MEASURING COMPETITION IN SERVICES MARKETS WITH PASS-THROUGH AND SPEED OF ADJUSTMENT

OECD TRADE
POLICY PAPER

December 2021 **n°258**

OECD TRADE AND AGRICULTURE DIRECTORATE

Measuring Competition in Services Markets with Pass-Through and Speed of Adjustment

Frédéric Gonzales, Hildegunn Kyvik Nordås and Michel Lioussis

Making trade work for all and harnessing popular support for openness to trade depends on consumers benefitting from lower prices and broader product variety. The present study reveals that those benefits depend on competition in services markets, in particular in telecommunication. These findings result from employing an industrial organisation framework to estimate the transmission of prices from the world market to consumers of certain services in local markets (distribution, transport, and financial services). The OECD Services Trade Restrictiveness Index (OECD STRI) is used to explore the relationship between the pass-through rate of input prices to consumer prices and policy measures that capture the openness and strength of competition in services markets. The OECD STRI in telecommunications is found to be associated with a more complete and faster pass-through of prices in all markets studied. The results also illustrate the crucial role played by the internet in allowing for price comparisons that generate competitive pressure on distributors.

Key words: Price signals, services trade restrictions, cointegration, pass-through rates

JEL classification: C1, D23, D41, L11

Acknowledgment

The authors would like to thank John Drummond, Chris Pike, Frank van Tongeren, Jehan Sauvage, Sebastian Benz and the members of the Working Party of the Trade Committee for their comments and suggestions. The authors thank Laetitia Christophe and Michèle Patterson for preparing this paper for publication.

Table of Contents

TABLES

FIGURES

Executive Summary

This study addresses the measurement and analysis of the role of competition in services sectors. It employs an industrial organisation framework to assess gains from services trade.

In a market economy, price signals constitute the channel through which resources are allocated to their best use and the information on which consumers, traders, producers and investors base their decisions. Price signals play a crucial role in realising potential gains from trade.

This study is an attempt to estimate the extent to which price signals from the world market are passed on to consumers in local markets, and the speed at which consumer prices adjust. There is a large body of literature on the pass-through of exchange rate fluctuations to local prices, but few have analysed price adjustments in services markets or the role of open services markets for price adjustments in goods markets. Since prices of services are often not well defined and market openness not easily measured, this is not surprising.

We aim to narrow this gap in the literature by analysing the pass-through of key input prices to consumer prices, and then relate the pass-through and speed of adjustment to services trade policy measures. The prices analysed are the consumer price indices for clothing and apparel, transport services and energy. The input price signals reviewed are the exchange rate for clothing and apparel prices, and the world market price of oil for energy and transport services prices. The pass-through of policy determined interest rates to lending rates in the commercial banking sector are also analysed.

The import penetration rate in clothing and apparel is over 90% in many OECD countries. However, between 30% and 50% of the retail price is attributed to the domestic distribution margin. Clothing is therefore ideal for analysing how consumers benefit from lower import prices and how competition in the distribution sector, or lack thereof, may curtail potential gains. Preliminary results of the present analysis suggest that the pass-through rate is not complete in any of the countries analysed. Recent studies have documented that prices are more flexible and transparent in on-line trading than in bricks and mortar stores. To explore this, we related the pass-through and speed of adjustment to the competitiveness of the telecommunications sector, which in turn is strongly related to internet use. We find that the pass-through rate is indeed negatively related to services trade restrictions (the STRI) for telecommunications.

Transport and energy services are among the few services sectors where consumer prices are precisely defined. The operational costs of providing such services are strongly affected by the price of oil, which is determined in the global market. Differences across countries in the pass-through rate of changes in oil prices could therefore be attributed to differences in market structure and the strength of competition in each country. We find incomplete pass-through rates for all countries, but with large variations across countries. The pass-through rates and the speed of adjustment are negatively related to the STRIs for logistics, transport and telecommunications, and positively related to the OECD Trade Facilitation Index (TFI) suggesting that competitiveness in services are important for consumer gains from trade.

The pass-through of policy rates to lending rates in commercial banking is not directly related to international trade, but is an interesting case for developing the methodology. Interest rates are well defined and data are readily available for many countries. It is also likely that the transmission of price signals from international financial markets affecting banks’ cost of funding is similar to the transmission of policy rates. We find a relatively high pass-through rate for lending rates. Interestingly, the countries with the lowest pass-through are the countries most affected by the financial crisis in the Euro zone. Also in this market, the pass-through rate and the speed of adjustment are negatively associated with the STRI in commercial banking and telecommunications.

This study is the first step in exploring the complementarities between trade and competition in bringing the benefits of open markets to consumers. Making trade work for all and harnessing popular support for openness to trade depends on consumers benefitting from lower prices and broader product variety. The present study reveals that price signals from global markets are not fully passed on to consumer prices, while adjustment takes time in all cases. Internet appears to play an important role for the pass-through, which suggests price transparency to be important.

More work needs to be done to define services prices more precisely, taking into account differences in geography, technology and other factors that may affect the cost-price pass through. Furthermore, we have not been able to establish causality between policy measures and pricing. A promising route for further analysis is to gather detailed price information on selected services from price comparison platforms and from e-commerce web sites, and in this way deepen the analysis of price pass through and speed of adjustment. This could possibly enable us to identify a causal relationship between policy and the pass-through of price signals from the world market to consumer prices, and to develop a better understanding of the complementarities between trade and competition policy.

Key messages

- *Price signals are an important mechanism in realizing the potential gains from trade:* This study employs an industrial organisation framework to estimate the transmission of prices from the world market to consumers in local markets.
- *Results demonstrate that price signals from global markets are not fully passed on to consumers*: Analysis reveals incomplete transmission for all countries in the sample, but with large variations across countries and sectors. Adjustment speed takes time in all cases.
- *Competition for services enable consumer gains from trade*: Price pass-through rates and the speed of adjustment are negatively related to the STRIs for logistics, transport and telecommunications, and positively related to the OECD Trade Facilitation Index (TFI).
- *Making trade work for all and harnessing popular support for openness to trade depends on consumers benefitting from lower prices and broader*.

1. Introduction

When a country opens up to international trade, price signals trigger reallocation of resources to their most efficient use. In addition, when trade generates competitive pressure on local markets, consumers benefit from lower prices and a wider variety of goods and services to choose from. None of the potential gains from trade will materialise if local prices are isolated from world market price changes.

This study investigates the extent to which local prices respond to price signals from the international marketplace. It constitutes a first attempt to introduce tools from industrial organisation into the analysis of gains from trade. In particular, the study helps to answer questions such as: do consumers reap the full benefits from cheaper imports when the exchange rate appreciates, import tariffs are reduced, or the price of oil goes down? Or are firms responding asymmetrically, e.g. with some firms raising prices fast when costs go up but taking more time to lower them when costs go down?

Markets are competitive when no firms or group of firms have the ability to raise and maintain prices above costs plus a normal rate of return on capital. One would therefore expect that the extent to which lower import prices are passed on to consumers depends on the strength of competition. The strength of competition is in turn determined by the cost of entering the market for newcomers, be they local or foreign; the regulatory framework; and the ease at which consumers can compare prices across suppliers. Price comparison is easy on the Internet and a number of recent studies have found that prices at on-line platforms are more flexible with faster pass-through of costs to prices than bricks and mortar stores (Cavallo, 2018[1]; Gorodnichenko and Talavera, 2017[2]).

This study calculates the pass-through to consumer prices of changes in key input prices for selected products and countries. The pass-through rate and the time it takes for consumer prices to adjust are then related to the policies that frame the strength of competition. While most previous work on the pass-through of costs to prices studied the prices of goods, this study brings new insight by focusing on services markets.[1] Since services account for a large share of household expenditure, their affordability is important for consumer well-being.

Calculating the pass-through of costs to prices obviously requires information on prices. Our choice of services for the empirical analysis is therefore limited to those that have well-defined prices. Among these are transport services and bank lending, which are also important in household expenditure.

Oil is an important input in the transport and energy sectors. World oil prices fluctuate widely, and thus generate frequent changes in the cost of providing transport and energy services all over the world. We are interested in the extent to which these fluctuations are reflected in consumer prices, how quickly consumers benefit from lower oil prices, and whether there is asymmetry between the speed of price adjustments to higher versus lower oil prices. Importantly, we present a first estimate of how the transmission of price signals relate to the policy framework affecting the transport sector including the Services Trade Restrictiveness Index (STRI) for transport, logistics services, telecommunications and to the OECD Trade Facilitation Index (TFI). Telecommunications are introduced as a policy measure related to internet use and thus price transparency.

The interest rate consumers pay on loans such as mortgages are determined by banks' cost of deposits and other liabilities. Information on interests and interest margins are readily available for OECD countries and beyond. Furthermore, there exists a body of research on interest rate pass-through that we can draw on. Differences in the pass-through rates and speed of adjustment are related to country-specific policy indicators, notably the STRI in commercial banking.

Import penetration is relatively high in most OECD countries for labour-intensive consumer goods. In addition to the factory gate price, the exchange rate and the distribution margin play an important role in determining the consumer price of such goods. The import penetration rate for textiles and clothing in many OECD countries is more than 90%.[2] One would therefore expect that the consumer price index for clothing and apparel is sensitive to fluctuations in the exchange rate and that the pass-through of changes in import prices to consumer prices depends critically on the competitiveness of the distribution sector (Goldberg and Campa, 2010[3]; Francois and Wooton, 2010[4]). To explore this, we calculate the pass-through of fluctuations in the exchanges rate to the consumer price index for clothing and next relate the results to the STRI for distribution services and telecommunications.

Our calculations of pass-through rates and speed of convergence show considerable variation across countries and markets. The pass-through is far from complete in the clothing, transport and energy sectors, while the pass-through rates are high, but not very fast in the banking sector. Interestingly, many of the countries most severely hit by the financial crisis exhibit a much lower pass-through rate than other countries. Transparency is important in most markets and indicators related to extensive use of the Internet are positively associated with the pass-through rate.

It is important to bear in mind that at this stage the policy analysis shows correlations, not causality. The number of observations is limited, such that rigorous policy impact analysis cannot be made. Nevertheless, the results provide some guidance on where to look for bottlenecks that may curtail the gains from open markets for consumers.

This study is organised as follows: Section 2 reviews relevant literature and identifies the contribution from this study; Section 3 presents data and stylised facts; empirical strategy and results are presented in Section 4; and Section 5 concludes. Technical annexes explain the methodology and present the detailed results.

[1] See Burstein and Gopinath (2014[7]) and Menon (1995[33]) for surveys covering the period from the 1970s onwards.

[2] Source: Calculated from the World Input Output table for 2014, the latest available.

2. Pass-through and competitiveness

Symptoms of lack of competition include excess profits that last over many years, high and long-lasting mark-ups, a slowdown in entry of new firms, and lower costs, including trade costs, being only partly passed on to consumers while increases in costs are fully and swiftly reflected in higher prices. In recent years, these symptoms have been observed in several countries and markets.[3]

This study focuses on one symptom of insufficient competition: the way domestic prices respond to changes in costs, and how this response may be related to relevant policies. It complements a previous study which found that higher trade barriers as measured by the STRI are associated with higher mark-ups (Rouzet and Spinelli, 2016[5]).

We calculate the pass-through rates and adjustment speeds in four markets: the exchange rate pass-through to consumer prices for textiles and clothing; the pass-through of world market oil prices to the consumer price of transport and energy services; and finally the pass through of banks' costs of funds to retail lending rates. In this section we take stock of what we know from the literature on pass-through rates in each of these markets.

Starting with the exchange rate, in a frictionless world, changes in prices should be the same across countries when converted to a common currency. The price *level* may differ across countries due to differences in distribution costs and the general cost level, but *changes* in costs should be reflected in changes in prices across all markets. Thus, the predicted pass-through rate in competitive markets is unity.[4]

In reality, the exchange rate pass-through falls significantly short of unity and the channels through which the exchange rate affect local prices are many and complex. The distribution margin accounts for between 30% and 50% of purchase prices and changes in these margins absorb some of the exchange rate fluctuations. In addition a significant share of imported products are used as intermediate inputs in local industries and affect consumer prices through the impact on local production cost (Goldberg and Campa, 2010[6]).

Previous studies find that exchange rate fluctuations do pass through to import prices. However, behind the border the distribution margins adjust so that the pass-through to consumer prices are far from complete. For instance, studies covering the period from the 1970s to the 2010s find that in the long run, between 50% and 97% of the exchange rate appreciation or depreciation are reflected in import prices for a sample of eight OECD countries.[5] However, only between -1% and 36% of the exchange rate fluctuations are passed through to the consumer price index for tradable goods (Burstein and Gopinath, 2014[7]; Campa and Goldberg, 2006[8]).[6]

This need not be a bad thing for consumers if the exchange rate fluctuates around a flat trend and the low pass-through rate reflects more stable prices. There is, for example evidence that the distribution margin absorbs random exchange rate fluctuations (Goldberg and Campa, 2010[9]). Furthermore, studies of large devaluations episodes report that a sharp increase in import prices were not passed on to consumers.[7]

---

[3] For a recent discussion see *The Economist*, 17 November 2018, https://www.economist.com/eu/printedition/2018-11-17.

[4] Competitive markets in economic theory are defined as markets subject to constant return to scale and marginal cost pricing. In empirical work, a mark-up covering short-run fixed costs and normal returns to capital are not considered a deviation from competitive markets.

[5] The countries included were Canada, France, Germany, Italy, Japan, Switzerland, the United Kingdom, and the United States.

[6] The number refers to long-run pass through to tradable CPI (Mussa, 1990[13]). See also Menon (1995[33]) for an earlier survey.

[7] The report studies large devaluation episodes in Argentina, Brazil, Korea, Mexico, Thailand, Finland, Italy, Sweden, the United Kingdom, and Iceland during the period 1992 to 2007 (Burstein and Gopinath, 2014[7]).

However, if the lack of pass-through of exchange rates is symptomatic for pass-through of price shocks in general, consumers may not gain as much from trade as they should. There are for instance a number of studies that show that a reduction in tariffs do not fully benefit consumers. In fact, the pass-through to consumer prices of lower tariffs and long-term appreciation of the currency has been very similar in past episodes of trade liberalisation (Feenstra, 1989[10]) and also more recently (Amiti, Redding and Weinstein, 2019[11]).

Experience from the recent financial crisis and the recovery has shown that the impact of exchange rate fluctuations on domestic prices depends on what moved the exchange rate in the first place. If the exchange rate appreciates due to a rise in domestic demand, for instance following fiscal stimulus, then lower import prices may result in higher margins rather than lower prices. Conversely, if the exchange rate appreciates because of monetary tightening, local firms may face more competitive pressure on their margins and the exchange rate pass through becomes higher (Forbes, Hjortsoe and Nenova, 2018[12]). In either case, the underlying mover is the cyclical nature of competitive pressure.

There is a large literature analysing the exchange rate pass-through for individual products. A general finding is that the product-level real exchange rate and the national nominal exchange rate move together (Mussa, 1990[13]). Nevertheless, product prices typically deviate significantly from purchasing parity and the nominal exchange rate explains only a small portion of the difference. Instead, it appears that price variation across countries persist and that the variation in prices across locations at a particular point in time is more important than time variation. Take the example of apples. They are tradable and reasonably homogenous, but the price of a kilogram varies immensely across cities in the world. According to a price comparison website, a kilogram of apples costs EUR 5.30 in Tokyo, EUR 3.54 in New York, EUR 2.76 in Paris, and EU 2.48 in Berlin in November 2018.[8] Furthermore, these price differences have persisted over decades (Crucini and Telmer, 2012[14]).

Most studies on exchange rate pass through have used price data from bricks and mortar stores. With the growing market share of e-commerce in the retail sector, it is interesting to see if on-line sales are different. The evidence so far unanimously documents that they are. For instance, online markets in the United States and Canada exhibit a pass-through rate of 60%–75% compared to 20%–40% for bricks and mortar stores. Furthermore, the speed of adjustment in response to movements of the nominal exchange rate is more than three times faster for online sales (Gorodnichenko and Talavera, 2017[2]).[9] Product and retailer characteristics and the degree of competition in the market explain the variation in pass-through rates.

A key difference between bricks and mortar stores and on-line sellers is the ease of making price comparison. Furthermore, there are a number of websites and platforms with the sole purpose of comparing prices across sellers in given markets. Obviously, widespread use of the Internet as a sales platform as well as for shopping is a precondition for a growing market share of on-line sales. Broadband density and internet use are both closely related to open and competitive markets in telecommunications (Nordås and Rouzet, 2015[15]).

We now turn to individual product markets where the distance between the input and output price investigated is shorter and simpler than the exchange rate pass-through, starting with oil prices.

Oil is an important input to a broad range of economic activities and the price of oil has been an important driver of both consumer prices and fluctuations in GDP in the past. Although the overall CPI has become less sensitive to changes in oil prices over time, a recent estimate suggests that a 10% increase in the price of oil is associated with a 0.4 percentage point increase in the CPI on average in 72 developed and developing countries (Chen, 2009[16]; Choi et al., 2018[17]).

The first link in the supply chain from oil prices to transport services prices is the refining and distribution margin for gasoline and diesel fuel. The linkages between crude oil prices and the pump price of fuel is well researched and many studies have looked into whether or not pump prices adjust more rapidly to oil price increases than to oil price slumps. The results are inconclusive; while a number of studies have found asymmetric adjustments in the predicted direction, others have found no such effects. It appears that asymmetry depends on whether oil price changes are demand or supply driven, the market conditions in

[8] See https://www.expatistan.com/price/apples.

[9] The half-live of adjustment is on average 2-2.5 months in online markets, compared to nine months to a couple of years for bricks and mortar stores.

the downstream retail market and also on the methodology of analysis (Blair, Campbell and Mixon, 2017[18]). A study from Germany illustrates the point. It found that gasoline and diesel pump prices adjusted more quickly to increases than to declines in oil prices during the period 2003-2007, but no such asymmetries were found thereafter. If anything, the pump price adjusted more rapidly to slumps in oil prices during the period 2009-2013. The change was attributed to pro-competitive policy intervention (Asane-Otoo and Schneider, 2015[19]).

As noted, there is a rich literature on the impact of oil prices on overall inflation, and the pump price of petrol, but there is surprisingly little research on the impact of oil prices on transport services prices. Our study is thus among the first to systematically analyse the pass-through of oil prices to the consumer price index for transport and energy services. Energy and raw material prices are among the products with the highest exchange rate pass through to border prices (Campa and Goldberg, 2006[8]). Import prices of oil should therefore be similar across countries and it is reasonable to attribute differences in the pass-through to local market conditions.

Lastly, this study analyses the pass-through of interest rates from policy determined rates to banks' lending rates to households and businesses. This is an essential channel through which monetary policy affects the real economy and has been studied at length. The most recent literature explores to what extent the pass-through during a long period of policy rates at or close to zero can be understood through the lens of standard theory and analysed using standard empirical methodology. It is beyond the scope of this study to analyse the transmission of monetary policy. Suffice to mention that the results of the empirical analyses are mixed and depends on methodology used as well as time period and markets analysed (Aristei and Gallo, 2014[20]; Karagiannis, Panagopoulos and Vlamis, 2010[21]; Horvath, Kotlebova and Siranova, 2018[22]).

This brings us to the choice of empirical strategy for our study. The literature offers a host of different techniques and the results are not always robust to the choice of methodology (Andries and Billon, 2016[23]). Of course, analysis of pass-through and speed of adjustment to full or incomplete pass-through requires time series econometrics. Depending on the research question, one may analyse several countries and markets at the same time, or one may choose to analyse one country or one market at the time. In the former case, controls to capture country or market-specific features that may affect the pass-through rate must be introduced. There are also different techniques to deal with structural breaks in the time series and asymmetries in the pass-through rates and speed of adjustment.

To summarize the empirical work on the pass-through of movements in the exchange rate to consumer prices, the evidence clearly points to a modest transmission rate. The rate varies across products and countries and can be explained by product characteristics as well as the strength of competition in the importing country. The pass-through rate and the speed of adjustment is significantly higher in on-line markets. Also, the pass-through rates of oil prices and interest rates depend crucially on the level of competition.

The objective of this study is to investigate the role of competition and competition policy in making services trade work for consumers. Consumers gain from services trade directly through access to affordable services and indirectly through imposing discipline on the distribution margins for traded goods. As a first step, we have chosen a simple, but robust methodology. We analyse one market at a time and study how the exchange rate, the oil price and the policy-determined interest rate respectively move together with the relevant consumer price. Having estimated this for each market, we next relate the pass-through rate and the speed of adjustment to policy indicators to explore to what extent there is a systematic relationship between the policy framework and the extent to which consumers reap the benefit from open markets. Notice, however, that the methodology cannot establish a causal relationship between policy and pass-through to consumer prices. Exploring the direction of causality could be the subject of future work.

3. Methodology and data

3.1. Methodology

Building on the work of Gorodnichenko and Talavera (2017[2])and Illes (2013[24]), this report proposes an approach to identify how measures of pass-through and speed of adjustment are linked with policy indicators (OECD STRIs and OECD TFIs) that reflect the strengths of competition in services markets across selected developed and developing countries.

The technique used for estimating the relationship between changes in input prices and output prices and the time it takes before input price changes are passed on to consumers is based on co-integration analysis and vector error-correction models (VECM) and is briefly described in this section and extensively explained in Annex A.

3.1.1. Estimation of pass-through and speed of adjustment with VECM models

Pass-through and the speed of adjustment are two metrics commonly used to analyse the dynamics of vertical price transmission from one level to the other in the marketing process. Pass-through is the magnitude of the response at each level (i.e. prices of goods and services, commercial lending rates) due to a shock of a given size at another level (exchange rate, oil prices, monetary rates). The speed of adjustment is the rate at which markets adjust to changing economic circumstances. Speeds of adjustment will tend to vary between different types of market. Both measures are equally important.

In addition to the two measures, structural break tests are run in order to determine the existence of regime changes over the period considered and asymmetry tests to identify if adjustments following positive and negative shocks at a certain marketing level exhibit asymmetry.

3.1.2. Competition measures and trade restrictions

Once the pass-through rates and the speed of adjustment are estimated for each relationship in each country, the link between competition measures and trade regulation is assessed using policy indicators in a simple regression. Policy indicators such as the OECD STRI's (distribution, transport, logistics and commercial banking), the OECD PMR's (distribution and transport), the OECD FDI RRI (transport and commercial banking), the OECD TFI and the World Bank LPI (transport and logistics) were selected due to expected connections with the sectors covered in this report.

3.2. Data

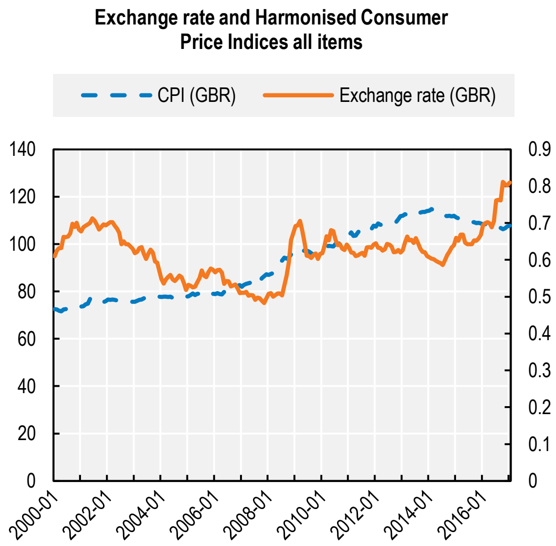
3.2.1. Exchange rate, oil price and harmonised index of consumer prices

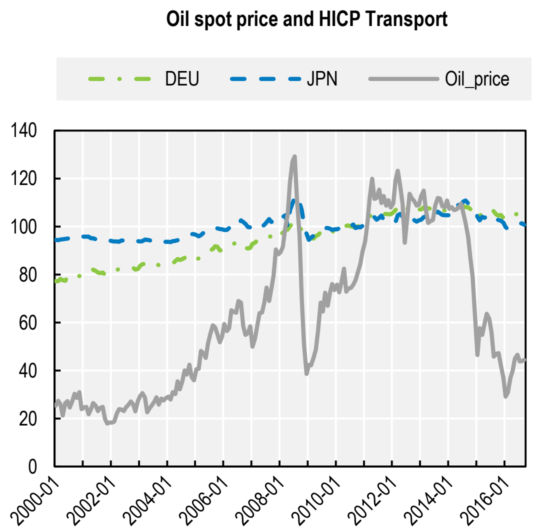
The first relations analysed in this study consider the pass-through of exchange rate and the oil price to different harmonized consumer price indices (HICP) from the OECD Main Indicators database. The variables selected are the following:

- "National Consumer Price Indices by COICOP (Classification of Individual Consumption according to Purpose) division": expressed in index – Harmonized Index of Consumer Prices for clothing (clothing and footwear), energy (housing, water, electricity, gas and other fuels) and transport.
- "Monthly Monetary and Financial Statistics (OECD Main Economic Indicators) Exchange rates (in USD monthly averages)": national currency per US dollars
- "West Texas Intermediate oil prices (WTI)": measure in US dollars per barrel (IEA)

These monthly time series cover a period starting in January 1980 for HICP and exchange rates and January 1985 for crude oil spot prices and ending in May 2017 for all. Figure 3.1 presents examples of the evolution for HICP for all items, exchange rates, and oil price and HICP transport.

Figure 3.1. Exchange rate, oil price and HICP





Source: OECD Main Economic Indicators and IEA.

3.2.2. Interbank and lending rates

In commercial banking, we collected monthly data on interest rates for the period January 2000 to January 2017 for 30 OECD and partner countries (see Annex table for details).

The policy related interest rate applied is the overnight interbank rate (rb). For the euro area the overnight index average also known as EONIA is used. In the case of the non-euro countries, the interbank rate was taken from OECD Main Economic Indicators database, called “Immediate Rates: less than 24 hours: Call Money/ Interbank Rate”. For the United Kingdom, the interbank rate is the “Overnight London Interbank Offered Rate (LIBOR) based on British Pound”.

The commercial loan lending rate (rl) applied in the analysis varies somewhat across countries since reporting practices are not homogeneous. We have used the commercial loan rates in each country with a maturity of one year where available and otherwise the closest possible to this definition. Regarding the European Union (euro and non-euro), the commercial loan rate was gathered from the European Central Bank which provided a “Bank interest rate-loan to corporations with an original maturity of up to one year” on monthly basis.

For the United States, the source is the Federal Reserve Bank of St Louis, from where we extracted the “Weighted-Average Effective Loan Rate for All Commercial and Industry Loans, All Commercial Banks”. This data was only available on quarterly frequency which was thus converted into monthly data using linear interpolation.

For Canada, we used the “1-year fixed mortgage rate” which was collected from ratehub.ca, the country’s leading financial comparison platform. The daily observations extracted were averaged and transformed into monthly data.

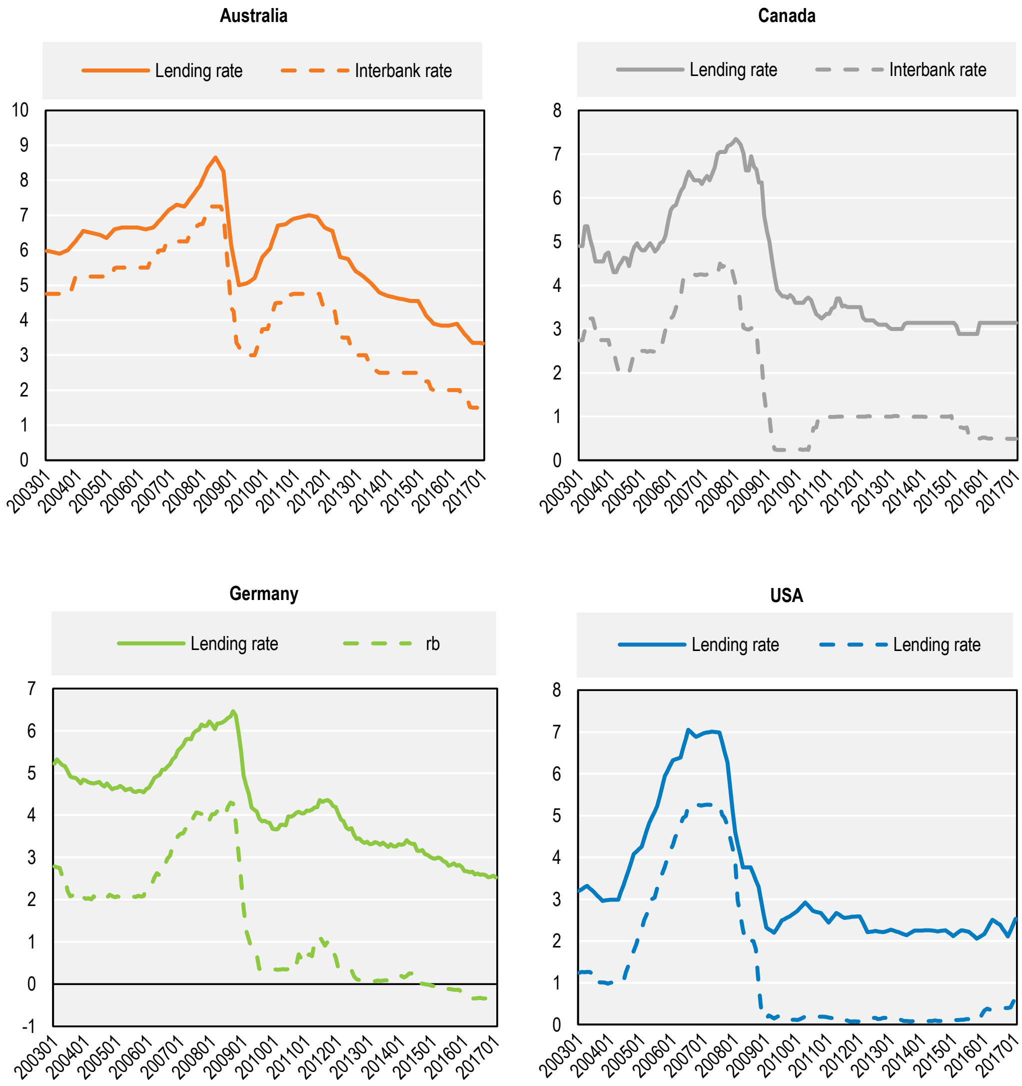
For Australia, the Reserve Bank of Australia provides several types of lending rate data. The one which seemed to be the most comparable with the rest of the countries is “Weighted-average lending rate on credit outstanding to large businesses” which again was linearly interpolated into monthly data from its initial quarterly frequency.

For Indonesia, we used Thomson Reuters DataStream from which we extracted “Credit interest rates-commercial banks, investment NADJ” in monthly frequency starting from January 2000.

Concerning the People’s Republic of China (hereafter “China”), India, Japan and South Africa, we extracted data from the World Bank database which provided a general lending rate on a yearly basis which had also to be linearly interpolated in order for us to have a homogeneous dataset with only monthly observations for all the countries. The difficulties in constructing a database with the same information for all countries is one of the reasons why we estimated the pass-through and speed of convergence country by country. This data constraint might have an impact on the quality of the estimations of the pass-through rate for these countries.

Figure 3.2 shows the trends of the two interest rates variables used in the analysis for four countries: Australia, Canada, Germany and the United States. In all cases, we can observe parallel trends between the monetary policy rate and the commercial bank lending rate. Significantly lower levels can be noted after 2010, with interbank rates becoming even negative in Germany after 2015.

Figure 3.2. Interbank and lending rates for four countries



Source: OECD Main Economic Indicators, IMF, World Bank statistics and Countries' central banks.

4. Results

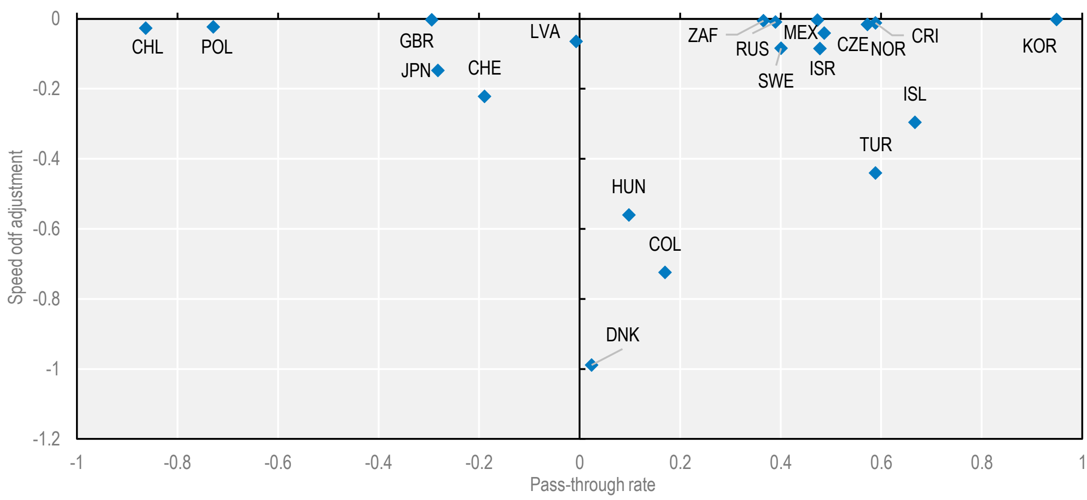
4.1. Distribution services

This section presents the results obtained for the pass-through of exchange rate to the HICP clothing. The results are plotted in Figure 4.1. The pass-through rate is depicted on the horizontal axis where a coefficient of unity represent complete pass-through. The speed of adjustment is portrayed on the vertical axis where the speed of adjustment increases when moving down the axis. For most of the countries the estimated pass-through rate is statistically significant with the expected positive sign, confirming the sensitivity of consumer prices to exchange rates. The majority of countries also exhibit a statistically significant speed of adjustment with some exceptions, including United Kingdom, Chile and Mexico, while others have statistically significant speed of adjustment close to zero. For instance, Korea has a pass-through rate close to unity but a very low speed of adjustment, which implies that the transmission of shocks is complete but very slow.

We can identify three groups of countries. Group 1 (CHL, POL, GBR, JPN, CHE and LVA) with a small speed of adjustment and negative pass-through; group 2 (HUN, COL, DNK, TUR and ISL) with a positive pass-through but a high speed of adjustment; and group 3 (ZAF, RUS, MEX, SWE, ISR, CZE, NOR, CRI and KOR) with a high pass-through and a relatively low speed of adjustment. Turkey and Iceland are the two countries with both high pass-through and speed of adjustment.

In line with the literature and with the exception of Turkey and Iceland, no countries display both a high pass-through and speed of adjustment.

Figure 4.1. Speed of adjustment vs. pass-through for exchange rate-HICP clothing, 1980-2017

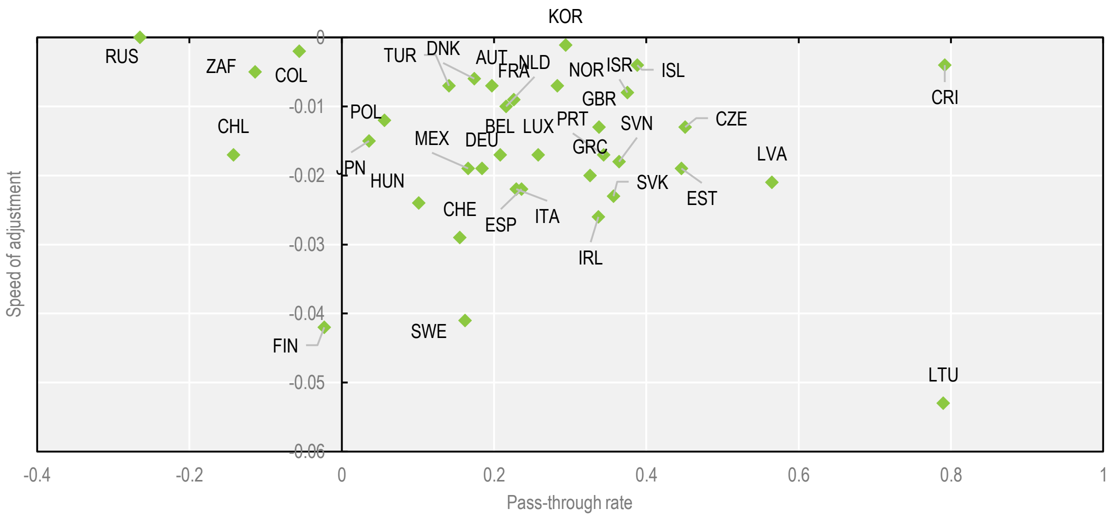


4.2. Energy sector

Figure 4.2 presents the distribution of the 36 countries analysed by speed of adjustment and pass-through rates. In this graph, Baltic countries are the geographic region presenting the highest significant positive pass-through rates (above 0.44) and a higher speed of adjustment than most of the European countries, except Sweden. Together with Lithuania, Costa Rica shows a very high pass-through rate but with a non-significant speed of adjustment. The centre of the figure is dominated by European countries who constitute a significant share of the sample of countries covered. Regime change has been identified for around 2012-2013 for most of the countries and asymmetry was tested positive for Latvia, Estonia, Iceland, France, Denmark, and Japan.

Figure 4.2 does not display clear patterns or similarities between countries. In particular, European countries do not distinguish themselves as a homogenous group. This fact could be explained by three main reasons affecting the quality of the pass-through. First, the tax structure is a decisive factor in explaining the only partial pass-through of primary energy prices to energy prices for consumers. This dimension varies significantly across the sample of countries. Second, consumer gas and electricity prices for households are regulated in some countries, which can certainly contribute to a reduction in the volatility of consumer price developments or at least delay the impact on consumer energy prices. Finally, institutional choices can affect the supply structure in which there is a relatively low sensitivity of electricity prices to primary energy prices. Indeed, the electricity produced in the countries of our sample depends primarily on energy sources with prices that are not directly linked to volatile oil prices (nuclear energy accounts for 30%, hydroelectricity for 22% and other energy sources for 15%). In addition, oil, natural gas and coal are, to a certain degree, substitutes for each other as the primary energy source generating electricity. These three aspects could diminish the impact on electricity prices of a shock specific to oil, and explain the concentration of countries in the area with a low pass-through rate and a slow speed of adjustment: Chile, Colombia, Finland, the Russian Federation (hereafter “Russia”), and South Africa.

Figure 4.2. Speed of adjustment vs. pass-through for oil price-HICP energy, 1985-2017

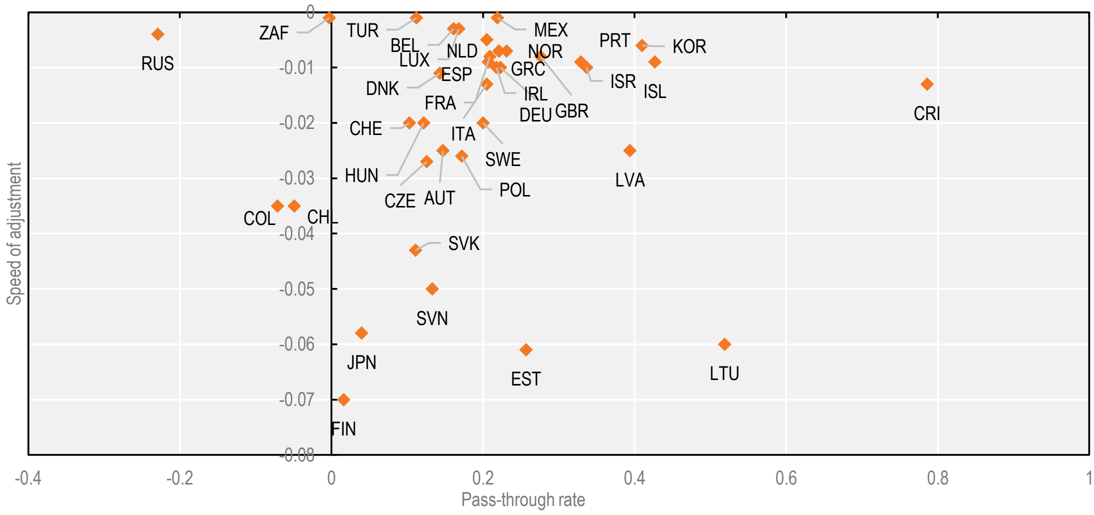


4.3. Transport services

Figure 4.3 illustrates the performance of 36 countries in terms of quality of price transmission measured by the pass-through rate and speed of adjustment in the transport sector.

Figure 4.3 shows, as in the energy sector, that Baltic countries are the geographic region presenting the highest quality of price transmission. All countries display significant positive pass-through rates, with the exception of Finland, but ten countries display non-significant negative speeds of adjustment (the United Kingdom, Greece, Mexico, Ireland, Spain, Netherlands, Luxembourg, Belgium, Denmark, and Turkey). Costa Rica, Lithuania and Latvia are the three best performers in this sector. The concentration of countries in an area of partial and incomplete pass-through (small pass-through and low speed of adjustment) could be explained as follows. In many countries in the sample, fare of buses, subways, and taxis is regulated by governments or city councils. Prices can be revised only once a year and the link between the cost of providing these services and their retail prices is not clear. By contrast, airfares and railway prices are market determined and their prices are affected by development in international oil markets.

Figure 4.3. Speed of adjustment vs. pass-through for oil price-HICP transport, 1985-2017



4.4. Commercial banking

The retail bank interest rate pass-through indicates the degree to which a change in the market interest rate is transmitted to bank interest rates on collected deposits and granted loans to firms and households.

Unlike the previous cases, the analysis of commercial banking interest rates uses very detailed information, measuring direct pass-through from central bank to commercial banks. It is expected that retail bank interest rate pass-through may impact differently across countries because of country-specific regulations and heterogeneous levels of competition in banking sectors.

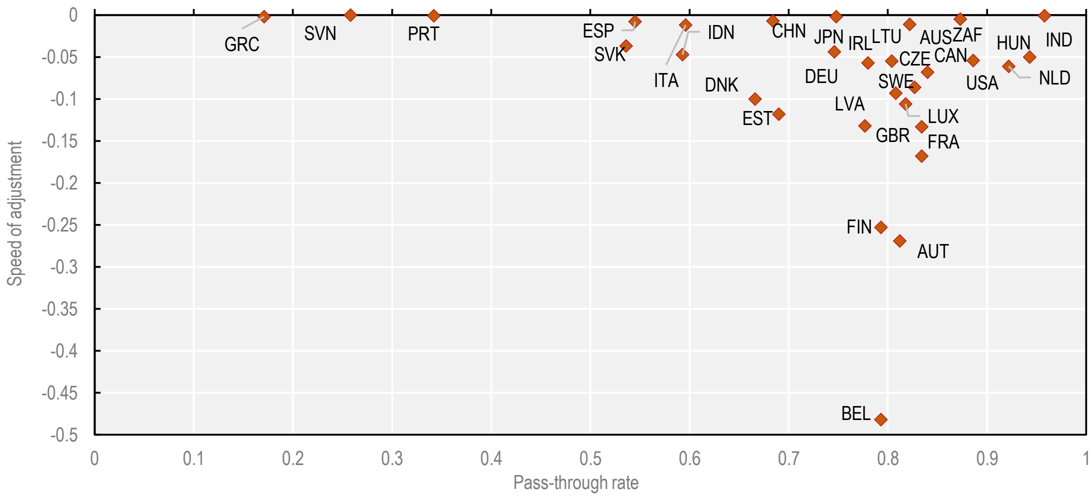
Figure 4.4 displays the estimated pass-through rates and speeds of adjustment for 26 OECD countries and four key partners from interbank monetary rates to commercial lending rates. These estimations demonstrate higher magnitudes than in the three previous cases.

Countries with more developed financial markets usually respond to market conditions more actively and fully, whereas those with less developed markets tend to take longer to adjust. Thus, among European countries, Greece, Slovenia, and Portugal, reflect a pass through rate of less than 40%. In line with the literature, the other European countries display a high pass-through rate (above 0.7) with heterogeneous speed of adjustment. Austria, Belgium and Finland perform well in both variables.

Pass-through rates for China, India, Indonesia and South Africa appear to be fairly high and significant but very slow. In China, for instance, pass-through in retail banking have been identified as being significantly high but very slow.

Regime changes are identified mostly for two periods, around 2008-2009 and around 2012-2014. Most of these relationship are found to be symmetric except for the United States, France, Luxembourg, and Austria.

Figure 4.4. Speed of adjustment vs. pass-through for interbank-lending rates, 2003-2017



4.5. Pass-through rate, speed of adjustment and trade regulations

This section explores the relation between different policy indicators (OECD FDI RRI, PMR, STRI, TFI, and World Bank LPI), and the previously estimated pass through rates and speed of adjustment.

In order to assess how trade regulations can be linked with the magnitude of the pass-through and speed of price adjustment, we regress the estimated normalized pass-through ($\widehat{\alpha}$) and speed of adjustment ($\widehat{\beta}$) on the relevant sector indicators of OECD FDI RRI, PMR and STRI and on the overall index of OECD TFI and World Bank LPI. Each of the estimated relations are ran separately.

In addition to the estimated pass-through rate and speed of adjustment, we also calculate two combined indicators of the normalized $\widehat{\alpha}$ and $\hat{\beta}$ using simple and geometric averages of these two parameters.

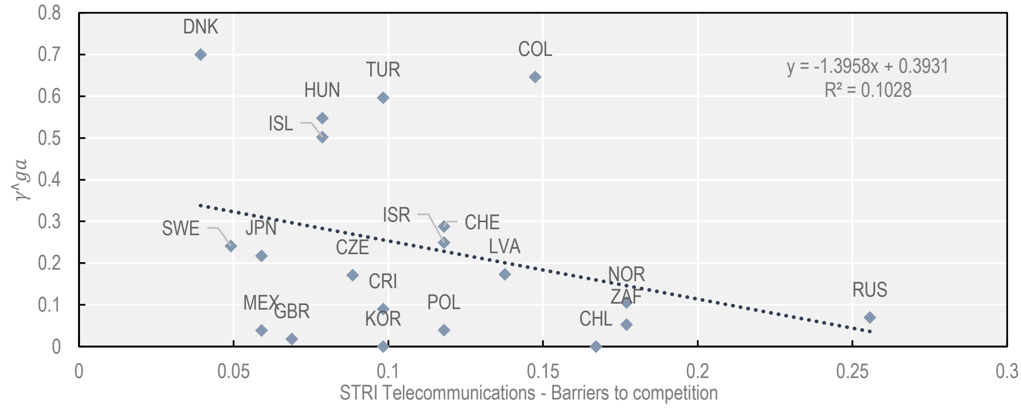
We expect that more competitive markets have a higher pass-through rate and a higher speed of adjustment. The score on the STRI is higher the less open and competitive the market. Thus, we expect a negative correlation between the score on the STRI and the pass-through rates as well as the two combination indices. The TFIs take a higher value the better the trade facilitation policies and procedures in place. Therefore, we expect a positive correlation with the pass-through rate and the estimated speed of adjustment $\widehat{\beta}$.

The following figures present the results of these estimations for the four sectors covered in this report: clothing (distribution services), energy, transport and commercial banking. The number of observations varies between 20 and 32, which is too small to draw strong conclusion. Nevertheless, the results represent interesting cues for further analysis.

4.5.1. Exchange rate-CPI clothing and STRI

This case covers a small sample of 20 countries. We do not find the expected negative relationship between STRI in distribution services and the pass-through rate. To the contrary, the correlation coefficients between the pass-through rate and STRI Distribution, and the STRI Telecommunications are positive and significant. As displayed in Figure 4.5, the expected negative correlation is found between speed of adjustment and geometric average of pass-through rate and speed of adjustment and the barriers to competition component of the STRI Telecommunications. The statistically significant negative coefficient on telecommunications is consistent with the literature on the impact of e-commerce on pass-through rates and speeds of adjustment, and OECD work that demonstrates a strong correlation between regulation in telecommunications and Internet use (Nordås and Rouzet, 2015[15]). More work is needed on a larger sample to control for market conditions that could influence the results.

Figure 4.5. Exchange rate-HICP clothing and STRI Telecommunications: Barriers to competition



Note: Geometric average of normalized pass-through and speed of adjustment regressed on STRI Telecommunications – Barriers to competition.
Source: OECD own estimates and OECD STRI 2017.

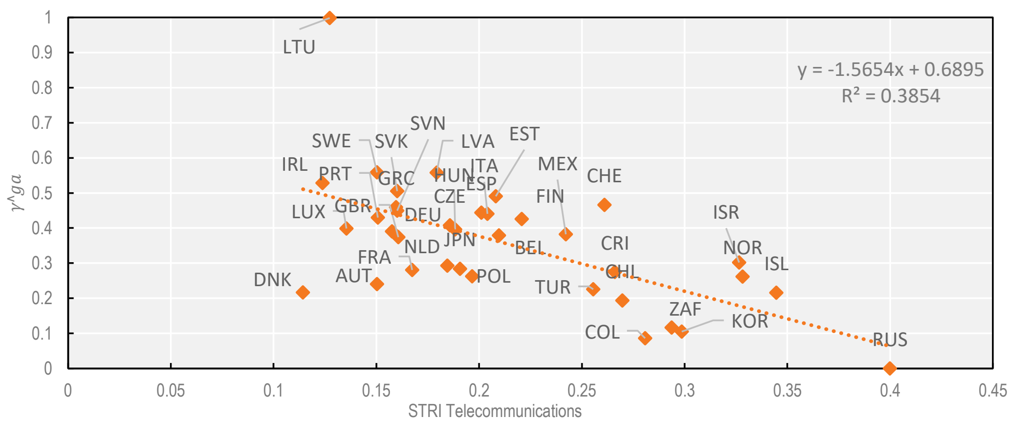
4.5.2. Oil price-HICP energy with STRI and TFI

Figure 4.6 displays the significant results observed for 36 countries when testing for the relationship between pass-through rate and speed of adjustment calculated for oil price-HICP energy and STRIs in telecommunications and logistics services (cargo-handling, storage and warehouse, and freight forwarding). Of the four cases covered in this report, this case shows the most significant results with the expected negative sign and the highest explanatory power (R-squared up to almost 0.4). This relation also correlates positively with the TFI for speed adjustment and the two types of average of normalized pass-through and speed of adjustment. Its explanatory power is low, i.e. less than 0.1. Two main points should be noted:

- Lithuania, one of the best performers in the STRI telecommunications also has the highest pass-through rate.
- Russia, the most restrictive country of the sample for STRI telecommunications is also performing poorly in terms of the quality of the pass-through.

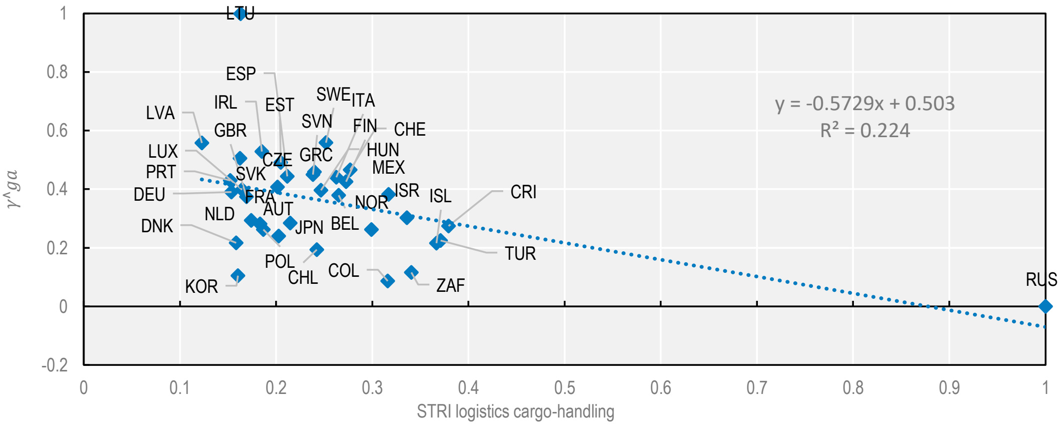
A similar pattern is observed in Figure 4.7 when the same parameter is regressed on STRI logistics for cargo-handling.

Figure 4.6. Oil price-HICP energy and STRI Telecommunications



Note: Geometric average of normalized pass-through and speed of adjustment regressed on STRI Telecommunications.
Source: OECD own estimates and OECD STRI 2017.

Figure 4.7. Oil price-HICP energy and STRI Logistics cargo-handling



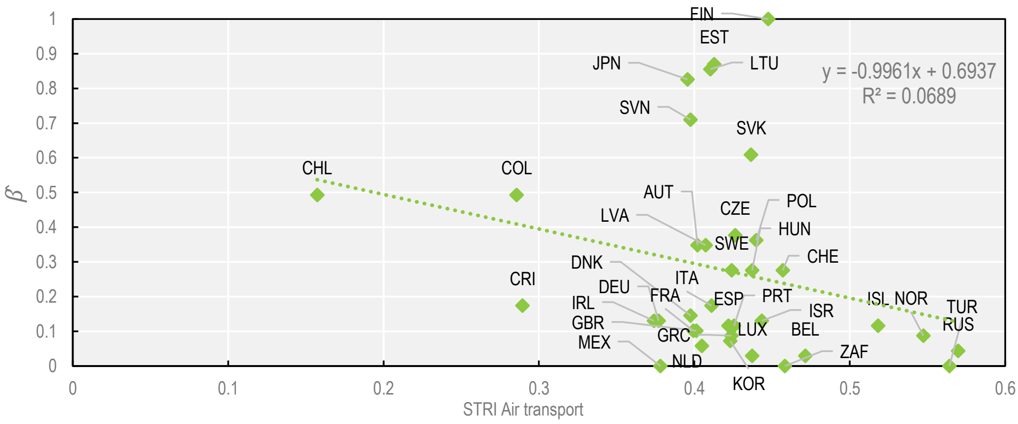
Note: Geometric average of normalized pass-through and speed of adjustment regressed on STRI Logistics cargo-handling.
Source: OECD own estimates and OECD STRI 2017.

4.5.3. Oil price-HICP transport with STRI and TFI

The correlation coefficients between the pass-through rate and speed of adjustment of the oil price to the consumer price index for transport services and relevant policy indicators take the expected sign in a number of cases. Thus, transport related STRIs: air, road and three logistics sectors (cargo-handling, storage and warehouse, freight forwarding) all have the expected negative sign (pass-through rate and speed of adjustment increase when regulatory barriers to trade in services decrease), except in the case of road transport. The explanatory power is, however, quite low in most cases except for two logistics sectors where, it goes above 0.14 up to around 0.22. There is also a positive correlation with the TFIs and the simple average of normalized pass-through and speed of adjustment as expected, albeit with a low R-squared. Figure 4.7 illustrates the correlation between normalized speed of adjustment and STRI air transport. Colombia and Chile, two of the most liberal countries in air transport have a high speed of adjustment. However, the Russian Federation (hereafter “Russia”) and Turkey, two of the most restrictive countries in air transport, also have a very low transmission rate of prices.

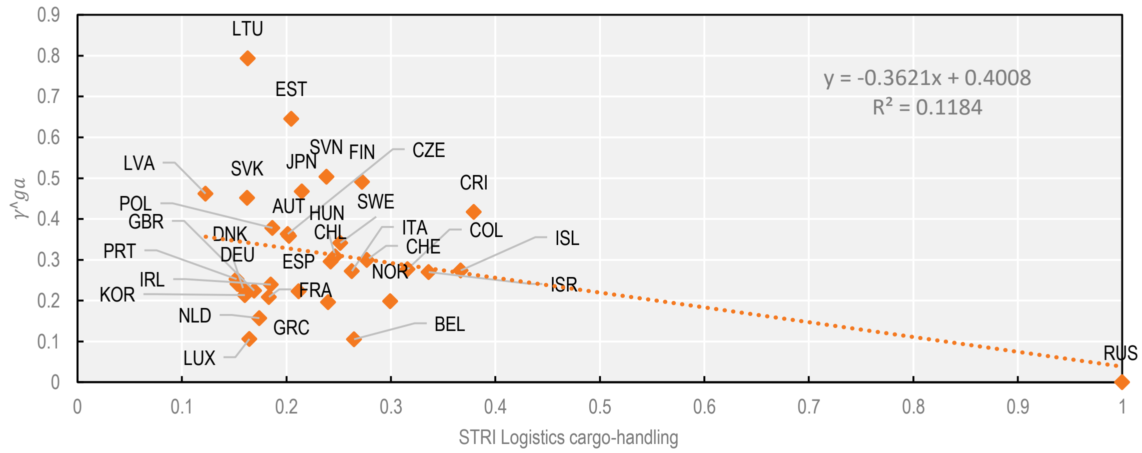
Figure 4.9 displays the regression results for the geometric average of normalized pass-through and speed of adjustment on STRI logistics cargo-handling.

Figure 4.8. Oil price-HICP transport and STRI Air transport



Note: Normalized speed of adjustment regressed on STRI Air transport.
Source: OECD own estimates and OECD STRI 2017.

Figure 4.9. Oil price-HICP transport and STRI Logistics services

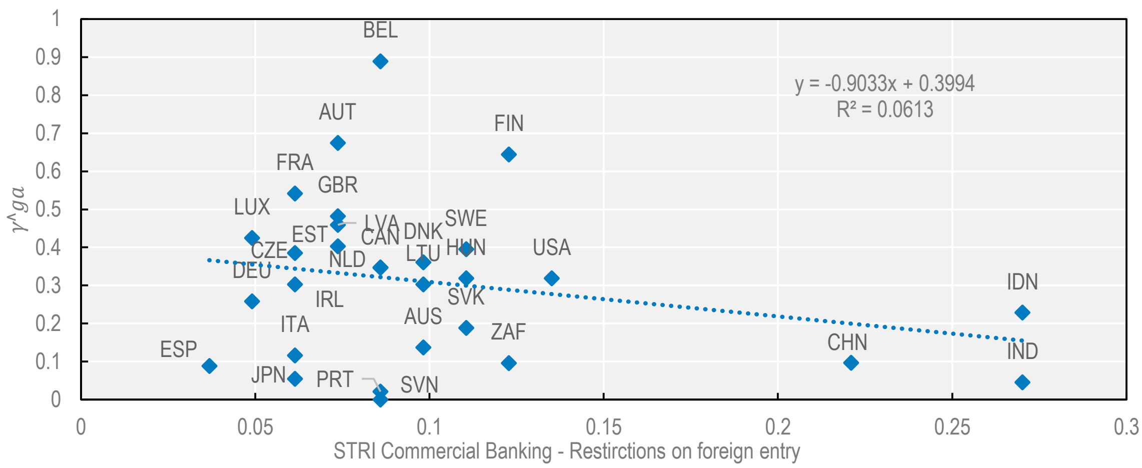


Note: Geometric average of normalized pass-through and speed of adjustment on STRI logistics services.
Source: OECD own estimates and OECD STRI 2017.

4.5.4. Banking rates and STRI

This section presents the results of the regressions of the four parameters measuring the quality of price transmission in the banking sector on relevant policy indicators. Significant results are observed when testing the relationship between bank interest pass-through rate and speed of adjustment and restrictions on the foreign entry component of STRI commercial banking and STRI telecommunications and also the overall score of STRI in telecommunications. These three significant cases occur when combining normalized pass-through rate and speed of adjustment in a geometric average regressed on the STRI. We note that the explanatory power is under 0.1, which is quite low (see detailed results in Table A.C.8).

Figure 4.10. Banking rates and STRI commercial banking: Restrictions on foreign entry



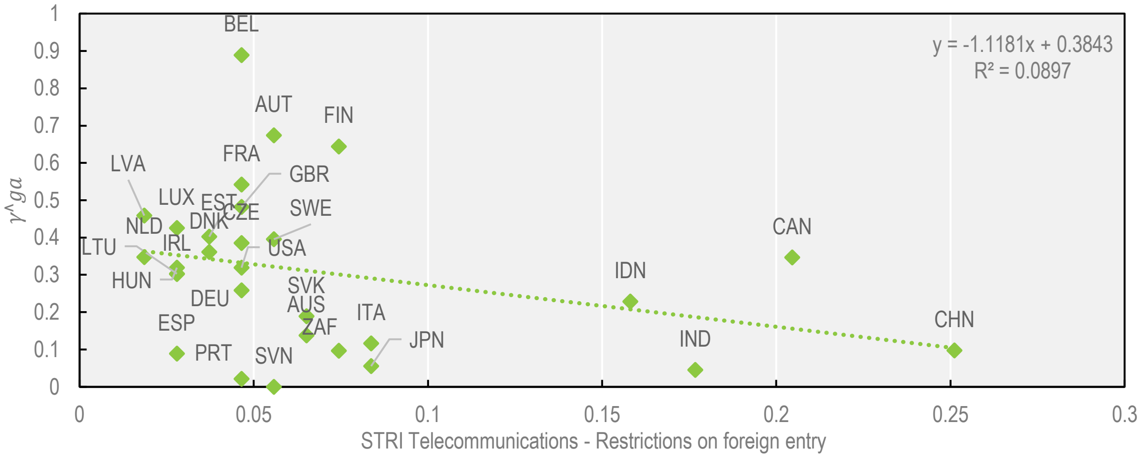
Note: Geometric average of normalized pass-through and speed of adjustment on STRI Commercial banking – Restrictions on foreign entry.
Source: OECD own estimates and OECD STRI 2017.

China, India and Indonesia present significant restrictions on foreign entry in the banking sector, among them foreign equity restrictions, screening of investment procedures and restrictions on board of directors. These three countries also display a low and slow pass-through between interbank and lending rates. At the other end of the spectrum, Belgium and Austria perform well for both dimensions, displaying a relatively low STRI on foreign entry in commercial banking and very high combined parameter for the quality of the pass-through. Finally, there is a group of ten countries with a significantly high score in restrictions on foreign entry in commercial banking performing also reasonably well in the transmission of prices that might explain the low explanatory power of this regression.

Figure 4.11 shows a similar pattern as Figure 4.10 when we regress the same parameter on the score related to restrictions on foreign entry in STRI telecommunications. Canada displays quite high restrictions on foreign entry in telecommunications, but a low score on the STRIs for commercial banking (Figure 4.10), and quite good quality of pass-through, suggesting that banking regulation may be more important than telecommunications regulations, at least when telecommunications infrastructure is reasonably good . Belgium together with Austria and Finland is one of the best performers. European countries more seriously affected by the financial crisis in 2008, such as Portugal, Spain and Italy present a low pass-through with a low STRI in this sector. None of the other policy indicators presented significant correlations with the four parameters.

As noted, the explanatory power of the regressions reported in this section are sometimes quite low. This does not necessarily weaken the correlation between policy and pass-through rates. Instead, a low R^2 suggests that there are other important variables omitted from the regressions that could affect the pass-through rate. More observations are needed to fully explain the determinants of the pass-through rate and the speed of adjustment, for instance using more granular data. This could be an area of future analysis.

Figure 4.11. Banking rates and STRI Telecommunications: Restrictions on foreign entry



Note: Geometric average of normalized pass-through and speed of adjustment on STRI Telecommunications – Restrictions on foreign entry.
Source: OECD own estimates and OECD STRI 2017.

5. Conclusion

This report is the first attempt of a joint analysis of price dynamics and competitiveness in services markets, measuring the extent to which input costs along the value chain are passed onto the consumer. It applies a well-known methodology in the analysis of price dynamics in goods markets transposed into services markets. In addition, it relates the pass-through rate of input prices to consumer prices to policy measures that capture the openness and strength of competition in services markets, using the STRI.

The study finds that price signals from global markets are not fully passed on to consumers and the speed at which this happens can be slow. There are also indications that rising costs are more quickly and fully transmitted to consumer prices than is a reduction in costs.

Preliminary results also suggest that an open and pro-competitive policy framework benefits consumers through faster adjustment of consumer prices to changes in input prices. Much remains to be done in order to establish a causal relationship between policy and price adjustments. Nevertheless, if the results are borne out in more in depth analysis, they have important implications for policy-making. First, openness and competitiveness in services could be crucial for making openness to trade in goods work for consumers. Second, trade and competition policy appears to be complementary and if so, consumers would benefit more from open markets if trade and competition policy were fully aligned. Third, the internet appears to play a crucial role in allowing consumers to make price comparisons and generate competitive pressure on distributors. Thus, the STRI in telecommunications is associated with a more complete and faster pass-through of prices in all markets studied.

In all cases analysed, the number of observations is too small to draw strong conclusions, hence future work on this topic could apply a similar approach to more disaggregated data, for instance airfares or retail prices at the product level. More investment in the data collection would then be required but connections with the Billions Prices project at MIT where new techniques that automatically collect information from the web and convert unstructured data into structured data that can be analysed (web scraping) have proven to be serious alternatives to more traditional approaches. Studying price dynamics at the product level, in line with Gorodnichenko and Talavera (2017[2]) seminal work on online prices should deliver very interesting additional insights on this topic.

References

Amiti, M., S. Redding and D. Weinstein (2019), *The Impact of the 2018 Trade War on U.S. Prices and Welfare*, National Bureau of Economic Research, Cambridge, MA, http://dx.doi.org/10.3386/w25672. [11]

Andries, N. and S. Billon (2016), "Retail bank interest rate pass-through in the euro area: An empirical survey", *Economic Systems*, Vol. 40/1, pp. 170-194, http://dx.doi.org/10.1016/j.ecosys.2015.06.001. [23]

Aristei, D. and M. Gallo (2014), "Interest rate pass-through in the Euro area during the financial crisis: A multivariate regime-switching approach", *Journal of Policy Modeling*, Vol. 36/2, pp. 273-295, http://dx.doi.org/10.1016/j.jpolmod.2013.12.002. [20]

Asane-Otoo, E. and J. Schneider (2015), "Retail fuel price adjustment in Germany: A threshold cointegration approach", *Energy Policy*, Vol. 78, pp. 1-10, http://dx.doi.org/10.1016/j.enpol.2014.12.013. [19]

Blair, B., R. Campbell and P. Mixon (2017), "Price pass-through in US gasoline markets", *Energy Economics*, Vol. 65, pp. 42-49, http://dx.doi.org/10.1016/j.eneco.2017.04.011. [18]

Burstein, A. and G. Gopinath (2014), "International Prices and Exchange Rates", in *Handbook of International Economics*, Elsevier, http://dx.doi.org/10.1016/b978-0-444-54314-1.00007-0. [7]

Campa, J. and L. Goldberg (2006), *Pass Through of Exchange Rates to Consumption Prices: What has Changed and Why?*, National Bureau of Economic Research, Cambridge, MA, http://dx.doi.org/10.3386/w12547. [8]

Carrion-i-Silvestre, J. and A. Sansó (2006), "Testing the Null of Cointegration with Structural Breaks", *Oxford Bulletin of Economics and Statistics*, Vol. 68/5, pp. 623-646, http://dx.doi.org/10.1111/j.1468-0084.2006.00180.x. [31]

Cavallo, A. (2018), *More Amazon Effects: Online Competition and Pricing Behaviors*, National Bureau of Economic Research , Cambridge, MA, http://dx.doi.org/10.3386/w25138. [1]

Chen, S. (2009), "Oil price pass-through into inflation", *Energy Economics*, Vol. 31/1, pp. 126-133, http://dx.doi.org/10.1016/j.eneco.2008.08.006. [16]

Choi, S. et al. (2018), "Oil prices and inflation dynamics: Evidence from advanced and developing economies", *Journal of International Money and Finance*, Vol. 82, pp. 71-96, http://dx.doi.org/10.1016/j.jimonfin.2017.12.004. [17]

Crucini, J. and C. Telmer (2012), "Microeconomic sources of real exchange rate variability", *NBER Working Paper*. [14]

David F. Hendry & Katarina Juselius, 2. (2000), *Explaining Cointegration Analysis: Part 1*, pp. vol. 0(Number 1), pages 1-42, https://ideas.repec.org/a/aen/journl/2000v21-01-a01.html. [25]

Dickey, D. and W. Fuller (1979), "Distribution of the Estimators for Autoregressive Time Series [27]

With a Unit Root", *Journal of the American Statistical Association*, Vol. 74/366, p. 427, http://dx.doi.org/10.2307/2286348.

Driscoll, J. (1998), "Consistent Covariance Matrix Estimation With Spatially Dependent Panel Data", *The Review of Economics and Statistics*, https://EconPapers.repec.org/RePEc:tpr:restat:v:80:y:1998:i:4:p:549-560. [32]

Engle, R. and C. Granger (1987), "Co-Integration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, Vol. 55/2, p. 251, http://dx.doi.org/10.2307/1913236. [28]

Feenstra, R. (1989), "Symmetric pass-through of tariffs and exchange rates under imperfect competition: An empirical test", *Journal of International Economics*, Vol. 27/1-2, pp. 25-45, http://dx.doi.org/10.1016/0022-1996(89)90076-7. [10]

Forbes, K., I. Hjortsoe and T. Nenova (2018), "The shocks matter: Improving our estimates of exchange rate pass-through", *Journal of International Economics*, Vol. 114, pp. 255-275, http://dx.doi.org/10.1016/j.jinteco.2018.07.005. [12]

Francois, J. and I. Wooton (2010), "Market Structure and Market Access", *World Economy*, http://dx.doi.org/10.1111/j.1467-9701.2010.01234.x. [4]

Goldberg, L. and J. Campa (2010), "The sensitivity of the CPI to exchange rates: Distribution margins, imported inputs, and trade exposure", *Review of Economics and Statistics*, http://dx.doi.org/10.1162/rest.2010.11459. [6]

Goldberg, L. and J. Campa (2010), "The Sensitivity of the CPI to Exchange Rates: Distribution Margins, Imported Inputs, and Trade Exposure", *Review of Economics and Statistics*, Vol. 92/2, pp. 392-407, http://dx.doi.org/10.1162/rest.2010.11459. [3]

Goldberg, L. and J. Campa (2010), "The Sensitivity of the CPI to Exchange Rates: Distribution Margins, Imported Inputs, and Trade Exposure", *Review of Economics and Statistics*, Vol. 92/2, pp. 392-407, http://dx.doi.org/10.1162/rest.2010.11459. [9]

Gorodnichenko, Y. and O. Talavera (2017), "Price Setting in Online Markets: Basic Facts, International Comparisons, and Cross-Border Integration", *American Economic Review*, Vol. 107/1, pp. 249-282, http://dx.doi.org/10.1257/aer.20141127. [2]

Granger, C. and T. Lee (1989), "Investigation of Production, Sales and Inventory Relationships Using Multicointegration and Non-symmetric Error Correction Models", *Journal of Applied Economics*, Vol. 4, pp. 135-159, https://doi.org/10.1002/jae.3950040508. [30]

Granger, C. and N. Swanson (1997), "An introduction to stochastic unit-root processes", *Journal of Econometrics*, Vol. 80/1, pp. 35-62, http://dx.doi.org/10.1016/s0304-4076(96)00016-4. [26]

Horvath, R., J. Kotlebova and M. Siranova (2018), "Interest rate pass-through in the euro area: Financial fragmentation, balance sheet policies and negative rates", *Journal of Financial Stability*, Vol. 36, pp. 12-21, http://dx.doi.org/10.1016/j.jfs.2018.02.003. [22]

Illes, A. (2013), *Interest rate pass-through since the financial crisis*, https://www.bis.org/publ/qtrpdf/r_qt1309g.htm. [24]

Karagiannis, S., Y. Panagopoulos and P. Vlamis (2010), “Interest rate pass-through in Europe and the US: Monetary policy after the financial crisis”, *Journal of Policy Modeling*, Vol. 32/3, pp. 323-338, http://dx.doi.org/10.1016/j.jpolmod.2010.02.006. [21]

Menon, J. (1995), “EXCHANGE RATE PASS-THROUGH”, *Journal of Economic Surveys*, Vol. 9/2, pp. 197-231, http://dx.doi.org/10.1111/j.1467-6419.1995.tb00114.x. [33]

Mussa, L. (1990), “Exchange rates in theory and reality”, *Essays in international finance, Priceton University* 179, https://www.princeton.edu/~ies/IES_Essays/E179.pdf. [13]

Nordås, H. and D. Rouzet (2015), “The Impact of Services Trade Restrictiveness on Trade Flows: First Estimates”*, OECD Trade Policy Papers*, No. 178, OECD Publishing, Paris, https://dx.doi.org/10.1787/5js6ds9b6kjb-en. [15]

Rouzet, D. and F. Spinelli (2016), “Services Trade Restrictiveness, Mark-Ups and Competition”*, OECD Trade Policy Papers*, No. 194, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jln7dlm3931-en. [5]

Von Cramon-Taubadel, S. and J. Loy (1996), “Price Asymmetry in the International Wheat Market: Comment”, *Canadian Journal of Agricultural Economics*, Vol. 44, pp. 311-317, https://doi.org/10.1111/j.1744-7976.1996.tb00153. [29]

Annex A. Data

Exchange rate, oil price and HICP

Table A A.1. Variables, country and time coverage

Relation	Countries	Period
Exchange rate – CPI Clothing	Chile, Colombia, Costa Rica, Czech Republic, Denmark, Hungary, Island, Israel, Japan, Latvia, Mexico, Norway, Poland, Russia, South Africa, Korea, Sweden, Switzerland, Turkey (20)	1980-2017
Oil Price - CPI Energy	Austria, Belgium, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom (36)	1985-2017
Oil Price – CPI Transport	Austria, Belgium, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Island, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom (36)	1985-2017

Source: OECD Main Economic Indicators and IEA.

Interbank and lending rates

Table A A.2. Variables, country coverage, definition and sources

Country	Variable code	Definition	Sources
Australia	rl	Weighted-average lending rate on credit outstanding to large businesses	Reserve Bank of Australia
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)
Canada	rl	1-year fixed mortgage rate	Canadian Association of Accredited Mortgage Professionals (CAAMP) World Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)
China	rl	Lending rate	World Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)
Euro countries	rl	Bank interest rate-loan to corporations with an original maturity of up to one year	European Central Bank
	rb	Euro overnight index average (EONIA)	European Central Bank
India	rl	Lending rate	World Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)
Indonesia	rl	Lending rate	Thomson Reuters, Credit interest rates-commercial banks, investment NADJ
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators-complete database", Main Economic Indicators (database)
Japan	rl	Lending rate	World Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators-complete database", Main Economic Indicators (database)

Country	Variable code	Definition	Sources
Non-Euro countries (Czech Republic, Denmark, Hungary, Sweden)	rl	Bank interest rate-loan to corporations with an original maturity of up to one year	European Central Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators-complete database", Main Economic Indicators (database)
United Kingdom	rl	Bank interest rate-loan to corporations with an original maturity of up to one year	European Central Bank
	rb	Overnight London interbank offered rate (LIBOR) based on British Pound	ICE Benchmark Administration Limited (IBA)
United States	rl	Weighted-average effective loan rate for all commercial and industry loans, all commercial banks	Board of Governors of the Federal Reserve System's E.2 release
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)
South Africa	rl	Lending rate	World Bank
	rb	Immediate rates: less than 24 hours: call money/interbank rate	OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database)

Annex B. Methodology

Co-integration and Vector Error Correction Model

Recognising that most macroeconomic and price series are nonstationary, a cointegration approach will be used to analyse the pure marketing margin and the degree of price transmission in the OECD members and partner countries. The approach using exchange rates, price data and commercial loan rates will be extended by testing for asymmetry within the price transmission process, and structural changes.

Spurious regressions and unit root test

The performance of a unit root test is the first step of every cointegration analysis. According to David, Hendry and Juselius (2000[25]), the dataset used can be unit root (integrated of degree 1) and in this case it cannot be employed in order to evaluate the relationship between the various variables due to the risk of spurious regression. This implies that the OLS estimates become invalid.

A series with such characteristics can be made stationary by using its first difference. In fact, a time series characterised by a stationary first difference can be qualified as having an exact/pure unit root (Granger and Swanson, 1997[26]).

To test for unit root, several methods are available. The one applied for this study is the augmented Dickey-Fuller test (ADF) (Dickey and Fuller, 1979[27]) which represents one of the most commonly used tests for stationarity (the null hypothesis is that the series have a unit root) and corresponds to one augmented version of the original Dickey-Fuller test which was expanded in order to be able to accommodate more complex models with unknown orders.

Equation (1) below represents the augmented Dickey-Fuller regression:

$$\Delta CPI_t = \alpha + \beta CPI_{t-1} + \partial t + \varphi_1 \Delta CPI_{t-1} + \varphi_2 \Delta CPI_{t-2} + \cdots + \varphi_k \Delta CPI_{t-p} + u_t \tag{1}$$

Where testing if β=0 is the same as testing if CPI_t is a unit root process.

Co-integration tests

In time series analysis, the Johansen co-integration approach (Johansen-Juselius) and the Engle and Granger test are the two most common tests for examining the long run relationship among a set of macroeconomic variables.

Johansen-Juselius (JJ) co-integration test

The JJ methodology constitutes a standard approach for testing co-integration among two series. The major advantage of this procedure is that it investigates the possibility of more than one co-integrating vector among all endogenous variables (contrary to Engle and Granger). Using a maximum likelihood method, it evaluates all possible co-integrating vectors providing two likelihood ratio tests for the number of co-integrating vectors.

The JJ approach proposes two tests: the maximum eigenvalue test and the trace test. The maximum eigenvalue test the null hypothesis that there are at most ‘r’ co-integrating vectors against the alternative of (r+1) co-integrating vectors. The trace test tests the null hypothesis that there are at most ‘r’ co-integrating vectors versus the alternative hypothesis that there are more than ‘r’ co-integrating vectors.

In this process, five possible trend terms specifications can be tested:

- “unrestricted trend” (or simply “trend”)
- “restricted trend”
- “unrestricted constant”(or simply “constant”)

- “restricted constant”
- “none”: all means and trends are eliminated (reduced to zero)

Engle and Granger test

Engle and Granger (1987[28])) theorized a two steps process to test for co-integration (an OLS regression and a unit root test) called the Engle Granger-Augmented Dickey Fuller test. In this approach, the two series are said to be co-integrated if the residuals of equation (1) are found to be stationary. The order of integration for each of the variables of the first equation is observed before executing the co-integration test. For the first step of this approach, the long run equilibrium relationship is tested using OLS. In the second step, this long run equilibrium relationship is estimated while the short run relationship is examined using the one-period lagged residuals evaluated in the first step.

Long-term relationship between variables:

$$CPI_t = \alpha_0 + \alpha_1 EXR_t + u_t \qquad (2)$$

Short run dynamics between variables:

$$\Delta CPI_t = \beta_0 + \sum \beta_{1s} \Delta EXR_{t-s} + \sum \beta_{2s} \Delta CPI_{t-s} + \beta_3 u_{t-1} + v_t \qquad (3)$$

Asymmetric transmission

A commonly used empirical approach to estimate this type of asymmetries is the error correction model (ECM) designed by Von Cramon-Taubadel and Loy (1996[29]). This asymmetric error correction model approach states that if two factors X1 and X2 are cointegrated, then an error correction representation exists. As specified in Granger and Lee (1989[30]) where the representation involves a Wolffram–type segmentation of the error correction term (ECT) into positive and negative components, Von Cramon-Taubadel and Loy (1996[29]) segmented the contemporaneous response term. This leads to a specification in which contemporaneous and short–run response to departures from the cointegrating relation are asymmetric

The method used in this analysis applies a joint F-test to the asymmetric model specified in the following equation (3):

$$\Delta CPI_t = \beta_0 + \beta_1^+ * \Delta EXR_t^+ + \beta_1^- * \Delta EXR_t^- + \beta_2^+ * ECT_{t-1}^+ + \beta_2^- * ECT_{t-1}^- + \beta_3 * \Delta EXR_{t-1} + \beta_4 * \Delta CPI_{t-1} + \varepsilon_t \qquad (4)$$

The formal test of the asymmetry hypothesis using equation (3) is:

$$H_0: \beta_1^+ = \beta_1^- \ and \ \beta_2^+ = \beta_2^-$$

Structural breaks

Testing for structural break enables to identify the date of a possible break. A break in the co-integrating relation will cause a spurious unit root which can lead to a rejection of co-integration. As a result, testing for structural break could provide an explanation of why some countries fail the co-integration.

This test for structural change was first introduced by Carrion-i-Silvestre and Sansó (2006[31]). The advantage of this test is that it avoids the problem of disentangling a regime shift from a stable co-integrating relationship and it permits for a structural break in the parameters of the co-integrating vector, including but not limited to the deterministic part of the vector.

Pass-through and speed of adjustment

In order to estimate the sensitivity of consumer price indices to exchange rates and oil prices, an evaluation of the pass-through needs to be performed before measuring the speed of price adjustment to equilibrium levels.

This study will use the following econometric specification based on the two equations:

Evaluation of pass-through:

$$log(CPI_{ct}) = \alpha log(EXR_{ct}) + error_{ct} \quad (5)$$

Evaluation of speed of price adjustment:

$$dlog(CPI_{ct}) = \beta \left(log(CPI_{c,t-1}) - \hat{\alpha} log(EXR_{c,t-1}) \right) + \varphi_1 dlog(CPI_{c,t-1}) + \lambda_1 dlog(EXR_{c,t-1}) + error_{ct} \quad (6)$$

Where $dx_t \equiv x_t - x_{t-1}$ correspond to t the first difference operator and EXR_{ct}corresponds to the exchange rate of country c in date t.

The first equation assesses the long term pass-through of exchange rates or oil prices to consumer price indices. In the second equation, β quantifies how fast the deviation from the equilibrium is eliminated, meaning that the more negative this parameter, the faster the price adjustment will be.

An important assumption behind these two equations is that price differentials have a joint stochastic trend captured by the exchange rate (or oil price). Also, in order to consider the possibility that the error terms of equation (5) and (6) could be correlated across time and countries standard errors will be calculated using the Driscoll (1998[32]) approach.

Pass-through rates, speed of adjustment and policy indicators

The next paragraphs describe in detail the calculation of these parameters and the results of the regressions.

This section explores the relation between different policy indicators (OECD FDI RRI, PMR, STRI, TFI, and World Bank LPI), and the previously estimated variables before discussing and comparing the obtained results with the rationally expected results.

In order to assess how trade regulations can be linked with the magnitude of the pass-through and speed of price adjustment, we regress the estimated normalized $\hat{\alpha}$ and $\hat{\beta}$ on the sector components of the sector indicators of OECD FDI RRI, PMR and STRI and on the overall index of OECD TFI and World Bank LPI. Each of the relations are ran estimated separately.

In addition to the estimated pass-through rate and speed of adjustment, we also calculate two combined parameters of the normalized $\hat{\alpha}$ and $\hat{\beta}$ using simple and geometric averages.

In order to merge together the two estimated variables, the first step is to normalize them using Min-Max normalization method. The method groups all the values between the range of [0: 1] (0 for the lowest value and 1 for the highest) making them comparable and allowing an association among them. The only issue in the initial variables is that a high pass-through is associated with a positive result while a high value of speed – and thus a less negative value – with a negative one as it represents a low speed. This implies that the value one in the normalized $\hat{\alpha}$ is the best value among the countries while the value 1 of the normalized $\hat{\beta}$ the worst one and so combining the two variables would not make any sense. In order to prevent this complication, we normalized the absolute value of the speed of adjustment; all the values of $\hat{\beta}$ being negative the highest absolute value would represent the country adjusting the most rapidly and in this case the two normalized variables would be comparable and apt to be assembled.

In order to merge together the two estimated variables, the first step is to normalize them using the Min-Max normalization method. The method groups all the values between the range of 0 and 1 (0 for the lowest value and 1 for the highest) making them comparable and allowing an association among them. The only issue in the initial variables is that a high pass-through is associated with a positive result while a high value of speed – and thus a less negative value – with a negative one as it represents a low speed. This implies that the value one in the normalized $\hat{\alpha}$ is the best value among the countries while the value 1 of the normalized $\hat{\beta}$ is the worst one and so combining the two variables would not make any sense. In order to prevent this complication, we normalized the absolute value of the speed of adjustment; all the values of $\hat{\beta}$ being negative the highest absolute value would represent the country adjusting the most rapidly and in this case the two normalized variables would be comparable and apt to be assembled.

To combine the two estimated variables, two methods were used to get two different indicators in order to have more flexibility and to be able to compare them. The first method was a simple average of the two estimations ($\widehat{\gamma^a}$) while the second a geometric average ($\widehat{\gamma^{ga}}$) using the following formula: $(normalized\ \hat{\alpha})^{\varphi} * (normalized\ \hat{\beta})^{1-\varphi}$ where φ in our case is equal to 0.5.

These two generated variables along with the estimated pass-through and speed of adjustment will constitute the four dependent variables in the different regressions estimated with the policy indicators.

To look for the possible correlations and have a precise estimation for each of the relations mentioned above, we estimated the following equation:

$$Outcome_c = \delta STRI_c + error_c$$

Where c indexes countries, $Outcome_c = \left\{\widehat{\alpha_c};\ \widehat{\beta_c};\ \widehat{\gamma_c^a};\ \widehat{\gamma_c^{ga}}\right\}$ and this equation being regressed for each of the different sectors separately.

Annex C. Regression results

Pass-through rates, speeds of adjustment, structural breaks and asymmetry tests

Exchange rate and HICP Clothing (item 3)

Table A C.1. Pass-through, speed of adjustment, structural break and asymmetry tests

Country	Pass-through	Speed of adjustment	Date of structural break	Asymmetric transmission (F-test)
Korea	0.949*** (0.000)	-0.002*** (0.236)	Dec-89	S
United Kingdom	-0.294*** (0.085)	-0.003 (0.498)	Jan-03	S
Mexico	0.473*** (0.000)	-0.004 (0.583)	Feb-13	S
South Africa	0.366*** (0.000)	-0.006*** (0.096)	Feb-10	A
Russia	0.390*** (0.000)	-0.009*** (0.055)	Jan-16	S
Costa Rica	0.589*** (0.000)	-0.012 (0.157)	Aug-10	A
Norway	0.573*** (0.000)	-0.016*** (0.028)	Jan-10	S
Poland	-0.729*** (0.000)	-0.023*** (0.085)	Oct-07	S
Chile	-0.863*** (0.000)	-0.027 (0.103)	Jan-13	A
Czech Republic	0.487*** (0.000)	-0.041*** (0.001)	Dec-11	A
Latvia	-0.007 (0.944)	-0.065*** (0.000)	Sep-98	S
Sweden	0.401*** (0.000)	-0.084*** (0.000)	Sep-85	S
Israel	0.478*** (0.000)	-0.085*** (0.000)	Aug-01	A
Japan	-0.282*** (0.000)	-0.148*** (0.000)	Apr-91	S
Switzerland	-0.189*** (0.000)	-0.222*** (0.000)	Sep-89	S
Iceland	0.667*** (0.000)	-0.296*** (0.000)	Jan-08	S
Turkey	0.589*** (0.000)	-0.440*** (0.000)	May-09	S
Hungary	0.098*** (0.000)	-0.560*** (0.000)	Oct-11	S
Colombia	0.170*** (0.000)	-0.724*** (0.000)	Mar-12	A
Denmark	0.024 (0.349)	-0.989*** (0.000)	Sep-02	S

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own calculations.

Oil prices and HICP energy (item4)

Table A C.2. Pass-through, speed of adjustment, structural break and asymmetry tests for oil price and HICP energy

Country	Pass-through	Speed of adjustment	Date of structural break	Asymmetric transmission (F-test)
Costa Rica	0.792*** (0.000)	-0.004 (0.204)	Jan-13	S
Lithuania	0.790*** (0.000)	-0.053*** (0.000)	Jun-12	S
Latvia	0.565*** (0.000)	-0.021*** (0.000)	Jan-12	A
Czech Republic	0.451*** (0.000)	-0.013*** (0.004)	Feb-12	S
Estonia	0.446*** (0.000)	-0.019*** (0.000)	Jan-13	A
Iceland	0.388*** (0.000)	-0.004* (0.057)	May-14	A
Israel	0.375*** (0.000)	-0.008*** (0.000)	Feb-94	S
Slovenia	0.364*** (0.000)	-0.018*** (0.000)	Feb-13	S
Slovak Republic	0.357*** (0.000)	-0.023*** (0.003)	Mar-08	S
Portugal	0.344*** (0.000)	-0.017*** (0.000)	May-12	S
United Kingdom	0.338*** (0.000)	-0.013*** (0.000)	Sep-12	S
Ireland	0.337*** (0.000)	-0.026*** (0.000)	Sep-12	S
Greece	0.326*** (0.000)	-0.020*** (0.003)	Aug-11	S
Korea	0.294*** (0.000)	-0.0011*** (0.000)	Sep-12	S
Norway	0.283*** (0.000)	-0.007 (0.121)	Feb-11	S
Luxembourg	0.258*** (0.000)	-0.017*** (0.000)	Dec-11	S
Spain	0.236*** (0.000)	-0.022*** (0.000)	Jun-12	S
Italy	0.229*** (0.000)	-0.022*** (0.000)	Oct-11	S
France	0.226*** (0.000)	-0.009*** (0.000)	Sep-12	A
Netherlands	0.216*** (0.000)	-0.010** (0.028)	Aug-13	S
Belgium	0.208*** (0.000)	-0.017*** (0.008)	Feb-11	S
Austria	0.197*** (0.000)	-0.007*** (0.004)	Oct-13	S
Germany	0.184*** (0.000)	-0.019*** (0.000)	Nov-12	S
Denmark	0.174*** (0.000)	-0.006*** (0.184)	Feb-12	A
Mexico	0.166*** (0.000)	-0.019** (0.012)	May-14	S
Sweden	0.162*** (0.000)	-0.041*** (0.000)	Sep-12	S
Switzerland	0.155*** (0.000)	-0.029*** (0.000)	Feb-12	S
Turkey	0.141** (0.044)	-0.007** (0.013)	Aug-08	S
Hungary	0.101*** (0.000)	-0.024** (0.031)	Jul-08	S
Poland	0.056 (0.104)	-0.012*** (0.001)	Sep-08	S
Japan	0.036*** (0.000)	-0.015*** (0.000)	Feb-94	A

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates.

Oil prices and HICP transport (item 7)

Table A C.3. Pass-through, speed of adjustments, structural break and asymmetry tests for oil price and HICP transport

Country	Pass-through	Speed of adjustment	Date of structural break	Asymmetric transmission (F-test)
Lithuania	0.608*** (0.004)	-0.057*** (0.012)	Apr-12	S
Costa Rica	0.586*** (0.006)	-0.020*** (0.010)	Apr-12	S
Latvia	0.447*** (0.005)	-0.018*** (0.007)	Apr-11	S
Turkey	0.436*** (0.011)	0.001 (0.005)	Jan-14	S
Iceland	0.425*** (0.008)	-0.019*** (0.009)	Dec-10	A
Korea	0.414*** (0.006)	-0.007* (0.006)	Feb-94	S
Portugal	0.372*** (0.007)	-0.010*** (0.013)	Feb-94	S
Israel	0.354*** (0.010)	-0.009*** (0.014)	Feb-94	S
Estonia	0.299*** (0.006)	-0.045*** (0.021)	Oct-13	S
United Kingdom	0.291*** (0.012)	-0.009* (0.029)	Apr-11	S
Mexico	0.284*** (0.006)	-0.002 (0.005)	Jan-14	S
Greece	0.275*** (0.008)	0.001 (0.005)	Mar-10	S
Norway	0.270*** (0.010)	-0.008* (0.011)	Sep-12	S
Spain	0.258*** (0.021)	-0.006 (0.016)	Mar-12	S
Hungary	0.253*** (0.005)	-0.020* (0.009)	Oct-08	S
Germany	0.249*** (0.015)	-0.010* (0.008)	Mar-12	S
Poland	0.249*** (0.012)	-0.062*** (0.003)	Feb-10	S
Ireland	0.243*** (0.008)	-0.013* (0.007)	Apr-96	S
Italy	0.237*** (0.002)	-0.012** (0.017)	Mar-12	S
Netherlands	0.237*** (0.011)	-0.003 (0.004)	Jul-12	S
France	0.232*** (0.037)	-0.007* (0.006)	Apr-12	S
Sweden	0.221*** (0.005)	-0.023*** (0.006)	Feb-12	S
Belgium	0.191*** (0.012)	0.002 (0.007)	Jan-12	S
Czech Republic	0.190*** (0.020)	-0.030*** (0.002)	May-98	S
Luxembourg	0.190*** (0.007)	-0.004 (0.010)	Feb-13	S
Denmark	0.177*** (0.008)	-0.001 (0.005)	Mar-14	S
Austria	0.170*** (0.010)	-0.025*** (0.027)	Mar-12	S
Slovenia	0.153*** (0.012)	-0.041*** (0.003)	Aug-02	S
Slovak Republic	0.130*** (0.007)	-0.043*** (0.019)	Nov-11	A
Switzerland	0.128*** (0.010)	-0.023*** (0.011)	Feb-94	S
Japan	0.045*** (0.006)	-0.056*** (0.009)	Nov-95	A
Finland	0.029*** (0.032)	-0.066*** (0.006)	Apr-12	S

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates.

Interbank and lending rates

Table A C.4. Pass-through, speed of adjustment, structural break and asymmetry tests for interbank and lending rates

Country	Pass-through	Speed of adjustment	Date of structural break	Asymmetric transmission (F-test)
India	0.958*** (0.000)	-0.001 (0.137)	Jun-09	S
Hungary	0.943*** (0.000)	-0.050 (0.111)	Aug-09	S
Netherlands	0.922*** (0.000)	-0.061**(0.030)	Feb-12	S
United States	0.886*** (0.000)	-0.054**(0.025)	Apr-12	A
South Africa	0.873***(0.000)	-0.005 (0.170)	Sep-08	S
Canada	0.840*** (0.000)	-0.068*** (0.008)	Feb-12	S
United Kingdom	0.834*** (0.000)	-0.133*** (0.000)	Dec-08	S
France	0.834*** (0.000)	-0.168*** (0.000)	Oct-12	A
Czech Republic	0.827***(0.000)	-0.086*** (0.000)	Apr-10	
Australia	0.822*** (0.000)	-0.011 (0.346)	Feb-09	
Luxembourg	0.818***(0.000)	-0.106*** (0.001)	Dec-08	A
Austria	0.812*** (0.000)	-0.269*** (0.000)	Nov-08	A
Sweden	0.808*** (0.000)	-0.093** (0.025)	Dec-11	
Lithuania	0.804*** (0.000)	-0.055***(0.003)	Mar-12	A
Finland	0.793*** (0.000)	-0.253***(0.000)	Aug-14	S
Belgium	0.793*** (0.000)	-0.482*** (0.000)	Dec-11	A
Ireland	0.780*** (0.000)	-0.057** (0.017)	Apr-13	S
Latvia	0.777*** (0.000)	-0.132*** (0.002)	Feb-09	S
Japan	0.748***(0.000)	-0.002 (0.291)	Apr-92	S
Germany	0.746***(0.000)	-0.044** (0.041)	Apr-12	S
Estonia	0.692*** (0.000)	-0.118*** (0.003)	Jul-14	S
China	0.684*** (0.000)	-0.007***(0.005)	Mar-12	
Denmark	0.666*** (0.000)	-0.100***(0.000)	Jun-15	S
Italy	0.596***(0.000)	-0.012 (0.363)	Jun-14	S
Indonesia	0.593*** (0.000)	-0.047*** (0.000)	Nov-03	
Spain	0.545***(0.000)	-0.008 (0.392)	Jan-12	S
Slovak Republic	0.536***(0.000)	-0.037* (0.085)	Sep-07	S
Portugal	0.342*** (0.000)	-0.001 (0.900)	Jan-12	S
Slovenia	0.258*** (0.000)	-0.000 (0.975)	Jun-14	A
Greece	0.171*** (0.000)	-0.002 (0.852)	Sep-08	S

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates.

Pass-through rates and speed of adjustment and policy indicators

Exchange rate-HICP clothing and STRI

Table A.C.5 presents a selection of the significant regressions of the four parameters calculated for the transmission from exchange rate on to HICP clothing described in Annex B on the STRI. None of the other policy indicators tested had significant coefficients.

Table A C.5. Exchange rate-CPI clothing and STRI

Estimated relations	Variables	On $\hat{\alpha}$	On $\hat{\beta}$	On $\widehat{\gamma^a}$	On γ^{ga}
EXR-HICP Clothing with STRI Distribution	Coefficient	1.614**	0.150	0.882	0.828
	R-squared	0.155	0.001	0.088	0.052
	Observations	0.155	0.001	0.088	0.052
EXR-HICP Clothing with STRI Distribution - Barriers to competition	Coefficient	8.165***	-1.258	3.453*	-0.545
	R-squared	0.268	0.005	0.091	0.002
	Observations	20	20	20	20
EXR-HICP Clothing with STRI Telecom	Coefficient	1.449**	-1.127	0.161	-0.587
	R-squared	0.169	0.087	0.004	0.035
	Observations	20	20	20	20
EXR-HICP Clothing with STRI Telecom - Restrictions on foreign entry	Coefficient	3.479***	-1.477	1.001	-0.673
	R-squared	0.347	0.053	0.055	0.016
	Observations	20	20	20	20
EXR-HICP Clothing with STRI Telecom - Barriers to competition	Coefficient	-0.165	-1.608*	-0.886	-1.396*
	R-squared	0.001	0.092	0.062	0.103
	Observations	20	20	20	20

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates and OECD STRI 2017.

Oil prices-HICP energy with STRI and TFI

Table A.C.6 presents a selection of the significant regressions of the four parameters calculated for the transmission from oil prices on to HICP energy described in Annex B on the STRIs and the TFIs. None of the other policy indicators tested had significant coefficients.

Table A C.6. Results for oil prices-HICP energy on STRI and TFI

Estimated Relations	Variables	On $\hat{\alpha}$	On $\hat{\beta}$	On $\widehat{\gamma^a}$	On γ^{ga}
Oil-HICP Energy with STRI Telecom	Coefficient	-0.980**	-1.590***	-1.285***	-1.565***
	R-squared	0.106	0.253	0.283	0.385
	Observations	36	36	36	36
Oil-HICP Energy with STRI Logistics Cargo-handling	Coefficient	-0.594***	-0.499**	-0.547***	-0.573***
	R-squared	0.170	0.108	0.222	0.224
	Observations	36	36	36	36
Oil-HICP Energy with STRI Logistics Storage and Warehouse	Coefficient	-0.542***	-0.453**	-0.497***	-0.509***
	R-squared	0.141	0.089	0.184	0.177
	Observations	36	36	36	36
Oil-HICP Energy with STRI Logistics Freight Forwarding	Coefficient	-0.514	-0.894*	-0.704*	-0.935**
	R-squared	0.022	0.059	0.063	0.102
	Observations	36	36	36	36
Oil-HICP Energy with TFI	Coefficient	0.506	0.660*	0.583**	0.624**
	R-squared	0.042	0.066	0.085	0.091
	Observations	35	35	35	35

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own calculations, OECD STRI 2017, OECD TFI 2017.

Oil price-HICP transport with STRI and TFI

Table A.C.7 presents a selection of the significant regressions of the four parameters calculated for the transmission from oil prices on to HICP transport described in Annex B on the STRIs and the TFIs. None of the other policy indicators tested had significant coefficients.

Table A C.7. Results for Oil prices-Transport HICP transport on STRI and TFI

Estimated Relations	Variables	On $\hat{\alpha}$	On $\hat{\beta}$	On $\widehat{\gamma^a}$	On γ^{ga}
Oil-HICP Transport with STRI Air Transport	Coefficient	-0.251	-0.996*	-0.623**	-0.490
	R-squared	0.011	0.069	0.085	0.050
	Observations	36	36	36	33
Oil-HICP Transport with STRI Road Transport	Coefficient	0.445*	-0.566	-0.060	-0.059
	R-squared	0.056	0.036	0.001	0.001
	Observations	36	36	36	33
Oil-HICP Transport with STRI Logistics Storage and Warehouse	Coefficient	-0.428***	-0.397	-0.413***	-0.376***
	R-squared	0.126	0.043	0.146	0.131
	Observations	36	36	36	33
Oil-HICP Transport with STRI Logistics Cargo-handling	Coefficient	-0.434***	-0.395	-0.415***	-0.362***
	R-squared	0.129	0.042	0.147	0.118
	Observations	36	36	36	33
Oil-HICP Transport with STRI Logistics Freight Forwarding	Coefficient	-0.129	-1.043*	-0.586*	-0.540
	R-squared	0.002	0.051	0.050	0.043
	Observations	36	36	36	33
Oil-HICP Transport with TFI	Coefficient	0.439	0.398	0.418*	0.153
	R-squared	0.047	0.015	0.050	0.007
	Observations	35	35	35	32

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates, OECD STRI and TFI.

Banking rates and STRI

Table A C.8. Banking rates and STRI

Estimated relations	Variables	On $\hat{\alpha}$	On $\hat{\beta}$	On $\widehat{\gamma^a}$	On γ^{ga}
Interest Rate Pass-Through with STRI Commercial Banking - Restrictions on foreign entry	Coefficient	1.054	-0.743	0.156	-1.098*
	R-squared	0.043	0.028	0.002	0.063
	Observations	30	30	30	29
Interest Rate Pass-Through with STRI Telecom	Coefficient	0.252	-0.332	-0.040	-0.545*
	R-squared	0.011	0.025	0.000	0.070
	Observations	30	30	30	29
Interest Rate Pass-Through with STRI Telecom - Restrictions on foreign entry	Coefficient	0.11	-0.81	-0.35	-1.118*
	R-squared	0.001	0.045	0.011	0.09
	Observations	30	30	30	29

Note: *** p<0.05, ** p<0.10, * p<0.2.
Source: OECD own estimates and OECD STRI 2017.

OECD TRADE POLICY PAPERS

Comments are welcome and can be sent to tad.contact@oecd.org.