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Global inflation: the role of food, housing and energy prices

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Abstract

This paper studies the role of global factors in causing common movements in consumer price inflation, with particular focus on the food, housing and energy sub-indices. It uses a comprehensive dataset of 223 countries and territories collected from national and international sources. Global factors explain a large share of the variance of national inflation rates for advanced countries – and more generally those with greater GDP per capita, financial development and central bank transparency – but not for middle and low income countries. Common factors explain a large share of the variance in food and energy prices.

JEL codes: E31, E52, F42.

Keywords: global inflation, common factor, food prices, energy prices.

Non-technical summary

Previous research has highlighted that inflation rates in OECD countries move similarly. Indeed, the common component, termed 'global inflation', can explain as much as 70 percent of the variance of national inflation rates in these countries. This paper extends the previous literature to consider a far greater range of countries and also to consider different types of products and services rather than just the all items price index.

A dataset of consumer prices for 223 countries and territories is constructed to carry out the analysis. This dataset includes some of the sub-components of the all items consumer price index, namely food, housing, energy, and an index which includes the remaining goods and services covered by the consumer price index.

The analysis here confirms that global inflation can account for a large share of the variance of national inflation rates in OECD countries. The influence of global inflation on national inflation rates is much lower for less developed countries, accounting for around a tenth of the variance of inflation in low income countries. In particular, higher income, greater financial sector development and more transparent central banks are associated with a higher influence of global inflation. Global inflation factors also have greater influence on national inflation rates of countries with fixed exchange rates.

At the sub-component level, the influence of global inflation factors is most prominent on energy prices, although there is also a significant influence on food prices.

1 Introduction

The beginning of the 21st Century was marked by low and stable inflation across the developed world, and reduced inflation in the developing world. This stability was threatened since the mid-2000s by volatility in commodity prices, most notably food and energy, causing concern for policymakers (See, among others, Bernanke, 2008; IMF, 2008; European Central Bank, 2008). Since mid-2014, falling energy prices have once more been at the forefront of policymakers' minds. Research into the effects of these movements in commodity prices on domestic inflation has generally been restricted to a small sample of typically advanced countries, owing principally to a lack of readily available data.

This paper makes two main contributions. First, it constructs a dataset for consumer prices for 223 countries and territories[1] for the period 1980-2012. For headline inflation alone this is wider coverage than existing datasets. In addition to headline consumer prices, this dataset also contains, where publicly available, the sub-indices for food, housing and energy, along with a core index excluding these sub-indices. Existing datasets for these sub-indices rarely extend beyond a small number of advanced countries. Every effort has been made to standardise the indices using the international standard Classification of Consumption according to Purpose (COICOP) in order to aid comparisons.

The second main contribution of this paper is to use this dataset to consider the role of food, housing and energy prices in driving global co-movement in consumer prices. Recent literature has noted how movements in national inflation rates can be explained in large part by movements in global inflation factors, most notably for advanced economies. That analysis is extended here in two dimensions – first by considering a more diverse group of countries, including low income countries which have for the most part been ignored by the literature to date. Second, greater consideration is given to the role of sub-components in generating co-movement in inflation. Analysis of sub-components has to date been limited to a small number of countries, given the lack of comparable international datasets.

This paper extends the previous literature by considering housing prices. There are two main reasons for doing this. First, housing prices are typically viewed as being non-tradable, so investigating these prices may provide insight as to whether the phenomenon of global inflation is a function of changes in tradable prices, or similar monetary policies across countries. The second reason is a practical one – due to limited data availability in developing economies it is easier to construct

[1] The official status of the countries and territories included here varies from internationally recognised sovereign states to overseas regions, dependencies, territories and autonomous regions. The term 'country' is used hereafter for brevity, and is in keeping with the practice of the World Bank.

a core measure excluding food, energy and housing for a wider range of countries than it is to construct the core measure commonly used in high income countries that excludes just food and energy.

There is a growing recent literature on the influence of global inflation factors on national inflation rates. The seminal contribution to this literature is Ciccarelli and Mojon (2010), who study the headline inflation rates for 22 OECD countries over the period 1960-2008. They establish that almost 70 percent of the variance of national inflation rates can be explained by a common, global factor. They demonstrate that including this global factor improves the forecasting performance of augmented Phillips curves. Ferroni and Mojon (2014) update that analysis and confirm a continued role for global factors through to 2013.

Eickmeier and Pijnenburg (2013) similarly augment the Phillips curves of 24 OECD countries with global factors, finding a role for the common global component in domestic inflationary pressures. Neely and Rapach (2011) decompose the inflation rates of 64 (mostly high income) countries into global, regional and domestic factors, finding that the global factor accounts for 36 percent of total inflation variance and regional factors a further 16 percent. Their regions are geographic in nature, so can include diverse economies such as the United States and Barbados in one group. The divide is also somewhat arbitrary at times - grouping English-speaking Caribbean nations into North America and Spanish-speaking ones into Latin America.

There have been a small number of studies that have studied the influence of global factors beyond just headline inflation. Mumtaz and Surico (2012) use a dynamic factor model to investigate the influence of global inflation factors on a wide range of price indices for 10 advanced economies. Their analysis suggests that the comovement in the series has increased since the 1980s. Karagedikli et al. (2010) study the global component of 28 matched product categories for 14 advanced countries. They allow for a global inflation factor, category-specific factors and individual country factors. They find that category-specific factors account for a large share of variance of products that are exposed to international trade.

Förster and Tillmann (2014) use the four-level dynamic hierarchical model proposed by Moench et al. (2013) to disentangle the effects of CPI sub-components, specifically food, energy and the remainder of the index, for a group of 60 countries, all but six of which are high income. Förster and Tillmann find common factors explain large shares of the variance for energy and food, but not for the remainder of the index. We extend their analysis in section 4.4 below to a markedly wider sample of countries and also by including CPI housing inflation.

The following analysis extends the literature by considering the influence of global factors on national inflation rates for a far broader, and more diverse, group of countries. We confirm the findings of Ciccarelli and Mojon (2010) that global factors can explain a large majority of the variance of national inflation rates for advanced countries. We also demonstrate that this finding does not hold for less developed countries. For medium income countries the share of national inflation variance explained by global factors is in the order of 15 to 20 percent, falling to around 10 percent for low income countries.

There are a number of potential country characteristics that could explain the differing effects of global inflation factors on national inflation rates. Considered individually, lower average inflation, lower inflation volatility and higher trade openness appear to increase the influence of global factors. However, when considered in a multivariate framework, these factors are not significant. Instead it is higher GDP per capita, deeper financial development and more transparent monetary policy that explain a greater role for global inflation factors. Relatively rich countries with deep domestic capital markets and good monetary policy are likely to be better able to mitigate idiosyncratic, domestic shocks. The apparent greater influence of global factors in these countries appears to be a function of this reduced idiosyncratic volatility.

In terms of sub-components of consumer prices, there is a more marked influence of global energy and food prices on the respective national inflation rates. Housing prices appear for the most part idiosyncratic and unrelated to global factors. Global factors can explain a greater share of the variance of national inflation for advanced countries for all sub-components. This finding demonstrates that the greater explanatory power of global factors is not solely a function of differing consumption patterns between high and low income countries.

2 Data

2.1 Desired series

This paper uses consumer prices for nearly all sovereign states, territories and geographically distinct autonomous regions (e.g. French overseas regions such as Réunion). Ultimately, CPI figures were found for 223 countries.[2] The coverage

[2] Of widely recognised sovereign states, only Eritrea, the People's Democratic Republic of Korea, Turkmenistan, Uzbekistan and the bulk of Somalia are missing here.

roughly coincides with the countries in the World Bank's *World Development Indicators* database.

The data are at quarterly frequency to maximise coverage. Many countries only publish at this frequency, particularly developing ones. For those countries that publish monthly, the quarterly index value is calculated as the average of the monthly outturns, in keeping with standard international practice.

Differences in exact definitions of CPI can render cross-country comparisons difficult. The scope of items covered and the exact structure of sub-indices differs between countries. Where possible, the indices used here are standardised using the international standard Classification of Consumption according to Purpose (COICOP).[3] COICOP is used for a number of modern CPIs, including the European Union's Harmonised Index of Consumer Prices. The desired COICOP categories are:

Overall (CPI) : the all items index. The COICOP classification does not include mortgage payments, which have been excluded, where possible, from the national indices that include them.

Food (CPIF) : COICOP 01.1 food purchased for consumption at home.

Housing (CPIH) : COICOP 04.1-04.4 rents, maintenance and repair of dwellings, water supply and local authority taxes based on housing.

Energy (CPIE) : COICOP 04.5 electricity, gas and other fuels and COICOP 07.2.2 fuels and lubricants for operation of personal transport equipment.

For countries that do not publish on a COICOP basis, the closest sub-index to the desired COICOP category was used, except where that closest series remains far from the desired definition. For example, food and non-alcoholic beverages was used in place of food, the series for electricity, gas and other fuels was deemed sufficient for CPI energy. Conversely, the full transport category was deemed too far removed from fuels and lubricants given it includes public transport, purchase of vehicles, tax on vehicles and spare parts. The accompanying appendix sets out the exact series used for each country.

Not all statistical agencies publish CPI at a detailed level. Many only publish at the 12 COICOP division level, which means it is not possible to separate out housing and energy. For these countries, COICOP division 04 - Housing, water, electricity, gas and other fuels is used for a combined housing and energy series

[3] See `http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5` for a description of the categories.

(CPIHE). For countries where separate housing and energy series are available, CPIHE combines the estimates for housing and energy.

National statistical agencies periodically rebase and re-reference their CPI series.[4] For the most part, an overlapping period is published for both the new and old series, allowing for the two series to be spliced together. In some cases there are no overlapping observations, but the old series has data covering the reference period for the new series. For example, the new series may only be published from 2008Q1, but is referenced to 2007=100 and the old series has observations for 2007. For the small number of cases where no overlap exists, the old and new series have been linked using the average growth of the relevant period in the preceding and subsequent five years. All such cases are noted in the appendix under the relevant country. The data have been re-referenced to 2010=100 (with a few exceptions of countries that do not have 2010 data).

Also included in the accompanying data are the weights of the sub-indices in the total index. Weights for CPI sub-indices are typically estimated using surveys of household spending. The frequency with which weights are updated varies between countries, with updates usually more frequent in advanced countries. Where weights are not published, estimates are derived using ordinary least squares.[5]

Core inflation indices are constructed using the sub-indices and weights. The accompanying dataset contains series on CPI excluding food (CPIxF), excluding energy (CPIxE), excluding housing (CPIxH) and excluding housing and energy (CPIxHE). The accompanying data also include series for CPI excluding food and energy (CPIxFE). This measure is commonly used internationally as a measure of core, or underlying, inflation. The final core measure, discussed in more detail below, is CPI excluding food, housing and energy (CPIxFHE).

To calculate a core measure it is necessary to unchain the relevant indices by setting the base period equal to 100. This unchaining is required for each change in weight. The unchained indices are then weighted together using the current period weights. Finally, the unchained core indices are once more chain-linked together. As an example, the formula for calculating CPI excluding food and

[4] Technically, the base refers to the period where the underlying expenditure used to calculate the weights takes place. The reference period is the period when the index is set to equal 100, or occasionally 1000. Since these periods often coincide, the use of 'base' for both is common practice.

[5] An accompanying data appendix that notes the cases when this method is used is available on request.

energy is shown below.

$$CPI\text{x}FE_t = \frac{100\left(100 \cdot \frac{CPI_t}{CPI_b}\right) - wF\left(100 \cdot \frac{CPIF_t}{CPIF_b}\right) - wE\left(100 \cdot \frac{CPIE_t}{CPIE_b}\right)}{100 - wF - wE}$$

Where CPI_t, $CPIF_t$ and $CPIE_t$ are the current index numbers for overall, food and energy prices, CPI_b, $CPIF_b$ and $CPIE_b$ are the index numbers for the base period – the quarter immediately before the change to the current weights – and wF and wE are the current weights for food and energy. The weight of overall CPI is 100.

2.2 Sources

There are a number of international databases with CPI data. The *International Financial Statistics* published by the International Monetary Fund contain data on overall CPI for most member countries. The *Laborstats* database of the International Labour Organisation has indices for overall CPI and CPI food. Neither of these sources has information on the other sub-indices, nor on the weights.

The *Main Economic Indicators* of the Organisation for Economic Co-operation and Development contain more detailed information on sub-indices, including energy, and weights for its (advanced economy) members. There are also a number of regional organisations with CPI data for several countries, including the Economic and Statistical Observatory for sub-Saharan Africa (AFRISTAT) and the Secretariat of the Pacific Community. Two major international subscription databases were also used - Thomson Reuters Datastream and Haver Analytics.

For the most part, the sub-indices and weights must be obtained from national sources. When particular series were not all available on the website of the national statistical agency nor the central bank, both were contacted to request the data. A number of these institutions provided the requested data and have been noted in the country notes.

There are data for overall CPI for 127 countries in 1980Q1, and for over 200 countries by 1998Q1. Coverage of CPI food is also extensive. The availability of CPI energy and CPI housing is mostly restricted to high income countries in the first half of the period. The combined housing and energy series is more widely available, as noted above.

There are a number of reasons why the panel is not fully balanced, despite these systematic attempts to obtain the relevant CPI data. First, country formation during the sample period creates periods of no data pre-independence. Examples include the states formed from the break-up of the Soviet Union and later of Yugoslavia as well as several newly independent states (e.g. Timor-Leste, South Sudan). Second, it was not always possible to obtain information on previous vintages of CPI for all countries – the records have not all been digitised or made available online. Furthermore, some countries did not publish CPI data on a quarterly or higher frequency throughout the sample (e.g. United Arab Emirates, Greenland). Finally, other breaks in collection have been caused by war, natural disasters or a lack of personnel at statistical agencies.

3 Evolution of inflation since 1980

3.1 Distribution of country headline inflation rates

There is a marked difference in overall CPI inflation between high income countries and less developed countries. For high income countries, there was a period of disinflation through the first half of the 1980s (figure 1). Inflation in these countries settled at low and stable rates from the early 1990s through to the middle of 2007. In the 15 year period between 1992Q3 and 2007Q3, the median inflation rate for high income countries ranged between 1.4 and 3.2 percent. This period is also remarkable for the reduction in the right-hand skew of the distribution of country inflation rates.

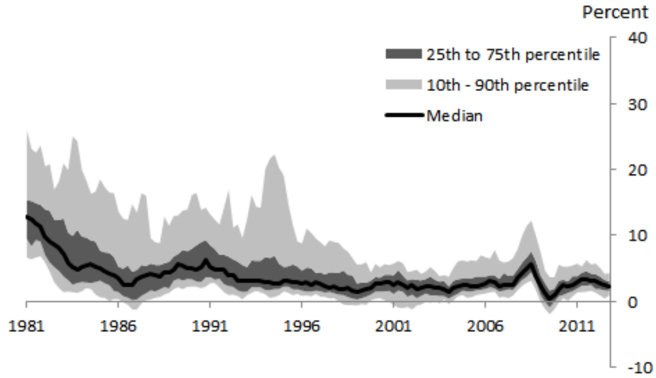
That period of inflation stability was followed by increased volatility during the global financial crisis (GFC) with a sharp peak in inflation, followed by an immediate trough. Inflation in 2011 and 2012 appears more in keeping with the pre-GFC distribution.

The median inflation for middle income countries follows a similar pattern to high income countries, albeit at a higher rate overall. The disinflation of the early 1980s is less marked, and continues through to 2000. This disinflationary period was accompanied by a reduction in skew. The period 2000-2007 appears to be a period of relative stability in inflation. The volatility around the GFC is more marked.

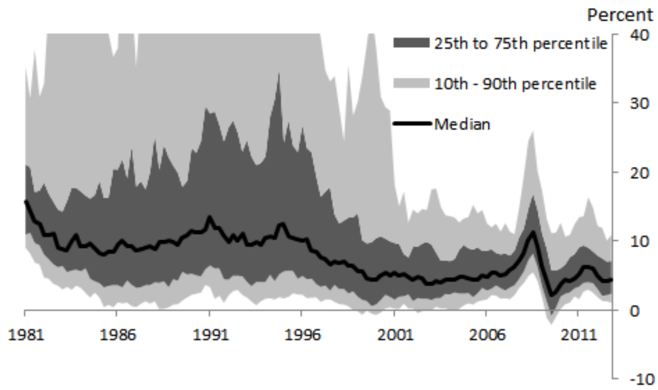
Inflation for low income countries is more volatile than for high or middle income countries. The median inflation rate follows a similar path to that of middle income countries, but with a greater variance. Deflation is more common in low income countries than in high or middle income countries. Indeed, there are periods when the 25th percentile lies below zero. There is a sharp spike in inflation in the early

Figure 1: Distribution of annual overall CPI inflation

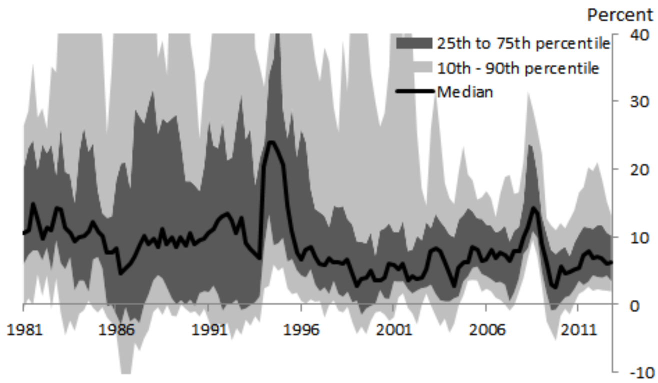
(a) High income



(b) Middle income



(c) Low income



1990s, in part reflecting the high inflation rates as former Soviet Union states transitioned from command to market economies.

3.2 Sub-indices

This section considers whether the evolution of CPI inflation noted in section 3.1 above is attributable to movements in any particular sub-index. In particular, are movements in the overall index dominated by the evolution of prices for food, housing and energy, or by the remainder of the index?

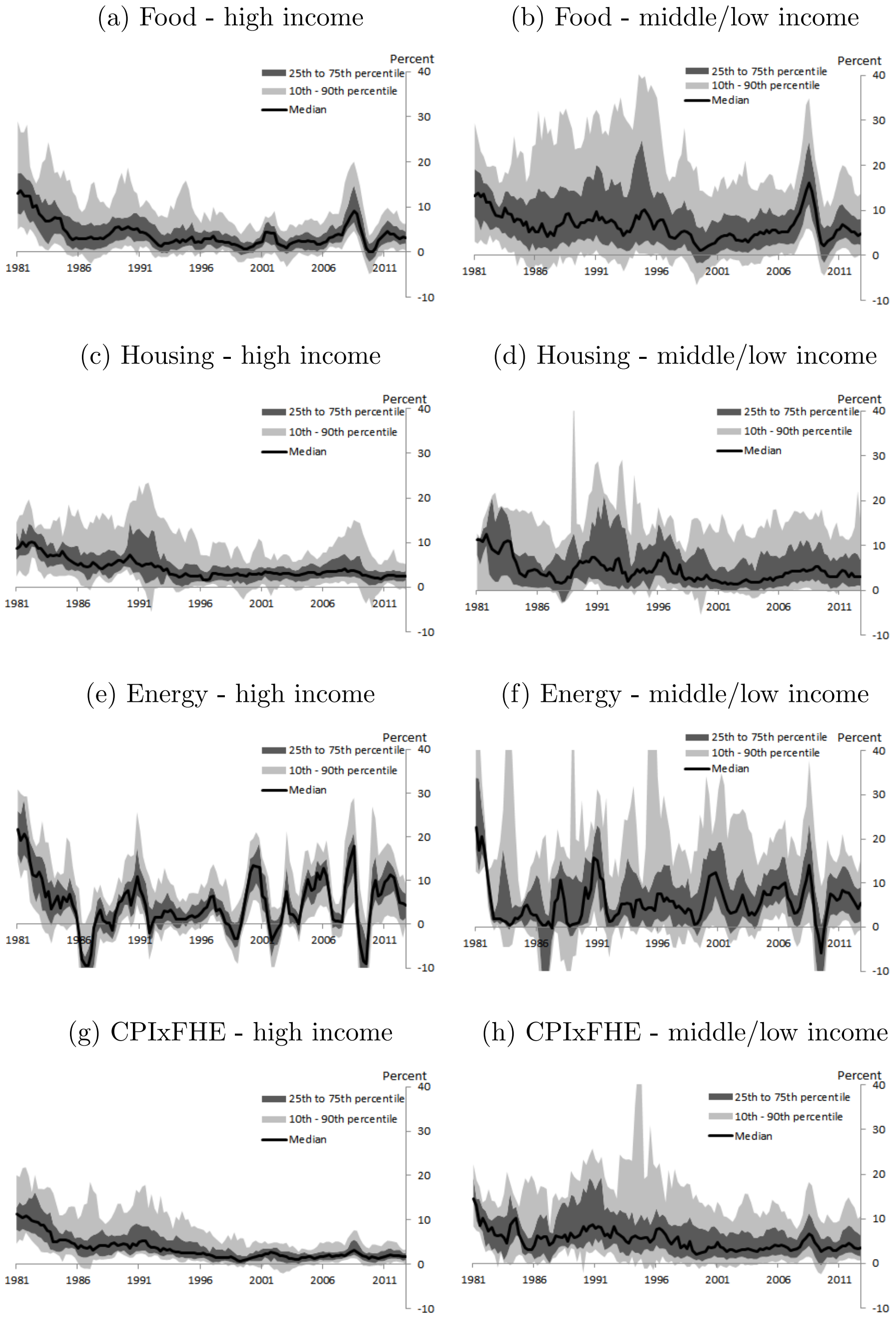
The evolution of food price inflation mirrors that for overall CPI (figure 2). For middle and low income countries this is perhaps not surprising given the weight of food in the total index (see section 3.4 below). There is a marked run-up in food price inflation worldwide immediately prior to the GFC, which quickly reversed following the collapse of Lehman Brothers in September 2008. This period is the most marked episode of volatility for high income countries, and appears to be a major contributing factor to movements in the overall index. For middle and low income countries, the food price inflation rate is higher on average, more volatile and more dispersed.

The median rate of housing inflation in high income countries displays less volatility than food-price inflation. The median housing inflation rate, and indeed the interquartile range, is not affected around the time of the GFC, in contrast to the volatility witnessed with food price inflation. It also contrasts with the widespread increase, and reversal, in house prices at that time. The housing component of the CPI is principally rents, and the lack of increase in the CPI component in line with house prices is consistent with evidence that house prices over the period became divorced from historic relationships with rents (e.g. OECD, 2012).

The energy sub-index is the most volatile of the sub-indices studied here, and also the most prone to outright price falls. There have been a number of cycles in energy prices since the early 1980s. This is most obvious in higher income countries where the distribution of inflation rates is tight relative to the volatility of the median. The outcomes are more dispersed for middle and low income countries (note there are few observations for these countries in the early part of the period).

For high income countries, the remainder of the CPI - the index excluding food, housing and energy - has been low and stable for most of the period. The outcomes across countries are similar, with very little dispersion in inflation rates. A minority of high income countries had an increase in CPIxFHE inflation immediately prior to the GFC, but in general this sub-index did not exhibit the same volatility around

Figure 2: Distribution of annual inflation of CPI sub-indices



(a) Food - high income
(b) Food - middle/low income
(c) Housing - high income
(d) Housing - middle/low income
(e) Energy - high income
(f) Energy - middle/low income
(g) CPIxFHE - high income
(h) CPIxFHE - middle/low income

the GFC that the other sub-indices did. The stability in the CPIxFHE inflation rate was less evident in middle and low income countries.

Table 1: Mean, median and standard deviation of inflation, by country type

Income	Full sample H	Full sample M/L	1980-1989 H	1980-1989 M/L	1990-2000 H	1990-2000 M/L	2001-2012 H	2001-2012 M/L
Mean								
Headline	4.9	9.9	8.0	13.5	5.0	12.2	3.0	6.8
Food	4.5	8.7	7.4	10.4	3.6	9.6	3.8	7.7
Housing	4.4	6.3	7.6	6.6	4.6	7.0	3.6	6.0
Energy	5.3	8.0	4.8	6.6	4.8	8.6	5.8	8.1
CPIxFHE	3.5	6.0	7.0	7.8	3.8	8.1	2.2	5.1
Median								
Headline	3.0	6.1	5.1	9.2	2.9	6.5	2.5	5.0
Food	3.1	5.8	5.3	8.1	2.4	5.5	3.1	5.5
Housing	3.3	3.6	6.5	5.3	3.2	3.9	3.1	3.3
Energy	4.3	5.9	4.1	2.7	3.2	5.4	5.2	6.1
CPIxFHE	2.3	4.0	5.4	6.3	2.3	5.2	1.9	3.7
Standard deviation								
Headline	7.8	13.6	11.2	16.3	8.5	16.8	3.0	7.7
Food	6.1	12.1	9.0	13.7	5.2	14.9	4.7	9.4
Housing	5.2	17.6	5.7	6.6	6.3	9.9	4.1	20.8
Energy	9.2	13.8	11.1	11.3	7.9	11.9	9.4	14.1
CPIxFHE	4.7	8.6	5.9	6.1	5.8	13.4	2.5	6.5

Note: H: high income countries; M/L: middle and low income countries.

3.3 Inflation volatility

Table 1 shows the mean, median and standard deviation of inflation for the period 1981-2012, split by country income level and by sub-index. In order to remove the influence of a small number of extreme outliers, we exclude periods of hyper-inflation from the analysis. Following Fischer et al. (2002), we define this as the quarter when the annual inflation rate exceeds 100 percent until the annual rate again drops below 100 percent.

Headline inflation averaged 4.9 percent over the whole period for high income countries. For middle and low income countries, the mean inflation rate was double that at 9.9 percent. As noted above, there was disinflation over the course of the three decades studied here, in both high income and middle/low income countries.

The energy sub-index exhibited the highest average rate of inflation, followed by food, then housing and finally the remainder of the index. Note the populations are not the same across sub-indices, so the sub-indices do not 'add up' to the headline result. In particular, there is a reporting bias, with those countries that provide separate information on housing and energy likely to be more economically developed and in general exhibit lower overall inflation.

Inflation volatility exhibits similar patterns to the mean rates. The standard deviation of inflation rates is lower for high income countries than for middle and low income countries. The standard deviation falls through the period under analysis. In terms of the sub-indices, energy is the most volatile, followed by food, then housing. Not only do the remaining items of the index have the lowest rates of inflation, they also have the lowest variance.

3.4 Expenditure weights

How households allocate expenditure has been the subject of a large literature dating back to Engel (1857). Engel's Law states that as households become richer, the share of their spending devoted to food declines: food has an income elasticity of less than 1. Research has extended to considering more categories of expenditure than just food, but in general focuses at the level of the individual household, using surveys of household expenditure. These same surveys are typically used to construct the expenditure weights in the CPI. These expenditure weights are used to combine the individual price series to form the overall index.

Despite the large literature at the household level, international comparisons of expenditure shares have been rare. Notable exceptions include Seale and Regmi (2006) who study expenditure shares for 114 countries and Kaus (2013) who studies 50 countries using UN data over the course of 50 years. These authors study a finer breakdown of expenditure weights by type than covered here, but have a markedly smaller coverage of countries. Only Anker (2011), who studies the food share of consumption, approaches the country coverage.

Comparisons between countries suffer from a number of potential problems. First, the exact nature of expenditure needs to be standardised across countries. For example, some countries include restaurants and cafés in their CPI food index. Second, transport costs, tariffs, taxes and subsidies can affect the relative price of goods and services between countries, and hence consumption shares. For example, petrol is frequently subsidised in developing countries, but taxed in advanced countries (Kojima, 2013). In some advanced countries the tax share of the price paid by consumers for petrol can exceed 40 percent. This difference is also true over time – changes in world commodity prices for oil and food can affect the relative price of these goods.

Finally, the frequency of updating expenditure weights varies between countries. Since household expenditure surveys are expensive, updating tends to be more frequent in high income economies. The longer between updates, the less likely the index represents true household spending. New expenditure surveys also allow for the incorporation of new goods and services, such as mobile phones, internet broadband providers and pet insurance. Infrequent weight updates in some countries means that there are several income observations for the same expenditure share.

Figure 3 shows international Engel curves for food, housing, energy, and the remaining items of consumer spending. These curves match the share of expenditure on these items, as measured by their weight in the CPI, against the average per capita income of the country. As noted above in section 2.1, every effort has been made to put the series on as consistent a basis as possible. The scatterplots show the respective weights only when updated, to avoid the aforementioned problem with income changing over the period between updates. Scatterplots using just the 2010 Q4 data (see figure 7 in the appendix) yield qualitatively similar results to the entire sample, suggesting that shifts in relative prices are of secondary importance to shifts in income.

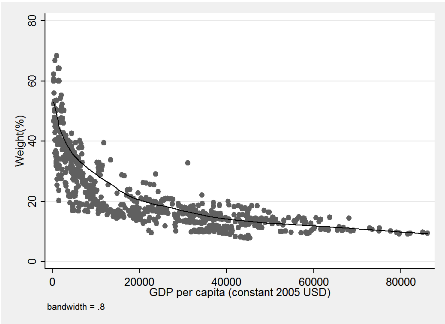
The Engel curves are fitted in a non-parametric fashion, using locally weighted scatterplot smoothing (LOWESS, Cleveland, 1979). LOWESS is a local linear estimator using the tricube kernel function to calculate sufficiently smooth weights for neighbouring observations.

For food, there is a clear negative slope to the cross-country Engel curve; the relationship between income and the expenditure share of food across countries replicates that observed at the household level. For the most part the Engel curve for energy is downward sloping – a 'necessity' in the parlance of the literature. For the poorest countries, the Engel curve for energy is upward sloping, suggesting that these countries are income constrained and consuming less energy than desired.

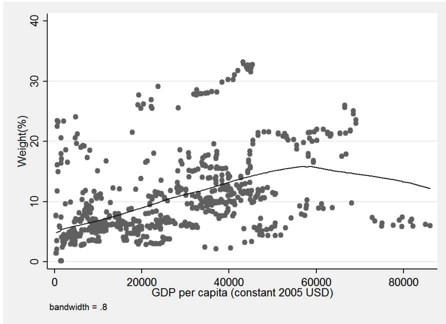
The Engel curve for housing is upward sloping, implying that housing is a 'luxury'. While shelter is a basic necessity, countries with higher incomes can devote a greater share of income on larger, and better quality housing. The remaining items of consumer spending also have an upward sloping Engel curve. The results here are qualitatively similar to the results found by Kaus (2013) for a much smaller sample of countries.

Figure 3: Engel curves for CPI components, updated weights

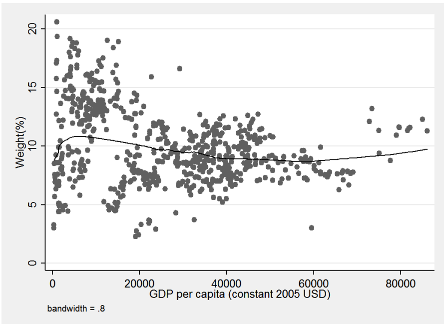
(a) Food



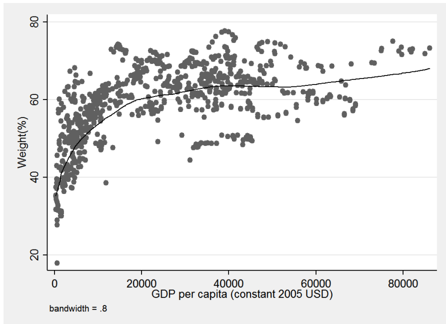
(b) Housing



(c) Energy



(d) CPIxFHE



4 Measures of global inflation

This section uses the data described above to consider the extent to which national inflation rates can be explained by measures of global inflation.

4.1 Headline

Like Ciccarelli and Mojon (2010), we consider three estimates of global headline inflation:

1. The median country-level inflation rate.
2. The average country-level inflation rate, weighted by GDP, and
3. A measure based on principal components analysis.

The median inflation rate is calculated separately for each quarter from 1981Q1 to 2012Q4. It uses all available national headline inflation rates for each quarter, so the sample changes over time. The GDP-weighted average inflation rate weights together available headline inflation rates for each quarter by real GDP (in 2005 US dollars) from the World Bank's *World Development Indicators*. Since the raw calculated series is heavily influenced by a small number of countries experiencing hyperinflation, the series used here excludes countries in quarters where their headline inflation exceeds 100 percent. Such episodes are rare, and account for less than 2 percent of the total.

The third measure is based on a static principal component approach (See Stock and Watson, 2002). This approach models the $nx1$ vector of national inflation rates, Π_t, as being comprised of two parts:

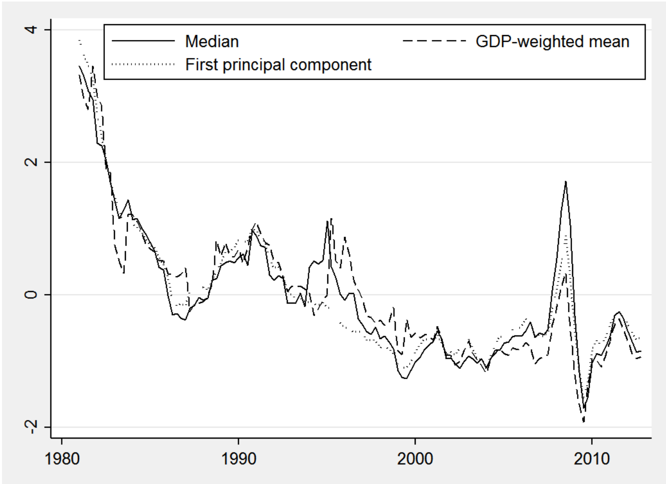
$$\underset{n\times 1}{\Pi_t} = \underset{n\times 1}{\Lambda} \underset{i\times 1}{f_t} + \underset{n\times 1}{\epsilon_t} \tag{1}$$

where the first part is the effect of the common, global factor f_t. Λ is the loading – the extent to which each country's inflation rate reacts to the global factor. The second term, ϵ_t, is the idiosyncratic component, representing the shocks to inflation that are domestic in nature. f_t and ϵ_t are assumed to be orthogonal, and ϵ_t is assumed to be normally distributed. The estimation of the static factors requires a balanced panel, so the inflation rates of the 104 countries for which there are observations of annual inflation in every quarter are used. These inflation rates are then de-meaned and standardised to have unit variance before the factors are estimated. The first principal component – the factor that explains the greatest share of the total variance – is taken as the measure of global inflation.

Figure 4 shows these three measures of global inflation. All three measures display the main features of inflation through the period – the disinflation through the 1980s and 1990s, the relatively low and stable inflation of the early 2000s and the sharp volatility around the time of the GFC. Overall, the three measures track reasonably closely through time, with the exception of the mid 1990s. This may be a function of the different samples, since a number of countries enter the sample over that period (notably the transition economies of Eastern Europe) that are picked up in the median and weighted mean series, but not the principal component measure.

Table 2 shows the share of the variance of national inflation that is explained by each of the three measures of global inflation. Countries are divided into four groups by income levels. First, we split out advanced countries – those high income countries that have been members of the OECD since the 1970s. This is essentially the group of countries considered in the analysis by Ciccarelli and Mojon (2010), so the results here can be easily compared to that previous research. The second

Figure 4: Measures of global inflation



Note: The median and GDP-weighted measures have been de-meaned and standardised for the figure.

group are the remaining countries classified as 'high income' by the World Bank. The final two categories are those countries classified by the World Bank as middle and low income. The variance shares are calculated by obtaining the R^2 from a regression of each national inflation rate on the global inflation measure and a constant.[6]

The share of inflation variance of advanced countries explained by global factors over the full sample is high – around two thirds, and in line with the findings of Ciccarelli and Mojon (2010). When each sub-period is considered the overall share explained by global factors declines somewhat. In part the difference between the full-sample results and the sub samples could be explained by the general trend in inflation, particularly during the 1980s. The low frequency movement in the full sample will tend to increase the overall amount of national inflation variance explained. Ferroni and Mojon (2014) also find somewhat lower results when considering the sub-samples.

The finding that global inflation accounts for a large share of the variance of national inflation rates do not extend to a wider range of countries. The three measures of global inflation explain a much smaller share of the variance of inflation rates of other countries – on average around a third of the variance of other high

[6]For those countries whose inflation rates are used to calculate the principal component measure, the method used here is equivalent to the $\lambda_i^2 var(f_t)/var(\pi_{it})$ more typically used for principal components. This latter method cannot be used since the factor loadings, λ_i do not exist for those countries not used in the calculation of the principal component measure.

Table 2: Share of inflation variance explained by measures of global inflation (percent)

	Mean variance explained				Median
	Full sample	1980-89	1990-2000	2001-2012	Full sample
Median					
Advanced	60.3	68.7	34.6	32.5	62.1
Other high income	32.7	54.0	31.5	37.6	31.9
Medium income	20.4	23.0	28.1	31.5	17.9
Low income	15.4	23.7	18.0	25.2	11.1
Weighted mean					
Advanced	59.4	61.0	34.0	48.0	64.6
Other high income	30.4	45.8	23.1	30.2	24.4
Medium income	19.7	20.1	23.6	23.9	16.1
Low income	12.5	20.1	12.7	18.3	6.0
Principal components					
Advanced	68.5	67.4	56.7	38.3	71.4
Other high income	34.1	55.4	39.0	37.2	26.9
Medium income	19.9	23.2	30.7	30.4	14.7
Low income	13.0	22.3	16.6	25.1	7.9

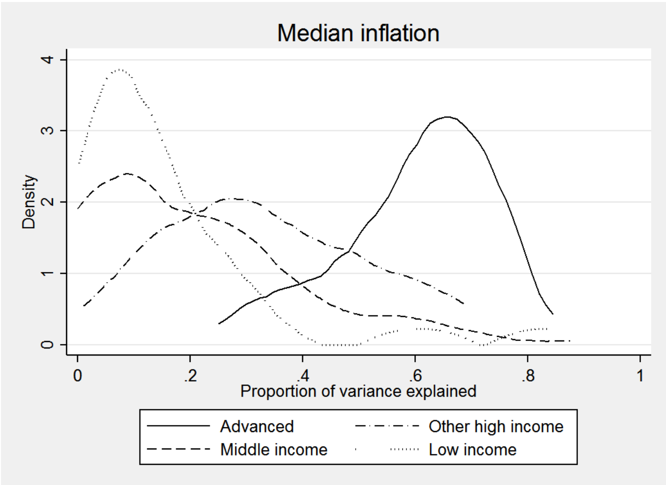
income countries, a fifth of the variance of middle income countries and slightly more than a tenth of the variance of low income countries.

The divergence between country groups of the share of variance of national inflation rate explained by the median global inflation measure is shown clearly in figure 5, which shows the kernel densities of the distribution by country type. There is a clear negative correlation between income and share of inflation variance explained by the global factors. The kernel densities by country type for the mean and principal components measures (not reported here) are broadly similar.

4.2 Sub-components

As shown in section 3.4 above, the weights of the sub-indices vary markedly between countries, so differences in the proportion of domestic inflation variance explained by global factor might simply be a function of differing consumption baskets. To test that hypothesis, we investigate the relationship between global factors and the individual sub-indices. analogous to the method used above for headline CPI, we calculate the median global inflation rate for food, housing, energy and CPIxFHE. We then regress the national inflation rates for these sub-indices on

Figure 5: Kernel density of share of variance explained by median global inflation measure



their respective global counterparts to estimate the proportion of national variance that can be explained by the global factor.

Figure 6 shows the kernel densities for the proportion of national inflation explained by global factors, split by country type and sub-component. Global factors appear to explain a greater proportion of inflation variance for advanced countries than for less developed countries for all sub-components. This demonstrates that the greater share of headline inflation variance explained by global factors for these countries is not just an artifact of the composition of the index.

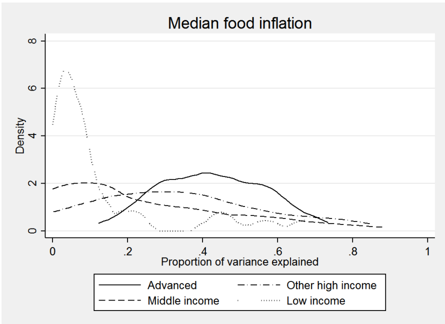
In terms of sub-components, the variance of national energy price inflation is the most explained by the global median. For advanced countries variance in food and CPIxFHE inflation is also explained in large part by global factors. Conversely, global factors do not appear to explain a large proportion of housing price inflation for any country group. It appears therefore that the divergence between countries of the influence of global factors is not solely a function of index composition and the differing consumption patterns that underlie that composition.

4.3 Country characteristics

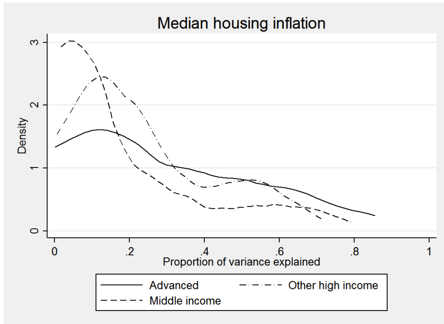
What explains the divergence in the proportion of national inflation variance explained by global inflation? As shown in section 4.2, differing consumption patterns are not the principal cause. There are a number of additional country characteristics that could potentially explain a greater or lesser influence of global factors

Figure 6: Kernel density of share of variance explained by global median inflation, by subcomponent

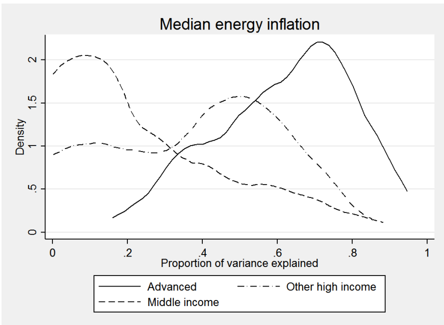
(a) Food



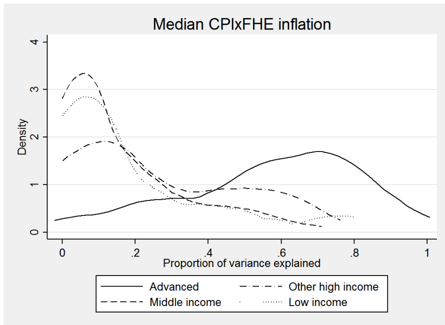
(b) Housing



(c) Energy



(d) CPIxFHE



on domestic inflation. We consider nine such factors in this section, extending the work of Neely and Rapach (2011).

The nine characteristics considered here are (1) the average headline inflation rate (2) inflation volatility as measured by the standard deviation (3) average real GDP per capita (4) trade openness, as measured by the trade share of GDP from the World Bank *World Development Indicators* (5) average government share of GDP from the World Bank *World Development Indicators* (6) financial development, measured by the domestic credit provided by financial sector as a share of GDP from the World Bank *World Development Indicators*[7] (7) the Chinn and Ito (2006) index of capital account openness (8) the Ilzetzki et al. (2009) measure of de facto exchange rate regime (where higher numbers mean a more flexible exchange rate) (9) The average Dincer and Eichengreen (2014) central bank transparency index (where higher numbers mean a more transparent central bank). There is a close

[7]The liquid liabilities measure used by Neely and Rapach (2011) gives similar results, but is available for far fewer countries.

correlation between transparency and independence of central banks, so we use transparency here since this index is available for a larger sample of central banks.

In a similar fashion to Neely and Rapach (2011) we regress the proportion of each country's national inflation rate explained by global median inflation on each of the characteristics in turn using a bivariate regression, then on all nine characteristics. The model of the bivariate regression is:

$$G_i = \alpha + \beta_j Z_{j,i} + e_i \tag{2}$$

where G_i is the proportion of the inflation variance of country i (i = 1,2,...,223) explained by the global median, and $Z_{j,i}$ is the average value for characteristic j (j = 1,2,...,9) in country i for the period where inflation data is available for country i. The multivariate regression is given by:

$$G_i = \alpha + \sum_{j=1}^{9} \beta_j Z_{j,i} + e_i \tag{3}$$

We estimate equations 2 and 3 using ordinary least squares and White (1980) heteroskedasticity-consistent standard errors. The explanatory variables studied here vary both cross-sectionally and over time. Given that for each country we only have one observation for G_i, we are only able to use the average of each explanatory variable over the period for which inflation data exist. Unfortunately, this does not allow for consideration of the time-varying component. That said, time variation is of second order of importance compared with the cross-sectional variation; the average variance over time for each country for each variable is markedly smaller than the variance of country averages. The results of the bivariate and multivariate regressions are presented in table 3.

For the bivariate equations, average inflation and inflation volatility are negatively related to G_i and significant at the 1 percent level. This means that global factors explain less of national inflation variance in countries with higher average inflation, or greater volatility of inflation. GDP per capita, financial development, capital account openness and central bank transparency are positively related to G_i and again significant at the 1 percent level. The more freely floating the country's exchange rate, the smaller the influence of global inflation on domestic inflation. There is some evidence that increased trade openness increases the influence of global factors on domestic inflation, but this effect appears small (increasing trade openness by 50 percent of GDP increases the share of inflation explained by global factors by 3 percentage points), and is only significant at the 10 percent level. The size of government appears to have no impact on G_i.

Table 3: Cross-sectional regression results for country characteristics that explain link between national and global inflation

	Bivariate regressions				Multivariate regressions			
Country characteristic	Slope	t-stat	N	$\overline{R}^2$	Slope	t-stat	N	$\overline{R}^2$
Average inflation	-0.0003	-2.71^{***}	222	0.03	0.0001	0.07	127	0.53
Inflation volatility	-0.0001	-2.84^{***}	222	0.02	-0.0002	-0.83		
GDP per capita	0.0732	9.07^{***}	199	0.27	0.0394	2.50^{**}		
Trade openness	0.0006	1.85^{*}	190	0.01	-0.0000	-0.13		
Government size	0.0025	1.04	187	0.00	-0.0034	-1.03		
Financial development	0.0027	8.28^{***}	182	0.28	0.0014	3.90^{***}		
Capital acct. openness	0.0653	5.46^{***}	175	0.22	-0.0070	-0.55		
De facto exchange rate	-0.0543	-3.32^{***}	184	0.28	-0.0463	-2.22^{**}		
CB transparency	0.0387	7.51^{***}	138	0.28	0.0213	3.49^{***}		

Note: F-statistic, testing a null hypothesis that the slope coefficients for the multivariate regression are jointly zero is 35.29***. t-stats and F-stat calculated based on the White (1980) heteroskedasticity-consistent standard errors and covariance matrix respectively. *, **, *** denote significance at the 10%, 5% and 1% levels respectively.

When the country characteristics are jointly considered in the multivariate model, only GDP per capita, financial development, the de facto exchange rate regime and central bank transparency remain significant. Higher income, and greater availability of credit enables such economies to reduce the impact of domestic shocks. Similarly, a flexible exchange rate insulates domestic prices from shifts in global inflation. Better monetary policy, as indicated by higher transparency, also reduces the idiosyncratic part of national inflation variation. With the idiosyncratic component reduced, the influence of global factors on national inflation becomes relatively greater.

4.4 A dynamic hierarchical factor model for global inflation

The disadvantage of the measures used in section 4.1 is that they treat all components of the CPI in equivalent fashion. Yet global shocks can have differing effects on sub-components. For example the greater integration of China into the global economy has depressed the prices of manufactured goods and at the same time put upwards pressure on commodity prices. Increased global liquidity over the 2000s put upward pressure on housing, food and energy prices, pressure which abated dramatically following the crisis in 2008/2009. To take into account these potential differences in spillovers, we use an alternative modelling strategy for global inflation, by using the dynamic hierarchical factor model developed by Moench et al. (2013). As noted above, this has been used by Förster and Tillmann (2014) for a group of 40, mostly high income, countries. We extend their analysis by including a much larger sample of countries, and by examining the housing sub-component of the CPI.

4.4.1 Model

The model has a hierarchical structure of order four. Specifically, at time t, let F_t denote the global factor that captures movements in inflation common to all sub-indices and all countries. G_{bt} are the factors that capture variations in sub-indices, indexed by b and H_{bst} are the factors that capture the variations in country group s in the CPI sub-index block b. The structure of the model is give by:

$$Z_{bsnt} = \Lambda_{Zbsn} H_{bst} + u_{Zbsnt} \tag{4}$$

$$H_{bst} = \Lambda_{Hbs} G_{bt} + u_{Hbst} \tag{5}$$

$$G_{bt} = \Lambda_{Gb} F_t + u_{Gbt} \tag{6}$$

where Z_{bsnt} represents an observation for country n in country group (sub-block) s of the CPI sub-index (block) b at period t. Λ_{Zbsn}, Λ_{Hbs} and Λ_{Gb} are constant factor loadings. One useful feature of this model is that the total number of time series, N_{bs} can differ between blocks b and sub-blocks s, allowing for different coverage of sub-indices by country group. The global factor is dynamic and assumed to follow an autoregressive process of order one:

$$F_t = \rho_F F_{t-1} + \epsilon_{Ft} \tag{7}$$

We make the following assumptions to match persistence in the data:

$$u_{Zbsnt} = \rho_{Zbsn} u_{Zbsn(t-1)} + \epsilon_{Zbsnt} \tag{8}$$

$$u_{Hbst} = \rho_{Hbs} u_{Hbs(t-1)} + \epsilon_{Hbst} \tag{9}$$

$$u_{Gbt} = \rho_{Gb} u_{Gb(t-1)} + \epsilon_{Gbt} \tag{10}$$

with $\epsilon_{jt} \sim N(0, \sigma_j)$ for $j = Zbsn$, Hbs, Gb, F. All residuals ϵ_{jt} are uncorrelated across j and t. For identification purposes,the first entries of Λ_{Zbsn}, Λ_{Hbs} and Λ_{Gb} are set equal to 1, and the variances σ^2_{Hbs}, σ^2_{Gb}, σ^2_F to 0.1.

Since the hierarchical nature of the model imposes vertical dependency of the factors, along with the time-varying intercepts from equations 8 to 10, the model is estimated using Markov Chain Monte Carlo methods and the Kalman filter. In brief, each factor is first drawn conditional on the other factors and parameters. Then the factor loadings, autoregressive parameters and sub-block level variances σ^2_{Zbsn} are drawn conditional on the factors estimated in the first step.[8] After the first 50,000 draws are discarded as burn-in, a further 50,000 draws are carried out, storing every fiftieth draw. The 1,000 stored draws are used to calculate the posterior means shown below.

We choose the following ordering for the estimation: the first block is CPI excluding food, housing and energy, the second block is CPI housing followed by CPI energy with the final block being CPI food. For the sub-blocks, the countries are grouped by income, rather than the grouping by geographical region that is use by e.g. Neely and Rapach (2011). We believe that commonalities associated with income and macroeconomic institutions are likely to be stronger than those associated with geographic location, a belief reinforced by the findings in section 4.3. Consider Australia and New Zealand: these two countries are small, open advanced economies whose monetary policy has been based on inflation targeting for the period in question. These characteristics are common with many other geographically distant high income countries - Canada, Sweden, Norway, the United Kingdom to name but a few. Neighbouring countries to Australia and New Zealand in Oceania, such as Fiji, Samoa and Tonga, are small island developing states with markedly different economic characteristics. The sub-blocks are ordered by high income countries first and medium income countries second. For the CPIxFHE and CPIF blocks there are sufficient observations to have sub-blocks for low income countries. To maximise the sample, the analysis is run on annual inflation starting in 2001Q1 and ending in 2012Q4.

The factor model set out above assumes that the underlying data series are stationary. There are a large number of studies on the stationarity of inflation rates, with the evidence inconclusive. Several authors finding inflation to exhibit some form of non-stationarity (e.g. King et al., 1991; Baba et al., 1992; Johansen, 1992), while others argue that inflation is stationary (e.g. Rose, 1988; Culver and Papell, 1997). We first test for stationarity of the series using an Augmented Dickey-Fuller (ADF) test, using both one and two lags (table 4). For CPI excluding food, housing and energy, we find significant evidence to reject the null of non-stationarity for around half the countries at the 5 percent significance level using two lags. The results for housing are similar. We find significant evidence to reject the null of non-stationarity of energy prices for all but one country, and also reject the null

[8]Moench et al. (2013) set out in full detail the MCMC approach and the use of the filter. The estimation of the model here is made with the help of the MATLAB code available on Serena Ng's website.

Table 4: Tests for stationarity

	ex Food, housing & energy	Housing	Energy	Food
No. of countries	96	62	63	148
ADF(1) 1%	9	2	3	9
ADF(1) 5%	24	7	22	19
ADF(2) 1%	29	5	51	62
ADF(2) 5%	53	24	62	114
LLC	-18.50^{**}	-10.33^{**}	-24.01^{**}	-27.70^{**}
CIPS	-2.43^{**}	-2.10	-2.73^{**}	-2.79^{**}

Notes: ADF(1) is an Augmented Dickey-Fuller test with one lagged coefficient, ADF(2) has two lagged coefficients. Numbers reported for the ADF tests are the number of countries which reject the null of non-stationarity at respectively the 1 percent and 5 percent levels of significance. LLC is the Levin et al. (2002) test for panel stationarity, CIPS is the panel unit root test of Pesaran (2007) that accounts for cross-sectional dependence. For both LLC and CIPS the null hypothesis is that all panels are non-stationary. *, ** denote significance at 5 and 1 percent level respectively.

for a large proportion of food price series.

ADF tests have low power, and struggle to reject the null hypothesis when roots are stationary, but close to unity. This is particularly the case in short time samples such as the one used here. Given this lack of power for the ADF test, we adopt two panel methods for testing for stationarity. The first is the LLC test (Levin et al., 2002) for panel stationarity. The LLC test is less commonly used in the literature because it requires a balanced panel and has the restrictive hypotheses that each panel (i.e. country) is non-stationary versus the alternative that all are stationary. LLC recommend using the test for panels of n between 10 and 250 and T between 25 and 250, which range covers the data here. The LLC test is significant at the 1 percent level for all series used here.

The second panel unit root test used here is the CIPS test of Pesaran (2007). If there is cross-sectional dependence between countries, then the LLC test is not properly specified, exhibits downward bias and lacks power. The CIPS test explicitly accounts for cross-sectional dependence. For three of the series considered here, the CIPS test rejects the null of non-stationarity at the 1 percent level of significance. The test statistic for CPI housing inflation lies just outside the 5 percent significance level of -2.12. Given the low power of the ADF tests, and the clear results from the panel unit root tests it is reasonable to assume that the

Table 5: Decomposition of variance from dynamic hierarchical factor model (percent)

Block	Subblock	N	Global	CPI subindex	Country group	Idiosyncratic
CPIxFHE	High	48	2.1	1.4	1.1	95.5
CPIxFHE	Middle	38	5.7	3.6	1.5	89.1
CPIxFHE	Low	10	5.1	3.2	2.7	89.0
CPIH	High	44	0.8	1.7	0.7	96.7
CPIH	Middle	18	0.0	0.1	9.9	90.0
CPIE	High	45	16.4	18.6	19.1	46.0
CPIE	Middle	18	7.1	8.0	2.7	82.3
CPIF	High	59	7.5	11.1	11.9	69.5
CPIF	Middle	68	9.0	13.3	1.0	76.7
CPIF	Low	21	3.2	4.7	9.6	82.4

Note: CPIxFHE: CPI excluding food, housing and energy prices; CPIH: CPI housing; CPIE: CPI Energy; CPIF: CPI food.

inflation rates in the panel are stationary and that the DHFM is appropriate.

4.4.2 Results

Table 5 reports the proportion of the variance of each sub-block explained by the different hierarchical levels of the model. The first observation is that the idiosyncratic component accounts for the majority of the variance in each sub-block, with the sole exception of high income countries' CPI energy. For these countries, global factors explain just over half of the variance, split between the global factor (16.4 percent), the energy sub-index (18.6 percent) and the high income countries' energy price factor (19.1 percent). For middle income countries, the idiosyncratic component of CPI energy explains a much larger (82.3 percent) share of total variance. The difference in the share of variance explained by common factors may arise because of differences in regulation. Regulated fixed prices and subsidies for fuel are relatively common in emerging and developing countries (Kojima, 2013), but less so in advanced countries.

Common factors also account for a relatively large share of the variance of food price inflation – around a third for high income countries and around a quarter for middle income countries. For both these groups of countries, the food sub-index factor accounts for at least 10 percent of the total variance. Yet even over a period marked by large volatility in world food commodity prices, the idiosyncratic components explained the majority of the variance. As with energy, the common factors for food explained a greater share of the variance for high income countries than for relatively poorer countries. This may be a result of higher food import shares for richer countries, and the existence of food price regulation in some countries.

For housing and for CPIxFHE, the common factors explain little of the variance. For high income countries the common factors explain 3.3 percent of the variance of CPI housing and 4.5 percent of the variance of CPIxFHE. For middle and low income countries, the proportion explained by common factors is in the order of 10 percent.

5 Conclusion

This paper sets out the construction of a comprehensive dataset of consumer prices for 223 countries and territories for the period 1980-2012. The dataset includes, where publicly available, the sub-indices for food, housing and energy, together with their respective weights in the overall index. Comparable international datasets for these sub-indices are rare, and almost exclusively confined to advanced economies. As a consequence, research on global inflation, and in particular its sub-components, has typically been confined to a small number of relatively rich countries.

There are a number of stylised facts on the cross-section and time-series properties of inflation provided by the dataset. Global inflation fell through the early part of the period studied, particularly in high income countries, and was relatively stable until the period around the recent global financial crisis. This recent volatility was mostly attributable to food and energy prices. Food and energy prices are the most volatile sub-indices, and also exhibit the highest average inflation over the past three decades. Inflation in consumer prices excluding food, housing and energy is comparatively low and stable. The share of food in total expenditure falls as income rises; the share of housing increases.

Using this dataset we extend the literature on the role of global inflation factors on national inflation rates to a larger, and more diverse, group of countries. We confirm the findings of Ciccarelli and Mojon (2010) that global factors can explain around 70 percent of the variance of advanced economies' inflation. However, we find that this conclusion does not hold true for a more diverse group of countries than that originally considered. The amount of national inflation variance explained by global factors declines markedly for lower income countries.

The extent that national inflation variance can be explained by global factors does not appear to be solely a function of the composition of the index. Global factors can explain a greater share of the variance of the sub-indices for food, energy, and CPI excluding food, housing and energy in higher income countries than in middle and low-income countries. Using an alternative approach of the dynamic hierarchical factor model of Moench et al. (2013) we show that common factors are important for explaining energy and, to a lesser extent, food prices.

There are a number of country characteristics that explain a greater apparent influence of global factors. In particular, higher GDP per capita, greater financial development and greater central bank transparency are associated with a greater share of national inflation variance explained by global factors. This suggests that advanced countries are more successful at eliminating domestic sources of inflation variation, resulting in a greater proportionate role for global factors.

Ciccarelli and Mojon (2010) conclude their paper with a view that inflation should be modelled, to some extent, as a global rather than a local phenomenon. We agree that common global elements exist, notably in energy and food prices, but conversely argue that such considerations are important only once domestic sources of inflation instability are contained.

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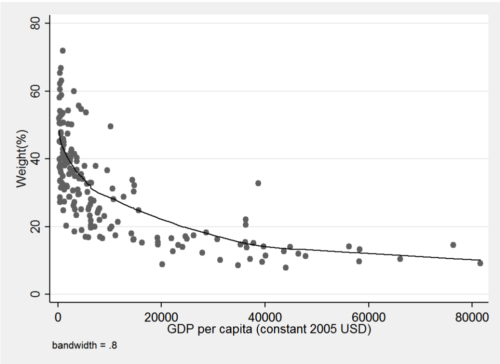
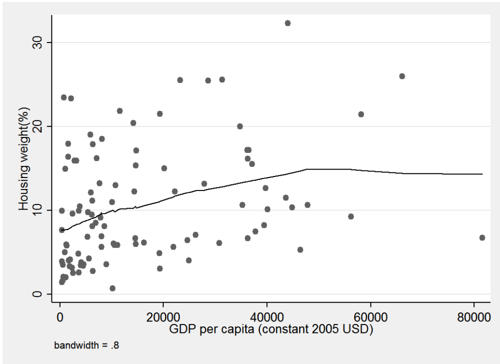
A Appendix - additional figures

Figure 7: Engel curves for CPI components, 2010Q4 weights weights

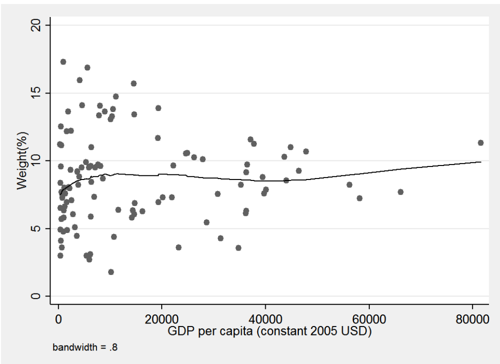
(a) Food



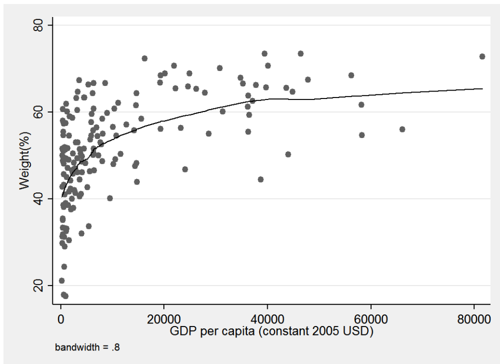
(b) Housing



(c) Energy



(d) CPIxFHE



B Appendix- CPI data coverage

The author gratefully acknowledges the assistance provided by the relevant national (*) central bank and (†) statistical agency. Indices: CPI: headline, CPIF: CPI food, CPIH: CPI housing, CPIE: CPI energy, CPIHE: CPI housing and energy, CPIxFE: CPI excluding food and energy, CPIxFHE: CPI excluding food, housing and energy.

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
Afghanistan	04Q2						
Albania	93Q1	01Q1			01Q1		01Q1
Algeria	80Q1	90Q1			02Q1		02Q1
Amer. Samoa	83Q1	83Q1			99Q1		99Q1
Andorra	98Q1	98Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Angola	98Q1	00Q1					
Anguilla	98Q1	00Q4	00Q4	00Q4	00Q4	00Q4	00Q4
Antigua & Barb.	94Q1	94Q1	0Q4	00Q4	00Q4	00Q4	00Q4
Argentina	80Q1	93Q1			93Q1		93Q1
Armenia *	95Q1	95Q1		98Q1		06Q1	
Aruba	84Q1	84Q1	01Q1	01Q1	01Q1	01Q1	01Q1
Australia	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Austria†	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	96Q1
Azerbaijan	91Q1	98Q1					
Bahamas	80Q1	86Q1					
Bahrain	80Q1	85Q3			07Q3		
Bangladesh	93Q3	93Q3			08Q1		08Q1
Barbados*	80Q1	85Q1	85Q1	85Q1	85Q1	85Q1	85Q1
Belarus*	91Q1	02Q1					
Belgium	80Q1	80Q1	80Q1	80Q1	84Q1	80Q1	80Q1
Belize*	83Q1	85Q1			90Q4		90Q4
Benin	92Q1	97Q1		03Q1	97Q1	98Q1	97Q1
Bermuda	82Q1	82Q1					
Bhutan	03Q2	03Q2					
Bolivia	80Q1	88Q1	88Q1	88Q1	88Q1	88Q1	88Q1
Bonaire	96Q2	96Q2			96Q2		96Q2
Bosnia Herz.	05Q1	05Q1			05Q1		05Q1

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
Botswana	80Q1	80Q4			04Q3		04Q3
Brazil	80Q1	94Q4			94Q4		94Q4
Br. Virgin Is.	85Q1	85Q1					
Brunei	83Q1	83Q1	06Q1	06Q1	06Q1	06Q1	06Q1
Bulgaria	91Q1	98Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Burkina Faso	80Q1	82Q4		03Q1	97Q1	00Q1	97Q1
Burundi†	80Q1	09Q1			09Q1		09Q1
Cambodia	94Q4	00Q1			00Q1		00Q1
Cameroon	80Q1	94Q1			94Q1		94Q1
Canada*	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Cape Verde	92Q1	05Q4					
Cayman Is.	80Q1	84Q3			08Q2		08Q2
Central Afr. Rep.	81Q1	81Q1			06Q1		06Q1
Chad	82Q4	88Q1			06Q1	95Q1	06Q1
Chile	80Q1	80Q1	89Q1	89Q1	89Q1	80Q1	89Q1
China	84Q1	93Q1			01Q1	93Q1	01Q1
Colombia	80Q1	88Q1			88Q1	99Q1	88Q1
Comoros	90Q1	92Q1	92Q1	92Q1	92Q1	92Q1	92Q1
Congo (Brazz.)	80Q1	80Q1			90Q1		90Q1
Congo, DR	80Q1						
Cook Is.	80Q1	80Q1	06Q1	06Q1	06Q1	06Q1	06Q1
Costa Rica	80Q1	95Q1	95Q1	95Q1	95Q1	95Q1	95Q1
Cote dIvoire	80Q1	97Q1		03Q1	97Q1	97Q1	97Q1
Croatia†	94Q1	94Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Cuba	00Q1	00Q1					
Curaçao	80Q1	90Q4			96Q1		96Q1
Cyprus	80Q1	96Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Czech Republic	93Q1	00Q1	00Q1	00Q1	00Q1	00Q1	00Q1
Denmark†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Djibouti	99Q3	99Q3			99Q3		99Q3
Dominica	80Q1	85Q1	00Q1	00Q1	00Q1	00Q1	00Q1
Dominican Rep.	80Q1	91Q1			91Q1	91Q1	91Q1
Ecuador	80Q1	81Q1			97Q1		97Q1
Egypt	80Q1	95Q1			03Q2	04Q1	03Q2
El Salvador	80Q1	80Q1			93Q1		93Q1
Eq. Guinea	85Q1						
Estonia	96Q1	96Q1	98Q1	98Q1	96Q1	98Q1	98Q1
Ethiopia	80Q1	80Q1					
Falkland Is.	82Q1	82Q1					
Faroe Is.	83Q1	83Q1	83Q1	83Q1	83Q1	83Q1	83Q1

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
FS Micronesia	00Q2	00Q2	00Q2	00Q2	00Q2	00Q2	00Q2
Fiji*†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Finland	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
France	96Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
French Guiana	80Q1	80Q1	98Q1	98Q1	98Q1	98Q1	98Q1
French Polynesia	80Q1	81Q1	81Q1	81Q1	81Q1	81Q1	81Q1
Gabon	80Q1	90Q3			90Q3		90Q3
Gambia	80Q1	80Q1					
Georgia†	97Q1	97Q1	04Q1	04Q1	00Q1	04Q1	00Q1
Germany	80Q1	80Q1	91Q1	80Q1	80Q1	80Q1	80Q1
Ghana*	80Q1	84Q1			97Q4		97Q4
Gibraltar	80Q1	80Q1			80Q1		80Q1
Greece	80Q1	80Q1	96Q1	89Q1	80Q1	89Q1	80Q1
Grenada	80Q1	01Q1			01Q1		01Q1
Guadeloupe	80Q1	80Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Guam	80Q1	80Q1	96Q3	96Q3	86Q2	96Q3	86Q2
Guatemala	80Q1	90Q1			01Q1	95Q1	01Q1
Guernsey	80Q1						
Guinea	87Q1	87Q1			03Q1	03Q1	03Q1
Guinea Bissau	86Q1	86Q1		03Q1	97Q1	03Q1	97Q1
Guyana	94Q1	94Q1			01Q1		01Q1
Haiti	80Q1	81Q1			99Q1		99Q1
Honduras	80Q1	80Q1			00Q1	00Q2	00Q1
Hong Kong	80Q4	82Q1	82Q1	82Q1	82Q1	82Q1	82Q1
Hungary†	80Q1	92Q1	01Q1	92Q1	01Q1	92Q1	01Q1
Iceland	80Q1	80Q1	96Q1	93Q1	93Q1	93Q1	93Q1
India	80Q1	80Q1	95Q1	95Q1	95Q1	95Q1	95Q1
Indonesia	80Q1	80Q1	99Q2	99Q2	96Q1	91Q1	96Q1
Ireland	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
Iran	80Q1	82Q1			06Q2		06Q2
Iraq	04Q1	04Q1	04Q1	09Q1	04Q1	04Q1	04Q1
Isle of Man†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Israel	80Q1	86Q1	86Q1	86Q1	86Q1	86Q1	86Q1
Italy	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
Jamaica	80Q1	80Q1	00Q1	00Q1	00Q1	00Q1	00Q1
Japan*	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Jersey	89Q1	00Q2	83Q1	83Q1	83Q1	83Q1	83Q1
Jordan	80Q1	80Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Kazakhstan	94Q1	97Q4			08Q1	03Q1	08Q1
Kenya*	80Q1	80Q1	80Q1	90Q1	90Q1	90Q1	90Q1

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
Kiribati	83Q1	88Q1	00Q1	00Q1	00Q1	00Q1	00Q1
Kosovo	02Q3	02Q3			02Q3		02Q3
Korea	85Q1	81Q1	85Q1	85Q1	85Q1	80Q1	85Q1
Kuwait	80Q1	01Q1	01Q1	01Q1	01Q1	01Q1	01Q1
Kyrgyzstan	95Q1	03Q1	03Q1	03Q1	03Q1	03Q1	03Q1
Lao PDR	93Q2	00Q1					
Latvia	92Q1	96Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Lebanon	00Q1	08Q1	08Q1	08Q1	08Q1	08Q1	08Q1
Lesotho	80Q1	84Q1			02Q1		02Q1
Liberia	01Q1	06Q1			06Q1		06Q1
Libya	01Q1	04Q1			04Q1		04Q1
Lithuania	92Q2	96Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Luxembourg	80Q1	80Q1	96Q1	80Q1	96Q1	80Q1	96Q1
Macau	88Q1	89Q1			01Q1		v
Macedonia	96Q1	96Q1	05Q1	05Q1	05Q1	05Q1	05Q1
Madagascar	80Q1	80Q1		01Q1	01Q1		01Q1
Malawi	80Q1	91Q1			01Q1		01Q1
Malaysia	80Q1	80Q1	05Q1	05Q1	84Q1	94Q1	84Q1
Maldives	85Q1	85Q1			85Q1		85Q1
Mali	87Q3	90Q1		03Q1	97Q1	03Q1	97Q1
Malta	80Q1	80Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Marshall Is.	91Q4	91Q4			03Q1		03Q1
Martinique	80Q1	80Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Mauritania	85Q3	04Q1	04Q1	06Q2	04Q1	04Q1	04Q1
Mauritius	80Q1	87Q3	87Q3	87Q3	87Q3	87Q3	87Q3
Mexico†	80Q1	89Q1	89Q1	89Q1	89Q1	89Q1	89Q1
Moldova*	93Q4	95Q1	99Q1	99Q1		99Q1	
Mongolia	91Q4	96Q1	05Q4	05Q4	96Q1	05Q4	96Q1
Montenegro†	01Q1	05Q1	07Q1	07Q1	07Q1	07Q1	07Q1
Montserrat†	92Q1	92Q1	89Q1	89Q1	89Q1	89Q1	89Q1
Morocco	80Q1	80Q1			90Q1		90Q1
Mozambique	94Q1	94Q1			94Q1		94Q1
Myanmar	80Q1	80Q1					
Namibia	80Q1	80Q1			01Q1		01Q1
Nauru†	08Q4	08Q4	08Q4	08Q4	08Q4	08Q4	08Q4
Netherlands	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
Nepal	80Q1	80Q1					
New Caledonia	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
New Zealand†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Nicaragua	92Q1	00Q1				99Q1	

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
Niger	80Q1	80Q1		03Q1	97Q1	98Q1	97Q1
Nigeria	80Q1	80Q1			03Q1	03Q1	03Q1
Niue	80Q1	80Q1	92Q1		92Q1		92Q1
Norfolk Is.	90Q4	90Q4					
N. Mariana Is.	88Q2	88Q2			88Q2		88Q2
Norway†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Oman	90Q1	90Q1	04Q4	04Q4	04Q4	04Q4	04Q4
Pakistan	80Q1	81Q3	98Q2	98Q2	98Q2	98Q2	98Q2
Palau	00Q2	00Q2	00Q2		00Q2		00Q2
Palestinian Terr.	97Q1	97Q1			07Q1		07Q1
Panama	80Q1	80Q1	07Q1	07Q1	03Q1	07Q1	03Q1
Papua New Guinea*	80Q1	80Q1	89Q1	89Q1	80Q1	89Q1	80Q1
Paraguay	80Q1	83Q1	95Q1	95Q1	95Q1	95Q1	95Q1
Peru	80Q1	95Q1	95Q1	95Q1	95Q1	95Q1	95Q1
Philippines	80Q1	80Q1			94Q1	00Q1	94Q1
Poland	88Q1	96Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Portugal	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Puerto Rico	80Q1	84Q1	84Q1	84Q1	84Q1	84Q1	84Q1
Qatar	02Q1	02Q1			02Q1		02Q1
Réunion	80Q1	80Q1	98Q1	98Q1	98Q1	98Q1	98Q1
Romania*	90Q4	01Q1	01Q1	01Q1	01Q1	01Q1	01Q1
Russian Fed.	92Q1	02Q1	02Q1	02Q1	02Q1	02Q1	02Q1
Rwanda	80Q1	85Q1		06Q1	06Q1	06Q1	06Q1
St Helena†	82Q4	82Q4	89Q4	89Q4	89Q4	89Q4	89Q4
St Kitts & Nevis	80Q1	83Q1	01Q1	01Q1	01Q1	01Q1	01Q1
St Lucia	80Q1	84Q2	01Q1	01Q1	01Q1	01Q1	01Q1
St Pierre & Miq.	97Q1	97Q1	04Q4	04Q4	05Q1	05Q1	05Q1
St Vincent & Gren.	80Q1	86Q1	01Q1	01Q1	01Q1	01Q1	01Q1
San Marino	83Q2	83Q2					
Samoa†	81Q1	81Q1			90Q1		90Q1
São Tomé & Prín.	93Q1	96Q4			96Q4		96Q4
Saudi Arabia	80Q1	84Q1			99Q1		99Q1
Senegal	80Q1	80Q1		03Q1	97Q1	97Q1	97Q1
Serbia	95Q1	01Q1	04Q1	04Q1	01Q1	01q3	04Q1
Seychelles†	80Q1	86Q1	86Q1	86Q1	86Q1	86Q1	86Q1
Sierra Leone	80Q1	93Q1	05Q1	05Q1	05Q1	05Q1	05Q1
Singapore	83Q1	80Q1	83Q1	83Q1	83Q1	83Q1	83Q1
Sint Maarten	80Q1	07Q1	07Q1	07Q1	07Q1	07Q1	07Q1
Slovak Republic	91Q1	91Q1	96Q1	96Q1	96Q1	96Q1	96Q1
Slovenia	93Q1	93Q1	00Q1	00Q1	00Q1	00Q1	00Q1

Country	CPI	CPIF	CPIH	CPIE	CPIHE	CPIxFE	CPIxFHE
Solomon Islands	80Q1	80Q1			07Q1		07Q1
Somaliland	07Q1	10Q1	10Q1	10Q1			
South Africa*†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
South Sudan	07Q2	07Q2			07Q2	07Q2	07Q2
Spain	80Q1	84Q1	84Q1	80Q1	80Q1	80Q1	84Q1
Sri Lanka†	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Sudan	80Q1						
Suriname	80Q1	96Q1					
Swaziland	80Q1						
Sweden	80Q1	80Q1	96Q1	80Q1	80Q1	80Q1	80Q1
Switzerland	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Syria	80Q1	80Q1	95Q1	95Q1	95Q1	95Q1	95Q1
Taiwan	80Q1	81Q1	81Q1	81Q1	81Q1	81Q1	81Q1
Tajikistan	00Q1	00Q1	02Q1	00Q1	02Q1	00Q1	02Q1
Tanzania	80Q1	98Q2	02Q1	02Q1	02Q1	02Q1	02Q1
Thailand	80Q1	85Q1	80Q1	80Q1	80Q1	85Q1	85Q1
Timor-Leste	03Q2	03Q2	03Q2	03Q2	03Q2	03Q2	03Q2
Togo	80Q1	97Q1		03Q1	97Q1	97Q1	97Q1
Tonga*	80Q1	80Q1	06Q1	06Q1	06Q1	06Q1	06Q1
Trinidad & Tob.	80Q1	80Q1	04Q1	04Q1	04Q1	04Q1	04Q1
Tunisia	80Q1	01Q1	06Q1	06Q1	01Q1	06Q1	01Q1
Turkey	80Q1	99Q1	03Q1	99Q1	03Q1	99Q1	03Q1
Tuvalu	87Q4	87Q4	96Q2	96Q2	96Q2	96Q2	96Q2
Uganda	81Q1	97Q3	05Q3	05Q3	97Q3	05Q3	97Q3
Ukraine	94Q1	02Q1	02Q1	02Q1	02Q1	02Q1	02Q1
Utd. Arab Emir.	08Q1	08Q1			08Q1		08Q1
United Kingdom	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
United States	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1	80Q1
Uruguay*	80Q1	93Q2	97Q1	97Q1	93Q2	97Q1	93Q2
Vanuatu	81Q1	81Q1			81Q1		81Q1
Venezuela	80Q1	97Q1	99Q1	00Q1	00Q1	99Q1	00Q1
Viet Nam	90Q1	98Q1			91Q1		98Q1
Wallis & Futuna	99Q4	99Q4	99Q4	99Q4	99Q4	99Q4	99Q4
Yemen	01Q1					05Q1	
Zambia	85Q1	04Q1					
Zimbabwe	80Q1	90Q1					

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