Thailand.

4. The role of exchange rate pass-through

There is extensive evidence that there has been a decline in the pass-through of exchange rate variations to domestic prices in industrialized and emerging market economies since the 1980s.[24] Moreover, the 1990s episodes of large exchange rate depreciations did not lead to significant increases in domestic inflation, even in small open economies where imported goods account for a large fraction of final consumption and intermediate inputs to production. For example, currency depreciations during the 1990s in Brazil, Sweden, and the United Kingdom had small pass-through effects on consumer prices (Taylor (2000)). New Zealand and Australia also saw a distinct downward shift in the pass-through rate in the period following the onset of the Asian crisis.[25] Amongst the emerging market economies, Mihaljek and Klau (2000) find that the pass-through of exchange rate changes was relatively low for Asian countries including Thailand and that the pass-through has lessened for most countries since the mid-1990s.

In the case of Thailand, the baht depreciated sharply by nearly 25 per cent during the economic crisis, from an average of 31.37 baht per US dollar in 1997 to 41.37 baht in 1998.[26] Inflation rose to a relatively high level of 8.1 per cent in 1998 as a result, but the effect was surprisingly little and short-lived. Indeed, since Thailand opted for a flexible exchange rate in July 1997, consumer prices appear to have been insensitive to large fluctuations in the baht. This has important implications not only on the way we perceive the role of the exchange rate in the economy but also for the conduct of monetary policy, issues which we shall address later. But first, we explain below how variations in the exchange rate may affect domestic inflation and then make an attempt to measure the degree of exchange rate pass-through for Thailand.

4.1 Effects of exchange rate movements on domestic prices

Movements in the exchange rate inevitably affect domestic prices through various channels (**Figure 4.1**). The direct or first-round effect is when exchange rate changes are transmitted directly to consumer prices via changes in the costs of imported inputs and finished goods, and this effect is likely to be immediate but temporary. Indirect or second-round effects on consumer prices occur through changes in the composition or levels of demand or via the impact on inflation expectations of wage bargainers and price-setters.

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[24] McCarthy (1999) documents the modest exchange rate pass-through to domestic prices in nine OECD countries examined between 1976 and 1998. In their investigation of 25 OECD countries during 1975-1999, Campa and Goldberg (2002) point out that cross-country differences in exchange rate pass-through to import prices were due to lower inflation and exchange rate variability as well as the changing composition of imports. Similarly, Gagnon and Ihrig (2001) establish a strong link between declining inflation variability and falling rates of pass-through for their sample of 20 industrial countries over the period 1971-2000. Goldfajn and Werlang (2000) also associate the lower pass-through with the low inflation environment for a large sample of 71 countries during 1980-1998.

[25] According to Dickman (2001), there has been a progressive decline in exchange rate pass-through to Australian CPI inflation since the 1980s. Brook (2001) attributes the weak pass-through in New Zealand in the 1990s mainly to the switch in monetary policy regime to inflation targeting since 1988.

[26] At the peak of the currency crisis in January 1998, the baht depreciated by over 50 per cent relative to the US dollar, resulting in exceptionally high inflation rates not seen since the early 1980s.

Figure 4.1: Pass-through from exchange rate to consumer prices

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                              ┌──────────────┐
                              │ Depreciation │
                              └──────────────┘
                 ┌──────────────────┐        ┌──────────────────┐
                 │  Direct effects  │        │ Indirect effects │
                 └──────────────────┘        └──────────────────┘

  ┌──────────────────┐      ┌──────────────────┐    ┌──────────────────┐
  │ Costs of imported│      │ Domestic demand  │    │ Foreign demand   │
  │  inputs increase │      │for import        │    │ for exports rises│
  └──────────────────┘      │substitutes rises │    └──────────────────┘
                            └──────────────────┘    ┌──────────────────┐
                                                    │ Demand for labour│
  ┌──────────────────┐      ┌──────────────────┐    │    increases     │
  │   Production     │      │Imports of finished│   └──────────────────┘
  │   costs rise     │      │goods become more │
  └──────────────────┘      │    expensive     │   ┌──────────────────┐
                            └──────────────────┘   │Import substitutes│
                                                   │ and exports become│
                                                   │  more expensive  │
                                                   └──────────────────┘

         ┌──────────────────────┐                ┌──────────────┐
         │ Consumer prices rise │◄───────────────│  Wage rises  │
         └──────────────────────┘                └──────────────┘

  ┌──────────────────┐      ┌──────────────────┐
  │ Real income and  │      │    Inflation     │
  │consumption       │      │  expectations    │
  │   decrease       │      │    increase      │
  └──────────────────┘      └──────────────────┘
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Exchange rate changes can directly influence the prices of imported goods, and raise production costs especially for industries that are heavily reliant on imported inputs. In markets where the speed of price adjustment is high, such as commodity markets, import prices are likely to respond immediately to currency variations. Nevertheless, exchange rate changes may not be entirely or instantly reflected in import prices. The sluggishness of pass-through may be attributable to a number of reasons.[27] First, foreign exporters may view the exchange rate movements as temporary and allow their profit margins to vary rather than incur the costs of adjusting their export prices. Second, prices set in local currency (local currency pricing) by foreign exporters may be subject to contractual arrangements, so import prices may be initially unchanged following currency variations. Third, as some foreign exporters set their prices according to prevailing conditions in the destination market (pricing to market), they can make more profit by selling fewer units if foreign currency prices for their products were allowed to adjust partially to the currency changes. For example, when the US dollar appreciates, US exporters will reduce the dollar price of their products by less than the full extent of the dollar appreciation, and be able to generate a higher profit even with lower volume of sales.[28] Following similar lines of argument, cost increases to producers and retailers associated with the exchange rate depreciation may not be fully or immediately passed on to prices of consumer goods. The magnitude and speed of the pass-

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[27] The Bank of England *Inflation Report* (May 2003) reports that for these reasons UK import prices were slow to adjust following the sterling appreciation since 1996. Herzberg et al. (2003) provide evidence that sticky prices and pricing-to-market behaviour were responsible for the incomplete exchange rate pass-through to import prices in the UK.

[28] The extent to which foreign exporters can obtain higher profit margin by not fully reducing the foreign currency price depends on the degree of product differentiation and existing restrictions that prevent rival firms from bidding down prices in the destination market.

through will depend on prevailing demand conditions, price adjustment costs, and the perceived persistence of the depreciation.

Second-round effects from exchange rate changes to consumer prices take place over a longer period of time. First, the baht depreciation raises the price of imported goods relative to Thai products. The composition of demand changes with higher domestic demand for import substitutes and stronger foreign demand for Thai exports resulting from an improvement in external competitiveness. Given limited supply capacity, the increased demand for Thai products puts upward pressure on domestic inflationary pressure. Second, as firms shift to the production of tradable goods, the higher demand for labour leads to rising wages, which will in turn push up prices. Moreover, workers are likely to demand higher wages when their inflation expectations increase. This, of course, needs not be the case if expectations are firmly anchored by the inflation objectives of monetary policy. Third, the rise in prices effectively reduces consumers' purchasing power by lowering their real income and thereby tends to dampen consumption. The linkage between sectors in the economy represented in BOTMM helps quantify to some extent the indirect effects of exchange rate variations. On the whole, how far-reaching second-round effects are will ultimately depend on inflation expectations and the response of monetary policy to aggregate demand shocks.

It is important at this point to distinguish between complete and incomplete pass-through, terms that are commonly used in the exchange rate literature.[29] When the pass-through is complete, a firm faced with higher costs may shift the burden fully to consumers by raising selling prices. There is no pass-through if the firm chooses to absorb all of the costs for competitive reasons. Pass-through is incomplete in the sense that prices do not respond fully to changes in the exchange rate, even in the long run. References are sometimes made to first stage pass-through which is associated with the effects of exchange rate variations on import prices "at the docks", as distinct from second stage pass-through which is used to describe the impact of changes in import price emanating from an exchange rate shock on producer and consumer prices (Dwyer and Leong (2001)).

Before we proceed to the empirical analysis of exchange rate pass-through, it is useful to give a flavour of the degree of pass-through in Thailand. **Figure 4.2** shows how different prices along the distribution chain respond to changes in the exchange rate over the period 1991-2003, in the order from imports to production and finally to consumption. Since Thailand is a price-taker for many traded goods, the first stage pass-through from exchange rate to import price in local currency terms is complete. Variations in import prices can be amplified by the exchange rate when world commodity markets cause import prices to move in a pro-cyclical fashion, as apparent in Thailand during 2000-2001.[30] The exchange rate is crucial in this pass-through stage because Thai importers also have to bear other costs such as import duties and VAT which use the baht value of goods as a basis for calculation. Since the pass-through in the first stage is complete, the import price and exchange rate are indistinguishable in the second stage pass-through. Producer prices are less sensitive to exchange rate changes while the effect diminishes for consumer prices. A notable feature of **Figure 4.2** is that the pass-through rate declines as one moves down the distribution chain. In

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[29] For a comprehensive review of the exchange rate pass-through literature, see Ho and McCauley (2003).

[30] During this period, foreign currency prices of computers and components, and vehicles and parts increased significantly.

fact, the impact of exchange rate pass-through to producer and consumer prices is partly determined by the share of imports in the respective baskets, and also by the availability of import substitutes.[31]   According to estimates from the Input-Output Table of Thailand, the import content of the PPI is 28 per cent, which is higher than 16 per cent for the headline CPI. One could then deduce the impact of exchange rate changes on producer and consumer prices to be about 28 per cent and 16 per cent respectively.[32]   While this provides a rough-and-ready measure of the immediate exchange rate impact on prices, we have to consider the lagged effects of exchange rate movements to fully appreciate the pass-through dynamics. This is precisely the essence of the following econometric analysis.

Figure 4.2: Pass-through in Thailand at different stages
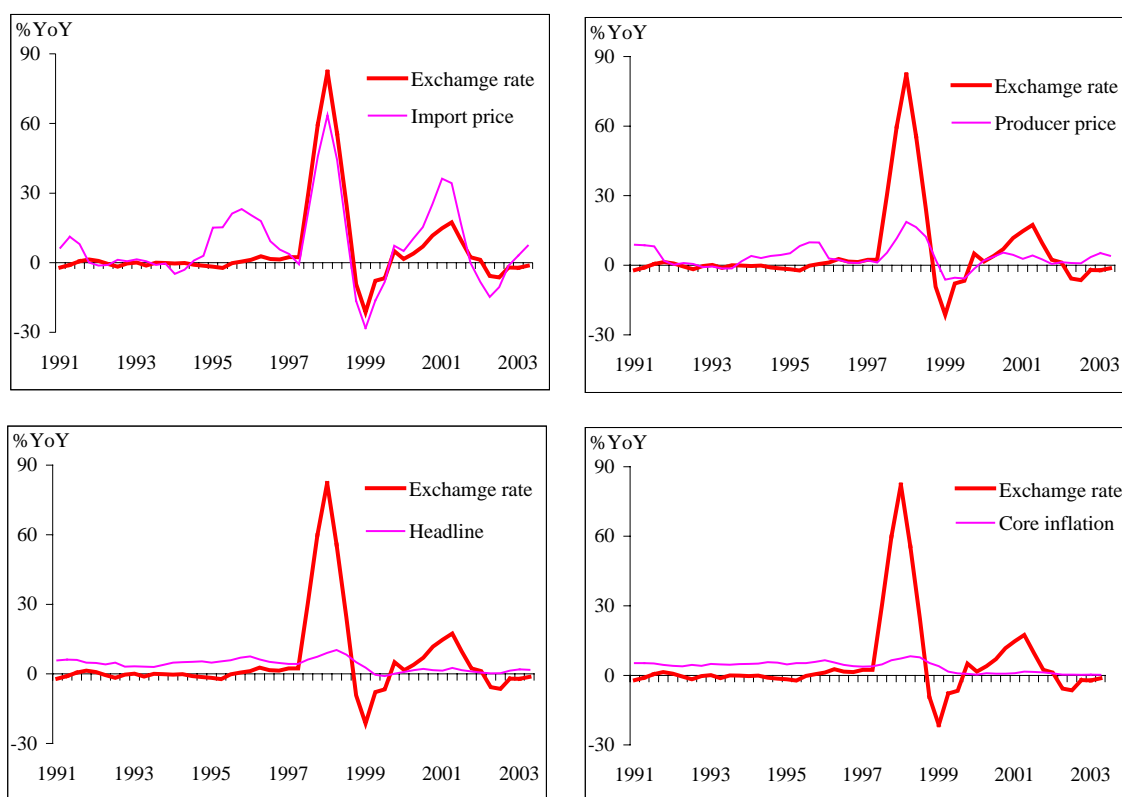
4.2 Empirical results

To assess the pass-through of exchange rate variations to producer and consumer price inflation, we employ a model of pricing along a distribution chain along the lines of studies by McCarthy (1999) for OECD countries and Bhundia (2002) for South Africa. Prices are set along a distribution chain that comprises three stages beginning with imports (import price), followed by production (producer price), and terminating in consumption

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[31] The level of import content varies from one good to another, depending on the type of industry the firm belongs to. For instance, the agricultural sector mainly uses domestic inputs, while a high proportion of inputs in oil and steel industries are from abroad.

[32] Laflèche (1996) estimates the exchange rate pass-through for Canada to be 20 per cent, which corresponds to the import share of the CPI (excluding food and energy) determined from Canada's Input-Output Model.

(consumer price). In contrast to BOTMM which is designed to capture both the direct and indirect effects of exchange rate movements on domestic inflation, the model we propose below focuses only on the direct effects. Unlike most other studies that often concentrate on the broadest measure of inflation, we distinguish the transmission of exchange rate shocks to headline inflation from that on core inflation, as effects on the latter have more profound implications on monetary policy in Thailand.

Our model is estimated using a non-structural vector autoregression (VAR) framework, which includes the baht-US dollar exchange rate (FX), import price in local currency (PMB), producer price (PPI), and consumer price (HCPI or CCPI depending on whether we are interested in headline or core CPI). Apart from the constant term, broad money supply (M2) enters the VAR as an exogenous variable to control for domestic demand pressures which may affect margins, while the local currency price of Dubai crude oil is included to reflect supply shocks.[33] All variables are expressed as indices using 1995 as the base year. In order for the estimation results to be comparable with those of BOTMM, we use quarterly, seasonally adjusted data, even though monthly data is available. Although data from the 1980s exist, the model is estimated over the period from 1990Q1 to 2003Q1 (49 quarters), since the exchange rate was fixed prior to 1997 and extending the sample could bias the results.[34] To conserve the degrees of freedom, the number of lags is set at one quarter, which is consistent with the optimal lag length determined by the Akaike and Schwarz information criteria.[35] Finally, despite the finding that the series in this model are non-stationary, the VAR is unrestricted in log levels under the assumption that the variables are cointegrated.[36] The results are slightly different when we estimate the VAR with variables in first differences, but these do not affect our overall conclusions.

To identify the structural shocks, reduced form residuals from the VAR are orthogonalized using a recursive Cholesky decomposition. This imposes an ordering of the variables in the VAR so that the most endogenous variable is affected by all shocks to other variables in the system within the same period. The pricing chain described above determines the variable ordering, such that the degree of endogeneity increases as we move along the chain. This means that the exchange rate is not sensitive to shocks to other prices in the contemporaneous period, while innovations in the exchange rate and import and producer prices have an instant impact on consumer prices. Alternative orderings of the price variables in the VAR produce similar results, given that the order of the exchange rate remains unaltered. The impulse responses of the CPI to shocks of the exchange rate and other prices provide estimates of the size of pass-through from these variables to the CPI. In

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[33] We chose M2 over capacity utilization rate, output gap, and manufacturing production index as a proxy for the domestic demand cycle because money supply series can be obtained from 1990. Quarterly capacity utilization rates are available only from 1995, and quarterly GDP from 1993. In addition, M2 seems to have a more stable relationship with inflation than the other measures even during the crisis period.

[34] When the sample was split into pre- and post-crisis periods, the results do not make sense for the period before 1997. Ideally, it would be better to estimate the model from 1997 onwards as this truly represents the period of flexible exchange rates. When we set the sample period to 1997Q3-2003Q1, the pass-through is found to be marginally higher. Constraining our model within this shorter period would, however, limit the degrees of freedom.

[35] The inclusion of additional lags does not alter the results.

[36] Cointegration tests indicate up to four cointegrating relations in the system. The assumption that long-run relationships between variables exist is also a feature of BOTMM.

addition, variance decompositions of the CPI indicate the relative importance of each random innovation in influencing the CPI over the sample period.

The role of the exchange rate in determining consumer prices can be gauged by examining the variance decompositions of the CPI variables. **Table 4.1** shows the percentage of the forecast variance of price variables attributable to each of the endogenous variables over a forecast horizon of two years. Exchange rate shocks are important in explaining variances of all price variables, ranging from 40 to 70 per cent at the one-year and two-year horizons. For import prices, the exchange rate accounts for nearly 80 per cent of the forecast variance initially, and remains a dominant factor even after two years. Although the impact is less for producer prices, the exchange rate still contributes to more than half of the PPI variance. In the bottom two panels of **Table 4.1**, we observe that most of the consumer price fluctuations can be attributed to exchange rate shocks, with the impact being greater at longer horizons. The influence of producer price variations on core CPI is notably smaller than it is on headline CPI, suggesting that the exclusion of raw food and energy components further differentiates core CPI from PPI. Similarly, import prices have marginal effects on domestic prices given the modest import content of CPI and PPI, as we mentioned earlier. These results are confirmed by the correlations between the exchange rate and price variables presented

Table 4.1: Variance decomposition of price variables

	Forecast horizon		
	1	**4**	**8**
PMB			
FX	77.95	68.53	63.93
PMB	22.05	29.33	31.09
PPI			
FX	42.96	50.66	52.21
PMB	1.86	2.48	2.87
PPI	55.17	42.44	38.45
HCPI			
FX	31.52	45.50	48.23
PMB	1.51	3.92	5.09
PPI	13.30	22.89	22.19
HCPI	53.68	27.70	24.49
CCPI			
FX	23.94	43.66	52.31
PMB	8.12	7.54	6.88
PPI	4.98	5.74	4.99
CCPI	62.97	43.06	35.83

Table 4.2: Correlation between exchange rate and price variables

	PMB	**PPI**	**HCPI**	**CCPI**
FX	0.84	0.72	0.52	0.37
PMB		0.76	0.53	0.32
PPI			0.72	0.50
HCPI				0.92

in **Table 4.2**. Given their high correlation, the impact of exchange rate shocks on import prices is most pronounced. Indeed, the effects of exchange rate variations on price variables are expected to increase with the degree of correlation. Finally, PPI is more strongly correlated with headline CPI than with core CPI, which explains why headline CPI responds more to producer price movements.

The distribution chain of pricing used in our VAR model sets the benchmark for our chosen ordering of variables, with the assumption that the causality runs in the following order: exchange rate, import price, producer price, and consumer price. To check whether the chain of causation is actually consistent with our natural perception, we perform pairwise Granger causality tests on year-on-year growth rates of exchange rate and price variables with two lags, using monthly data from 1990M1 to 2003M6. The Granger causality test regresses a measure of inflation on its own past values as well as past values of the price variables of interest. The statistical results reported in **Table 4.3** reject the null hypothesis that exchange rate changes do not cause import price inflation, but not vice versa. In

Table 4.3: Granger causality tests

(1990M1 - 2003M6)	F-Statistic	Probability
PMB does not cause FX	0.36	0.70
FX does not cause PMB	5.77	0.00
PPI does not cause PMB	0.98	0.38
PMB does not cause PPI	20.74	0.00
HCPI does not cause PPI	0.12	0.89
PPI does not cause HCPI	4.19	0.02

addition, the evidence suggests that the second stage pass-through from import price to producer price is uni-directional. It also appears that producer price causes consumer price, although the result is sensitive to the lag length. Overall, the results are robust across different lags in the specification, with the exception of the relationship between PPI and CPI.[37] Nevertheless, in separate tests we were able to confirm that the exchange rate leads both PPI and CPI, even though they tend to move together contemporaneously.

In order to measure the exchange rate pass-through, we evaluate the impulse responses to exchange rate shocks over a two-year horizon. Impulse response functions trace out the dynamic effects on prices originating from a one-time shock to one of the innovations in the system. The exchange rate shock is estimated from a VAR model containing past values of all the endogenous variables, and the current values of money supply and oil price. The pass-through elasticity at time t is defined as the percentage change in the price level at time t (following the shock) resulting from the percentage change in the exchange rate in the initial period, and varies in values between zero and 100 per cent (analogous to pass-through coefficients ranging from zero to one). The higher the elasticity, the greater is the pass-through effect, while an elasticity of 100 per cent implies that the pass-through is complete. Since the impulse responses are derived from one standard deviation innovations in the exchange rate (equivalent to 5.6 per cent), these are normalized to correspond to the response of a one per cent shock.

Figure 4.3 illustrates the cumulative impulse responses of different price variables to

Figure 4.3: Cumulative responses of prices to exchange rate shock

the initial exchange rate shock. The first stage pass-through from an exchange rate depreciation of one per cent to import prices is almost complete in the initial period and peaks in the fifth quarter, with the effect declining for the remaining periods.[38] Exchange rate shocks are transmitted to producer prices and consumer prices gradually, although the effect on consumer prices is much smaller. **Table 4.4** summarizes the exchange rate pass-through effect for various prices over a two-year horizon. At the end of the first year, the pass-through elasticity for producer prices is 64 per cent, but it is only 23 per cent for headline CPI. Core CPI seems to be least responsive to exchange rate changes, with a pass-

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[37] The Granger causality tests point to the same order in the pricing chain when variables are measured in levels and quarterly changes.

[38] Among the OECD countries, McCarthy (1999) finds that the pass-through to import prices is quite large for Belgium and the Netherlands. For most countries, however, the pass-through is significant but usually incomplete. Campa and Mínguez (2002) attribute the strong pass-through in Belgium and the Netherlands to their higher degree of openness to imports from outside the euro area.

through elasticity of just 15 per cent. After two years, the estimated pass-through for headline and core CPI rises to 34 per cent and 26 per cent respectively, implying that more than half of the long-run pass-through to consumer prices occurs within the first year.[39] Although the impetus of the exchange rate shock on consumer prices is mainly in the first year, it appears to persist even after three years. It is interesting to note that the pass-through elasticity declines as we move along the pricing chain, so that shocks to the exchange rate have the biggest impact on import prices, followed by producer prices and consumer prices. This observation is consistent with the pass-through characteristic of South Africa (Bhundia (2002)). Finally, the ranking of pass-through elasticities is robust to different specifications of the VAR, such as the inclusion of more lags and variables in first differences.

Table 4.4: Exchange rate pass-through coefficients

	Response horizon		
	1	4	8
PMB	0.79	1.86	1.79
PPI	0.19	0.64	0.87
HCPI	0.06	0.23	0.34
CCPI	0.04	0.15	0.26

We now turn to investigate the response of consumer prices to import price and producer price shocks. These shocks reflect fluctuations in world commodity markets and adjustments in firm's profit margins, rather than movements in the exchange rate. As apparent in **Figure 4.4**, import and producer price shocks have greater influence on headline CPI than on core CPI, as with the case of an exchange rate shock, since core CPI excludes prices of items that are sensitive to external conditions. A distinct feature that emerges in **Figure 4.4** is the complete pass-through from producer prices to headline CPI after only eight quarters, which is expected given the high correlation between the two price indices. This reflects the fact that producers eventually pass on most of the cost increases to consumers. In light of the continued divergence between headline CPI and PPI in the past few years, this behaviour may have changed as competition became stronger and as producers adopted more severe cost-cutting strategies. **Table 4.5** indicates that producers are affected by import price more than consumers because the response of producer price to import price shocks is complete within two years. Furthermore, consumer prices are more sensitive to import price shocks than to exchange rate shocks. Nevertheless, the pass-through elasticity for consumer prices is not very high at around 30-40 per cent, suggesting that consumers may be substituting away from imported goods to domestically produced goods or that the availability of import substitutes is greater. It is important to point out that the pass-through

Figure 4.4: Cumulative responses of consumer prices to import and producer price shocks

CCPI : PPI
CCPI : PMB
HCPI : PPI
HCPI : PMB

Table 4.5: Import price pass-through coefficients

	Response horizon		
	1	4	8
PPI	0.24	0.81	1.11
HCPI	0.07	0.29	0.43
CCPI	0.05	0.20	0.34

Table 4.6: Producer price pass-through coefficients

	Response horizon		
	1	4	8
HCPI	0.18	0.75	1.03
CCPI	0.08	0.25	0.27

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[39] This is in contrast to evidence in McCarthy (1999) that the pass-through to producer and consumer prices is generally weak in OECD countries.

elasticity for core CPI is low and similar between all types of shocks, ranging between 25-35 per cent at the end of two years (**Tables 4.4-4.6**).

For completeness, we compare results obtained from the VAR model with those from other methods of estimating the exchange rate pass-through in **Table 4.7**. At the end of Section 3, we discussed the impact of an exchange rate shock on inflation from BOTMM simulations. In both the VAR and BOTMM, the effect on consumer prices is identical in the initial period and increases gradually over time. The pass-through is stronger in the VAR possibly due to the lag structure that includes lags of all endogenous variables in each price equation. At any rate, the pass-through coefficients are essentially low and not much different. In Section 4.1, we mentioned that the import content of the CPI provides a rough measure of the exchange rate pass-through. In fact, this method turns out to be a good indication of the pass-through, producing similar estimates to the BOTMM and VAR. Pass-through elasticities for Thailand reported in other related works, although estimated using different methods, are also comparable to our results. After one year, the pass-through elasticity for headline inflation amounts to around 14-28 per cent, close to our result of 15-23 per cent. On the whole, the pass-through elasticity at the end of the two-year horizon lies between 15-35 per cent for headline CPI and within a narrower range of 15-25 per cent for core CPI. These estimates verify that headline CPI is somewhat more responsive than core CPI to exchange rate changes, which is consistent with the way these two measures of inflation are defined.

Table 4.7: Comparison of pass-through coefficients

	Forecast horizon		
	1	**4**	**8**
(a) VAR			
Headline inflation	0.06	0.23	0.34
Core inflation	0.04	0.15	0.26
(b) BOTMM			
Headline inflation	0.05	0.15	0.20
Core inflation	0.03	0.09	0.14
(c) Import content			
Headline inflation		0.16	
Core inflation		0.15	
(d) Choudhri and Hakura (2001)			
Headline inflation		0.14	
(e) Hausmann et al. (2000)			
Headline inflation		0.19	
(f) Mihaljek and Klau (2001)			
Headline inflation		0.28	

The evidence so far confirms our perception that the impact of exchange rate changes on prices is diluted along the distribution chain from importers to producers, and finally to consumers. The extent to which cost increases associated with an exchange rate depreciation are absorbed in the intermediate stages of production depends on the characteristics of the goods in question. We already know that headline CPI responds more strongly to variations in the exchange rate, simply because it contains raw food and energy items whose prices are driven by external influences. It would not be surprising to find that sectors with higher shares of import content are more sensitive to exchange rate movements. When we employ the VAR model to examine the exchange rate effects on prices of various types of goods based on our classification of CPI goods in Section 2, the results support our intuition about the price dynamics of different markets.

For the sectoral analysis, we replace headline CPI in the VAR model with composite price indices of each sector, using the same base year. Due to the lack of disaggregated CPI data prior to 1995, the sample period for the sectoral VAR is reduced to 1995Q1-2003Q1. The VAR model contains the same set of variables and ordering of variables as before.

Table 4.8 presents the exchange rate pass-through coefficients for each pair of corresponding sectors, with the share of import content in parentheses. The pass-through elasticity for the goods sector is twice greater than that for the services sector, since the price of services primarily mirrors domestic wage pressures and is thus less influenced by external factors.

Table 4.8: Exchange rate pass-through in various sectors

Response horizon (8 quarters)		
HCPI (16.1%)	>	CCPI (14.5%)
0.34		0.26
Goods (21.0%)	>	Services (6.5%)
0.34		0.18
Tradables (27.9%)	>	Non-tradables (10.0%)
0.42		0.25
Imported (42.7%)	>	Domestic (10.3%)
0.74		0.45
Admin (23.6%)	>	Non-admin (13.0%)
0.51		0.44

Nevertheless, services also encompass transportation fees that are usually set based on energy costs whose prices in domestic currency are determined in part by the exchange rate. Even so, the services sector records the lowest elasticity of only 18 per cent. Following from this, the exchange rate pass-through is less pronounced for non-tradables because services account for a large fraction of non-tradables. In addition, tradables have higher import content and contain agricultural products that are traded in world markets. As one would expect, imported goods (goods whose import content exceeds 30 per cent) are most sensitive to exchange rate fluctuations, with the largest pass-through elasticity at 74 per cent. Finally, the exchange rate affects prices of administered items more than non-administered items because the former includes energy and transportation costs that are often adjusted in line with global oil prices.

In the final part of our analysis, we evaluate the exchange rate pass-through in various countries for comparative purposes. Using international data from 1990Q1 to 2003Q1 (except for the EU for which the harmonized index of consumer prices (HICP) is available only from 1995Q1), we estimate the VAR model separately for each country in our sample. **Table 4.9** reports the pass-through coefficients of consumer price inflation for three industrial countries (Japan, euro area, and the UK) and four Asian economies (Korea, Singapore, Taiwan, and the Philippines). The size and speed of exchange rate pass-through in Thailand most resembles that of Korea and the UK.

Table 4.9: Exchange rate pass-through across countries

	Response horizon		
	1	4	8
Philippines	0.02	0.34	0.72
Thailand	0.06	0.23	0.34
United Kingdom	0.00	0.11	0.25
Korea	0.04	0.15	0.16
Japan	-0.02	-0.01	0.07
Euro area	0.01	-0.02	-0.15
Singapore	-0.01	-0.14	-0.49
Taiwan	-0.10	-0.26	-0.70

Due to its high exchange rate volatility, the Philippines is very sensitive to external shocks with a pass-through elasticity of 72 per cent. Indeed, we found that the exchange rate volatility tends to be positively correlated to the pass-through rate in the countries in our sample.[40] The case of Japan is unique, having a relatively weak pass-through, as the economy has been in a deflationary spiral for more than five years.[41] Despite evidence of low pass-through for EU countries (McCarthy (1999), Hausmann et al. (2000)), the negative pass-through

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[40] Campa and Goldberg (2002) contend that countries with low inflation and low exchange rate variability tend to have smaller pass-through elasticities.

[41] Otani et al. (2003) attribute the decline in Japan's exchange rate pass-through to the yen's sharp appreciation, change in Japanese trade structure, and the global low inflation environment.

estimated from our model is somewhat unconventional. We suspect that because the EU comprises a group of economies with wide structural differences and active intra-regional trade, our result does not represent the actual pass-through of individual countries. Moreover, the euro has been relatively stable since its inception, which also explains the low inflation experienced in the EU. Finally, the pass-through coefficients for Singapore and Taiwan are difficult to interpret and probably reflect the stability of exchange rates in these countries.

5. What explains the low pass-through in Thailand?

The evidence presented in the previous section points to the modest response of consumer prices to exchange rate fluctuations in Thailand. While this may not be totally unexpected in the period following the economic crisis when domestic demand was sluggish, the diminished role of the exchange rate in determining consumer price inflation may be somewhat puzzling in light of the rapid pace of economic activity in recent years. The Thai

Figure 5.1: Real GDP growth and headline inflation
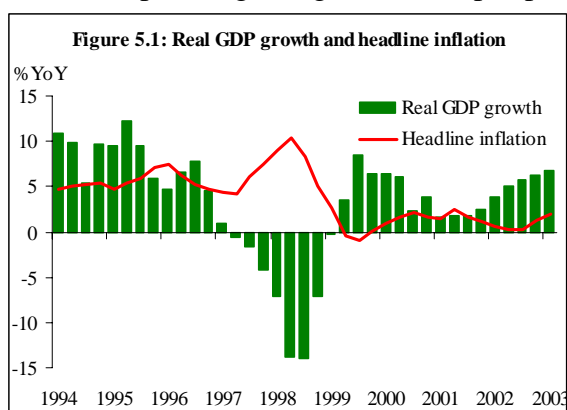
economy posted a growth rate of 5.3 per cent in 2002 and during the first quarter of 2003 alone it grew by 6.7 per cent. Economic projections at the Bank of Thailand as well as other public and private agencies indicate that the economy is likely to remain on a firm growth path. Moreover, robust private consumption has been largely responsible for propelling the economy towards its pre-crisis levels (**Figure 5.1**). Despite the conventional belief that the negative output gap in Thailand has helped to offset the inflationary effect of exchange rate depreciations by reducing firms' margins, it has become increasingly difficult to attribute the weak pass-through relationship to unfavourable demand factors. In this section, we outline several reasons that may have contributed to the low pass-through observed in Thailand.

5.1 Changes in firms' pricing strategy

In general, a firm that uses a high proportion of imported inputs will encounter considerable increases in its costs of production when the exchange rate depreciates. Depending on the degree of market power that the firm possesses and hence its ability to preserve profit margins by adjusting prices, it will naturally pass on part or all of the costs to consumers and speed up the pass-through of higher import prices to consumers.[42] In an era of intense domestic and international competition stemming from globalization and greater trade openness that is associated with the reduction of trade barriers within the region and globally, firms' pricing power may have been eroded. The rapid growth of hypermarkets (such as Tesco Lotus, Big C, and Carrefour) and supermarkets (Tops, Food Lion) compared with traditional markets in Thailand has increased domestic competition in the household

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[42] Taylor (2000) points out that the degree of product differentiation, product substitutability, and the reaction of other firms in the market determine how much control the firm has over the market.

goods sector in recent years. In order to maintain their market shares, firms have had to sacrifice some of their profit margins in reaction to changes in exchange rates.[43] As a result, prices have become more sticky and the inertia in prices has become more persistent,
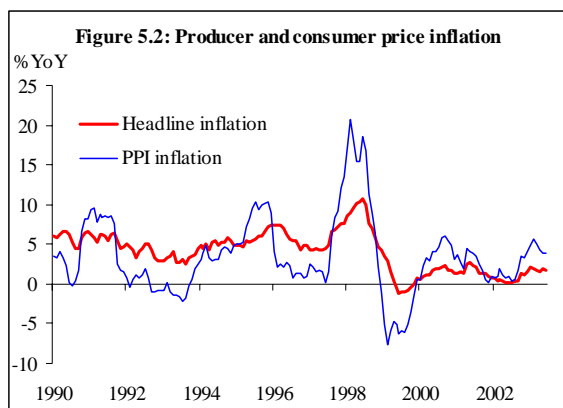
attenuating the pass-through of cost increases into higher prices. Indeed, a positive gap between producer and consumer prices, albeit not very large, has been observed in Thailand since the beginning of 2000 (**Figure 5.2**). While the PPI and CPI baskets are not directly comparable, this provides an indication that firms have been reluctant to increase selling prices by as much as the rise in production costs (from exchange rate changes or other influences), thereby implying a squeeze on profit margins. This is often accompanied by severe cost-cutting measures, as evidenced by the slower rates of wage increases and higher rates of unemployment in recent years compared to the pre-crisis period.

Figure 5.2: Producer and consumer price inflation

One of reasons for the sluggish price adjustment is that since firms are faced with menu costs in prices (such as re-tagging goods and updating catalogues) and in production (such as changing the production line), they will only adjust prices (or output level) of their products when the implied costs from an exchange rate depreciation are large or persistent enough to justify the changes.[44] Moreover, if firms perceive the depreciation to be temporary, they will allow their profit margins to vary rather than incur adjustment costs.[45] However, when firms view exchange rate fluctuations as a permanent phenomenon, they are likely to adjust prices and shift the burden of cost increases to consumers. Since the baht was floated, it has been relatively stable compared to other regional currencies, prompting firms to set prices for longer periods. At the same time, the availability of foreign exchange hedging contracts has delayed the pass-through from exchange rate changes to production costs, and has allowed firms to operate with more certainty and without having to adjust prices frequently.

To assess whether prices have in fact become stickier, we observe the frequency and direction of price changes in the CPI basket. This type of analysis provides useful information on relative price movements and price flexibility over time. **Figure 5.3** presents the distribution of price changes in the headline CPI, weighted by their share in expenditure, averaged in each year during 1996-2003.[46] For each month, we separate the 326 product items in the CPI into three groups based on whether the price of the product has increased,

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[43] Laflèche (1996) documents the fall in profit margins as firms attempt to preserve market shares by absorbing the cost increases associated with the sharp depreciation of the Canadian dollar during 1992-1994.

[44] For an exporting firm, the increase in foreign demand for its products owing to the exchange rate depreciation may raise output and offset the higher production costs.

[45] Dickman (2001) notes that perceptions about the nature of exchange rate changes have helped to explain the weak pass-through in Australia.

[46] Annual inflation rates of each product were not available for 1998 and 2002 since these were the CPI base years and contained different product items. The weighted average price change for 2003 refers to the first half of the year only.

Figure 5.3: Distribution of price changes in headline CPI
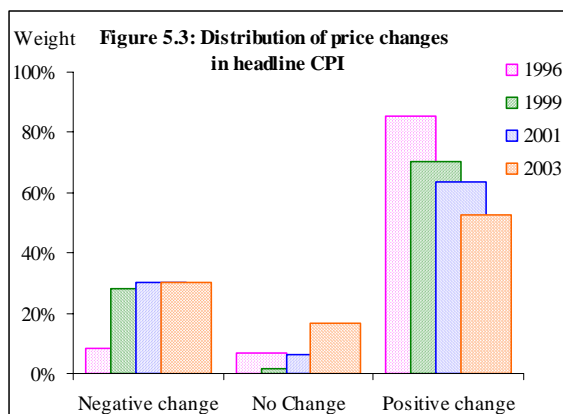
decreased, or remained unchanged from the same month in the previous year, and compute the weighted average price change using relative weights of the items in the corresponding month. The annual price change is simply the average of the monthly figures. Note that we are concerned only with the direction of price movements and not with the extent to which the price of a product has changed. As the overall inflation rate (for both headline and core CPI) has fallen since 1998, the distribution of price changes has tended to shift to the left over time, with a higher proportion of goods witnessing negative price changes. **Table 5.1** shows that the share of goods that saw declining prices rose from 8-9 per cent between 1996 and 1997 to around 30 per cent over the last five years, indicating that price cuts were much more widespread in recent years. Over the period 1996-2003, goods whose prices have remained constant more than doubled to 17 per cent. The corollary of these developments is that price increases have become noticeably less frequent, judging from the steady decline in the share of CPI goods with positive inflation rates from 85 per cent in 1996 to just over 50 per cent in the first half of 2003. On the whole, the evidence suggests that firms have had endure to price cuts or freeze over an extended period of time despite the increase in production costs due to exchange rate variations and higher costs of inputs.

Table 5.1: Weighted average price changes in headline CPI

	1996	1999	2001	2003
Negative change	8.1%	28.3%	30.4%	30.4%
No Change	6.7%	1.6%	6.0%	16.8%
Positive change	85.2%	70.1%	63.6%	52.8%

5.2 Lower inflation expectations

One of the prominent factors explaining why exchange rate variations have had surprisingly little effects on consumer prices is the shift in inflation expectations in the face of global disinflation and increased monetary policy emphasis on price stability, sometimes with explicit inflation targets. It has been argued that price increases in a low inflation environment are more noticeable to consumers than during periods of high inflation when prices are more volatile. As a result, consumer demand are likely to react more strongly to a firm's higher prices in times of price stability. Firms are therefore reluctant to immediately transfer to consumers the full extent of depreciation-induced cost increases. Consequently, inflation persistence as well as the pass-through of cost increases in the form of higher prices tends to dissipate in times of low inflation.[47]

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[47] Taylor (2000) interprets the reduction in the exchange rate pass-through as the decline in the pricing power of firms.

When inflation is low and more stable, expectations of the persistence of cost and price changes are also lower. More precisely, firms regard cost increases from exchange rate depreciations – and price adjustments at competing firms - to be temporary, while consumers perceive price movements to be less persistent. Thailand's adoption of inflation targeting in 2000 has had a positive effect in conditioning public expectations. Inflation expectations appear to have become more firmly anchored to lower inflation following the change in the monetary regime.[48] Although inflation was already low when the target was put in place, the Bank of Thailand has been successful at keeping it within the target band (**Figure 5.4**). The central bank's commitment to the inflation targeting framework coupled with its credibility in delivering price stability has convinced businesses and consumers that the central bank will successfully resist any persistent
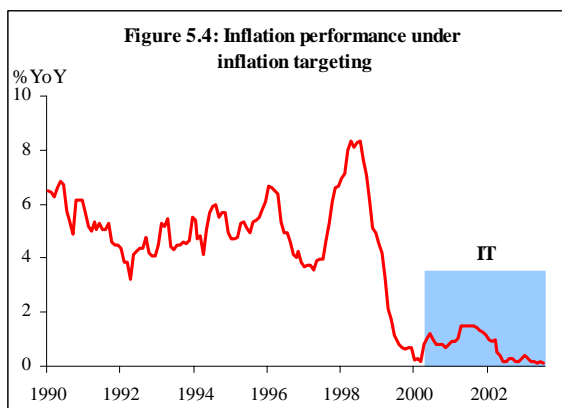
Figure 5.4: Inflation performance under inflation targeting

movements of inflation from the target band. Moreover, the increased availability and accessibility of information regarding forecasts of inflation and detailed analyses of the likelihood of economic shocks, though subject to uncertainty, has induced better anticipation of shocks and a low inflation anchor upon which firms and consumers based their decisions.

Although it is generally difficult to measure inflation expectations without conducting comprehensive surveys, we can obtain a sense of how expectations have evolved by looking

Figure 5.5: Distribution of price changes in core CPI
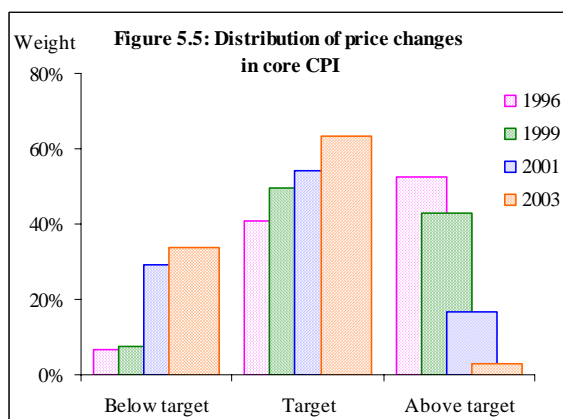
at the proportion of goods whose price changes are within the policy target band of 0 to 3.5 per cent. **Figure 5.5** shows that the distribution of price changes has become more concentrated in the target band. When inflation targeting was first introduced in 2000, approximately half of goods had annual inflation rates within the target range, as reported in **Table 5.2**. As inflation expectations became entrenched, this share increased to 63 per cent in the first half of 2003. Indeed, only three per cent of goods witnessed price increases that exceeded the target ceiling in 2003. The fraction of goods with falling prices increased steadily, but this was mainly attributable to the continuous decline in housing rent, a major component of the core CPI. At any rate, the fact that an increasing share of price increases occurred within the

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[48] Central bank policy statements suggest that inflation expectations have been better behaved in other inflation targeting countries including Australia, New Zealand, and the UK. Choudhri and Hakura (2001) claim that countries with a credible low inflation policy regime tend to have lower pass-through. Garcia and Restrepo (2001) find that the weak exchange rate pass-through in Chile was due to the low inflation achieved. In a panel of 11 countries that includes five inflation targeting countries, Johnson (2002) purports that inflation targets have a significant influence on the behaviour of expected inflation, particularly in the periods following the announcements of targets.

target band implies that the variability of inflation has fallen, which helps to explain why consumer prices have been less responsive to exchange rate shocks.

Table 5.2: Weighted average price changes in core CPI

	1996	1999	2001	2003
Below target	6.6%	21.1%	29.0%	33.8%
Target	40.7%	59.0%	54.3%	63.2%
Above target	52.6%	20.0%	16.7%	3.0%

5.3 Shifts in housing market structure

Housing rent is a key driver of inflation in Thailand, constituting up to 18 per cent of the headline CPI basket (or equivalent to 24 per cent in core CPI).[49] With rent falling persistently since the beginning of 2000, inflation has been subdued.[50] As depicted in **Figure 5.6**, the trend of falling interest rates has reduced mortgage costs and increased the demand for housing loans. With lower interest rates and improved access to mortgage credit, households may find that purchasing a home is more attractive to renting one, particularly for first-time buyers. As the demand for housing continued to grow, the market for rented accommodation has become less active. From the supply side, house prices were contained with the increase in housing supply from government support measures such as the housing project for low-income households (*Baan Ua-arthorn*) that aims to provide up to one million units of low-cost housing for the less privileged over five years.[51] In addition, since rents are usually adjusted based on expected inflation, on top of quality improvements in new dwellings, the fall in rents may reflect the general decline in inflation. In light of low inflation during the past four years, homeowners may take this into account when renewing rental contracts. For these reasons, the housing market has contributed to the downward pressure in prices.
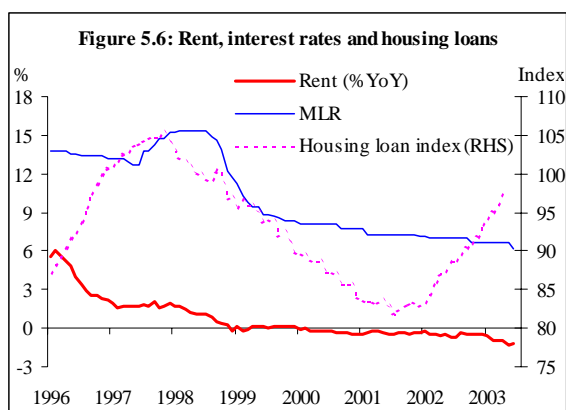
Figure 5.6: Rent, interest rates and housing loans

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[49] Housing rent accounts for only 5-6 per cent of the UK's and EU's consumer price baskets.

[50] Disyatat (2003) concludes that declines in housing costs accounted for most of the fall in consumer prices in Hong Kong, Singapore, and Taiwan, which coincided with the slide in property prices. An assessment of developments in the Thai housing market and its impact on core inflation is provided in the Bank of Thailand July 2003 *Inflation Report*.

[51] By the end of July 2003, the project has already provided 11,727 units to eligible applicants.

5.4 Prevalence of administered price measures

Another reason for the low pass-through of external shocks to consumer prices may be the fact that a relatively large proportion of goods and services in the CPI basket - or

approximately 30 per cent based on our classification scheme - are subject to some form of official price administration. **Figure 5.7** illustrates the trends of just a few examples of regulated items and their respective weights in the CPI. Prices of these items seldom change, but when they do, the adjustments can be arbitrarily large. The rationale behind the imposition of price measures is to prevent unfair practice in the pricing of products by businesses that would directly affect consumers, and to protect consumers from adversely supply shocks.
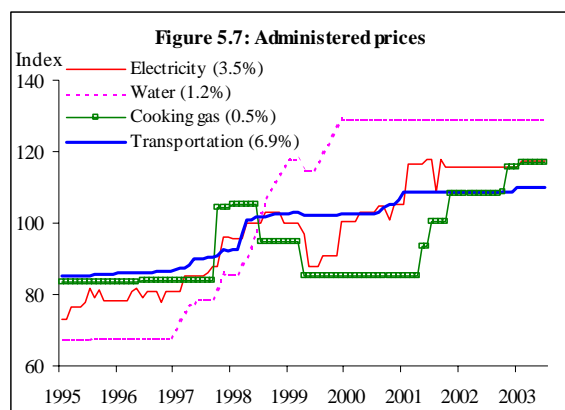
Figure 5.7: Administered prices

Index

- Electricity (3.5%)
- Water (1.2%)
- Cooking gas (0.5%)
- Transportation (6.9%)

1995 1996 1997 1998 1999 2000 2001 2002 2003

Administered prices range from transportation, education and medical fees to basic consumer goods such as sugar and milk products. Goods and services are regulated by different government agencies depending on the type of industry they belong to. For instance, the Ministry of Commerce (MOC) regularly monitors price movements of consumer goods including gasoline, cooking gas, vehicles, and medicine. Businesses are requested to inform the MOC on prices for new products or changes in prices of existing products 15 days prior to the adjustment. The MOC will then consider whether the price proposed for each product is appropriate before the good is distributed for sale. The Prices of Goods and Services Act 1999 consists of 20 goods and services that are subject to administrative price measures. Depending on the degree of regulation, businesses have to report the details on their production quantity, costs, profit margin, and price adjustment plan. Sugar is a special case whose price is subject to ceilings set by the MOC. In addition, the MOC keeps a close watch over 73 goods and 21 services to ensure that prices are reasonably set.[52] As a result, prices of some goods and services have not adjusted in line with the increase in costs, which may have delayed or mitigated the exchange rate pass-through effects.

6. Policy implications

This paper has highlighted some of the main influences on inflation in Thailand, focusing on the magnitude and speed of the pass-through from exchange rate variations to consumer prices. Following the economic crisis in 1997, when the baht was floated and Thailand became a full-fledged member of the flexible exchange rate system, periods of large currency movements did not exert such an acute and persistent inflationary pressure commonly expected of small open economies. The evidence in this paper suggests that the exchange rate pass-through to domestic prices has been low even against the backdrop of a

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[52] Goods and services are monitored at various intervals according to the following list: sensitive list (daily), priority watch list (twice a week), and watch list (weekly). A majority of goods and services fall under the watch list. There exists some overlapping of goods in this list and the 1999 Act.

speedy pick-up in economic growth supported by strong consumer demand. This has profound implications on policymakers' understanding about the monetary transmission mechanism with regard to the role ascribed to the exchange rate in precipitating macroeconomic fluctuations as well as for the conduct of monetary policy. In this section, we offer some guidelines for the appropriate policy response to external shocks in an environment where the effects of exchange rate changes appear to be limited, and for the preparations that would aid in gearing monetary policy towards its ultimate goal of price stability.

6.1 Response to exchange rate fluctuations

As the impact of exchange rate changes on domestic prices has been far less than that normally envisaged by policymakers, the central bank can be more tolerant of volatility in the exchange rate in setting monetary policy. The short-run pass-through effects are negligible and may be permanently lower, while the long-run effects are not very significant but may be prolonged. If the lagged effects are sufficiently protracted, then movements in the exchange rate become less relevant to policymakers, particularly when the inflationary impact emerges beyond the policy horizon. Once these risks are recognized, there is little need for the central bank to respond promptly or aggressively to currency fluctuations. Frequent interest rate adjustments to keep the exchange rate at a certain level could be costly in terms of its effects on investment and growth, with limited influence on inflation. The resultant volatile interest rates would inevitably signal economic uncertainties, disrupt financial stability, and blur the objectives of monetary policy. Moreover, the precise impact of interest rates on the exchange rate is not measurable by any models, no matter how sophisticated they are. In fact, exchange rates are more than often affected by factors not within the control of monetary policy. These include changes in foreign monetary policy, divergence in Thai and foreign inflation rates, regional currency trends, investor sentiment, stock market performance, foreign currency debt settlements, and perceived risks associated with future exchange rate movements, amongst others. It is therefore important for policymakers to be able to distinguish between exchange rate movements that reflect changes in the economy's fundamentals and those that arise from a shift in investor preferences for which a monetary policy response may be warranted. Indeed, Mishkin (2000) recognizes the need for some inflation targeting emerging market economies to smooth out short-run exchange rate fluctuations, while allowing the exchange rate to be determined by market forces over longer horizons.

It would be too hasty to jump to the conclusion that the exchange rate no longer has a role in the monetary transmission mechanism. The exchange rate pass-through may become more prominent as the economic cycle shifts to a boom stage, where the direct and indirect inflationary effects of exchange rate changes will become more pronounced. As the economy still has room to expand while inflationary pressures are limited, the central bank should maintain an accommodative monetary policy to foster the economic recovery. Although the rapid economic growth rates are likely to be sustained in the intervening period, inflation pressures will eventually materialize once the economy reaches its potential level. In addition, when accompanied by commodity price shocks or demand shocks, the pass-through

of large unexpected movements in the exchange rate could be potentially destabilizing for the economy.

At any rate, Thailand's relatively short experience with flexible exchange rates, with intermittent periods of sluggish demand and global disinflation, is certainly not conclusive evidence that the country has become more resilient to external shocks. As more data are collected over time, policymakers will be able to obtain a clearer picture of the interactions between the exchange rate and other parts of the economy. Nevertheless, if the central bank manages to maintain low and stable inflation in a climate of macroeconomic stability and productive capital inflows, the pass-through should remain low. At the same time, policy emphasis should be placed on the continual development of financial markets and increased availability of and access to hedging contracts against foreign exchange exposure, both of which would be instrumental in reducing the pass-through and the uncertainty in business operations.

6.2 Greater emphasis on the micro level

Throughout the paper we discussed the distribution chain of pricing associated with the stages of production from imports to consumer goods. The low pass-through implies that consumer price inflation is marginally affected by wide swings in the exchange rate. To fully understand the nature of the pass-through process and safeguard against potential macroeconomic imbalances, it is crucial to assess the impact of exchange rate changes at each production stage. It is inadequate to focus solely on the final consumption stage even though consumer prices are what policymakers really care about, since important signals may be missed along the pricing chain. For instance, there is ample evidence that the pass-through from exchange rate variations to import prices is rapid and complete. Close monitoring of world commodity markets and cyclical variations in importers' and foreign exporters' margins can provide useful information about the sources of and trends in import price inflation. In favourable circumstances, the exchange rate can assume a stabilizing role by acting as a buffer against these external shocks. Since movements in the exchange rate can help insulate the economy from imported cost pressures, the appropriate monetary policy response will have to take this into account to avoid an inflation overkill. Similarly, the evidence from our analysis suggests that shocks to producer prices have considerable impact on consumer prices. Consequently, policies oriented toward containing inflationary pressures at the producer stage would assist in taming consumer price inflation. In addition, because the exchange rate pass-through to domestic prices is usually slower than that to import prices, it is essential to make an attempt at deciphering the complicated chain of transactions linking the two prices.

While it is likely that the trend toward increased competition and greater trade openness will continue, policymakers need to look more closely at firms' production and pricing behaviour in order to gauge the "threshold" profit margin. By having a rough idea of the threshold or minimum profit margin below which firms begin to pass on cost increases to consumers in the form of higher prices, policymakers can anticipate not only the timing of these price adjustments, but also the types of industries in which inflation is likely to be most prevalent. As monetary policy is not a panacea for all inflationary pressures, it should not be

employed profusely to address a variety of sectoral adjustment problems. These structural problems are best dealt with using microeconomic measures that aim to increase the efficiency of product and labour markets. However, it is the central bank's responsibility to carefully trace out the indirect (demand) effects of exchange rate changes on the labour and product markets. As these real effects usually take a long time to feed through into consumer prices, an extension of the monetary policy horizon is therefore necessary.

Given the fact that the central bank explicitly targets consumer price inflation, policymakers need to continuously monitor changes in the composition of the CPI basket to detect changes in consumption patterns, proportion of imported goods, price changes, and ultimately the pressure on core inflation, the policy target. Shifts in consumer spending patterns can have important implications on the degree of controllability of monetary policy. For instance, between 1994 and 1998 the weight of raw food and energy items in the CPI basket – over which monetary policy virtually has no control - rose from 21 per cent to 25 per cent. As a result, the proportion of goods in the core CPI basket has declined, which means that monetary policy currently has influence over a smaller share of consumer prices compared with earlier years.

We saw earlier that the housing market can determine the direction of prices because housing rent commands a considerable share of consumer expenditure. Even though house prices and rents are not direct aims of monetary policy, the central bank must monitor developments in the housing market (and other asset markets) very closely. Housing rent accounts for around 18 per cent of total consumption, while other expenditures associated with housing such as electricity, water, and household goods represent a further eight per cent of consumption. Taken together, housing-related expenditures amount to over a quarter of the CPI basket. Price changes in the housing market thus have strong influence in propelling inflation in either direction. Finally, due to the sizeable share of administered prices in the core CPI, unanticipated and concerted changes in these prices can generate undesirable inflationary shocks. To avoid conflicts of policy, this requires close coordination between monetary and fiscal authorities on the timing and magnitude of future changes in administered prices.

6.3 Managing inflation expectations

The introduction of the inflation targeting framework in Thailand has brought benefits not only in terms of shaping inflation expectations, but also by dampening the variability of inflation and the persistence of exchange rate pass-through impact. A small pass-through is more welcome since large exchange rate effects make it harder for central banks to keep inflation at the target. More importantly, the credibility of the central bank in guaranteeing that deviations of inflation from the target are temporary and that price stability will be quickly restored is actually more important than the actual pass-through. Over time, the reduced role of the exchange rate should help to shift the focus of monetary policy more towards price stability and less on exchange rate stability.

What is required for successful monetary policy is the ability to measure inflation expectations in the economy. Inflation expectations not only act as a guidepost for monetary

policy but also play a major role in stabilizing the economy even when monetary policy mistakes have been committed based on some serious forecasting errors in the preceding periods. Surveys of expectations conducted on financial institutions are not sufficient as these reflect the inflation outlook of a small group of investors who are generally more informed. Policymakers have to design a simple yet informative survey of inflation expectations covering households, businesses and financial market participants in order to capture the inflation perception of the general public. These can then be incorporated as part of the central bank's forecasting exercise and analyses of consumer behaviour, so that monetary policy is forward-looking and consistent with agents' expectations.

6.4 Improvements in forecast ability

By providing a credible anchor to inflation expectations, central banks have had to put greater effort in forecasting inflation. Borio et al. (2003) assert that the central bank will act pre-emptively to expected pressures on output and prices only if it is confident of its ability to forecast such pressures. Forecast errors, if large enough, can lead to wrong policy decisions that have irrevocable consequences on the economy. The low pass-through found for Thailand, coupled with assumptions about the levels of the exchange rate, has important implications for monetary policy because it influences both the forecasts of inflation and the anticipated effects of changes in monetary policy on inflation. Additionally, Anderson and Wascher (2001) stress the need to distinguish between transitory and more fundamental factors causing inflation. It is important for policymakers to identify the sources of inflation pressure so that monetary policy can respond appropriately. For instance, if policymakers perceive favourable supply shocks as permanent structural changes, monetary policy might be too expansionary and the disinflationary gains are lost. The inclusion of additional explanatory variables of inflation might help reduce forecast errors to some extent, but it could mask the main sources of inflation. It might be better to have several models of inflation based on different methodologies, including smaller versions of BOTMM, as tools to check the consistency of forecasts.

One drawback of using an estimated model to make economic projections is that the coefficients reflect past data and are usually fixed in value. Changes in the economic relationships in the most recent periods may not be reflected in the model instantly as data are still being accumulated. The period of transition to a new equilibrium could affect the model's ability to forecast inflation accurately. Calibrating parts of the model based on sound judgment is a viable solution, although substantial errors are likely to arise when calibration is applied across the entire model. Frequent assessments of the ways in which the economy has adapted to the changing environment are thus part and parcel of the model building process. So far as the exchange rate pass-through is concerned, it would be interesting to see how the pass-through in Thailand has evolved over time. The degree of pass-through will determine the extent to which the economy is exposed to external shocks. Since estimates of pass-through coefficients are not constant over the forecast horizon, this has important bearing on the conduct of monetary policy. With too few observations in the flexible exchange rate period, together with structural changes taking place throughout the economy, it is not possible to determine whether the pass-through has declined in Thailand as it had in many other countries, regardless of the monetary policy regime.

7. Conclusion

The dynamics of inflation revolves around many price variables, with the most important one being the exchange rate. The role of the exchange rate has become more prominent since Thailand opted for flexible exchange rates in the aftermath of the economic crisis. Not only do exchange rates directly influence the domestic prices of imported goods, but they also determine the country's export competitiveness and influence the formation of inflation expectations. During the 1990s, however, the large currency variations faced by small open economies had surprisingly little effects on inflation. This has prompted numerous studies on the pass-through of exchange rate changes on domestic prices in various countries. This paper contributes to the literature by providing evidence on the exchange rate pass-through in Thailand.

One of the main findings of this paper is the low pass-through rate for Thailand. While import prices adjust rapidly and completely to variations in the exchange rate, domestic consumer prices do not respond fully even in the long run. This is in line with international evidence that the pass-through impact may have lessened in recent years for both industrial and emerging market economies. In Thailand, the degree of pass-through also tends to vary across sectors, reflecting differences in the share of import content. As one might expect, the pass-through is stronger for tradables than non-tradables because the former generally has higher import content. Nevertheless, due to the overwhelming proportion of non-tradables in the Thai CPI, comprising mainly food products and services, it is not surprising that the imported component of consumer goods amounts to less than 20 per cent. This is perhaps one reason why a weak pass-through relationship was found for Thailand. In addition, since headline CPI encompasses food and energy items which account for a substantial share of the CPI basket and whose prices are sensitive to variations in the exchange rate, the pass-through rate is higher for headline CPI than for core CPI.

The low pass-through from exchange rate to domestic prices is partly responsible for the continuous periods of relatively subdued inflation experienced in Thailand. In fact, there is evidence that prices of goods have not changed frequently during the past few years. The inertia in the inflation process is already apparent from the slow speed of price adjustment in the BOT's macroeconomic model. Moreover, a closer look at CPI data reveals that in the first half of 2003, nearly half of all goods saw no change or a fall in prices, compared with only 15 per cent in 1996. The most obvious reason for the low pass-through might be the persistent negative output gap in the Thai economy. However, strengthening economic conditions in recent periods, supported by robust consumer demand, do not substantiate this argument. An alternative explanation is that due to strong market competition as a result of greater trade openness, firms have been reluctant to increase prices for fear of losing market share. Instead, firms have allowed their mark-ups to vary to changes in the exchange rate rather than adjusted the price of their products, at least in the short term. Another possible reason is the prolonged reduction in housing rent - which accounts for a considerable portion of household consumption – as lower mortgage costs have shifted the demand from rental accommodation to home ownership. At the same time, a non-trivial share of goods and services in the CPI are administered, which means that price changes are less frequent. Finally, the central bank's commitment to maintaining price stability within the inflation

targeting framework has provided a firm anchor for inflation expectations of households and businesses alike.

An important policy implication that emerged from this study is that the low pass-through has provided more room for manoeuvre in monetary policy. Instead of focusing on the direct inflationary impact of exchange rate fluctuations, policymakers can place greater emphasis on the indirect effects of such shocks on the economy. This requires a thorough understanding of firm behaviour and labour market dynamics. Due to long lags associated with these real effects, the horizon of monetary policy needs to be extended. Since price increases often feed into higher inflation expectations, the central bank must ensure that deviations of inflation from the target are temporary so that expectations do not become entrenched. Moreover, the limited effects of exchange rate variations mean that monetary policy can concentrate more on price stability and less on exchange rate stability.

The credibility of the inflation targeting central bank rests primarily on its ability to keep inflation to the target. The trend and variability of inflation will depend on the pace of economic activity and the propagation of supply shocks amongst others. To the extent that exchange rate pass-through is essentially bounded by the import content of consumer goods, sufficiently large exchange rate fluctuations – in either direction - can still pose a threat to the inflation target. The central bank must therefore be able to anticipate and respond to future shocks in a timely fashion. More emphasis should be placed on not only obtaining accurate inflation forecasts but also assessing the balance of risks in the inflation outlook. Equally important, policymakers must be able to identify the source of price shocks, so that the correct policy dosage can be applied.

Whether or not the economy is resilient to external shocks will depend on the evolution of the exchange rate pass-through. The evidence of low pass-through for Thailand reflects economic trends in the few years of flexible exchange rates, and does not suggest that the economy is immune to external shocks. If exchange rates become highly volatile in an environment of macroeconomic instability, the pass-through effect could amplify and render monetary policy ineffective. There is no specific policy rule with which inflation targeting countries should respond to exchange rate or any other types of shocks. The appropriate policy response will depend on the state of the economy at the time, as well as on how well anchored are inflation expectations.

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Appendix A: Classifications of CPI goods

Code	Description (English)	Description (Thai)	Headline	Core	Goods
1111001	RICE	ข้าวสารเจ้า	1	0	1
1111002	GLUTINOUS RICE	ข้าวสารเหนียว	1	0	1
1112102	MANIOC (CASSAVA) FLOUR	แป้งมันสำปะหลัง	1	0	1
1112201	NOODLE	เส้นก๋วยเตี๋ยวสด	1	0	1
1112203	BEAN CURD	เต้าหู้	1	0	1
1112205	BREAD	ขนมปังปอนด์	1	0	1
1112206	PASTRY	ขนมขบเคี้ยว	1	0	1
1121101	LEAN PORK	เนื้อสุกร	1	0	1
1121102	PORK FAT	มันหมูแข็ง	1	0	1
1121103	SPARE RIB	กระดูกซี่โครงหมู	1	0	1
1121104	BEEF FILLET	เนื้อโค	1	0	1
1121203	PREPARED PORK	หมูหยอง	1	0	1
1121204	SAUSAGE	ไส้กรอก	1	0	1
1121205	CHINESE SAUSAGE	กุนเชียง	1	0	1
1121206	SALTED MEAT	เนื้อเค็ม	1	0	1
1122102	DRESSED CHICKEN	ไก่สด	1	0	1
1122201	STREAM DUCK	เป็ดพะโล้	1	0	1
1122202	ROASTED CHICKEN	ไก่ย่าง	1	0	1
1123101	SERPENT-HEAD FISH	ปลาช่อน	1	0	1
1123102	CATFISH	ปลาดุก	1	0	1
1123103	TILAPIA	ปลานิล	1	0	1
1123104	BLACK PROMFRET	ปลาจะระเม็ดดำ	1	0	1
1123105	RED SNAPPER	ปลากระพง	1	0	1
1123106	SHEET FISH	ปลาแดง	1	0	1
1123107	MACKEREL	ปลาทู	1	0	1
1123108	INDIAN MACKEREL	ปลาสั้ง	1	0	1
1123201	PRAWN	กุ้งนาง	1	0	1
1123202	SHRIMP	กุ้งขาว	1	0	1
1123203	JUMBO TIGER PRAWN	กุ้งกุลาดำ	1	0	1
1123204	SQUID	ปลาหมึกกล้วย	1	0	1
1123205	COCKLE	หอยแครง	1	0	1
1123208	SEA CRAB	ปูทะเล	1	0	1
1123209	FRESHWATER CRAB	ปูม้า	1	0	1
1123301	STEAMED FISH	ปลาทูนึ่ง	1	0	1
1123302	DRIED FRESHWATER FISH	ปลาสลิดแห้ง	1	0	1
1123306	DRIED SEAWATER FISH	ปลาอินทรีเค็ม	1	0	1
1123401	SHRIMP, PRAWN AND LOBSTER (DRIED)	กุ้งแห้ง	1	0	1
1123403	FISH BALL	ลูกชิ้นปลา	1	0	1
1123404	FERMENTED FISH	ปลาร้า	1	0	1
1131001	CHICKEN EGG	ไข่ไก่	1	0	1
1131002	DUCK EGG	ไข่เป็ด	1	0	1
1131003	SALTED EGG	ไข่เค็ม	1	0	1
1132001	FRESH MILK	นมสด	1	0	1
1132002	SWEETENED CONDENSED MILK	นมข้นหวาน	1	0	1
1132003	POWDERED MILK	นมผง	1	0	1
1132004	YOGHURT	นมเปรี้ยว	1	0	1
1132005	CREAMER	ครีมเทียม	1	0	1
1132006	ICE CREAM	ไอศกรีม	1	0	1
1141101	CABBAGE	กะหล่ำปลี	1	0	1
1141102	CUCUMBER	แตงกวา	1	0	1
1141103	CHINESE CABBAGE	ผักกาดขาว	1	0	1
1141104	KALE	ผักคะน้า	1	0	1
1141105	MUSHROOM	เห็ด	1	0	1
1141106	MORNING GLORY	ผักบุ้ง	1	0	1
1141107	CORIANDER	ผักชี	1	0	1
1141108	EGGPLANT	มะเขือ	1	0	1
1141109	TOMATO	มะเขือเทศ	1	0	1
1141110	COWPEA	ถั่วฝักยาว	1	0	1
1141111	GOURD	บวบ	1	0	1
1141112	PAPAYA	มะละกอดิบ	1	0	1
1141113	SQUASH	ฟักเขียว	1	0	1
1141114	PUMPKIN	ฟักทอง	1	0	1
1141115	LEMON	มะนาว	1	0	1
1141116	CHILLI	พริกขี้หนูสด	1	0	1
1141117	CHILLI	พริกชี้ฟ้าสด	1	0	1

Appendix A: Classifications of CPI goods

Code	Description (English)	Description (Thai)	Tradables	Imported	Admin
1111001	RICE	ข้าวสารเจ้า	1	0	0
1111002	GLUTINOUS RICE	ข้าวสารเหนียว	1	0	0
1112102	MANIOC (CASSAVA) FLOUR	แป้งมันสำปะหลัง	1	0	0
1112201	NOODLE	เส้นก๋วยเตี๋ยวสด	0	0	0
1112203	BEAN CURD	เต้าหู้	0	0	0
1112205	BREAD	ขนมปังปอนด์	0	0	0
1112206	PASTRY	ขนมขบเคี้ยว	0	0	0
1121101	LEAN PORK	เนื้อสุกร	0	0	1
1121102	PORK FAT	มันหมูแข็ง	0	0	0
1121103	SPARE RIB	กระดูกซี่โครงหมู	0	0	0
1121104	BEEF FILLET	เนื้อโค	0	0	0
1121203	PREPARED PORK	หมูหยอง	0	0	0
1121204	SAUSAGE	ไส้กรอก	0	0	0
1121205	CHINESE SAUSAGE	กุนเชียง	0	0	0
1121206	SALTED MEAT	เนื้อเค็ม	0	0	0
1122102	DRESSED CHICKEN	ไก่สด	1	0	0
1122201	STREAM DUCK	เป็ดพะโล้	0	0	0
1122202	ROASTED CHICKEN	ไก่ย่าง	0	0	0
1123101	SERPENT-HEAD FISH	ปลาช่อน	0	0	0
1123102	CATFISH	ปลาดุก	0	0	0
1123103	TILAPIA	ปลานิล	0	0	0
1123104	BLACK PROMFRET	ปลาจะระเม็ดดำ	0	0	0
1123105	RED SNAPPER	ปลากระพง	0	0	0
1123106	SHEET FISH	ปลาแดง	0	0	0
1123107	MACKEREL	ปลาทู	0	0	0
1123108	INDIAN MACKEREL	ปลาสัง	0	0	0
1123201	PRAWN	กุ้งนาง	1	0	0
1123202	SHRIMP	กุ้งขาว	1	0	0
1123203	JUMBO TIGER PRAWN	กุ้งกุลาดำ	1	0	0
1123204	SQUID	ปลาหมึกกล้วย	0	0	0
1123205	COCKLE	หอยแครง	0	0	0
1123208	SEA CRAB	ปูทะเล	0	0	0
1123209	FRESHWATER CRAB	ปูม้า	0	0	0
1123301	STEAMED FISH	ปลาทูนึ่ง	0	0	0
1123302	DRIED FRESHWATER FISH	ปลาสลิดแห้ง	0	0	0
1123306	DRIED SEAWATER FISH	ปลาอินทรีเค็ม	0	0	0
1123401	SHRIMP, PRAWN AND LOBSTER (DRIED)	กุ้งแห้ง	0	0	0
1123403	FISH BALL	ลูกชิ้นปลา	0	0	0
1123404	FERMENTED FISH	ปลาร้า	0	0	0
1131001	CHICKEN EGG	ไข่ไก่	0	0	0
1131002	DUCK EGG	ไข่เป็ด	0	0	0
1131003	SALTED EGG	ไข่เค็ม	0	0	0
1132001	FRESH MILK	นมสด	1	1	1
1132002	SWEETENED CONDENSED MILK	นมข้นหวาน	1	1	1
1132003	POWDERED MILK	นมผง	1	1	0
1132004	YOGHURT	นมเปรี้ยว	1	1	0
1132005	CREAMER	ครีมเทียม	0	1	0
1132006	ICE CREAM	ไอศกรีม	0	1	0
1141101	CABBAGE	กะหล่ำปลี	0	0	0
1141102	CUCUMBER	แตงกวา	0	0	0
1141103	CHINESE CABBAGE	ผักกาดขาว	0	0	0
1141104	KALE	ผักคะน้า	0	0	0
1141105	MUSHROOM	เห็ด	0	0	0
1141106	MORNING GLORY	ผักบุ้ง	0	0	0
1141107	CORIANDER	ผักชี	0	0	0
1141108	EGGPLANT	มะเขือ	0	0	0
1141109	TOMATO	มะเขือเทศ	0	0	0
1141110	COWPEA	ถั่วฝักยาว	0	0	0
1141111	GOURD	บวบ	0	0	0
1141112	PAPAYA	มะละกอดิบ	0	0	0
1141113	SQUASH	ฟักเขียว	0	0	0
1141114	PUMPKIN	ฟักทอง	0	0	0
1141115	LEMON	มะนาว	0	0	0
1141116	CHILLI	พริกขี้หนูสด	0	0	0
1141117	CHILLI	พริกชี้ฟ้าสด	0	0	0

Code	Description (English)	Description (Thai)	Headline	Core	Goods
1141118	SHALLOT PLANT	ต้นหอม	1	0	1
1141119	GARDEN PEA	ถั่วลันเตา	1	0	1
1141121	RADISH	หัวผักกาดขาว	1	0	1
1141122	BEAN SPROUT	ถั่วงอก	1	0	1
1141123	GINGER	ขิง	1	0	1
1141201	DRIED SHALLOT	หัวหอมแดง	1	0	1
1141203	DRIED GARLIC	หัวกระเทียม	1	0	1
1141204	DRIED CHILLI	พริกชี้ฟ้าแห้ง	1	0	1
1141208	BAMBOO SHOOT	หน่อไม้ต้ม	1	0	1
1141209	SALTED LEAF MUSTARD	ผักกาดดอง	1	0	1
1142101	BANANA	กล้วยน้ำว้า	1	0	1
1142102	ORANGE	ส้มเขียวหวาน	1	0	1
1142103	PAPAYA	มะละกอสุก	1	0	1
1142104	PINEAPPLE	สับปะรด	1	0	1
1142105	RAMBUTAN	เงาะ	1	0	1
1142106	MANGO	มะม่วง	1	0	1
1142107	MELON	แตงโม	1	0	1
1142108	DURIAN	ทุเรียน	1	0	1
1142201	PRESERVED FRUIT	ผลไม้แช่อิ่ม	1	0	1
1142202	CANNED FRUIT	เงาะกระป๋อง	1	0	1
1151101	SUGAR	น้ำตาลทราย	1	1	1
1151102	COCONUT SUGAR	น้ำตาลมะพร้าว	1	1	1
1151103	FRUIT JAM	แยมผลไม้	1	1	1
1151104	DESSERT	ขนมหวาน	1	1	1
1151105	CANDY	ลูกอม	1	1	1
1152101	VEGETABLE OIL	น้ำมันถั่วเหลือง	1	1	1
1152104	LARD OIL	น้ำมันหมู	1	1	1
1152201	POWDER SALT	เกลือป่น	1	1	1
1152202	FISH SAUCE	น้ำปลา	1	1	1
1152203	SOY SAUCE	ซีอิ๊ว	1	1	1
1152204	OYSTER SAUCE	ซอสหอยนางรม	1	1	1
1152205	CHILLI SAUCE	ซอสพริก	1	1	1
1152206	TOMATO PASTE	ซอสมะเขือเทศ	1	1	1
1152208	VINEGAR	น้ำส้มสายชู	1	1	1
1152209	SHRIMP PASTE	กะปิ	1	1	1
1152210	TAMARIND	มะขามเปียก	1	1	1
1152211	GROUND COCONUT	มะพร้าวขูด	1	1	1
1152212	GOURMET POWDER	ผงชูรส	1	1	1
1160001	CHOCOLATE DRINK	เครื่องดื่มรสชอกโกแลต	1	1	1
1160002	INSTANT COFFEE	กาแฟผง	1	1	1
1160003	TEA	ชา	1	1	1
1160004	SODA WATER	โซดา	1	1	1
1160005	CARBONATED SOFT DRINK	น้ำอัดลม	1	1	1
1160006	FRUIT JUICE	น้ำผลไม้	1	1	1
1160008	DRINKING WATER	น้ำดื่มบริสุทธิ์	1	1	1
1160009	ICE	น้ำแข็ง	1	1	1
1160010	COFFEE	กาแฟ	1	1	1
1160011	ENERGY DRINK	เครื่องดื่มบำรุงกำลัง	1	1	1
1210001	READY-MADE MEAL	กับข้าวสำเร็จรูป	1	1	1
1210002	FRIED RICE	ข้าวผัด	1	1	1
1210003	PORK NOODLE	ก๋วยเตี๋ยวหมู	1	1	1
1210004	CHICKEN RICE	ข้าวมันไก่	1	1	1
1210005	INSTANT NOODLE	บะหมี่กึ่งสำเร็จรูป	1	1	1
1210006	CANNED FISH (SARDINE)	ปลาซาร์ดีนกระป๋อง	1	1	1
1220001	BREAKFAST	อาหารเช้า	1	1	1
1220002	LUNCH	อาหารกลางวัน	1	1	1
1220003	DINNER	อาหารเย็น	1	1	1
1220004	SNACK	อาหารว่าง	1	1	1
2111001	TROUSER CLOTH	ผ้าตัดกางเกง	1	1	1
2112002	BOYS' SCHOOL UNIFORM	เครื่องแบบนักเรียนมัธยมชาย	1	1	1
2112003	MEN'S GOVERNMENT UNIFORM	เครื่องแบบข้าราชการชาย	1	1	1
2113001	MEN'S JACKET	เสื้อแจ็กเก็ตบุรุษ	1	1	1
2113002	MEN'S SHIRT (LONG SLEEVES)	เสื้อเชิ้ตแขนยาวบุรุษ	1	1	1
2113003	MEN'S SHIRT (SHORT SLEEVES)	เสื้อเชิ้ตแขนสั้นบุรุษ	1	1	1
2113004	MEN'S T-SHIRT	เสื้อยืดบุรุษ	1	1	1
2113005	UNDERSHIRT	เสื้อกล้าม	1	1	1

Code	Description (English)	Description (Thai)	Tradables	Imported	Admin
1141118	SHALLOT PLANT	ต้นหอม	0	0	0
1141119	GARDEN PEA	ถั่วลันเตา	0	0	0
1141121	RADISH	หัวผักกาดขาว	0	0	0
1141122	BEAN SPROUT	ถั่วงอก	0	0	0
1141123	GINGER	ขิง	0	0	0
1141201	DRIED SHALLOT	หัวหอมแดง	0	0	0
1141203	DRIED GARLIC	หัวกระเทียม	0	0	0
1141204	DRIED CHILLI	พริกชี้ฟ้าแห้ง	0	0	0
1141208	BAMBOO SHOOT	หน่อไม้ต้ม	0	0	0
1141209	SALTED LEAF MUSTARD	ผักกาดดอง	0	0	0
1142101	BANANA	กล้วยน้ำว้า	0	0	0
1142102	ORANGE	ส้มเขียวหวาน	0	0	0
1142103	PAPAYA	มะละกอสุก	0	0	0
1142104	PINEAPPLE	สับปะรด	0	0	0
1142105	RAMBUTAN	เงาะ	0	0	0
1142106	MANGO	มะม่วง	0	0	0
1142107	MELON	แตงโม	0	0	0
1142108	DURIAN	ทุเรียน	0	0	0
1142201	PRESERVED FRUIT	ผลไม้แช่อิ่ม	0	0	0
1142202	CANNED FRUIT	เงาะกระป๋อง	0	0	0
1151101	SUGAR	น้ำตาลทราย	1	0	1
1151102	COCONUT SUGAR	น้ำตาลมะพร้าว	1	0	0
1151103	FRUIT JAM	แยมผลไม้	0	0	0
1151104	DESSERT	ขนมหวาน	0	0	0
1151105	CANDY	ลูกอม	0	0	0
1152101	VEGETABLE OIL	น้ำมันถั่วเหลือง	0	1	1
1152104	LARD OIL	น้ำมันหมู	0	1	0
1152201	POWDER SALT	เกลือป่น	0	0	0
1152202	FISH SAUCE	น้ำปลา	0	0	0
1152203	SOY SAUCE	ซีอิ๊ว	0	0	0
1152204	OYSTER SAUCE	ซอสหอยนางรม	0	0	0
1152205	CHILLI SAUCE	ซอสพริก	0	0	0
1152206	TOMATO PASTE	ซอสมะเขือเทศ	0	0	0
1152208	VINEGAR	น้ำส้มสายชู	0	0	0
1152209	SHRIMP PASTE	กะปิ	0	0	0
1152210	TAMARIND	มะขามเปียก	0	0	0
1152211	GROUND COCONUT	มะพร้าวขูด	0	0	0
1152212	GOURMET POWDER	ผงชูรส	0	0	0
1160001	CHOCOLATE DRINK	เครื่องดื่มรสชอกโกแลต	0	0	0
1160002	INSTANT COFFEE	กาแฟผง	0	0	0
1160003	TEA	ชา	0	0	0
1160004	SODA WATER	โซดา	0	0	0
1160005	CARBONATED SOFT DRINK	น้ำอัดลม	0	0	0
1160006	FRUIT JUICE	น้ำผลไม้	0	0	0
1160008	DRINKING WATER	น้ำดื่มบริสุทธิ์	0	0	0
1160009	ICE	น้ำแข็ง	0	0	0
1160010	COFFEE	กาแฟ	0	0	0
1160011	ENERGY DRINK	เครื่องดื่มบำรุงกำลัง	0	0	0
1210001	READY-MADE MEAL	กับข้าวสำเร็จรูป	0	0	0
1210002	FRIED RICE	ข้าวผัด	0	0	0
1210003	PORK NOODLE	ก๋วยเตี๋ยวหมู	0	0	0
1210004	CHICKEN RICE	ข้าวมันไก่	0	0	0
1210005	INSTANT NOODLE	บะหมี่กึ่งสำเร็จรูป	0	0	0
1210006	CANNED FISH (SARDINE)	ปลาซาร์ดีนกระป๋อง	0	0	0
1220001	BREAKFAST	อาหารเช้า	0	0	0
1220002	LUNCH	อาหารกลางวัน	0	0	0
1220003	DINNER	อาหารเย็น	0	0	0
1220004	SNACK	อาหารว่าง	0	0	0
2111001	TROUSER CLOTH	ผ้าตัดกางเกง	1	0	0
2112002	BOYS' SCHOOL UNIFORM	เครื่องแบบนักเรียนมัธยมชาย	1	0	1
2112003	MEN'S GOVERNMENT UNIFORM	เครื่องแบบข้าราชการชาย	1	0	0
2113001	MEN'S JACKET	เสื้อแจ็กเก็ตบุรุษ	1	0	0
2113002	MEN'S SHIRT (LONG SLEEVES)	เสื้อเชิ้ตแขนยาวบุรุษ	1	0	0
2113003	MEN'S SHIRT (SHORT SLEEVES)	เสื้อเชิ้ตแขนสั้นบุรุษ	1	0	0
2113004	MEN'S T-SHIRT	เสื้อยืดบุรุษ	1	0	0
2113005	UNDERSHIRT	เสื้อกล้าม	1	0	0

Code	Description (English)	Description (Thai)	Headline	Core	Goods
2113006	PAJAMAS	ชุดนอนบุรุษ	1	1	1
2114001	MEN'S TROUSERS	กางเกงขายาวบุรุษ	1	1	1
2114002	MEN'S BRIEFS	กางเกงชั้นในบุรุษ	1	1	1
2115001	SARONG	โสร่ง	1	1	1
2115004	MEN'S SOCKS	ถุงเท้าบุรุษ	1	1	1
2116001	LEATHER BELT	เข็มขัดหนัง	1	1	1
2121001	WOMEN'S CLOTH (SKIRT)	ผ้าตัดกระโปรง	1	1	1
2121002	WOMEN'S CLOTH (DRESS)	ผ้าตัดเสื้อ	1	1	1
2122002	SCHOOL GIRLS' UNIFORM	เครื่องแบบนักเรียนมัธยมหญิง	1	1	1
2122003	WOMEN'S UNIFORM	เครื่องแบบข้าราชการหญิง	1	1	1
2123001	WOMEN'S JACKET	เสื้อแจ็กเก็ตสตรี	1	1	1
2123003	WOMEN'S SHIRT	เสื้อสตรี	1	1	1
2123004	WOMEN'S DRESS	ชุดทำงาน	1	1	1
2123006	WOMEN'S PAJAMAS	ชุดนอนสตรี	1	1	1
2123009	BRASSIERE	เสื้อยกทรงเสริมฟองน้ำ	1	1	1
2124001	WOMEN'S SLACKS	กางเกงขายาวสตรี	1	1	1
2124002	WOMEN'S PANTIES	กางเกงชั้นในสตรี	1	1	1
2125001	PATUNG	ผ้าถุง	1	1	1
2125002	STOCKINGS	ถุงน่อง	1	1	1
2126002	WALLET	กระเป๋าธนบัตร	1	1	1
2131001	CHILDREN'S SCHOOL UNIFORM	เครื่องแบบนักเรียนอนุบาลชาย	1	1	1
2132001	CHILDREN'S JACKET	เสื้อแจ็กเก็ตเด็ก	1	1	1
2132002	CHILDREN'S SHIRT	เสื้อเชิ้ตเด็ก	1	1	1
2132003	CHILDREN'S T-SHIRT	เสื้อยืดเด็ก	1	1	1
2133001	CHILDREN'S TROUSERS	กางเกงขายาวเด็ก	1	1	1
2134001	SCHOOL SOCKS	ถุงเท้านักเรียน	1	1	1
2134002	CHILDREN'S PAJAMAS	ชุดนอนเด็ก	1	1	1
2134003	BABY CLOTHING	ชุดเด็กอ่อน	1	1	1
2134004	SCHOOL BAG	กระเป๋านักเรียน	1	1	1
2141001	MEN'S TAILOR CHARGE	ค่าจ้างตัดเสื้อบุรุษ	1	1	0
2141002	WOMEN'S TAILOR CHARGE	ค่าจ้างตัดเสื้อสตรี	1	1	0
2211001	MEN'S LEATHER SHOES	รองเท้าหุ้มส้นหนังแท้บุรุษ	1	1	1
2212001	MEN'S SPORTS SHOES	รองเท้ากีฬาบุรุษ	1	1	1
2213001	MEN'S LEATHER SANDALS	รองเท้าแตะหนังเทียมบุรุษ	1	1	1
2213002	MEN'S SPONGE SANDALS	รองเท้าแตะฟองน้ำบุรุษ	1	1	1
2221001	WOMEN'S LEATHER SHOES	รองเท้าหุ้มส้นหนังแท้สตรี	1	1	1
2222001	WOMEN'S SPORTS SHOES	รองเท้ากีฬาสตรี	1	1	1
2223001	WOMEN'S LEATHER SANDALS	รองเท้าแตะหนังเทียมสตรี	1	1	1
2223002	WOMEN'S SPONGE SANDALS	รองเท้าแตะฟองน้ำสตรี	1	1	1
2231001	BOYS' LEATHER CANVAS SHOES	รองเท้านักเรียนหนังเทียมเด็กชาย	1	1	1
2231002	BOYS' CANVAS SHOES	รองเท้าผ้าใบนักเรียนชาย	1	1	1
2233001	BOYS' LEATHER SANDALS	รองเท้าแตะหนังเทียมเด็กชาย	1	1	1
2241001	MEN'S SHOE REPAIR CHARGE	ค่าซ่อมรองเท้าหนังบุรุษ	1	1	0
2241002	WOMEN'S SHOE REPAIR CHARGE	ค่าซ่อมรองเท้าหนังสตรี	1	1	0
3110001	HOUSING RENT	ค่าเช่าบ้าน	1	1	0
3130001	PLYWOOD	แผ่นไม้อัด	1	1	1
3130002	CORRUGATED IRON SHEET	เหล็กแผ่นเคลือบสังกะสี	1	1	1
3130003	ROOF TILES	กระเบื้องซีเมนต์ใยหินมุงหลังคา	1	1	1
3130005	CEMENT	ปูนซิเมนต์	1	1	1
3130007	CLAY BRICK	อิฐมอญ	1	1	1
3150001	ELECTRICITY LABOUR CHARGE	ค่าแรงช่างไฟฟ้า	1	1	0
3150002	WATER SUPPLY LABOUR CHARGE	ค่าแรงช่างประปา	1	1	0
3150003	PAINTING CHARGE	ค่าแรงช่างทาสี	1	1	0
3210001	ELECTRICITY	ค่ากระแสไฟฟ้า	1	0	1
3220001	COOKING GAS	ก๊าซหุงต้ม	1	0	1
3220002	WOOD CHARCOAL	ถ่านไม้	1	1	1
3220003	MATCH	ไม้ขีดไฟ	1	1	1
3230001	WATER SUPPLY	ค่าน้ำประปา	1	1	1
3240001	FLASHLIGHT BATTERY	ถ่านไฟฉาย	1	1	1
3240002	FLUORESCENT TUBE	หลอดไฟฟ้าฟลูออเรสเซนต์	1	1	1
3300002	MOSQUITO NET	มุ้ง	1	1	1
3300004	BED SHEET	ผ้าปูที่นอน	1	1	1
3300006	BLANKET	ผ้าห่ม	1	1	1
3300008	TOWEL	ผ้าเช็ดตัว	1	1	1
3300010	MAT	เสื่อน้ำมัน	1	1	1
3400001	GLASSWARE	แก้วน้ำ	1	1	1

Code	Description (English)	Description (Thai)	Tradables	Imported	Admin
2113006	PAJAMAS	ชุดนอนบุรุษ	1	0	0
2114001	MEN'S TROUSERS	กางเกงขายาวบุรุษ	1	0	0
2114002	MEN'S BRIEFS	กางเกงชั้นในบุรุษ	1	0	0
2115001	SARONG	โสร่ง	1	0	0
2115004	MEN'S SOCKS	ถุงเท้าบุรุษ	1	1	0
2116001	LEATHER BELT	เข็มขัดหนัง	1	0	0
2121001	WOMEN'S CLOTH (SKIRT)	ผ้าตัดกระโปรง	1	0	0
2121002	WOMEN'S CLOTH (DRESS)	ผ้าตัดเสื้อ	1	0	0
2122002	SCHOOL GIRLS' UNIFORM	เครื่องแบบนักเรียนมัธยมหญิง	1	0	1
2122003	WOMEN'S UNIFORM	เครื่องแบบข้าราชการหญิง	1	0	0
2123001	WOMEN'S JACKET	เสื้อแจ็กเก็ตสตรี	1	0	0
2123003	WOMEN'S SHIRT	เสื้อสตรี	1	0	0
2123004	WOMEN'S DRESS	ชุดทำงาน	1	0	0
2123006	WOMEN'S PAJAMAS	ชุดนอนสตรี	1	0	0
2123009	BRASSIERE	เสื้อยกทรงเสริมฟองน้ำ	1	0	0
2124001	WOMEN'S SLACKS	กางเกงขายาวสตรี	1	0	0
2124002	WOMEN'S PANTIES	กางเกงชั้นในสตรี	1	0	0
2125001	PATUNG	ผ้าถุง	1	0	0
2125002	STOCKINGS	ถุงน่อง	1	1	0
2126002	WALLET	กระเป๋าธนบัตร	1	0	0
2131001	CHILDREN'S SCHOOL UNIFORM	เครื่องแบบนักเรียนอนุบาลชาย	1	0	0
2132001	CHILDREN'S JACKET	เสื้อแจ็กเก็ตเด็ก	1	0	0
2132002	CHILDREN'S SHIRT	เสื้อเชิ้ตเด็ก	1	0	0
2132003	CHILDREN'S T-SHIRT	เสื้อยืดเด็ก	1	0	0
2133001	CHILDREN'S TROUSERS	กางเกงขายาวเด็ก	1	0	0
2134001	SCHOOL SOCKS	ถุงเท้านักเรียน	1	1	0
2134002	CHILDREN'S PAJAMAS	ชุดนอนเด็ก	1	0	0
2134003	BABY CLOTHING	ชุดเด็กอ่อน	1	0	0
2134004	SCHOOL BAG	กระเป๋านักเรียน	1	0	0
2141001	MEN'S TAILOR CHARGE	ค่าจ้างตัดเสื้อบุรุษ	0	0	0
2141002	WOMEN'S TAILOR CHARGE	ค่าจ้างตัดเสื้อสตรี	0	0	0
2211001	MEN'S LEATHER SHOES	รองเท้าหุ้มส้นหนังแท้บุรุษ	1	1	0
2212001	MEN'S SPORTS SHOES	รองเท้ากีฬาบุรุษ	1	0	0
2213001	MEN'S LEATHER SANDALS	รองเท้าแตะหนังเทียมบุรุษ	1	1	0
2213002	MEN'S SPONGE SANDALS	รองเท้าแตะฟองน้ำบุรุษ	1	0	0
2221001	WOMEN'S LEATHER SHOES	รองเท้าหุ้มส้นหนังแท้สตรี	1	1	0
2222001	WOMEN'S SPORTS SHOES	รองเท้ากีฬาสตรี	1	0	0
2223001	WOMEN'S LEATHER SANDALS	รองเท้าแตะหนังเทียมสตรี	1	1	0
2223002	WOMEN'S SPONGE SANDALS	รองเท้าแตะฟองน้ำสตรี	1	0	0
2231001	BOYS' LEATHER CANVAS SHOES	รองเท้านักเรียนหนังเทียมเด็กชาย	1	1	Admin
2231002	BOYS' CANVAS SHOES	รองเท้าผ้าใบนักเรียนชาย	1	1	0
2233001	BOYS' LEATHER SANDALS	รองเท้าแตะหนังเทียมเด็กชาย	1	1	0
2241001	MEN'S SHOE REPAIR CHARGE	ค่าซ่อมรองเท้าหนังบุรุษ	0	0	0
2241002	WOMEN'S SHOE REPAIR CHARGE	ค่าซ่อมรองเท้าหนังสตรี	0	0	0
3110001	HOUSING RENT	ค่าเช่าบ้าน	0	0	0
3130001	PLYWOOD	แผ่นไม้อัด	1	0	0
3130002	CORRUGATED IRON SHEET	เหล็กแผ่นเคลือบสังกะสี	1	0	0
3130003	ROOF TILES	กระเบื้องซีเมนต์ใยหินมุงหลังคา	1	0	0
3130005	CEMENT	ปูนซีเมนต์	1	0	0
3130007	CLAY BRICK	อิฐมอญ	1	0	0
3150001	ELECTRICITY LABOUR CHARGE	ค่าแรงช่างไฟฟ้า	0	0	0
3150002	WATER SUPPLY LABOUR CHARGE	ค่าแรงช่างประปา	0	0	0
3150003	PAINTING CHARGE	ค่าแรงช่างทาสี	0	0	0
3210001	ELECTRICITY	ค่ากระแสไฟฟ้า	1	0	1
3220001	COOKING GAS	ก๊าซหุงต้ม	1	0	1
3220002	WOOD CHARCOAL	ถ่านไม้	1	0	0
3220003	MATCH	ไม้ขีดไฟ	1	0	0
3230001	WATER SUPPLY	ค่าน้ำประปา	1	0	1
3240001	FLASHLIGHT BATTERY	ถ่านไฟฉาย	1	1	0
3240002	FLUORESCENT TUBE	หลอดไฟฟ้าฟลูออเรสเซนต์	1	1	0
3300002	MOSQUITO NET	มุ้ง	1	1	0
3300004	BED SHEET	ผ้าปูที่นอน	1	1	0
3300006	BLANKET	ผ้าห่ม	1	1	0
3300008	TOWEL	ผ้าเช็ดตัว	1	1	0
3300010	MAT	เสื่อน้ำมัน	1	0	0
3400001	GLASSWARE	แก้วน้ำ	1	0	0

Code	Description (English)	Description (Thai)	Headline	Core	Goods
3400002	DISH	จาน/ชาม	1	1	1
3400004	SPOON AND FORK	ช้อน - ส้อม	1	1	1
3400006	POT	หม้อ	1	1	1
3400008	KITCHEN KNIFE	มีด	1	1	1
3400009	PAN	กระทะ	1	1	1
3400010	WATER BUCKET	ถังน้ำ	1	1	1
3400011	HOT WATER FLASK	กระติกน้ำร้อน	1	1	1
3400013	CHARCOAL STOVE	เตาหุงต้ม	1	1	1
3510001	BED	เตียง	1	1	1
3510002	PLASTIC CHAIR	เก้าอี้พลาสติก	1	1	1
3510004	MATTRESS	ที่นอนใยมะพร้าว	1	1	1
3510006	TABLE	โต๊ะอาหาร	1	1	1
3520001	GAS FURNACE	เตาแก๊ส	1	1	1
3520002	REFRIGERATOR	ตู้เย็น	1	1	1
3520005	ELECTRIC FAN	พัดลม	1	1	1
3520006	RICE COOKER	หม้อหุงข้าวไฟฟ้าอุ่นทิพย์	1	1	1
3520008	MICROWAVE OVEN	เตาอบไมโครเวฟ	1	1	1
3520009	AIR CONDITIONER	เครื่องปรับอากาศ	1	1	1
3520010	VACUUM CLEANER	เครื่องดูดฝุ่น	1	1	1
3520011	WASHING MACHINE	เครื่องซักผ้า	1	1	1
3520012	SEWING MACHINE	จักรเย็บผ้า	1	1	1
3600001	DETERGENT	ผงซักฟอก	1	1	1
3600003	FABRIC SOFTENER	น้ำยาปรับผ้านุ่ม	1	1	1
3600005	DISHWASHING LIQUID	น้ำยาล้างจาน	1	1	1
3600006	INSECTICIDE	สารกำจัดแมลง	1	1	1
3600008	BROOM	ไม้กวาด	1	1	1
3600009	LAUNDRY CHARGE	ค่าจ้างซักรีด	1	1	0
4111001	COUGH MEDICINE	ยาแก้ไอ	1	1	1
4111002	PAIN RELIEF	ยาแก้ปวดและลดไข้	1	1	1
4111003	ANALGESICS	ยาแก้ไข้หวัด	1	1	1
4111005	ANTIBIOTICS	ยาปฏิชีวนะ (ยาฆ่าเชื้อ อักเสบจากการติดเชื้อ)	1	1	1
4111007	ANTIFUNGALS	ยาฆ่าเชื้อรา	1	1	1
4111008	ANTISEPTICS	ยาใส่แผล	1	1	1
4111009	LAXATIVES	ยาระบาย	1	1	1
4111011	ANTACIDS	ยาลดกรดในกระเพาะ	1	1	1
4111013	ANTIDIARRHEALS	ยาแก้ท้องเสีย	1	1	1
4111014	CONTRACEPTIVES	ยาคุมกำเนิด	1	1	1
4111016	VITAMIN B-COMPLEX	ยาวิตามินบีคอมเพล็กซ์	1	1	1
4111018	BITTER PILL	ยาหอม	1	1	1
4111019	BALM	ยาหม่อง	1	1	1
4111020	INHALANT	ยาดม	1	1	1
4111021	ANTI-INFLAMMATORIES	ยาบรรเทาปวดกล้ามเนื้อ	1	1	1
4112001	PLASTER	พลาสเตอร์ยา	1	1	1
4121101	MEDICAL EXAMINATION FEE (GOVERNMENT)	ค่าตรวจโรคโรงพยาบาลรัฐบาล	1	1	0
4121102	MEDICAL EXAMINATION FEE (PRIVATE)	ค่าตรวจโรคโรงพยาบาลเอกชน	1	1	0
4121103	DOCTOR'S FEE	ค่าตรวจโรคคลีนิคเอกชน	1	1	0
4121201	DENTIST'S FEE	ค่าถอนฟัน	1	1	0
4121301	OPTICAL CHECKUP FEE	ค่าตรวจสายตาประกอบแว่น	1	1	0
4122101	HOSPITAL ROOM CHARGE (GOVERNMENT)	ค่าห้องพักคนไข้ - โรงพยาบาลรัฐบาล	1	1	0
4122102	HOSPITAL ROOM CHARGE (PRIVATE)	ค่าห้องพักคนไข้ - โรงพยาบาลเอกชน	1	1	0
4210001	SOAP	สบู่ถูตัว	1	1	1
4210002	TOOTHPASTE	ยาสีฟัน	1	1	1
4210003	SHAMPOO	แชมพู	1	1	1
4210004	HAIR CREAM	น้ำมันใส่ผม	1	1	1
4210005	PERFUME AND COLOGNE	น้ำปรุงหอม	1	1	1
4210006	TALC	แป้งทาผิว	1	1	1
4210007	LIPSTICK	ลิปสติก	1	1	1
4210009	TOOTHBRUSH	แปรงสีฟัน	1	1	1
4210010	RAZOR BLADE	ใบมีดโกน	1	1	1
4210011	TOILET PAPER	กระดาษชำระ	1	1	1
4210013	SANITARY NAPKIN	ผ้าอนามัย	1	1	1
4220001	MEN'S HAIRCUT	ค่าแต่งผมชาย	1	1	0
4220002	WOMEN'S HAIR CURL	ค่าดัดผมสตรี	1	1	0
4220003	WOMEN'S HAIRSET	ค่าแต่งผมสตรี	1	1	0
5110001	BUS FARE	ค่าโดยสารรถประจำทาง 1	1	1	0
5110002	MINIBUS FARE	ค่าโดยสารรถเมล์เล็ก 1	1	1	0

Code	Description (English)	Description (Thai)	Tradables	Imported	Admin
3400002	DISH	จาน/ชาม	1	0	0
3400004	SPOON AND FORK	ช้อน - ส้อม	1	1	0
3400006	POT	หม้อ	1	1	0
3400008	KITCHEN KNIFE	มีด	1	1	0
3400009	PAN	กระทะ	1	1	0
3400010	WATER BUCKET	ถังน้ำ	1	1	0
3400011	HOT WATER FLASK	กระติกน้ำร้อน	1	1	0
3400013	CHARCOAL STOVE	เตาหุงต้ม	1	1	0
3510001	BED	เตียง	1	0	0
3510002	PLASTIC CHAIR	เก้าอี้พลาสติก	1	1	0
3510004	MATTRESS	ที่นอนใยมะพร้าว	1	0	0
3510006	TABLE	โต๊ะอาหาร	1	1	0
3520001	GAS FURNACE	เตาแก๊ส	1	1	0
3520002	REFRIGERATOR	ตู้เย็น	1	1	0
3520005	ELECTRIC FAN	พัดลม	1	1	0
3520006	RICE COOKER	หม้อหุงข้าวไฟฟ้าอุ่นทิพย์	1	1	0
3520008	MICROWAVE OVEN	เตาอบไมโครเวฟ	1	1	0
3520009	AIR CONDITIONER	เครื่องปรับอากาศ	1	1	0
3520010	VACUUM CLEANER	เครื่องดูดฝุ่น	1	1	0
3520011	WASHING MACHINE	เครื่องซักผ้า	1	1	0
3520012	SEWING MACHINE	จักรเย็บผ้า	1	1	0
3600001	DETERGENT	ผงซักฟอก	1	1	0
3600003	FABRIC SOFTENER	น้ำยาปรับผ้านุ่ม	1	1	0
3600005	DISHWASHING LIQUID	น้ำยาล้างจาน	1	1	0
3600006	INSECTICIDE	สารกำจัดแมลง	1	1	0
3600008	BROOM	ไม้กวาด	1	0	0
3600009	LAUNDRY CHARGE	ค่าจ้างซักรีด	0	0	0
4111001	COUGH MEDICINE	ยาแก้ไอ	1	1	1
4111002	PAIN RELIEF	ยาแก้ปวดและลดไข้	1	1	1
4111003	ANALGESICS	ยาแก้ไข้หวัด	1	1	1
4111005	ANTIBIOTICS	ยาปฏิชีวนะ (ยาฆ่าเชื้อ อักเสบจากการติดเชื้อ)	1	1	1
4111007	ANTIFUNGALS	ยาฆ่าเชื้อรา	1	1	1
4111008	ANTISEPTICS	ยาใส่แผล	1	1	1
4111009	LAXATIVES	ยาระบาย	1	1	1
4111011	ANTACIDS	ยาลดกรดในกระเพาะ	1	1	1
4111013	ANTIDIARRHEALS	ยาแก้ท้องเสีย	1	1	1
4111014	CONTRACEPTIVES	ยาคุมกำเนิด	1	1	1
4111016	VITAMIN B-COMPLEX	ยาวิตามินบีคอมเพล็กซ์	1	1	1
4111018	BITTER PILL	ยาหอม	1	1	1
4111019	BALM	ยาหม่อง	1	1	1
4111020	INHALANT	ยาดม	1	1	1
4111021	ANTI-INFLAMMATORIES	ยาบรรเทาปวดกล้ามเนื้อ	1	1	1
4112001	PLASTER	พลาสเตอร์ยา	1	1	1
4121101	MEDICAL EXAMINATION FEE (GOVERNMENT)	ค่าตรวจโรคโรงพยาบาลรัฐบาล	0	0	1
4121102	MEDICAL EXAMINATION FEE (PRIVATE)	ค่าตรวจโรคโรงพยาบาลเอกชน	0	0	1
4121103	DOCTOR'S FEE	ค่าตรวจโรคคลีนิคเอกชน	0	0	0
4121201	DENTIST'S FEE	ค่าถอนฟัน	0	0	0
4121301	OPTICAL CHECKUP FEE	ค่าตรวจสายตาประกอบแว่น	0	0	0
4122101	HOSPITAL ROOM CHARGE (GOVERNMENT)	ค่าห้องพักคนไข้ - โรงพยาบาลรัฐบาล	0	0	1
4122102	HOSPITAL ROOM CHARGE (PRIVATE)	ค่าห้องพักคนไข้ - โรงพยาบาลเอกชน	0	0	1
4210001	SOAP	สบู่ถูตัว	1	1	0
4210002	TOOTHPASTE	ยาสีฟัน	1	1	0
4210003	SHAMPOO	แชมพู	1	1	0
4210004	HAIR CREAM	น้ำมันใส่ผม	1	1	0
4210005	PERFUME AND COLOGNE	น้ำปรุงหอม	1	1	0
4210006	TALC	แป้งทาผิว	1	1	0
4210007	LIPSTICK	ลิปสติก	1	1	0
4210009	TOOTHBRUSH	แปรงสีฟัน	1	1	0
4210010	RAZOR BLADE	ใบมีดโกน	1	0	0
4210011	TOILET PAPER	กระดาษชำระ	1	1	0
4210013	SANITARY NAPKIN	ผ้าอนามัย	1	1	0
4220001	MEN'S HAIRCUT	ค่าแต่งผมชาย	0	0	0
4220002	WOMEN'S HAIR CURL	ค่าดัดผมสตรี	0	0	0
4220003	WOMEN'S HAIRSET	ค่าแต่งผมสตรี	0	0	0
5110001	BUS FARE	ค่าโดยสารรถประจำทาง 1	0	0	1
5110002	MINIBUS FARE	ค่าโดยสารรถเมล์เล็ก 1	0	0	1

Code	Description (English)	Description (Thai)	Headline	Core	Goods
5110003	TAXI FARE	ค่าโดยสารรถแท็กซี่	1	1	0
5110004	MOTORCYCLE FARE	ค่าโดยสารรถจักรยานยนต์รับจ้าง	1	1	0
5110005	SAMLOR FARE	ค่าโดยสารรถจักรยานสามล้อรับจ้าง	1	1	0
5110006	BOAT FARE	ค่าโดยสารเรือ	1	1	0
5110007	TRAIN FARE (URBAN)	ค่าโดยสารรถไฟสายชานเมือง	1	1	0
5110008	TOLL FEE	ค่าธรรมเนียมผ่านทางด่วน	1	1	0
5120002	BUS FARE (AIR-CONDITIONED, FIRST CLASS)	ค่าโดยสารรถประจำทางปรับอากาศชั้น 1	1	1	0
5120003	BUS FARE (AIR-CONDITIONED, SECOND CLASS)	ค่าโดยสารรถประจำทางปรับอากาศชั้น 2	1	1	0
5120006	TRAIN FARE	ค่าโดยสารรถไฟ	1	1	0
5120007	AIRFARE	ค่าโดยสารเครื่องบิน	1	1	0
5211001	AUTOMOBILE	รถยนต์นั่งขนาดต่ำกว่า 1800 cc	1	1	1
5211002	SMALL TRUCK	รถบรรทุกขนาดเล็ก	1	1	1
5211003	MOTORCYCLE	รถจักรยานยนต์	1	1	1
5211004	BICYCLE	รถจักรยานสองล้อแบบครอบครัว	1	1	1
5212001	CAR TYRE	ยางรถยนต์	1	1	1
5220002	BENZENE 91	น้ำมันเบนซิน 91	1	0	1
5220003	BENZENE 95	น้ำมันเบนซิน 95	1	0	1
5220004	DIESEL	น้ำมันดีเซล	1	0	1
5220005	LUBRICANT	น้ำมันเครื่องยนต์	1	0	1
5230001	CAR WASH	ค่าบริการล้างรถ	1	1	0
5230002	TYRE REPAIR CHARGE	ค่าบริการปะยางรถยนต์	1	1	0
5230004	CAR MAINTENANCE FEE	ค่าบริการบำรุงรักษายานยนต์	1	1	0
5310001	CAR REGISTRATION FEE	ค่าภาษีรถยนต์ประจำปี	1	1	0
5320001	CAR INSURANCE FEE	ค่าเบี้ยประกันภัยรถยนต์	1	1	0
5410001	TELEPHONE FEE	ค่าบริการใช้โทรศัพท์	1	1	0
5410002	MOBILE PHONE SERVICE FEE	ค่าบริการใช้โทรศัพท์มือถือ	1	1	0
5420001	TELEPHONE SET	เครื่องรับโทรศัพท์	1	1	1
5420002	MOBILE PHONE	เครื่องรับโทรศัพท์มือถือ	1	1	1
6110001	CINEMA ADMISSION FEE	ค่าบัตรชมภาพยนตร์	1	1	0
6110002	SWIMMING POOL RENTAL FEE	ค่าเช่าสระว่ายน้ำ	1	1	0
6110003	BADMINTON COURT RENTAL FEE	ค่าเช่าสนามแบดมินตัน	1	1	0
6121001	BADMINTON RACKET	ไม้แบดมินตัน	1	1	1
6122001	BRAIN TEASER	ของเล่นฝึกสมอง	1	1	1
6122002	CHILDREN'S TOY	รถสามล้อเด็ก	1	1	1
6123001	PHOTOGRAPHY FILM	ฟิล์มถ่ายรูป	1	1	1
6124001	DISKETTE	แผ่นดิสก์	1	1	1
6124002	CASSETTE TAPE	เทปเพลง	1	1	1
6124003	VIDEO RENTAL FEE	ค่าเช่าเทป วีดีโอ	1	1	0
6124004	CABLE TELEVISION MEMBERSHIP FEE	ค่าสมาชิกเคเบิลทีวี	1	1	0
6125001	PET FOOD	อาหารสุนัข	1	1	1
6130001	RADIO RECEIVER	เครื่องรับวิทยุ	1	1	1
6130002	COLOUR TELEVISION	เครื่องรับโทรทัศน์	1	1	1
6130003	TAPE-DISC PLAYER	เครื่องเล่นเทป-ดิสก์	1	1	1
6130004	VIDEO PLAYER	เครื่องเล่นวีดีโอ	1	1	1
6130005	CAMERA	กล้องถ่ายรูป	1	1	1
6140001	NEWSPAPER	หนังสือพิมพ์รายวัน	1	1	1
6140002	WEEKLY MAGAZINE	วารสารรายสัปดาห์	1	1	1
6140003	BI-WEEKLY MAGAZINE	วารสารรายปักษ์	1	1	1
6212001	SCHOOL FEE (GOVERNMENT)	ค่าเล่าเรียน - ค่าธรรมเนียมมัธยมศึกษาสายสามัญภาครัฐ	1	1	0
6212002	SCHOOL FEE (PRIVATE)	ค่าเล่าเรียน - ค่าธรรมเนียมมัธยมศึกษาสายสามัญภาคเอ	1	1	0
6214001	UNIVERSITY FEE (GOVERNMENT)	ค่าลงทะเบียน - ค่าธรรมเนียมอุดมศึกษาภาครัฐบาล	1	1	0
6214002	UNIVERSITY FEE (PRIVATE)	ค่าลงทะเบียน - ค่าธรรมเนียมอุดมศึกษาภาคเอกชน	1	1	0
6215001	MUSIC LESSON FEE	ค่าเรียนดนตรี	1	1	0
6221103	TEXTBOOK	หนังสือแบบเรียนเอกชน - ม.1	1	1	1
6222001	NOTEBOOK	สมุด	1	1	1
6222002	PENCIL	ดินสอ	1	1	1
6222003	BALL POINT PEN	ปากกาลูกลื่น	1	1	1
7100001	CIGARETTE	บุหรี่	1	1	1
7100002	SNUFF	ยานัตถุ์	1	1	1
7210001	BEER	เบียร์	1	1	1
7220001	WINE	ไวน์	1	1	1
7230001	LIQUOR	สุรา	1	1	1

Code	Description (English)	Description (Thai)	Tradables	Imported	Admin
5110003	TAXI FARE	ค่าโดยสารรถแท็กซี่	0	0	1
5110004	MOTORCYCLE FARE	ค่าโดยสารรถจักรยานยนต์รับจ้าง	0	0	0
5110005	SAMLOR FARE	ค่าโดยสารรถจักรยานสามล้อรับจ้าง	0	0	0
5110006	BOAT FARE	ค่าโดยสารเรือ	0	0	1
5110007	TRAIN FARE (URBAN)	ค่าโดยสารรถไฟสายชานเมือง	0	0	1
5110008	TOLL FEE	ค่าธรรมเนียมผ่านทางด่วน	0	0	1
5120002	BUS FARE (AIR-CONDITIONED, FIRST CLASS)	ค่าโดยสารรถประจำทางปรับอากาศชั้น 1	0	0	1
5120003	BUS FARE (AIR-CONDITIONED, SECOND CLASS)	ค่าโดยสารรถประจำทางปรับอากาศชั้น 2	0	0	1
5120006	TRAIN FARE	ค่าโดยสารรถไฟ	0	0	1
5120007	AIRFARE	ค่าโดยสารเครื่องบิน	0	0	1
5211001	AUTOMOBILE	รถยนต์นั่งขนาดต่ำกว่า 1800 cc	1	1	1
5211002	SMALL TRUCK	รถบรรทุกขนาดเล็ก	1	1	1
5211003	MOTORCYCLE	รถจักรยานยนต์	1	1	1
5211004	BICYCLE	รถจักรยานสองล้อแบบครอบครัว	1	1	0
5212001	CAR TYRE	ยางรถยนต์	1	0	0
5220002	BENZENE 91	น้ำมันเบนซิน 91	1	1	1
5220003	BENZENE 95	น้ำมันเบนซิน 95	1	1	1
5220004	DIESEL	น้ำมันดีเซล	1	1	1
5220005	LUBRICANT	น้ำมันเครื่องยนต์	1	1	0
5230001	CAR WASH	ค่าบริการล้างรถ	0	1	0
5230002	TYRE REPAIR CHARGE	ค่าบริการปะยางรถยนต์	0	1	0
5230004	CAR MAINTENANCE FEE	ค่าบริการบำรุงรักษายานยนต์	0	1	0
5310001	CAR REGISTRATION FEE	ค่าภาษีรถยนต์ประจำปี	0	0	1
5320001	CAR INSURANCE FEE	ค่าเบี้ยประกันภัยรถยนต์	0	0	0
5410001	TELEPHONE FEE	ค่าบริการใช้โทรศัพท์	0	0	1
5410002	MOBILE PHONE SERVICE FEE	ค่าบริการใช้โทรศัพท์มือถือ	0	0	1
5420001	TELEPHONE SET	เครื่องรับโทรศัพท์	1	1	0
5420002	MOBILE PHONE	เครื่องรับโทรศัพท์มือถือ	1	1	0
6110001	CINEMA ADMISSION FEE	ค่าบัตรชมภาพยนตร์	0	0	0
6110002	SWIMMING POOL RENTAL FEE	ค่าเช่าสระว่ายน้ำ	0	0	0
6110003	BADMINTON COURT RENTAL FEE	ค่าเช่าสนามแบดมินตัน	0	0	0
6121001	BADMINTON RACKET	ไม้แบดมินตัน	1	0	0
6122001	BRAIN TEASER	ของเล่นฝึกสมอง	1	0	0
6122002	CHILDREN'S TOY	รถสามล้อเด็ก	1	1	0
6123001	PHOTOGRAPHY FILM	ฟิล์มถ่ายรูป	1	1	0
6124001	DISKETTE	แผ่นดิสก์	1	0	0
6124002	CASSETTE TAPE	เทปเพลง	1	0	0
6124003	VIDEO RENTAL FEE	ค่าเช่าเทป วีดีโอ	0	0	0
6124004	CABLE TELEVISION MEMBERSHIP FEE	ค่าสมาชิกเคเบิลทีวี	0	0	1
6125001	PET FOOD	อาหารสุนัข	1	1	0
6130001	RADIO RECEIVER	เครื่องรับวิทยุ	1	1	0
6130002	COLOUR TELEVISION	เครื่องรับโทรทัศน์	1	1	0
6130003	TAPE-DISC PLAYER	เครื่องเล่นเทป-ดิสก์	1	1	0
6130004	VIDEO PLAYER	เครื่องเล่นวีดีโอ	1	1	0
6130005	CAMERA	กล้องถ่ายรูป	1	0	0
6140001	NEWSPAPER	หนังสือพิมพ์รายวัน	1	0	0
6140002	WEEKLY MAGAZINE	วารสารรายสัปดาห์	1	0	0
6140003	BI-WEEKLY MAGAZINE	วารสารรายปักษ์	1	0	0
6212001	SCHOOL FEE (GOVERNMENT)	ค่าเล่าเรียน - ค่าธรรมเนียมมัธยมศึกษาสายสามัญภาครัฐ	0	0	1
6212002	SCHOOL FEE (PRIVATE)	ค่าเล่าเรียน - ค่าธรรมเนียมมัธยมศึกษาสายสามัญภาคเอ	0	0	0
6214001	UNIVERSITY FEE (GOVERNMENT)	ค่าลงทะเบียน - ค่าธรรมเนียมอุดมศึกษาภาครัฐบาล	0	0	1
6214002	UNIVERSITY FEE (PRIVATE)	ค่าลงทะเบียน - ค่าธรรมเนียมอุดมศึกษาภาคเอกชน	0	0	0
6215001	MUSIC LESSON FEE	ค่าเรียนดนตรี	0	0	0
6221103	TEXTBOOK	หนังสือแบบเรียนเอกชน - ม.1	1	0	1
6222001	NOTEBOOK	สมุด	1	0	0
6222002	PENCIL	ดินสอ	1	0	0
6222003	BALL POINT PEN	ปากกาลูกลื่น	1	0	0
7100001	CIGARETTE	บุหรี่	1	0	1
7100002	SNUFF	ยานัตถุ์	1	1	0
7210001	BEER	เบียร์	1	0	0
7220001	WINE	ไวน์	1	0	0
7230001	LIQUOR	สุรา	1	0	0

Appendix B: Derivation of import content in CPI and PPI[53]

This section outlines the methodology used in obtaining the import content of CPI and PPI from the NESDB's Input-Output Table (IO Table). We match each of the 326 CPI items and 494 PPI items as closely as possible with sector classifications in the IO Table. The base year for the input structure in the IO Table is 1998, which corresponds to the CPI base year. However, the PPI base year is 1995, so we assume that the input structure for PPI in 1995 is similar to that in the IO Table in 1998. Private or household consumption expenditure is represented by Code 301 in the IO Table. Estimates of the import share of the CPI can be established using the share of imports derived below, by product item, multiplied by the price-index weight of each good.

Figure A1: Import content of CPI and PPI

	HCPI	CCPI	PPI
Indirect	7.3%	7.6%	8.0%
Direct	8.9%	6.9%	20.4%
Domestic	83.9%	85.5%	71.6%
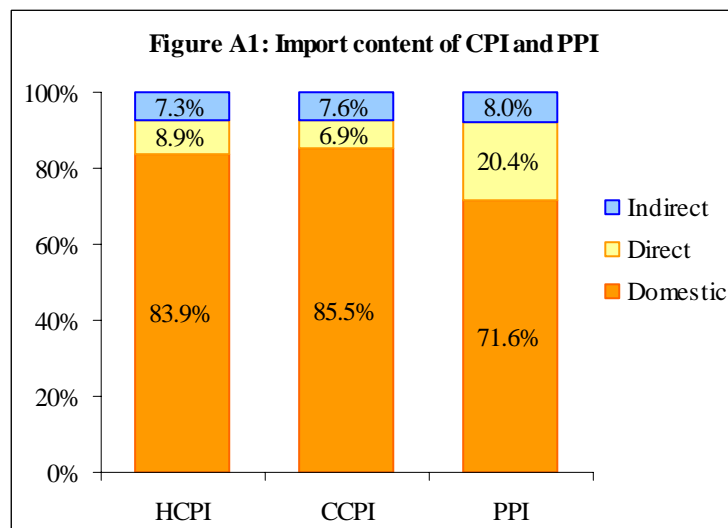
Computation:

- Direct import content

$$Direct \ import \ value = {}_A M \ \hat{C}$$

where A^M represents import matrix coefficient (180x180)

$\hat{C}$ represents a square matrix with private or household consumption expenditure in its principal diagonal and zeros everywhere else

Then,

$$Direct \ import \ content \quad = \quad \frac{Sum \ of \ direct \ import \ value_i}{Private \ consumption \ expenditure_i}$$

where i represents output i

- Indirect import content

$$\textit{Indirect import value} = A^M \, [I - A]^{-1} \, A \, \hat{C}$$

where $[I - A]^{-1}$ represents Leontief inverse matrix (180x180)

        A   represents technical input coefficient matrix

Then,

$$\textit{Indirect import content} \quad = \quad \frac{\textit{Sum of indirect import value}_i}{\textit{Private consumption expenditure}_i}$$

- Total import content

Total import content = Direct import content + Indirect import content

Input-Output Sector Classification		
I/O Code	Description (English)	Description (Thai)
001	PADDY	การทำนา
002	MAIZE	การทำไร่ข้าวโพด
003	OTHER CEREALS	การปลูกข้าวฟาง และธัญญพืชอื่น ๆ
004	CASSAVA	การทำไร่มันสำปะหลัง
005	OTHER ROOT CROPS	พืชไร่อื่น ๆ
006	BEANS AND NUTS	การปลูกพืชตระกูลถั่ว
007	VEGETABLES	การทำสวนผัก
008	FRUITS	การทำสวนผลไม้
009	SUGAR CANE	การทำไร่อ้อย
010	COCONUT	การทำสวนมะพร้าว
011	OIL PALM	การทำสวนปาล์ม
012	KENAF AND JUTE	การปลูกปอแก้ว ปอกระเจา
013	CROPS FOR TEXTILE AND MATTING	การเพาะปลูกพืชเส้นใย
014	TOBACCO	การทำไร่ยาสูบ
015	COFFEE AND TEA	การทำสวนกาแฟและสวนชา
016	RUBBER	การทำสวนยางพารา
017	OTHER AGRICULTURAL PRODUCTS	ผลิตผลทางเกษตรอื่น ๆ
018	CATTLE AND BUFFALO	การเลี้ยงโคและกระบือ
019	SWINE	การเลี้ยงสุกร
020	OTHER LIVESTOCK	การเลี้ยงปศุสัตว์อื่น ๆ
021	POULTRY	การเลี้ยงสัตว์ปีก
022	POULTRY PRODUCTS	ผลผลิตจากสัตว์ปีก
023	SILK FARMING	การเลี้ยงไหม
024	AGRICULTURAL SERVICES	การบริการทำการเกษตร
025	LOGGING	การทำไม้ซุง
026	CHARCOAL AND FIREWOOD	การเผาถ่าน และการทำฟืน
027	OTHER FORESTRY PRODUCTS	ผลผลิตจากป่าอื่น ๆ
028	OCEAN AND COASTAL FISHING	การประมงในมหาสมุทร, ชายฝั่ง
029	INLAND WATER FISHING	การประมงน้ำจืด
030	COAL AND LIGNITE	การทำเหมืองถ่านหิน และแร่ลิกไนต์
031	CRUDE OIL AND NATURAL GAS	การขุดเจาะน้ำมันดิบและก๊าซธรรมชาติ
032	IRON ORE	การทำเหมืองแร่เหล็ก
033	TIN ORE	การทำเหมืองแร่ดีบุก
034	TUNGSTEN ORE	การทำเหมืองทังสเตน
035	OTHER NON-FERROUS METAL ORE	เหมืองแร่อื่น ๆ ที่ไม่ใช่แร่เหล็ก
036	FLUORITE ORE	การทำเหมืองแร่ฟลูออไรต์
037	NATURAL CHEMICAL AND FERTILIZER	เหมืองแร่ที่ใช้ทำเคมีภัณฑ์และปุ๋ยเคมีภัณฑ์
038	SALT	เกลือ
039	LIMESTONE	การทำเหมืองหินปูน
040	STONE QUARRYING	การทำเหมืองหินและการย่อยทราย
041	OTHER MINING AND QUARRYING	การทำเหมืองแร่และเหมืองหินอื่น
042	SLAUGHTERING	การฆ่าสัตว์
043	CANNING AND PRESERVING OF MEAT	การทำเนื้อกระป๋อง
044	DAIRY PRODUCTS	การผลิตน้ำนม และผลิตภัณฑ์จากนม
045	CANNING AND PRESERVING OF FRUITS AND VEGETABLES	การบรรจุกระป๋อง และการเก็บรักษาผัก ผลไม้ น้ำผลไม้

I/O Code	Description (English)	Description (Thai)
046	CANNING AND PRESERVING OF FISH AND SEAFOOD	การบรรจุกระป๋อง การเก็บรักษาอาหารประเภทปลาและสัตว์น้ำอื่น ๆ
047	COCONUT AND PALM OIL	การผลิตน้ำมันมะพร้าว และน้ำมันปาล์ม
048	OTHER VEGETABLE AND ANIMAL OILS	การผลิตน้ำมันจากสัตว์ และจากพืช
049	RICE MILLING	โรงสีข้าว และผลพลอยได้จากการสีข้าว
050	FLOUR AND SAGU MILD PRODUCTS, AND TAPIOCA MILLING	ผลิตภัณฑ์อื่น ๆ ที่ได้จากแป้งมันสำปะหลังและแป้งมัน
051	GRINDING CORN	การสีและบดข้าวโพด
052	FLOUR AND OTHER GRAIN MILLING	โรงงานทำแป้งและการปนแป้งอื่น ๆ
053	BAKERY PRODUCTS	ผลิตภัณฑ์ทำขนมปังและขนมปังกรอบ
054	NOODLE AND SIMILAR PRODUCTS	โรงงานทำก๋วยเตี๋ยวและผลิตภัณฑ์ที่คล้ายคลึงกัน
055	SUGAR REFINERY	โรงงานทำน้ำตาล และผลิตภัณฑ์อื่น ๆ
056	CONFECTIONERY AND SNACK	การผลิตผลิตภัณฑ์ขนมชนิดเคลือบและมีไส้เป็นน้ำตาล
057	ICE	การผลิตน้ำแข็ง
058	MONOSODIUM GLUTAMATE	การผลิตผงชูรส
059	COFFEE, COCOA AND TEA PROCESSING	การผลิตกาแฟ โกโก้ และชา
060	OTHER FOOD PRODUCTS	การผลิตผลิตภัณฑ์อาหารอื่น ๆ
061	FISH MEAL AND ANIMAL FEED	การผลิตอาหารสัตว์สำเร็จรูป และปลาป่น
062	DISTILLING AND BLENDING OF SPIRIT	การต้ม กลั่น การผสมสุรา
063	BREWERIES	โรงเบียร์
064	SOFT DRINKS AND CARBONATED WATER	อุตสาหกรรมเครื่องดื่มที่ไม่มีแอลกอฮอล์ และน้ำอัดลม
065	TOBACCO PROCESSING	การอบ การบ่มใบยาสูบ
066	TOBACCO PRODUCTS	การผลิตผลิตภัณฑ์ใบยาสูบ
067	SPINNING	การปั่นด้าย
068	WEAVING	การทอผ้า
069	TEXTILE BLEACHING, PRINTING AND FINISHING	การฟอก การพิมพ์ การย้อม
070	MADE-UP TEXTILE GOODS	การผลิตสิ่งทอสิ่งถักสำเร็จรูป
071	KNITTING	การผลิตสิ่งถัก
072	WEARING APPARELS	การผลิตเครื่องแต่งกาย
073	CARPETS AND RUGS	การผลิตพรมและเครื่องปูลาด
074	JUTE MILL PRODUCTS	อุตสาหกรรมเกี่ยวกับผลิตภัณฑ์เชือก
075	TANNERY AND LEATHER FINISHING	โรงฟอกหนังและการแต่งสำเร็จหนังสัตว์
076	LEATHER PRODUCTS	การผลิตผลิตภัณฑ์หนังสัตว์
077	FOOTWEAR EXCEPT RUBBER	การผลิตรองเท้า ยกเว้นรองเท้ายาง
078	SAW MILL AND WOODEN CONSTRUCTION MATERIALS	การแปรรูปไม้ ไม้อัด และอุปกรณ์ไม้
079	WOOD AND CORK PRODUCTS	การผลิตผลิตภัณฑ์จากไม้และไม้ก๊อก
080	WOODEN FURNITURE AND FIXTURE	การผลิตเครื่องเรือนเครื่องตกแต่งที่ทำด้วยไม้
081	PAPER AND PAPERBOARD	การผลิตกระดาษและเยื่อกระดาษ
082	PAPER AND PAPERBOARD PRODUCTS	การผลิตผลิตภัณฑ์จากกระดาษ
083	PRINTING AND PUBLISHING	การพิมพ์, การพิมพ์โฆษณา
084	BASIC CHEMICALS	การผลิตเคมีภัณฑ์ขั้นมูลฐาน
085	FERTILIZER, PESTICIDE AND INSECTICIDE	การผลิตปุ๋ย ยาปราบศัตรูพืช และยาฆ่าแมลง
086	PETROCHEMICAL PRODUCTS	ผลิตภัณฑ์ปิโตรเคมี
087	PAINT	การผลิตสีทา น้ำมันชักเงา
088	DRUG AND MEDICINE	การผลิตยารักษาโรค
089	SOAP, CLEANING AND PREPARATION PRODUCTS	การผลิตสบู่และผลิตภัณฑ์ที่ใช้ทำความสะอาด
090	COSMETICS	การผลิตเครื่องสำอางค์

I/O Code	Description (English)	Description (Thai)
091	MATCHES	การผลิตไม้ขีดไฟ
092	OTHER CHEMICAL PRODUCTS	การผลิตผลิตภัณฑ์ทางเคมีอื่น ๆ
093	PETROLEUM REFINERY AND GAS SEPARATION PLANT	น้ำมันปิโตรเลียมและก๊าซธรรมชาติ
094	OTHER COAL AND PETROLEUM PRODUCTS	ผลผลิตอื่น ๆ จากถ่านหิน และน้ำมันปิโตรเลียม
095	RUBBER SHEET AND BLOCK RUBBER	การผลิตยางแผ่นและยางก้อน
096	TYRES AND TUBES	การผลิตยางนอกยางใน
097	OTHER RUBBER PRODUCTS	การผลิตผลิตภัณฑ์ยางอื่น ๆ
098	PLASTIC WARES	การผลิตผลิตภัณฑ์พลาสติก
099	CERAMIC AND EARTHEN WARES	การผลิตกระเบื้องเคลือบและเครื่องปั้นดินเผา
100	GLASS AND GLASS PRODUCTS	การผลิตแก้วและผลิตภัณฑ์แก้ว
101	STRUCTURAL CLAY PRODUCTS	การผลิตผลิตภัณฑ์ที่ใช้ในงานก่อสร้าง
102	CEMENT	การผลิตซีเมนต์
103	CONCRETE AND CEMENT PRODUCTS	การผลิตผลิตภัณฑ์คอนกรีต
104	OTHER NON-METALLIC PRODUCTS	การผลิตผลิตภัณฑ์อโลหะอื่น ๆ
105	IRON AND STEEL	อุตสาหกรรมเหล็กและเหล็กกล้า
106	SECONDARY STEEL PRODUCTS	การผลิตผลิตภัณฑ์เหล็กกล้า
107	NON-FERROUS METAL	ผลิตภัณฑ์อื่น ๆ ที่ไม่ใช่เหล็ก, ถลุงแร่อื่น ๆ เช่น ถลุงดีบุก
108	CUTLERY AND HAND TOOLS	การผลิตเครื่องตัดและเครื่องมือ
109	METAL FURNITURE AND FIXTURE	การผลิตเครื่องเรือนที่ทำด้วยโลหะ
110	STRUCTURAL METAL PRODUCTS	การผลิตผลิตภัณฑ์โลหะ
111	OTHER FABRICATED METAL PRODUCTS	การผลิตผลิตภัณฑ์โลหะอื่น ๆ
112	ENGINE AND TURBINE	การผลิตเครื่องยนต์และกังหัน
113	AGRICULTURAL MACHINERY AND EQUIPMENT	การผลิตเครื่องจักรและอุปกรณ์ทางเกษตร
114	WOOD AND METAL WORKING MACHINERY	การผลิตเครื่องจักรที่ใช้ประดิษฐ์เครื่องไม้และโลหะ
115	SPECIAL INDUSTRIAL MACHINERY	การผลิตเครื่องจักรและอุปกรณ์พิเศษ
116	OFFICE EQUIPMENT AND MACHINERY	เครื่องมือเครื่องจักรที่ใช้ในสนง. และครัวเรือน
117	ELECTRICAL INDUSTRIAL MACHINERY AND APPLIANCES	เครื่องจักรและเครื่องไฟฟ้าสำหรับโรงงานอุตสาหกรรม
118	RADIO, TELEVISION SET AND COMMUNICATION EQUIPMENT	อุปกรณ์การสื่อสารเครื่องรับวิทยุ โทรทัศน์ และแผงวงจรไฟฟ้า
119	OTHER ELECTRIC APPLIANCES	เครื่องใช้และอุปกรณ์ไฟฟ้าอื่น ๆ
120	INSULATED WIRE AND CABLE	ลวดและสายเคเบิลชนิดหุ้มฉนวน
121	ELECTRIC ACCUMULATOR AND BATTERY	แบตเตอรี่และหม้อเก็บประจุไฟฟ้า
122	OTHER ELECTRICAL APPARATUSES AND SUPPLIES	เครื่องมือเครื่องใช้ไฟฟ้าอื่น ๆ
123	SHIP BUILDING	การต่อเรือและการซ่อมเรือ
124	RAILWAY EQUIPMENT	การผลิตอุปกรณ์รถไฟ
125	MOTOR VEHICLE	การผลิตยานยนต์
126	MOTORCYCLE, BICYCLE AND OTHER CARRIAGES	การผลิตรถจักรยานยนต์ จักรยาน และรถเข็นอื่น ๆ
127	REPAIRING OF VEHICLE	การซ่อมแซมยานพาหนะทุกชนิด
128	AIRCRAFT	การผลิตอากาศยาน
129	SCIENTIFIC EQUIPMENT	อุปกรณ์เกี่ยวกับงานวิทยาศาสตร์
130	PHOTOGRAPHIC AND OPTICAL GOODS	การผลิตอุปกรณ์การถ่ายภาพและสายตา
131	WATCHES AND CLOCKS	การผลิตนาฬิกา
132	JEWELRY AND RELATED ARTICLES	การผลิตเครื่องประดับและผลิตภัณฑ์ที่เกี่ยวข้อง
133	RECREATIONAL AND ATHLETIC EQUIPMENT	การผลิตเครื่องดนตรีและเครื่องกีฬา
134	OTHER MANUFACTURING GOODS	การผลิตสินค้าอุตสาหกรรมอื่น ๆ
135	ELECTRICITY	การผลิตไฟฟ้า

I/O Code	Description (English)	Description (Thai)
136	PIPE LINE	ระบบท่อก๊าซ
137	WATER SUPPLY SYSTEM	การประปา
138	RESIDENTIAL BUILDING CONSTRUCTION	การก่อสร้างที่อยู่อาศัย
139	NON-RESIDENTIAL BUILDING CONSTRUCTION	การก่อสร้างอาคารที่ไม่ใช่ที่อยู่อาศัย
140	PUBLIC WORKS FOR AGRICULTURE AND FORESTRY	การก่อสร้างงานบริการสาธารณะทางด้านการเกษตรและป่าไม้
141	NON-AGRICULTURAL PUBLIC WORKS	การก่อสร้างงานบริการที่ไม่เกี่ยวกับงานเกษตร
142	CONSTRUCTION OF ELECTRIC PLANT	การก่อสร้างโรงงานผลิตพลังไฟฟ้าและสาธารณูปโภค
143	CONSTRUCTION OF COMMUNICATION FACILITIES	การก่อสร้างอาคารโทรศัพท์ โทรเลข วิทยุกระจายเสียง และหอโทรทัศน์
144	OTHER CONSTRUCTIONS	การก่อสร้างอื่น ๆ
145	WHOLESALE TRADE	การค้าส่ง
146	RETAIL TRADE	การค้าปลีก
147	RESTAURANT AND DRINKING PLACE	ภัตตาคารและร้ายขายเครื่องดื่ม
148	HOTEL AND LODGING PLACE	โรงแรมและที่พักอื่น ๆ
149	RAILWAYS	การขนส่งโดยรถไฟ
150	ROUTE AND NON-ROUTE OF ROAD PASSENGER TRANSPORT	การขนส่งโดยรถประจำทางและไม่ประจำทาง
151	ROAD FREIGHT TRANSPORT	การขนส่งสินค้าทางบก
152	LAND TRANSPORT SUPPORTING SERVICES	การให้บริการแก่การขนส่งทางบก
153	OCEAN TRANSPORT	การขนส่งทางทะเลหลวงและชายฝั่ง
154	COASTAL AND INLAND WATER TRANSPORT	การขนส่งทางน้ำภายในประเทศ
155	WATER TRANSPORT SERVICES	บริการการขนส่งทางน้ำ
156	AIR TRANSPORT	การขนส่งทางอากาศ
157	OTHER SERVICES	บริการเกี่ยวเนื่องกับการขนส่ง
158	SILO AND WAREHOUSE	สถานที่เก็บสินค้าและไซโล
159	POST AND TELECOMMUNICATION	บริการไปรษณีย์โทรเลข
160	BANKING SERVICE	สถาบันการเงิน
161	LIFE INSURANCE SERVICE	การประกันชีวิต
162	OTHER INSURANCE SERVICE	บริการประกันภัยอื่น ๆ
163	REAL ESTATE	บริการด้านอสังหาริมทรัพย์
164	BUSINESS SERVICE	การบริการทางธุรกิจต่าง ๆ
165	PUBLIC ADMINISTRATION	การบริหารราชการ
166	SANITARY AND SIMILAR SERVICES	การบริการรักษาความสะอาด
167	EDUCATION	การบริการการศึกษา
168	RESEARCH	สถาบันวิจัย
169	HOSPITAL	การบริการทางการแพทย์และอนามัย
170	BUSINESS AND LABOUR ASSOCIATIONS	สถาบันธุรกิจ สมาคมอาชีพและผู้ใช้แรง
171	OTHER COMMUNITY SERVICES	การบริการชุมชนอื่น ๆ
172	MOTION PICTURE PRODUCTION	บริการด้านภาพยนต์และการจัดจำหน่าย
173	MOVIE THEATRE	โรงฉายภาพยนต์และโรงละคร
174	RADIO, TELEVISION AND RELATED SERVICES	วิทยุ โทรทัศน์, บริการที่เกี่ยวข้อง
175	LIBRARY AND MUSEUM	ห้องสมุด, พิพิธภัณฑ์ และบริการทางวัฒนธรรมอื่น ๆ
176	ENTERTAINMENT AND RECREATION	การบันเทิงและบริการสันทนาการ
177	REPAIRING, NOT ELSEWHERE CLASSIFIED	การซ่อมแซม
178	PERSONAL SERVICES	การบริการส่วนบุคคล
180	UNCLASSIFIED	กิจกรรมที่มิอาจระบุประเภทได้

I/O Code	Description (English)	Description (Thai)
190	TOTAL INTERMEDIATE TRANSACTION	ผลรวมของมูลค่าปัจจัยการผลิตขั้นกลางทั้งหมด
201	WAGES AND SALARIES	เงินเดือน ค่าจ้าง ค่าตอบแทน
202	OPERATING SURPLUS	ผลตอบแทนการผลิต
203	DEPRECIATION	ค่าเสื่อมราคา
204	INDIRECT TAXES LESS SUBSIDIES	ภาษีทางอ้อมสุทธิ
209	TOTAL VALUE ADDED	มูลค่าเพิ่มรวม
210	CONTROL TOTAL	ผลผลิตรวมภายในประเทศ
301	PRIVATE CONSUMPTION EXPENDITURE	รายจ่ายเพื่อการอุปโภคบริโภคภาคเอกชน
302	GOVERNMENT CONSUMPTION EXPENDITURE	รายจ่ายเพื่อการอุปโภคบริโภคภาครัฐบาล
303	GROSS FIXED CAPITAL FORMATION	การสะสมทุน
304	INCREASE IN STOCK	ส่วนเปลี่ยนของสินค้าคงเหลือ
305	EXPORTS (F.O.B.)	การส่งออก
306	SPECIAL EXPORTS	การส่งออกพิเศษ
309	TOTAL FINAL DEMAND	อุปสงค์ขั้นสุดท้ายรวม
310	TOTAL DEMAND	อุปสงค์รวม
401	IMPORTS (C.I.F.)	การนำเข้า
402	IMPORT TAX	ภาษีศุลกากร
403	IMPORT DUTY	ภาษีการนำเข้า
404	SPECIAL IMPORTS	การนำเข้าพิเศษ
409	TOTAL IMPORTS	การนำเข้ารวม
501	WHOLESALE TRADE MARGIN	ส่วนเหลื่อมการค้าส่ง
502	RETAIL TRADE MARGIN	ส่วนเหลื่อมการค้าปลีก
503	TRANSPORTATION COST	ค่าขนส่ง
509	TOTAL MARGIN AND TRANSPORTATION COST	ผลรวมของส่วนเหลื่อมการค้าและค่าขนส่ง
600	CONTROL TOTAL	ผลผลิตรวมภายในประเทศ
700	TOTAL SUPPLY	อุปทานรวม

Appendix C: BOTMM variables listing and data sources

Name	Description	Source[1]
AVGEARN	Average earnings (baht/month)	MOLSW
CINFEX	Core inflation expectations (per cent)	BOT
CORE, CINFLAT	Core consumer price index (CPI excluding raw food and energy prices) (1998 = 100), Core inflation rate (per cent)	MOC
CPI	Headline consumer price index (1998 = 100)	MOC
CPIEN	Energy price index (1998 = 100)	MOC
CPIRFOOD	Raw food price index (1998 = 100)	MOC
DUBAI	Dubai crude oil price (US dollars/barrel)	PTTEP
FARMPRICE_12	Farm price index (12 main products of Thailand) (1995 = 100)	MOC
FARMPRICE_OTH	Other items of farm price index (1995 = 100)	BOT
FARMPRICE	Farm price index (1995 = 100)	MOC
FX	Exchange rate (baht/US dollar)	BOT
FX88	Exchange rate index (1988 = 100)	BOT
GDPR	Gross domestic product at 1988 constant prices (billion baht)	NESDB
GDPR_HSM	Gross domestic product trend at 1988 constant prices, estimated from Hodrick–Prescott and exponential smoothing method (billion baht)	BOT
INFLAT	Headline inflation rate	MOC
INFLATEN	Energy inflation rate	MOC
INFLATRFOOD	Raw food inflation rate	MOC
INFNONCORE	Raw food and energy inflation rate	MOC
MINWAGE	Minimum wage rate	MOLSW
NONCORE	Raw food and energy price index	MOC
PM$	Goods and services import price index (US dollars, 1988 = 100)	NESDB
PW_NONF	World non-fuel commodity price index (1990 = 100)	WB
RPPI	Retail petroleum price index (1996 = 100)	PTTEP
WEN	Energy weight in CPI basket (proportion)	MOC
WFARMPRICE_12	Weight of 12 main products in farm price index basket (proportion)	BOT
WFARMPRICE_OTH	Weight of other items in farm price index basket (proportion)	BOT
WFP_12	World farm price index (12 main products of Thailand) (1995 = 100)	WB
WRFOOD	Raw food weight in CPI basket (proportion)	MOC

[1] BOT: Bank of Thailand; MOC: Ministry of Commerce; MOLSW: Ministry of Labour and Social Welfare; NESDB: National Economic and Social Development Board; PTTEP: PTT Exploration and Production Public Company Limited; and WB: World Bank.