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WHAT A DIFFERENCE A DECADE MAKES: SURVEY EVIDENCE FROM ICELANDIC FIRMS

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What a difference a decade makes:

Survey evidence from Icelandic firms*

Aðalheiður Ó. Guðlaugsdóttir†, Karen Á. Vignisdóttir‡, Lilja S. Kro§

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Abstract

Understanding firms' price-setting behaviour is of vital importance for central banks charged with maintaining price stability. This paper presents the results of a survey conducted among Icelandic firms in 2019, following a period of relative price stability, and contrasts it with the results from an almost identical survey taken in 2008, during a period of extreme volatility and uncertainty. The survey responses show that firms both review and change their prices less frequently in 2019 than they did in 2008. Furthermore, respondents indicate that the impact of changes in the exchange rate on pricing decisions is more symmetric than before, as firms are likelier to lower their prices following a currency appreciation, and a larger share of them report that a sizeable depreciation would be needed to prompt them to raise prices.

Keywords: Price setting, Price stickiness, Exchange rate pass-through, Inflation dynamics, Iceland

JEL Classification: D40, E31, L11

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1 Introduction

Price setting and firms' pricing behaviour are of particular importance to central banks. Understanding how firms decide the prices of their goods and services, and the drivers of those decisions is essential because it plays a significant role in inflation dynamics and the monetary policy transmission mechanism. In the summer of 2008, the Central Bank of Iceland conducted a survey of domestic firms' pricing decisions (Olafsson, Petursdottir, & Vignisdottir, 2011). At that time, inflation measured 12.4% and had averaged just over 5% since the inflation target was adopted in 2001. The Central Bank decided to repeat the survey in 2019, following a period of relatively stable inflation, during which inflation had averaged close to the 2.5% target since the beginning of 2012. The objective of the survey is to gain a fuller understanding of the factors that affect Icelandic firms' pricing decisions, the frequency of price changes, the effects of exchange rate movements on pricing, and whether a decade of relative price stability altered how prices are set. It is especially interesting to monitor whether the effects of exchange rate movements on prices have changed markedly during this period. Another topic of particular interest is whether competition has increased and how it affects firms' price-setting behaviour.

Digitisation has had various effects on price-setting behaviour in recent decades and could partly explain the changes we see in price-setting behaviour in Iceland. E-commerce has become more common over the past decade with the result that Icelandic retail companies face growing competition from abroad. These technological innovations also reduce the menu cost of changing prices. It could therefore affect the frequency of price changes, perhaps strenghtening pass-through from changes in the exchange rate. Furthermore, on the consumers' side, e-commerce facilitates price comparison, potentially increasing competition and therefore affecting price mark-ups. Therefore, the survey included questions specifically addressing the extent and possible impact of digital technology on firms' price-setting behaviour.

The remainder of the paper is organised as follows. Section 2 provides details about

the survey and the macroeconomic conditions firms faced during the two survey periods, while Section 3 considers the impact of firms' operating environment on their price-setting decisions. Sections 4 and 5 investigate the survey results on firms' price reviews and price changes, respectively. The impact of exchange rate movements on price-setting decisions is covered in Section 6, and evidence on theories of price stickiness is presented in Section 7. Finally, Section 8 examines the extent of digitisation and its impact on firms' price-setting.

2 About the study

It was the seminal work of Blinder (1991) that pioneered the use of surveys to inform researchers about firms' price setting behaviour. Since then, numerous survey studies for various economies have been published. Fabiani et al. (2005) conducted a survey among more than 11,000 firms located in the Eurozone. Many of their findings are in line with our results, such that firms mostly set prices with mark-up rules. They also show that firms do have some market power as they are able to discriminate between customers which lends credence to support models of monopolistic competition. Also in line with our results, customer relations, in the form of implicit and explicit contracts, are the main culprits for price stickiness. Morris and de Vincent-Humphreys (2019) conduct an *ad hoc* survey of 58 large firms operating in the Eurozone. They also found that firms are able to discriminate between customers, both geographically and by type of customer.[1]

The new survey was conducted during a month-long period in March and April 2019, a little over a decade after the previous study, which was conducted in June and July 2008. The Icelandic economy had undergone dramatic changes during the decade that passed between the surveys. It witnessed the fall and resurrection of the Icelandic banking sector and the rapid rise of the tourism sector. The macroeconomic conditions that firms faced in the two survey periods were very different. The period leading up

[1]For a more detailed discussion of international comparison of results of price setting surveys, the reader is referred to Olafsson et al. (2011) and the references therein.

to the 2008 survey was characterised by extreme volatility and uncertainty; the króna had depreciated by roughly 40% over the preceding twelve months, inflation measured 12.7%, and the entire banking system was on the verge of collapse. In the period before the 2019 survey, firms had enjoyed several years of relative stability and low volatility, even though the króna had depreciated by roughly 12% over the previous twelve months. Inflation measured just over 3% at the time the survey was conducted and averaged 2.5% (i.e. at the inflation target) during the preceding six years. However, both surveys were conducted following periods of strong output growth. GDP growth averaged about 7% during the three-year period before the 2008 survey and a little over 5% during the same timeframe preceding the 2019 survey. The 2019 survey period was therefore deemed opportune for comparison to the previous survey as firms had overall enjoyed favourable circumstances with regard to domestic demand for several years, while this time around inflation had remained subdued. One of the goals of this survey is to investigate the causes of this change in price dynamics.

The current survey was conducted by Gallup and took the form of an online questionnaire. A random sample of firms with four or more employees was drawn from the business directory and Gallup's own Sentiment survey group. To eliminate holding companies that exist mainly for tax purposes, only firms with four or more employees were sampled. Firms were drawn until roughly 250 firms had provided answers. Only firms that were not restricted in their price-setting decisions (by regulation or a parent company) completed the questionnaire. In order to make the results more directly comparable between surveys, the sectoral composition of firms in the sample is broadly in line with the 2008 survey, which was in line with the sectoral composition of the Icelandic economy at the time. The current analysis is based on six sectoral categories; manufacturing, industry (including fisheries), wholesale and retail, services including hotels, restaurants, transport, IT and telecommunications, other services, and other.[2] Firms were asked to base their answers on their "main product", which refers to the product that generates

[2]In the 2008-survey, firms were classified into five sectoral categories, reflecting manufacturing, the financial sector, construction, and two service categories.

the most revenue. They were also asked to consider only sales in the domestic market.

The survey is based on a structured questionnaire, which is suitable for statistical analysis. To ease comparison with the 2008 survey, the questions were virtually unchanged between surveys. They are based on similar international studies (see, e.g., Keeney, Lawless, & Murphy, 2010, Langbraaten, Nordbo, & Wulfsberg, 2008 and Hall, Walsh, & Yates, 1997, 2000) but also include additional questions on issues particularly relevant for Iceland, particularly questions regarding exchange rate pass-through. As is mentioned above, the current survey also adds several questions about perceived changes in competition and digitisation. The translated questionnaire is presented in Appendix A.

3 Main characteristics of the market and firms' price setting method

A firm's operating environment is a vital factor in its price-setting behaviour. The degree of competition that the firm faces, its relationship with its customers, and the sector in which it operates are key elements to consider when reviewing and setting prices. They also influence the price-setting method the firm uses: whether costs, competitors' prices, or other variables are the most important factors a firm considers when changing prices. In this section, we examine how market structure influences firms' pricing decisions, whether those factors have changed in the past decade, and which price-setting methods firms employ.

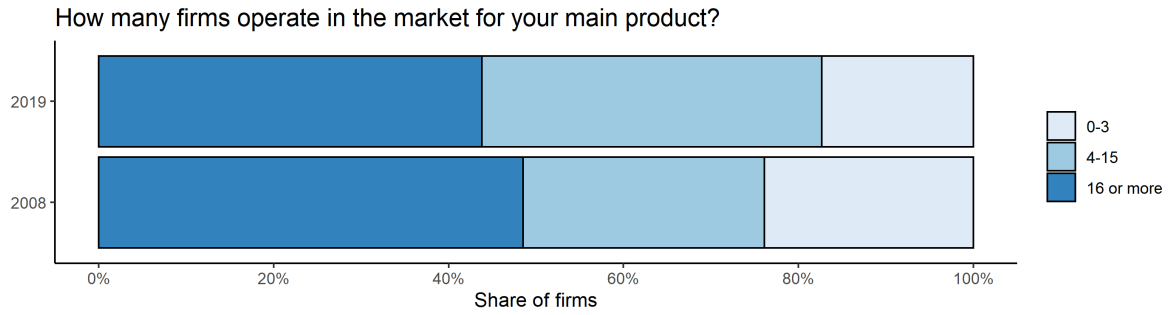
3.1 Market structure

In the survey, firms were asked about the market structure in which they operate, along two lines: relationships with their customers and with their competitors. Firms were also asked about their primary type of customers, i.e., whether they sell mainly to consumers

or to other firms. The responses show a more or less equal split between business-to-business sales and business-to-consumer sales, in line with results from the 2008 survey. The findings of this survey therefore apply to both consumer and wholesale prices.

When asked about the longevity of their relationships with customers, roughly three-fourths of firms reported having long-term relationships with their customers, which accords with the 2008 survey. However, there is a clear distinction between firms that sell mainly to consumers and those that sell to other firms. Roughly half of firms that sell mainly to consumers reported having a long-term relationship with their customers, compared with roughly 90% for firms selling mainly to other firms. The distinction is much more pronounced than in the 2008 survey, when the corresponding figures were 63% and 80%, respectively. A longer relationship between firm and customer can result in the prevalence of so-called implicit contracts over explicit contracts which can lead to stickier prices. This topic is discussed in more detail in Section 7.

The degree of competition in the market in which the firm operates is also likely to affect the method and frequency of price changes. Faced with more competition, firms are likely to change prices more frequently, not only due to internal factors such as changes in their own cost structure, but also because of external factors such as changing market conditions or price revisions by key competitors. Firms operating in a less competitive environment tend to have more leeway with their margins and can afford to be less vigilant in monitoring costs and competitors. Measuring competition is notoriously difficult, however, as the degree of competition depends not only on the number of competitors, but also on the nature of those competitors, and how easily new competitors can enter the market (Lewis, 2008). Therefore, several survey questions centered on how competitive firms perceive their operating environment to be, as well as how important competition is in their price-setting decisions. When asked directly, over 75% of firms thought their operating environment had become more competitive in the last few years. However, half of those firms reported that increased competition had had a limited effect on their prices. The perceived increase in competition appears to have been broad-based, although the



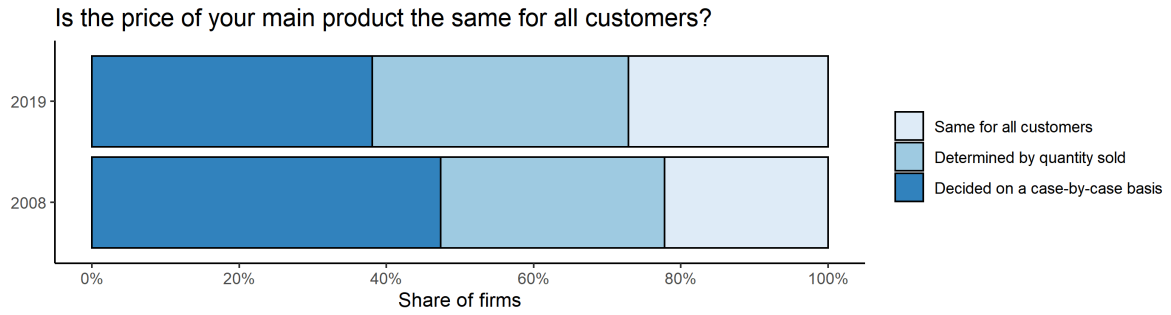
Sources: Capacent Gallup, Central Bank of Iceland.

Figure 1. Number of competitors

manufacturing and other services sectors were the least affected.

Companies were also asked how many firms operate in the market for their main product (see figure 1). Their answers provided mixed evidence of increased competition; fewer firms report operating in a monopoly or oligopoly market with 0-3 competitors (17% compared to 24% in 2008), but there was also a slight drop in the share of firms operating in a market with 16 or more competitors (44% compared to 49% in 2008). Almost 40% of firms had 4-15 rivals, up from roughly 25% in 2008. Firms were also asked whether a market leader existed in the market for their main product. The answers to this question were nearly identical to those in 2008, with roughly half of firms stating there was no market leader and roughly 30% reporting they were the market leader. Furthermore, the responses appear to correlate strongly with the number of firms operating in the market: more than 60% of firms operating in a monopoly or oligopoly considered themselves to be a market leader, whereas 65% of firms operating with 16 or more competitors said there was no market leader.

Another approach used to gauge the degree of competition a firm faces, is the importance firms attach to changes in competitors' prices in explaining their own price changes. When asked to rate the importance of four factors in their decision to lower prices, respondents cited competitors' prices as the least important factor. About 45% of firms rated it as important and nearly 30% rated it as unimportant. For comparison, roughly 75% of firms rated "lower costs" as important, and 10% rated them as unimpor-



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 2. Degree of price discrimination

tant. Remarkably, there was no statistically significant difference in the responses of firms operating in a monopoly or oligopoly or those operating with few (4-15) or many (16+) competitors. Nor was there a statistically significant difference whether or not there was a market leader operating in the market.[3] In contrast with the above-mentioned results, these responses appear to indicate that competition has decreased since 2008, when changes in demand and competitors' prices were the main determinants of price decreases, with close to half of firms referring to competitors' prices as one of the two most important factors in their decision to decrease prices.

The extent of price discrimination - that is, charging different prices to different customers - is another factor to consider when assessing how much competition a firm faces. Price discrimination indicates that the firm has some market power, as it is able to differentiate between its customers. It appears that price discrimination, although still prevalent, has abated somewhat since the survey was last conducted (see figure 2). Roughly 40% of firms set their prices on a case-by-case basis, down from nearly half in 2008, while 27% charge everyone the same price, up from 22% in 2008. A third of firms set their prices according to quantity sold, broadly as in 2008. Uniform pricing was more common for firms that sell directly to consumers: 60% of firms that sell directly to consumers charge everyone the same price, while only roughly a tenth of firms that

[3]These results appear to be at odds with the Bank's regular surveys of Iceland's 400 largest firms, where "competition and mark-ups" are usually ranked as most important when firms lower prices. This could reflect the fact that the sample for the current survey also includes small firms.

sell mainly to other firms do so. Around half of firms that sell exclusively to other firms decide prices on a case-by-case basis. This is in line with the results of Morris and de Vincent-Humphreys (2019), where price discrimination became less prevalent the closer the firm was to the end consumer.

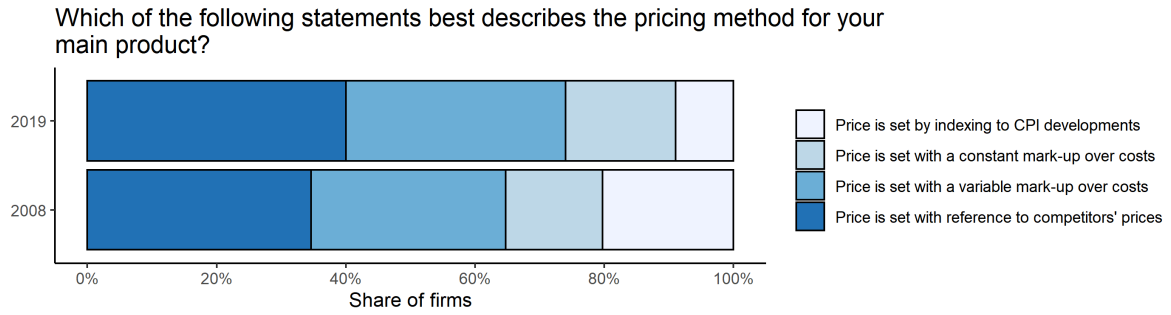
Overall, the evidence for increased competition among firms compared to roughly a decade ago appears to be somewhat mixed - firms believe there to be more competition, but it seems not to affect their pricing decisions to a significant degree. Competition from abroad and increased e-commerce may have made customers more aware of price differences, as price discrimination among different consumers appears to be less prevalent than before.

3.2 Price-setting method

Macroeconomic models typically assume that firms set their prices in accordance with their marginal costs. A standard way to incorporate price stickiness into general equilibrium models, such as standard DSGE models, is to assume monopolistic competition where firms set prices with a markup over their marginal cost (Smets & Wouters, 2007, and Thorarinsson, 2020). Models of oligopoly, however, assume that firms also take competitors' prices into account (Shapiro, 1989), while simple supply and demand models emphasise demand conditions. Knowing which of these factors - costs, competitors' prices, and demand conditions - are most important for firms' price-setting decisions is helpful information for any economic modeller.

This survey finds that cost-based pricing is indeed the most commonly used price setting method (see figure 3). This is consistent with other international studies (Fabiani et al., 2005 and Morris & de Vincent-Humphreys, 2019).[4] Over half of firms stated that they set their prices as either a constant or a variable mark-up over their costs, up

[4]In the macroeconomic literature, prices are set as a mark-up over marginal costs. However, in order to simplify the wording in the survey, firms were asked about their costs in general, not marginal costs. In line with the wording used in the questionnaire, we refrain henceforth from using the term "marginal costs" when discussing firms' responses.

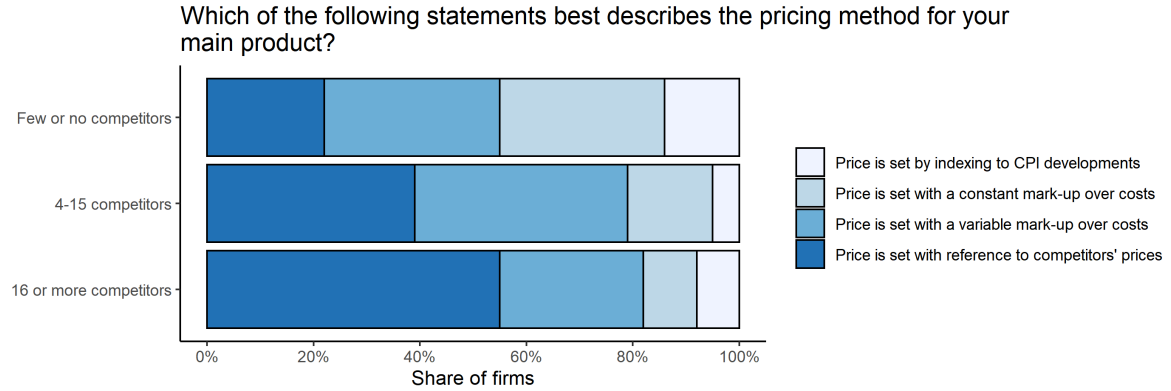


Sources: Capacent Gallup, Central Bank of Iceland.

Figure 3. Pricing methods

from 45% in 2008. Another 40% of firms set their prices with reference to competitors' prices, up from 35% in 2008, providing further evidence that competition has indeed increased over the past decade. A significantly smaller share of firms base their price-setting on indexing their prices to developments in overall price movements (captured by the CPI), according to the new survey (9% now, compared to over 20% in 2008). In 2008, Iceland stood out in international comparison due to this large share of firms that indexed their prices to the CPI. This kind of indexation typically makes inflationary shocks more persistent; e.g., following a depreciation of the króna or a change in the VAT rate. Firms that rely heavily on imported inputs, for example, are likely to raise prices in the wake of a currency depreciation. This leads to higher inflation, other things equal, and firms that index their prices to the CPI will therefore also raise prices even though the currency depreciation has not affected them directly. Therefore, it is a positive development with regard to price stability that a smaller share of firms than before set their prices based on changes in the CPI. This could stem from the fact that inflation had been lower and more stable at the time the survey was conducted than was typical in Iceland during the preceding decades, as is discussed in Section 2. It could also reflect better anchoring of inflation expectations (Petursson, 2022).

Unsurprisingly, market structure appears to be an important factor in firms' choice of price-setting method (see figure 4). Firms operating in a less competitive environment predominantly determine prices as a mark-up over costs. Two-thirds of firms facing few



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 4. Pricing methods and number of competitors

rivals or who consider themselves market leaders used this method, as compared with one-third of firms facing more than 16 rivals. The converse also holds true, as over half of firms that face 16 or more rivals set their prices with reference to competitors' prices.

Another determining factor regarding which price-setting method is predominant was the combination of inputs used in production. Firms were asked about both imported inputs and wage costs as a share of their total production costs. Firms that use a relatively large share of imported inputs in their production, which makes them more vulnerable to fluctuations in the exchange rate of the króna, will henceforth be referred to as import-intensive firms.[5] Roughly 70% of import-intensive firms set their prices as a mark-up over costs, up from 50% in the 2008 survey. Approximately a third of firms that used no imported inputs in their production set their prices as a mark-up over costs, in line with the 2008 survey.

4 Price reviews

Price adjustments seem to take place in two steps, as firms need to consider whether a price change is optimal before actually changing prices. This section focuses on the first step of the price adjustment process, namely price reviews. An important feature of price

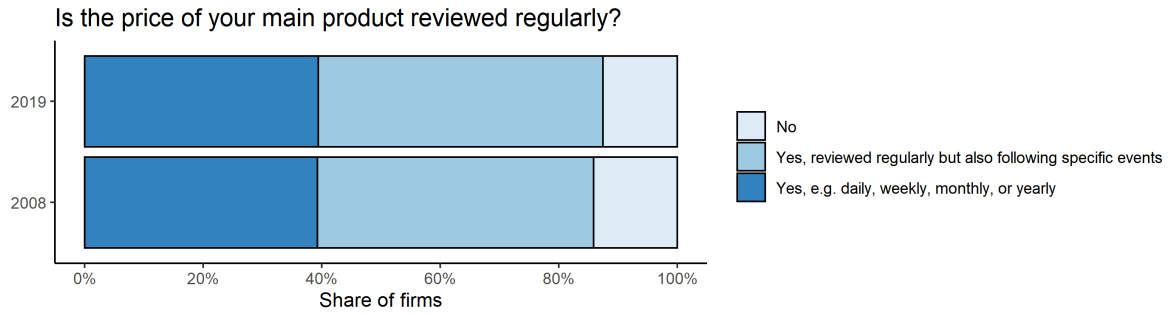
[5]Defined as having a share of imported inputs over 40% of total production costs.

reviews is whether they are time- or state-dependent; that is, whether firms review prices only on a regular basis or whether they review them following abrupt changes in economic conditions. Firms' price reviews also depend on the information set firms use when they consider reviewing prices; that is, whether they base their reviews on past information or future expectations. This section explores how these features, including the frequency of price reviews, have changed since the survey was last conducted in 2008.

4.1 Time-dependent versus state-dependent pricing strategies

Before changing prices, a firm will examine whether it is profitable to make the change, as there can be direct as well as indirect costs involved. Price changes can affect both demand for the firm's product or service and its reputation, thereby affecting sales and market share. The benefits of the price change must therefore exceed the cost of adjustment. The theoretical literature considers two main forms of pricing behaviour: time-dependent and state-dependent rules (Taylor, 1980 and Caballero & Engel, 1991). Firms that follow the former pricing strategy review prices at regular intervals, while firms that follow the latter review prices when a large enough shock occurs. If economic conditions are volatile, with large and frequent shocks, as in the period prior to the 2008 survey, time-dependent price reviews are likely to lead to more price rigidity than state-dependent strategies, as the timing of reviews becomes exogenous. Conversely, in such circumstances, state-dependent price setters are likely to conduct price reviews quite frequently, even though they do not necessarily change prices each time.

Surveys have frequently been used to shed light on firms' price review process, even though it is an imperfect measure. Firms in the survey were asked if they review prices on a regular basis. According to the survey, just under 40% of firms review their prices on a regular basis, and nearly half usually review their prices regularly but also review them following specific events (see figure 5). These results are similar to those from the 2008 survey, which may be surprising because the Icelandic economy had been more stable in the years leading up to the new survey than before the financial crisis, as is discussed



Sources: Capacent Gallup, Central Bank of Iceland.

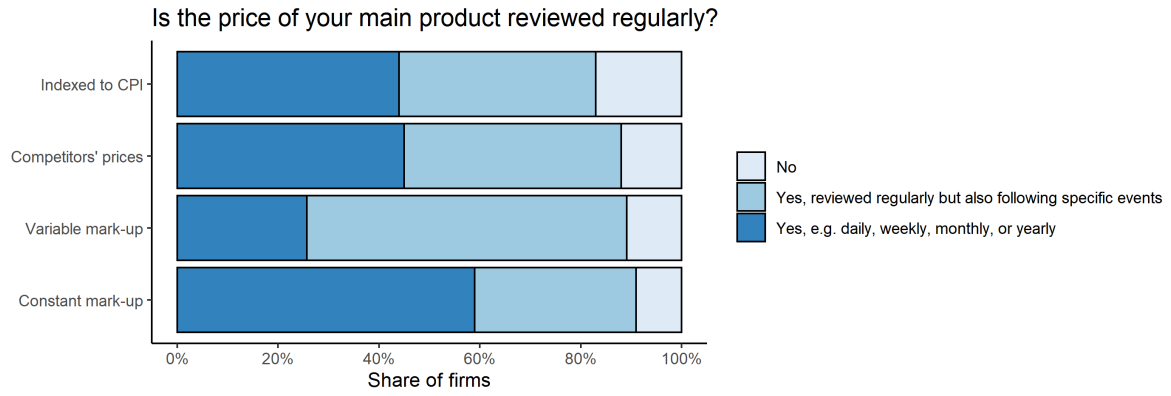
Figure 5. Time-dependent or state-dependent price reviews

in Section 2. Because of these factors, it could have been expected that a larger share of firms would review their prices only at regular intervals, as there were fewer shocks calling for *ad hoc* price reviews, like the results of Morris and de Vincent-Humphreys (2019) indicated, where roughly 80% of firms reviewed their prices regularly.

When firms' pricing strategies are placed in the context of their price-setting method there is a significant difference between groups (see figure 6). Almost 60% of firms that base their price-setting on a constant mark-up over costs responded that they reviewed their prices only on a regular basis, while a third responded that they also reviewed prices following specific events. However, only about a quarter of firms that use a variable mark-up on costs claimed to review prices only on a regular basis, whereas nearly two-thirds of them also review their prices following specific events. Therefore, as could be expected, firms that use variable mark-up pricing are more likely to review their prices more often when special circumstances call for it. Firms that set their prices with reference to competitors' prices were almost equally split between reviewing their prices only on a regular basis and also reviewing them following specific events. Almost 20% of firms that base their price-setting on indexation to the CPI did not review their prices regularly.

4.2 Information set used in price reviews

The information set on which firms base their pricing decisions is an important factor in the speed of price adjustment and reactions to shocks. The term *information set* refers

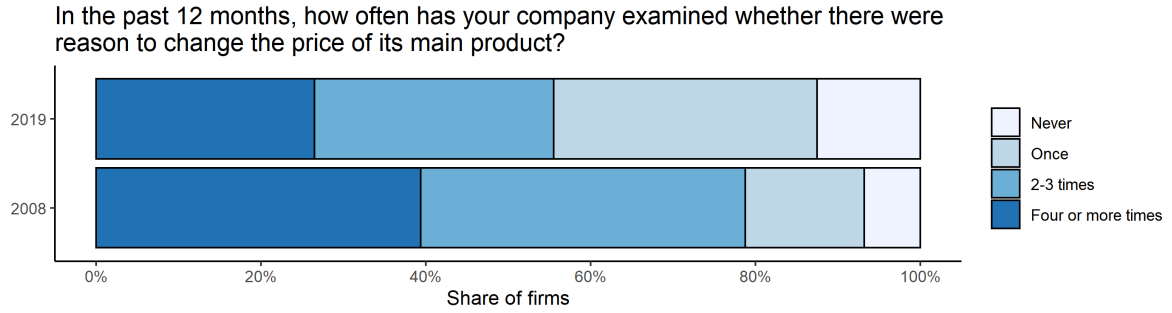


Sources: Capacent Gallup, Central Bank of Iceland.

Figure 6. Price reviews and pricing method

to whether firms base their decisions on recent and past developments or expectations of future conditions. Firms being more backward-looking should lead to more persistent price adjustments as past shocks can propagate for a longer time. In the 2008 survey, Icelandic firms seemed to be more backward-looking in their pricing behaviour than firms in studies for other countries, and this was further confirmed in the 2019 survey. In fact, the share of firms that evaluate their prices mainly on the basis of current information and past developments was 78%, compared to 68% in 2008, whereas only a third of firms did so in the study by Fabiani et al. (2005). Therefore, the share of firms that consider prospects for the future a more important factor in pricing decisions declined between surveys to 22%. This development could be seen as a step backwards for price stability, since when firms base their pricing decisions to a relatively large extent on past shocks, this could make inflation more persistent in certain cases.

It is also interesting to look at differences across various sectors and firms' characteristics with regard to the information set used in price reviews. The tendency among larger firms to be more forward-looking than smaller firms continues to hold in the recent survey, which is not surprising since larger firms are likely to have more resources to assess the future outlook than their smaller counterparts. The result holds whether the size of firms is categorised based on turnover or staff numbers. Furthermore, the results indicate that firms in wholesale, hotel operations, and transport are more likely



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 7. Frequency of price reviews

to focus to a greater extent on future conditions than firms in other sectors, which is not surprising as especially hotels and transport firms often sell their services in advance.

The previous survey highlighted the fact that extensive backward-looking behaviour together with widespread use of price indexation contributed to high intrinsic persistence of inflation in Iceland. Even though an increasing share of firms seem to be backward-looking in their price-setting compared to the last survey, it is positive that fewer firms seem to index their prices to developments in the CPI (see Section 3.2).

4.3 Price review frequency

Firms were asked how often during the previous twelve months they had reviewed the price of their main product without necessarily having changed it (see figure 7). The most frequently cited frequency indicates that firms reviewed their prices once a year, with almost a third of firms responding that they had reviewed their prices once during the preceding year, compared to just over 14% in 2008. Furthermore, 29% of firms claimed to have reviewed their prices two to three times compared to almost 40% previously. The survey results therefore show that firms had examined less often whether there were reasons to change the price of their main product than in the 2008 survey. This is in line with the decline in inflation and inflation volatility over the years preceding the survey.

The survey results also portray important differences between sectors. Firms in wholesale and retail tend to review their prices more often than firms in other sectors,

while service sectors reviewed their prices the least frequently. This is in line with the results of Morris and de Vincent-Humphreys (2019). The cost structure of service sector firms, which consists mainly of wages, is most likely more stable than that for wholesale and retail firms, who are to a large extent subject to exchange rate movements. These findings are also shown in the fact that import-intensive firms tend to review their prices more often than other firms (see further discussion in Section 6).

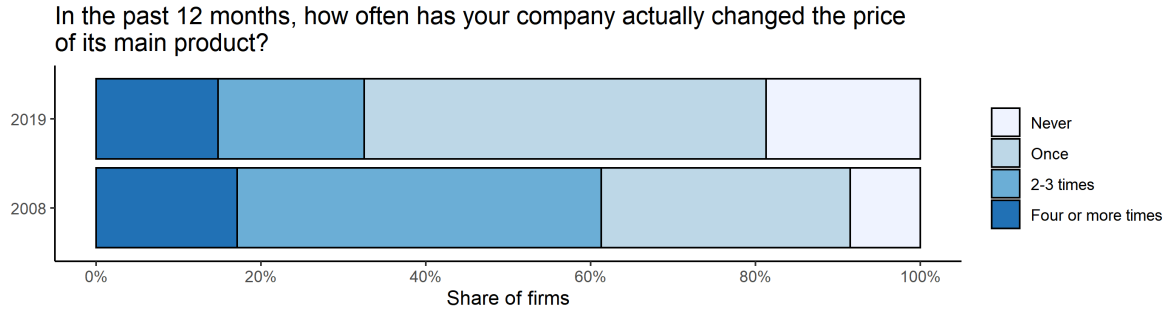
The price-setting method influences the frequency of price reviews. Firms that set their prices as a variable mark-up over costs or set them with regard to competitors' prices review their prices more frequently. A third of firms in these sectors report reviewing prices four times or more in the past year. However, relatively few firms that use price indexation reviewed their prices this often, while roughly 40% of them claimed to have reviewed prices once during the past twelve months.

5 Price changes

After having examined whether it is profitable to change the price, firms take the second step of the price adjustment process; actually changing prices. This section discusses the survey results on firms' price change frequency. It is interesting to compare these results to the previous survey and examine whether the result of less frequent price reviews mentioned above carries over to price change frequency. Also discussed are the main determinants of price changes according to firms' responses.

5.1 Price change frequency

Firms were asked how often they had changed the price of their main product during the previous twelve months (see figure 8). Almost half of respondents claimed to have changed the price of their main product only once during the reference period, while just under 18% changed their price two to three times. In general, firms change their prices less often now than they did a decade ago, which is in line with expectations since



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 8. Frequency of price changes

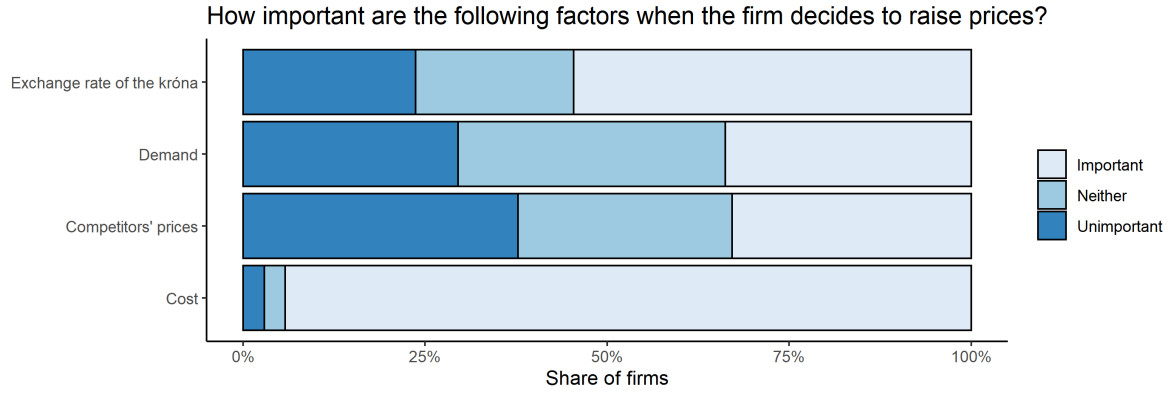
inflation had declined and was less volatile in the years preceding the survey. In the previous survey, about 30% of firms reported having changed their prices once during the preceding twelve months, and a full 60% had changed them two or more times.

The results support the theory that price adjustment takes place in two steps. Price reviews seem to be performed more frequently than actual price changes, indicating that firms use resources to review their prices and determine whether it is beneficial to change them, but without necessarily changing them. Also, firms that reviewed their prices relatively more often were more likely to change the price of their main product. As with the results regarding price reviews, the frequency of price changes differs according to sectors and cost structure. Import-intensive firms changed their prices more frequently than other firms (for further discussion see Section 6). Firms in retail, tourism, and transport have the highest frequency of price changes, followed by manufacturing, in line with the 2008 survey.

The level of competition as measured by the number of market competitors does not seem to be a deciding factor for firms' price change frequency, and the pattern of price changes is similar across various competition environments. The results therefore seem to support the conclusions of Section 3.1: that competition does not affect firms' pricing decisions to a large extent. The same applies to differing price-setting methods, unlike the results about frequency of price reviews. It seems as though the pattern of price change frequency is similar across price-setting mechanisms.

5.2 Determinants of price changes

In the survey, firms were also asked about the main determinants of price changes (see figures 9 and 10). Survey participants considered their own costs to be by far the most important factor underlying price changes, both price increases and decreases. The second most important factor regarding price increases is the exchange rate of the króna.[6] Almost all participants claimed cost increases to be a very important factor in possible price hikes, and just over half of firms stated that changes in the exchange rate were a very important factor. Just over a third of firms answered that competitors' price rises and increased demand were important factors in their decisions on possible price hikes.

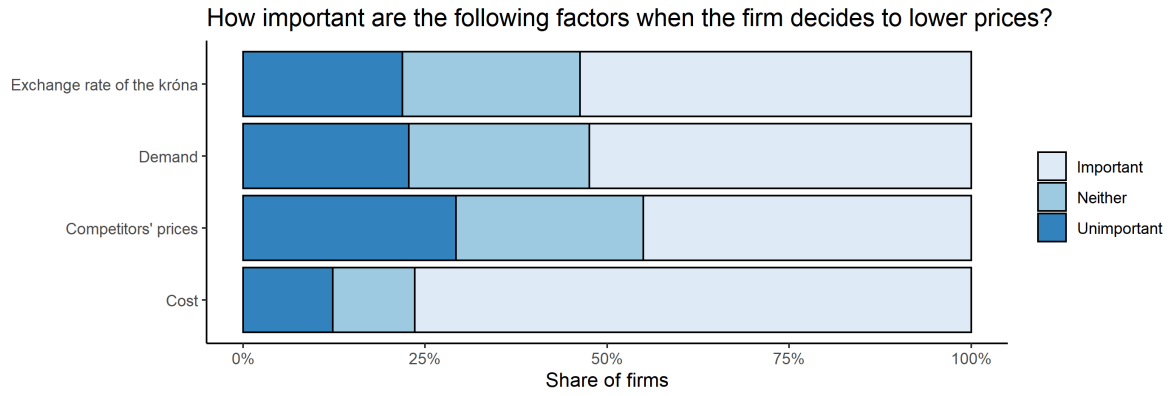


Sources: Capacent Gallup, Central Bank of Iceland.

Figure 9. Importance of factors when raising prices

When asked about the main determinants of decisions to lower prices, just over three-fourths of firms replied that cost decreases were a major factor. Roughly half of firms claimed that competitors' price decreases and weaker demand were very important factors in possible price decreases. Interestingly, the responses regarding the importance of changes in the exchange rate for price decreases appear symmetrical to those for price increases. Just over half of participants answered that exchange rate movements were

[6]The exchange rate of the króna is of course a direct part of costs for firms that use imported inputs, which makes it hard for those firms to distinguish between cost changes and movements in the exchange rate. However, as is discussed in Section 6.1, roughly one-fourth of firms who use no imported inputs rate the movements in the króna exchange rate as important for their pricing decisions.



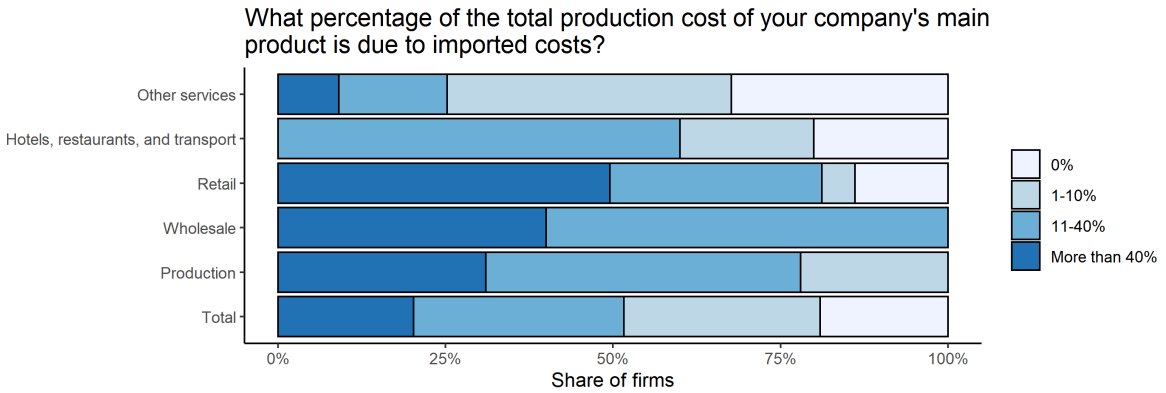
Sources: Capacent Gallup, Central Bank of Iceland.

Figure 10. Importance of factors when lowering prices

very important in their decisions to lower prices. The results suggest that exchange rate pass-through to prices may be more symmetric than was suggested by the 2008 survey. This is discussed further in Section 6.2.

The survey responses also reveal compelling results regarding the link between the frequency of price reviews and price changes, on the one hand, and the importance of exchange rate movements for price hikes, on the other. There was a significant difference among firms in this respect. The more often firms reviewed and changed their prices, the more inclined they were to react with price hikes following a depreciation of the króna. Just over 60% of firms that reviewed and/or changed their prices most often in the past year claimed that a depreciation of the króna was a very important factor in the decision to raise prices. The same is evident in the decision to lower prices following an appreciation of the currency. This further supports the result that the effects of changes in the króna exchange rate on prices seem to be more symmetrical than was apparent in the 2008 survey.

Other noteworthy results include indications that changes in costs seem to be more of a deciding factor for possible price changes (both increases and decreases) for firms with relatively few competitors. The reason for this could be that in an oligopolistic market, firms are more likely to pass changes in costs through to prices. Another interesting result is that forward-looking firms are more likely than backward-looking firms to raise



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 11. Share of import costs for various sectors

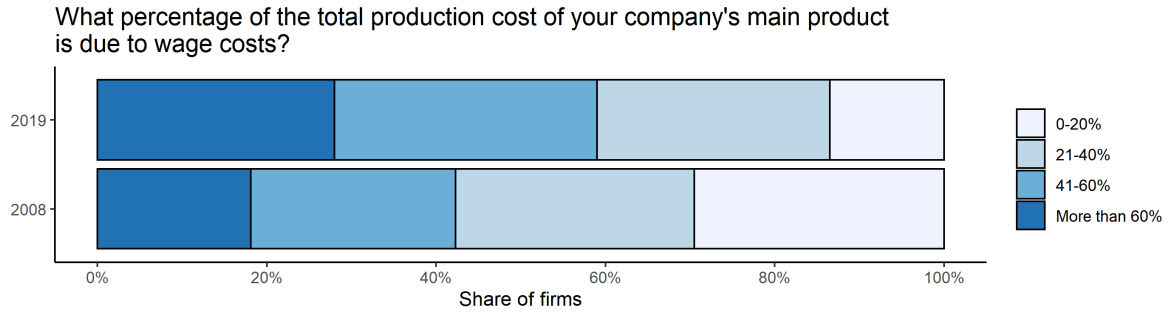
prices following an increase in demand. Furthermore, the importance of stronger demand in decisions to raise prices varies greatly across sectors. Firms in wholesale and retail respond that stronger demand is not an important factor in price increases. On the other hand, the opposite applies to firms in manufacturing, agriculture, and fishing. However, exchange rate movements are an extremely important factor regarding price increases in wholesale and retail, which does not come as a surprise. Over 90% of firms in wholesale and retail and 80% of firms in manufacturing claimed that changes in the exchange rate were important.

6 Exchange rate movements and price setting

This section focuses on the interaction between exchange rate developments and firms' price-setting behaviour in the domestic market, that is the degree of pass-through from exchange rate movements to the general price level. We analyse how firms' cost structure affects various aspects of their price-setting behaviour: namely the frequency of price reviews and price changes, to the method firms used to set their prices, as well as which factors are key drivers of price changes. Furthermore, we look at how symmetric firms' responses are with regard to changes in the exchange rate of the króna.

The composition of firms' cost structure is used to distinguish between firms based

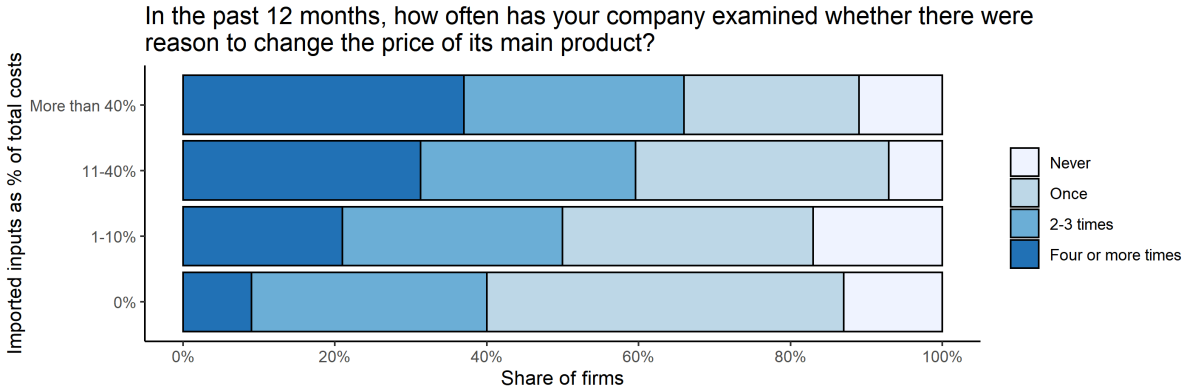
on how exposed they are to exchange rate movements. We base our analysis on the categorisation of firms subject to their direct exposure to exchange rate movements, which we define in terms of imported input costs as a share of total production costs (see Section 3.2).[7] One-fifth of firms claim to be import-intensive, with more than 40% of their total production costs stemming from imported costs, which makes them highly vulnerable to exchange rate fluctuations (see figure 11). The share is largest for retailers, where half of firms are import-intensive, and for wholesale, where the share is 40%. Hotels, restaurants, and transportation are less exposed to exchange rate fluctuations, with 40% of firms reporting that less than 11% of total costs is due to imported costs. The *other services* sector is also less exposed to exchange rate movements, as it is relatively labour-intensive. Based on the results, *other services* turns out to be the most labour-intensive sector with half of firms reporting that wage costs account for more than 60% of their total costs. It is noteworthy that the ratio of wage costs to total production costs has risen markedly in the past decade. For 59% of respondent firms, wage costs account for more than 40% of total expenses, up from 42% of firms in the last survey (see figure 12). To some extent, this reflects the large wage increases implemented in the years preceding the survey, but it also reflects the structural shift the Icelandic economy underwent, as the tourism industry, a labour-intensive sector, grew rapidly.



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 12. Share of wage costs

[7] Note, they do not include indirect exposure.



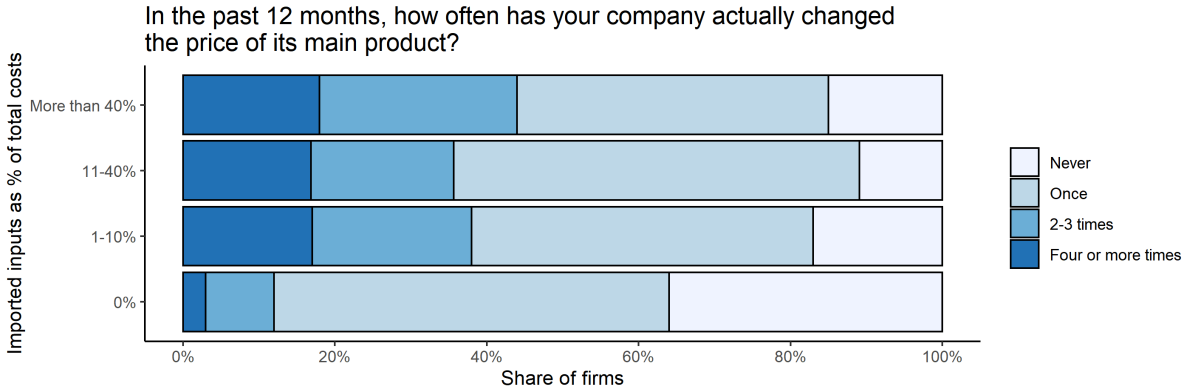
Sources: Capacent Gallup, Central Bank of Iceland.

Figure 13. Frequency of price reviews and share of imported inputs

6.1 Exchange rate exposure and price setting

There is evidence that changes in the exchange rate play a significant role in price setting. The results indicate that import-intensive firms consider mainly the current situation and past developments when setting prices. About 86% of import-intensive firms are backward-looking in their price setting. These firms are more sensitive to exchange rate developments and therefore have a more volatile cost structure. Also, it is usually more difficult to estimate future developments in the exchange rate than, for example, future developments in wages. However, the evidence is more clear-cut now than in the previous survey, when the results were quite ambiguous, although they did indicate that firms that were heavily exposed to exchange rate movements were more forward-looking.

As expected, the frequency of price reviews seems to increase in line with rising imported input costs as a share of total production costs (see figure 13). The results indicate that 37% of import-intensive firms had reviewed their prices four times or more in the previous twelve months, as compared with only 9% of firms with no imported inputs. In the 2008 survey, roughly 65% of import-intensive firms, and 30% of firms with no imported costs, stated that they reviewed their prices four or more times in the past year. Overall, firms reviewed their prices less frequently in 2019 than in 2008 (see section 4). However, the difference between the frequency of price reviews of import-intensive



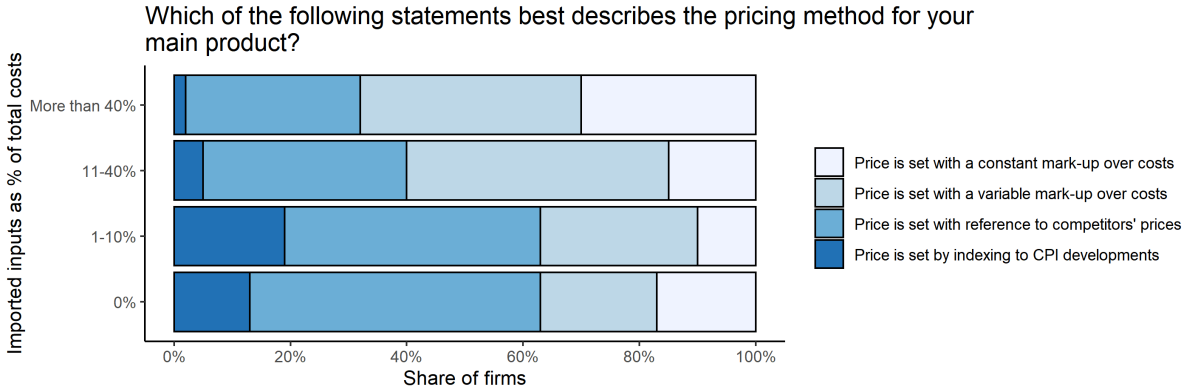
Sources: Capacent Gallup, Central Bank of Iceland.

Figure 14. Frequency of price changes and share of imported inputs

firms and firms with no imported inputs has abated. This could be attributed to the exchange rate of the króna being far less volatile in the period preceding the 2019 survey. By the same token, the frequency of price reviews declines as the ratio of labour costs to total costs increases, reflecting the fact that wages change less frequently and more predictably than the exchange rate of the króna does.

Similar results apply to the frequency of firms' price changes (see figure 14). Even though the frequency of price changes has declined overall, it is still the case that sectors that are highly exposed to exchange rate movements seem to change their prices more frequently than other firms do, as is mentioned in Section 5. There is a clear indication that the larger the share of imported inputs, the greater the frequency of price changes. This ties in with the results of Edwards and Cabezas (2022), that the degree of pass-through is higher for tradeable goods than for non-tradeable goods in Iceland. Even so, comparing these results to the previous survey, the relationship between the frequency of price changes and the share of imported inputs in total production costs seems to have weakened. Around 38% of import-intensive firms claimed to have changed their prices two or more times in the previous year, compared to 68% in the previous survey. This could again reflect the lower level of volatility in both inflation and the exchange rate preceding the 2019 survey relative to the previous survey.

It appears that firms with relatively higher wage costs change their prices less often



Sources: Capacent Gallup, Central Bank of Iceland.

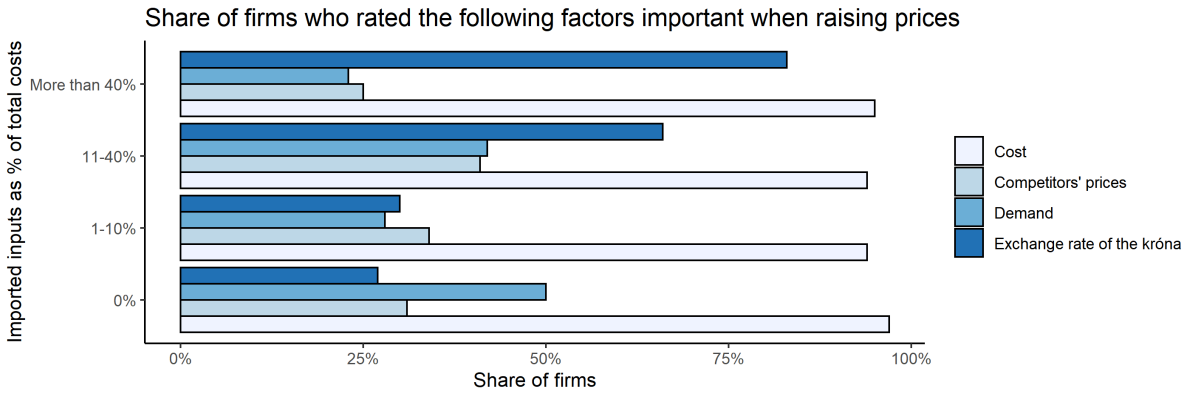
Figure 15. Pricing method and share of imported inputs

than other firms do. In line with the discussion above, this could partly be explained by wages changing less frequently than, for instance, imported input prices. The Icelandic labour market is highly centralised, with over 90% of workers belonging to unions (OECD, 2021). The cost structure of firms with relatively higher share of wage costs is therefore more stable and predictable than that of import-intensive firms. This does not reflect that wages are less important for firms' pricing decisions than imported inputs, only the frequency at which wages typically change. About three-fourths of firms whose wage costs account for a large share of their total expenses changed their prices once or not at all during the twelve-month period covered by the survey, compared to 45% of firms for the entire sample. Furthermore, this is in line with the overall results that price change frequency has declined: in the 2008 survey about 40% of firms with a relatively heavy wage cost burden changed their prices once or not at all during the preceeding year.

A majority of firms that rely heavily on imported inputs set their prices as a mark-up, either constant or varying, over costs. On the other hand, firms that are less exposed to exchange rate developments are more likely to base their pricing decisions on developments in the CPI (see figure 15). This can lead to a vicious cycle, where import-intensive firms raise their prices following a depreciation of the króna, resulting in a rise in inflation, other things equal, prompting firms that index their prices to the CPI to increase their prices as well. This cycle can therefore make inflation more persistent. In the 2008 survey,

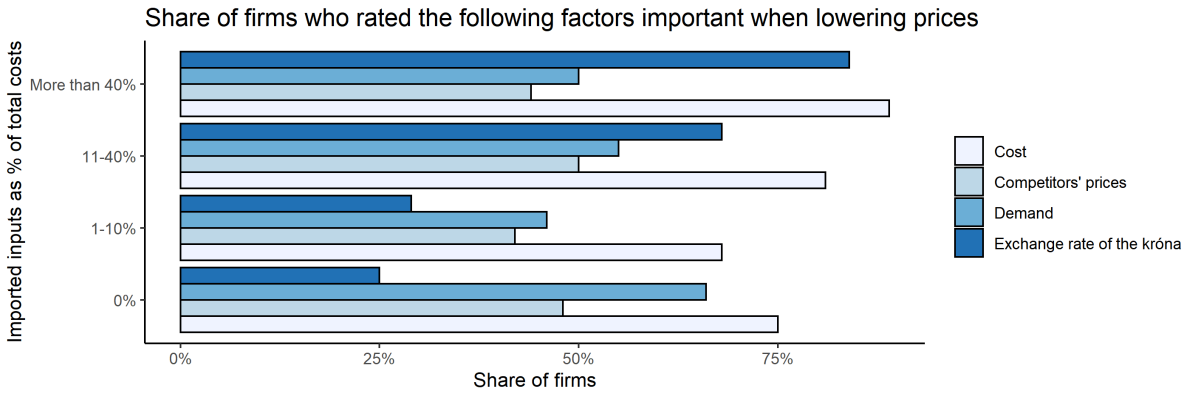
about one-third of firms with highly significant wage costs reported that developments in the general price level affected their pricing decisions most strongly. That share has fallen to 17% in the current survey, which indicates that inflation might be less persistent in the aftermath of a depreciation of the króna than before. This is further supported by the results of Edwards and Cabezas (2022), who found that exchange rate pass-through to headline inflation was lower than previously estimated. This could be the result of lower and more stable inflation during the years preceding the survey, and an indicator of increased credibility of the Central Bank's monetary policy.

Survey participants considered their costs to be the most important factor underlying both upward and downward price changes (see figures 16 and 17), except for firms that are highly subject to exchange rate movements, as is mentioned in Section 5.2. Those firms responded that movements in the exchange rate were as important as developments in costs in their decision to change prices. However, exchange rate movements and costs are highly correlated for import-intensive firms. Furthermore, changes in demand have a significantly stronger effect on labour-intensive firms than import-intensive firms when considering changing prices.



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 16. Importance of factors when raising prices and share of imported inputs



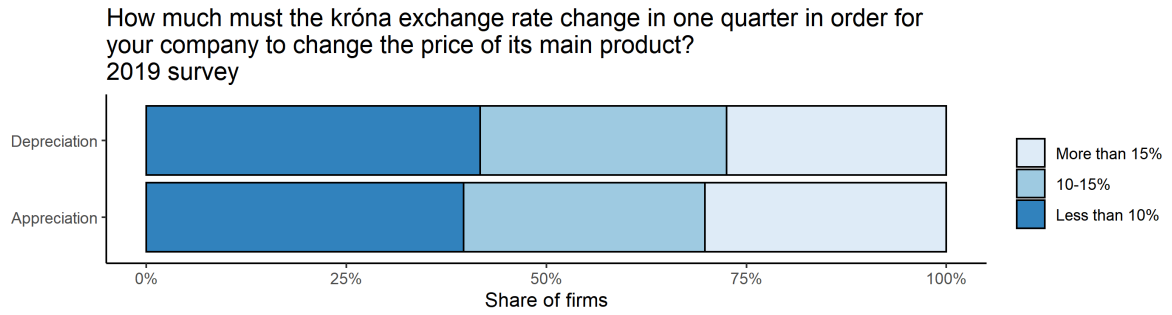
Sources: Capacent Gallup, Central Bank of Iceland.

Figure 17. Importance of factors when lowering prices and share of imported inputs

6.2 Asymmetric exchange rate pass-through

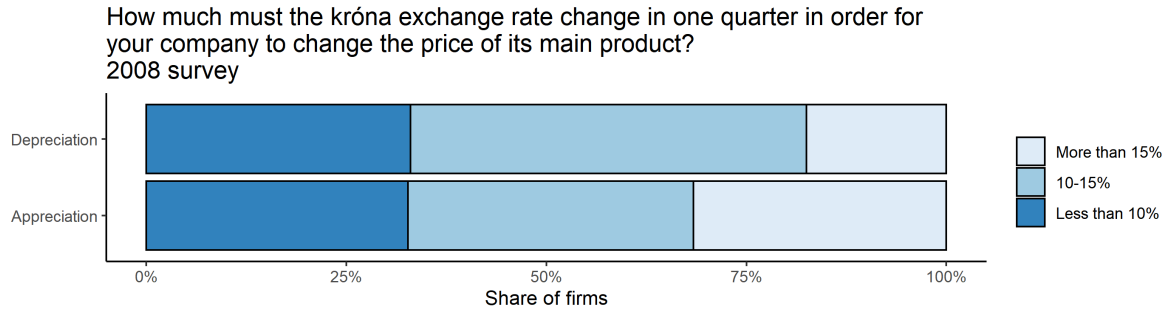
In the survey, firms were asked about the magnitude of hypothetical exchange rate movements necessary to affect price setting (see figures 18 and 19). When firms were asked how much the króna would have to depreciate in a single quarter before they would raise prices, roughly 40% responded that a depreciation of less than 10% would suffice, up from one-third of respondents in 2008. Nearly 30% of firms specified that the króna would have to depreciate by more than 15% in a single quarter, up from 20% in the 2008 survey.

When respondents were asked how much the króna would have to appreciate in a single quarter before they would lower their prices, the results were similar to the responses to the corresponding question about the price response following a depreciation of the króna. This is in stark contrast to the 2008 survey, when firms' responses were highly asymmetrical with regard to the size of the króna depreciation/appreciation required to prompt pass-through to prices. This is an indication that the impact of exchange rate movements on pricing decisions has become more symmetric in the past decade. Just under 40% of respondents answered that the króna would have to rise by less than 10% in a given quarter for them to lower prices, compared to one-third in the 2008 survey. In addition, the share that considered an appreciation of more than 15% necessary was



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 18. Size of changes in the króna exchange rate needed for price changes, results from 2019 survey

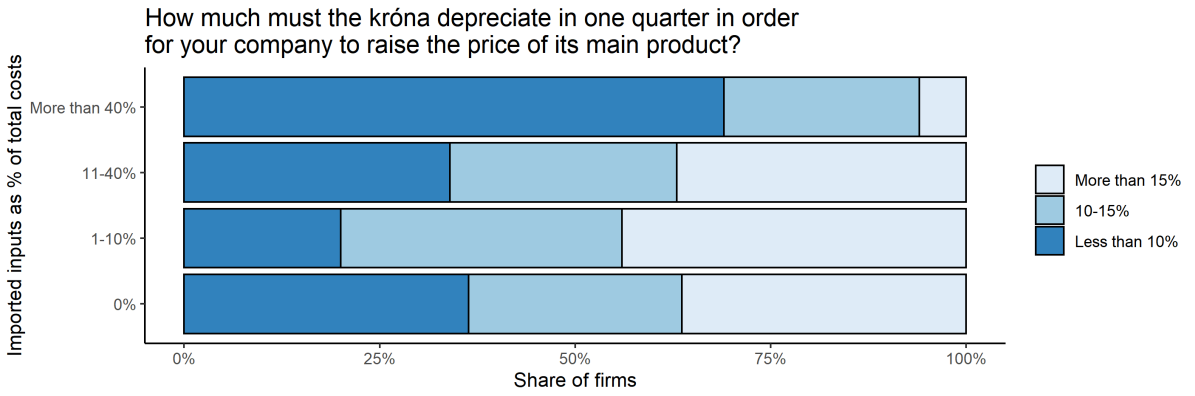


Sources: Capacent Gallup, Central Bank of Iceland.

Figure 19. Size of changes in the króna exchange rate needed for price changes, results from 2008 survey

about 30%, broadly the same as in the 2008 survey. It seems, then, that firms are more inclined to pass a currency appreciation through to the price level by lowering their prices than they were a decade ago.

As expected, the magnitude of exchange rate movements necessary for firms to raise prices declines with rising imported input costs relative to total production costs. Firms that are more exposed to changes in the exchange rate seem to have a lower threshold for the exchange rate movement needed to prompt them to change prices. Almost 70% of import-intensive firms, which are highly exposed to changes in the exchange rate, respond that a depreciation of less than 10% would be enough to prompt them to raise prices, while the corresponding figure is roughly 30% for other firms (see figure 20). Remarkably, in the 2008 survey there was no statistically significant difference between

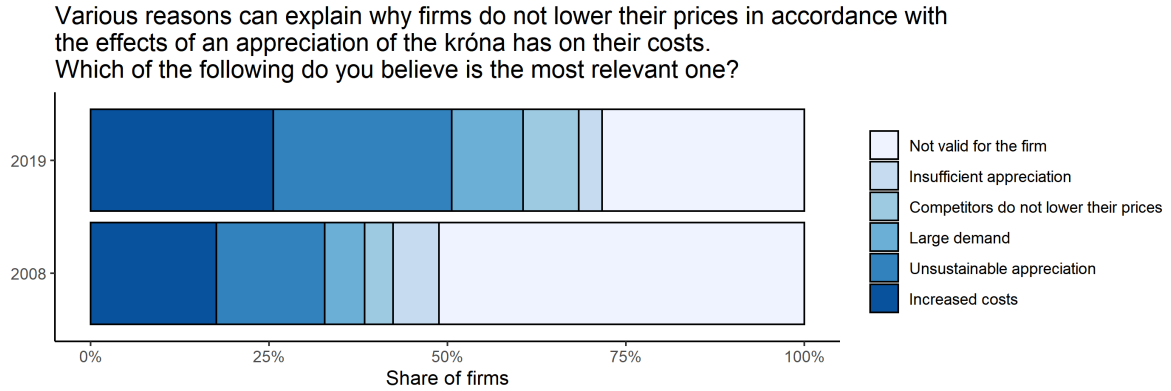


Sources: Capacent Gallup, Central Bank of Iceland.

Figure 20. Size of depreciation of the króna exchange rate needed for a price increase and import share

import-intensive firms and other firms that were asked the same question. At that time, about 40% of import-intensive firms stated that a depreciation of less than 10% would suffice for them to raise their prices, while the corresponding ratio for firms that used no imported inputs was nearly 50%. In the 2019 survey that ratio had fallen to 36%. It is therefore seen as a positive development that exchange rate movements do not feature as prominently in the pricing decisions of less import-intensive firms as they did a decade ago, although, on the downside, import-intensive firms appear keener to pass exchange rate movements on to their prices than before. There was no statistically significant difference between responses of firms with respect to size, measured either as number of employees or turnover, although larger firms appeared more sensitive to exchange rate movements. This runs counter to intuition as larger firms should be more able to hedge away exchange rate risk.

As for the question regarding depreciation of the króna, import-intensive firms require smaller changes in the exchange rate before they change their prices. However, there appears to be some asymmetry in the responses of import-intensive firms to these two questions. As is stated above, roughly 70% of import-intensive firms require the exchange rate to depreciate by less than 10% before they raise prices, while roughly 60% of them consider an appreciation of the same magnitude necessary to lower prices.



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 21. Reasons for not lowering prices following an appreciation of the króna

The survey further addresses the issue of incomplete pass-through of currency appreciation by asking firms to give the main reasons for not lowering prices to take fully into account the effects of a currency appreciation. Rising costs seem to be the main reason for incomplete pass-through of a strengthening króna, as 26% of firms mention that increased costs stood in the way of a decision to lower prices. There is also evidence that firms might question how long-lasting a króna appreciation will prove to be, and they may expect the currency to depreciate again soon. In this case, they may view a price decrease as premature. About 25% of firms mention this as a reason for incomplete pass-through (see figure 21).[8]

7 Evidence on theories of price stickiness

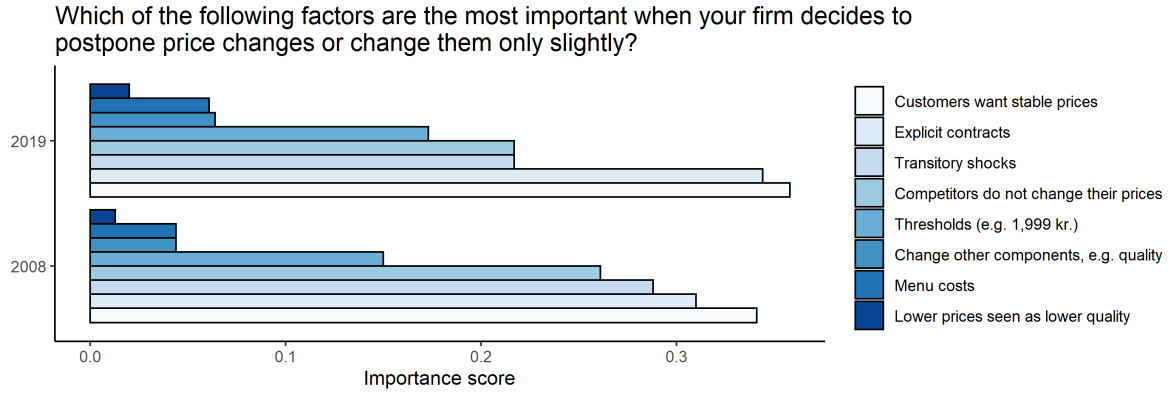
One of the cornerstones of New-Keynesian macroeconomic models is that prices are sticky, meaning that they are slow to adjust to changing conditions. This nominal stickiness means that monetary policy can affect the real economy: when monetary policy changes, the aggregate price level does not change immediately, meaning that the central bank can affect the real interest rate and thereby the real economy. Numerous empirical studies confirm that prices do indeed seem to be sticky (see e.g. Klenow & Malin, 2010). However,

[8]Note that the wording of this question was changed slightly between surveys, making comparison between surveys harder.

the reason for this stickiness and the best ways to model it are widely debated topics. This survey adds to that discussion by investigating the validity of several competing theories for price stickiness.

Numerous competing theories about price stickiness have gained traction in the literature in recent years. One strand of models assumes that the timing of price changes is exogenous. A deluge of modern macroeconomic models, especially of the DSGE variant, model prices following the mechanism described by Calvo (1983). That mechanism assumes that price reoptimisation is exogenous; i.e., firms will keep their prices fixed unless they receive a signal that allows them to reoptimize their prices. That signal is assumed to follow an exogenous, random process. The result is a tractable model with sticky prices. The Taylor model of staggered contracts (Taylor, 1979, 1980) assumes that firms set prices for a fixed and known period of time. Both models are seen as a tractable method for modelling prices in the aggregate and are able to fit the macro data with some adjustments, such as indexation. However, this is inconsistent with micro level empirical evidence and does not help us understand how individual firms set their prices, as the timing of price-setting decisions in both models is assumed to be exogenous (Kehoe & Midrigan, 2015).

Several models for an endogenous pricing decision also exist. These include the menu cost model (Mankiw, 1985), the cost of price adjustment model (Rotemberg, 1983), and models of cost-based pricing (Gordon, 1981 and Blanchard, 1983). Frustrated by a lack of progress in adjudicating the validity of competing theories of price and wage stickiness using conventional econometric methods, Blinder (1991) proposes a new method for studying the reasons for stickiness - simply ask the people in charge of setting prices. Blinder constructed a questionnaire where various competing theories of price stickiness - such as menu costs, implicit contracts, and coordination failure - were "translated" into everyday English. During in-depth interviews with firm representatives they were asked if these competing theories were important in their decision-making process. A variant of this method was used in this price-setting survey; firms were asked to rate the importance



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 22. Importance of competing theories for price stickiness

of several statements reflecting different theories of price stickiness when postponing price changes. The results are summarised in figure 22.

In the 2019 survey, firms overwhelmingly rated contracts, either implicit or explicit, as their most important reasons for postponing price changes, just as they did in the 2008 survey and in line with the surveys conducted by Blinder (1991), Fabiani et al. (2005), and Morris and de Vincent-Humphreys (2019). The theory of implicit contracts, or the "invisible handshake", refers to an unobservable agreement between firms and consumers that prices should be kept stable (Okun, 1981). The theory states that consumers consider it unfair when firms raise prices due to increased demand but are sympathetic when firms raise prices due to higher costs. Implicit contracts were especially important to firms that set their prices as a mark-up over costs, chiefly for ones using a fixed mark-up. Furthermore, explicit contracts seem to be more prevalent for firms that sell mostly or exclusively to other firms. Those findings suggests that firms' unwillingness to jeopardise their longstanding relationships with their customers is the main source of price rigidities.

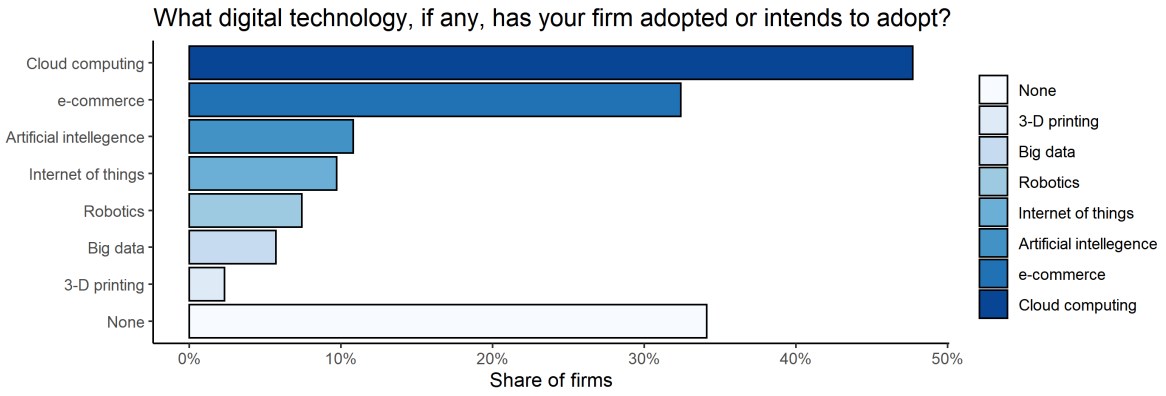
Also receiving a high importance score in the 2019 survey were temporary shocks; i.e., when firms do not change prices after a shock has occurred because they believe the shock to be transient. There is therefore less need to change the price immediately following the shock, as it might reverse itself in a short time span. Unsurprisingly, firms with a low ratio of wage costs to total costs (and therefore a relatively stable cost structure), were

more likely to rate temporary shocks as an important factor in delaying price changes. Furthermore, firms that had fewer competitors operating in their market were also more likely to rate temporary shocks important. Although it placed third in the ranking, as in the 2008 survey, the importance score had fallen significantly. This is hardly surprising, as firms' operating environment had been more stable than it was during the turbulent aftermath of the financial crisis.

The results of the 2019 survey showed that coordination failure received the same importance score as temporary shocks. Coordination failure refers to the case where a firm's optimal price is positively correlated with that of its competitors. In this setting, following an aggregate shock, firms do not fully adjust their prices in response to the shock, instead waiting for their competitors to also increase their prices, resulting in smaller but more frequent price changes. Thus prices are stickier in the aggregate even though they change frequently (Cooper & Andres, 1988 and Ball & Romer, 1991). Surprisingly, coordination failure received a lower importance score than it did a decade ago, even though several factors indicate that competition had increased (see Section 3.1). This is however in line with firms feeling that competition had increased, but that it did not affect their price-setting behaviour. Pricing thresholds, where firms set enticing prices (e.g., 1,999) and do not change their prices until the desired price approaches the next threshold (Kashyap, 1990), ranked fifth. Firms that rated pricing thresholds as important were more likely to sell directly to consumers, rather than to other firms. The importance score of pricing thresholds was almost unchanged compared to the survey conducted a decade ago. Other factors, such as menu costs, received a much lower importance score.

8 The impact of digitisation on price setting

One phenomenon that could help explain the changes in price setting during the recent decade is digitisation or the adoption of digital technology. Adoption of digital technology has had wide-ranging effects on the economy in recent years, including price-setting



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 23. Implemented digital technology

behavior (see, for example, Cavallo, 2018, and Sveriges Riksbank, 2015). Digitisation is usually considered to influence price setting through three channels: Effects via automation and productivity-enhancing innovations, effects via e-commerce and direct effects via components of the CPI (Sveriges Riksbank, 2015).

Digitisation has affected inflation directly through production costs for certain goods, notably electronics. Their prices have declined due to the decline in prices for advanced electronic components such as processors. The change from physical to digital distribution has also resulted in falling costs, as can be seen in the shift from VHS to Netflix (Sveriges Riksbank, 2015). In this section, we discuss the survey results about firms' use of different kinds of digital technology and possible effects on their price setting.

According to the survey results, the most common digital technologies adopted by firms were cloud computing and e-commerce (see figure 23). Approximately half of firms have adopted cloud computing or plan to do so, possibly in the hope of lowering costs, and approximately one-third had set up e-commerce or planned to. Cloud computing - i.e., data centres that are available over the Internet - gives the user access to data storage (cloud storage) and computing power, without requiring direct active management by the user. An example is Google's Gmail. Gmail users can access files and applications hosted by Google via the Internet from any device.

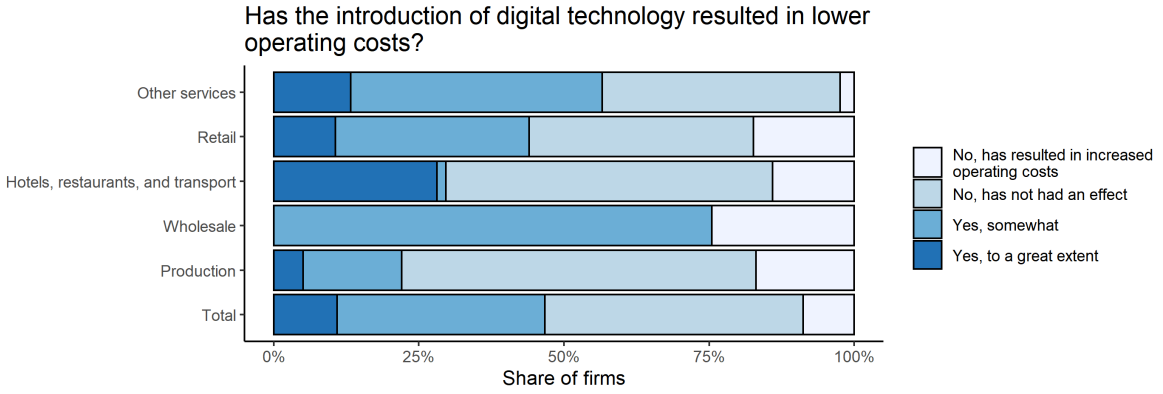
Approximately 11% of firms had used or planned to use artificial intelligence. Artifi-

cial intelligence, also known as machine intelligence, is a branch of computer science that emphasises the development of intelligent machines that think and work like humans; i.e., speech recognition, problem-solving, learning, and planning. Approximately 10% of firms had or planned to use the Internet of things (IoT), which applies to any non-standard computing device that connects to Wi-Fi and can transmit data. Well-known examples of IoT are smart speakers like Amazon Alexa, smartwatches and internet connected baby monitors. Other forms of digital technology were not as widely used by firms, with one-third of firms not using or intending to use any digital technology.

8.1 Effects via automation and productivity-enhancing innovations

Technological innovations tend to increase productivity. This can take place through innovations acting as complements to labour, making employees more productive, and as substitutes, where automated production frees up labour to perform other tasks. Both processes work to reduce costs, which could lower prices (Sveriges Riksbank, 2015). According to another survey study conducted by the Central Bank in the spring of 2018, almost 14% of firms that had adopted digital technology believed their number of employees would decrease in the next three years (Central Bank of Iceland, 2018). However, adopting digital technology can be expensive and may require labour with specialised expertise, as well as regular maintenance. In the same study, 7% of firms believed adopting digital technology would lead to a higher number of employees. Therefore, the overall effect on expenses is unclear.

According to the survey from 2019, approximately half of firms that had adopted digital technology reported that it had reduced their operating expenses, while nearly 10% of firms reported that it increased operating expenses (see figure 24). The impact is greatest among companies in *other services*, with two-thirds of companies having adopted digital technology or planning to do so. Thereof, more than half reported that the



Sources: Capacent Gallup, Central Bank of Iceland.

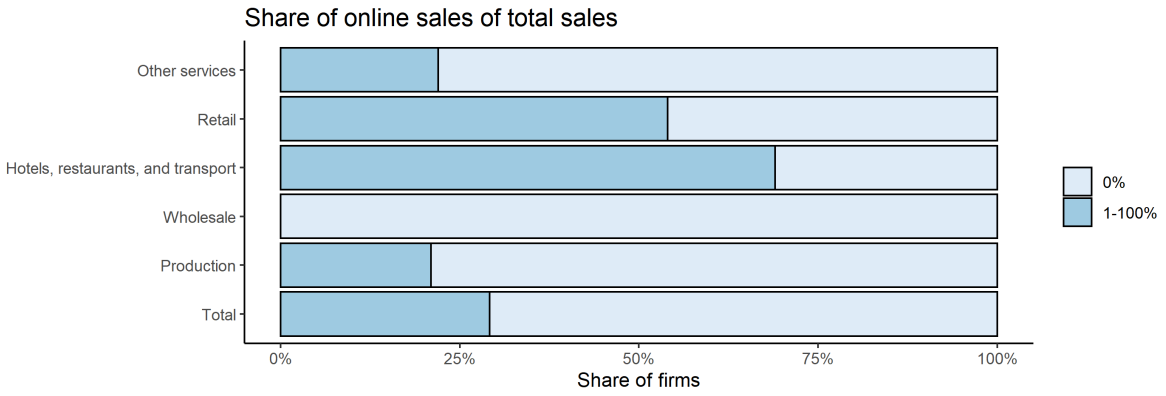
Figure 24. Impact of digital technology on costs

adoption of digital technology had resulted in lower operating expenses. These cost reductions may therefore lead to lower prices, especially where there is strong competition.

8.2 Effects of e-commerce and market structure

Digital technology can also influence price setting through market structure and consumer behaviour. Just like globalisation, e-commerce has opened new markets for consumers and increased competition which has led to lower prices. Digitisation and e-commerce has also reduced the barriers for firms to enter markets. Any firm, small or large, can go online and reach potential customers across the world at a faster rate and at lower cost.[9] Companies are therefore competing not only with companies within their district but could also be facing competition from rivals on the other side of the planet. However, companies are also faced with competition from dominant "superstar" firms. The term "superstar" firm refers to both firms in the digital industries, such as Google and Apple, and firms that are not in the digital sector but have business models that rely heavily on it (e.g., Amazon, Netflix, Spotify). These companies have considerable market power and can produce products at a lower cost due to their size, and can therefore force traditional and smaller players out of the market. While the effects of greater market

[9]This does not only apply to selling goods and services. Digital technologies can also make the matching process easier for firms looking for a specific skill and can help firms and start-ups to finance or access technologies they may not have been able to buy otherwise (e.g., via cloud computing).



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 25. Share of onlines sales for various industries

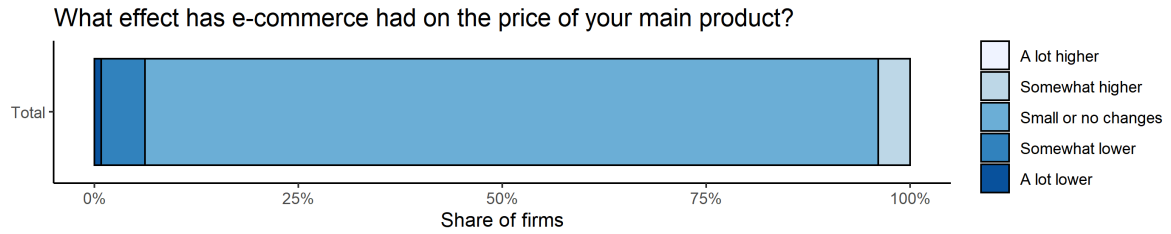
concentration and market power would normally result in higher prices, evidence suggests that "superstars" pass significant cost saving to consumers so the overall effect is to lower prices (Charbonneau et al., 2017).

E-commerce also enhances transparency, as customers can easily compare prices and quality of products over the Internet. These factors can boost competition and potentially force companies to reduce their mark-ups and lower prices (Sveriges Riksbank, 2015, Charbonneau et al., 2017, and Dong et al., 2017). A growing part of the literature has been dedicated to the issue of online and offline prices. Cavallo (2018) finds that online prices are remarkably similar to offline prices. He collects online prices daily in the United States and nine other countries. The conclusion is that prices are identical in 72% of cases, on average.[10] Gorodnichenko, Sheremirov, and Talavera (2018) arrive at the same conclusion: that online prices are similar to offline prices. However, according to their results, price changes are more frequent online than offline. Morris and de Vincent-Humphreys (2019) also find that firms' prices did not depend on the sales platform.

According to the survey results, approximately 30% of firms use online sales platforms, and more than half of firms in retail, hotel-, restaurant-, or transport-related operations do so (see figure 25).[11] This is not surprising, as hotels in Iceland rely heavily

[10]The study only contains "multi-channel retailers" and therefore excludes retailers such as Amazon.

[11]This share is likely to have risen further in the recent COVID-19 pandemic, as many companies set up online sales as a response to social distancing.



Sources: Capacent Gallup, Central Bank of Iceland.

Figure 26. Effect of e-commerce on prices

on foreign visitors, and e-commerce allows them to reach potential visitors from abroad. E-commerce's effect on prices are ambiguous, though. Increased competition should normally lower prices, but big data analytics can allow firms to charge higher prices through dynamic pricing or price discrimination (Dong et al., 2017). A large majority of firms report that e-commerce has little or no impact on their goods and services prices (see figure 26), while about 20% of retailers, wholesalers, and firms in hotel-, restaurant-, or transport-related operations consider online shopping to have led to moderate or large price reductions. However, roughly 10% of firms in retail and hotel-, restaurant-, or transport-related operations report that e-commerce has led to moderate price increases. On the whole, digitisation does not seem to have had a major impact on firms' price setting, according to this survey. Developments within digitisation are notoriously fast-paced, however, and the recent pandemic accelerated many firms' implementation of various technologies. Whether or not these developments have a major impact on prices remains to be seen.

9 Conclusions

The objectives of repeating a survey on firms' pricing decisions are to gain a better understanding of the factors that affect Icelandic firms' pricing decisions, the frequency of price changes, the effects of exchange rate movements on pricing, and whether a decade of relative price stability altered how prices are set. It is especially interesting to review

whether the effects of exchange rate movements on prices have changed markedly during this period. Another interesting topic is whether competition has increased and how it impacts firms' price-setting behaviour.

Many of the survey responses indicate clearly that economic conditions improved during the period between the two surveys. Even though the evidence is somewhat mixed, overall, firms seem to perceive that competition has increased, but that increased competition has a limited effect on their prices. Furthermore, the increase in competition seems to be rather broad-based. Firms now appear both to review and to change prices less often than they did a decade ago which is in line with expectations seeing that inflation had declined and was less volatile in the years preceding this survey. Also, this probably reflects to some extent the improvement in monetary policy conduct. It is not surprising that developments in firms' costs are of paramount importance regarding their price-setting decisions. Interestingly, higher costs seem to be a stronger determinant in firms that have relatively few competitors.

The survey presents positive results indicating that the impact of exchange rate movements on pricing decisions is more symmetric than before. Firms are likelier to lower their prices following a currency appreciation, and a larger share of them report that a sizeable depreciation would be needed to prompt them to raise prices. However, on the downside, import-intensive firms appear keener to pass exchange rate changes to their prices than according to the previous survey. Differences in price-setting methods are found to depend on firms' cost structure, as the majority of firms that rely heavily on imported inputs set their prices as a mark-up over costs, while firms that are less exposed to exchange rate changes rather base their pricing decisions on developments in the CPI. In the 2008 survey, Iceland stood out in international comparison, as a much larger share of firms indexed prices to the CPI. In that case, it is positive that in the current survey, a smaller share of firms than previously claim that developments in the CPI have a strong effect on their price setting. In light of the above, the results imply that, among other factors, increased credibility of monetary policy during the period between the two

surveys and more transparency regarding the Central Bank's communication has had a positive effect on firms' price-setting behaviour and price dynamics.

Adoption of digital technology has had wide-ranging effects on the economy in recent years, even though the effects on pricing are ambiguous. A large majority of firms report that e-commerce has had little or no impact on their goods and services prices, while about 20% of retailers and wholesalers consider online shopping to have led to moderate or large price reductions. About a third of firms report that adopting digital technology reduced their operating expenses and signs of this were clearest among companies in services. In those sectors, about half of firms report that digital technology has led to lower operating expenses. However, the developments that have occurred during the period that has passed since the survey was conducted have been extremely rapid, due to the COVID-19 pandemic among other factors.

Overall, the survey results on firms' price-setting behaviour are similar to results from relevent international studies which accords with what was found roughly a decade ago. However, like in the previous survey, Iceland still stands out with regard to a relatively high share of firms that index their prices to CPI developments, although, as has been mentioned, the share has declined. Also, Icelandic firms seem to be significantly more backward-looking in their price setting than firms in other advanced countries, and a lower share of firms review their prices only at regular intervals. Even though macroeconomic conditions had been relatively favourable and more stable in the years preceding the current survey, Iceland is a very small open economy and is highly exposed to exchange rate developments and external conditions. It is likely that this still affects firms' pricing strategies to some extent.

Since the price setting survey was conducted in 2019 the global economy has experienced large shocks - including a global pandemic, with accompanying public health measures, wide-ranging supply shocks, and production difficulties. When the effects of the pandemic started to subside in the beginning of 2022, Ukraine was invaded by Russia which led to an enormous increase in various commodity prices, and increased uncer-

tainty. Inflation, both in Iceland and globally, has increased rapidly since the survey was conducted and is relatively widespread. It measured 9.3% in Iceland in November 2022, with roughly a quarter of annual inflation being attributed to higher imported goods prices. The króna depreciated by just over 12% following the start of the pandemic. When the war in Ukraine started it had, however, appreciated by 6.3% in the past twelve months. The developments in imported goods prices over the past few years indicate that exchange rate pass-through to imported goods prices has indeed become more symmetric like the survey results indicated. Also evident, firms seem to have changed their prices more rapidly following changes in the exchange rate rather than immediately following an increase in trading partners' inflation. This is also in line with the results that the threshold needed for a change in the exchange rate to affect prices was seen to be somewhat lower than before. These survey results therefore appear to still hold in today's environment of increased uncertainty and volatility. However, in light of persistent high inflation, the recent rise in inflation expectations, and indications that they have become less firmly anchored to the inflation target, it is of the utmost importance that the Central Bank of Iceland bring inflation and inflation expectations down to the target within an acceptable time frame.

Appendix A: Questionnaire

Question 1

The company's principal product is the product or service that generates the greatest share of its sales revenues/turnover. Does the company itself determine the price of the principal product, or is the price determined by other factors, such as the parent company or external regulatory instruments?

- ❑ The company itself
- ❑ Parent company or external regulatory instruments (Do not answer more questions in the survey)
- ❑ Do not wish to answer
- ❑ Don't know

Question 2

What is the company's principal product in the domestic market; that is, what product generates the most turnover?

- ❑ _____
- ❑ Do not wish to answer
- ❑ Don't know

Question 3

How many competitors are there in the domestic market for the principal product?

- ❑ 0-3
- ❑ 4-15
- ❑ 16 or more
- ❑ Do not wish to answer
- ❑ Don't know

Question 4

How large a proportion of domestic sales of the principal product takes place in the consumer market, and what proportion in the corporate market?

- ❑ 100% in consumer market
- ❑ Majority in consumer market
- ❑ Distributed equally between markets
- ❑ Majority in corporate market
- ❑ 100% in corporate market
- ❑ Do not wish to answer

❑ Don't know

Question 5

Are the majority of buyers of the company's principal product long-term customers or random customers?

❑ Long-term customers

❑ Random customers

❑ Do not wish to answer

❑ Don't know

Question 6

Which of the following factors are most important for the competitiveness of the company's principal product in the domestic market?

❑ Price

❑ Quality

❑ Uniqueness of product

❑ Long-term contracts

❑ Do not wish to answer

❑ Don't know

Question 7

Is your company the leader in the domestic market for the principal product, is another company the leader, or is no single company the leader?

❑ My company

❑ Another company

❑ No leader

❑ Do not wish to answer

❑ Don't know

Question 8

Approximately what percentage of the total production cost of the principal product is due to wages?

❑ 0-20%

❑ 21-40%

❑ 41-60%

❑ Do not wish to answer

❑ Don't know

Question 9

Approximately how large a share of the total production cost of the principal product is due to imported factors?

- ❑ 0%
- ❑ 1-10%
- ❑ 11-40%
- ❑ More than 60%
- ❑ Do not wish to answer
- ❑ Don't know

Question 10

Which of the following statements applies best to the pricing of the principal product?

- ❑ The price is based on a FIXED mark-up
- ❑ The price is based on a VARIABLE mark-up
- ❑ The price depends on competitors' prices
- ❑ The price changes with the consumer price index
- ❑ Do not wish to answer
- ❑ Don't know

Question 11

Which of the following statements applies best to the pricing of the principal product?

- ❑ Assessment of future outlook
- ❑ Assessment of current situation and recent developments
- ❑ Do not wish to answer
- ❑ Don't know

Question 12

If the price of the principal product the same for all customers, is it determined by volume sold, or is it determined in each instance?

- ❑ Same for all customers
- ❑ Determined by volume sold
- ❑ Determined in each instance
- ❑ Do not wish to answer
- ❑ Don't know

Question 13

Is the price of the principal product reviewed at regular intervals?

- ❑ Yes; i.e., daily, weekly, monthly, or annually
- ❑ Yes, usually at regular intervals, but also following extraordinary events
- ❑ No
- ❑ Do not wish to answer
- ❑ Don't know

Question 14

In the past 12 months, how often has your company examined whether there were reason to change the price of its principal product, but without then changing the price?

- ❑ Never
- ❑ Once
- ❑ 2-3 times
- ❑ 4 times or more
- ❑ Do not wish to answer
- ❑ Don't know

Question 15

How often in the past 12 months has your company actually changed the price of its principal product?

- ❑ Never
- ❑ Once
- ❑ 2-3 times
- ❑ 4 times or more
- ❑ Do not wish to answer
- ❑ Don't know

Question 16

How important or unimportant are the following factors in a decision is made to RAISE the price of the principal product?

Increased expense

Competitor raises prices

Demand grows

ISK exchange rate changes

- ❑ Very important

- ❑ Somewhat important
- ❑ Neither likely nor unlikely
- ❑ Somewhat unimportant
- ❑ Very unimportant
- ❑ Do not wish to answer
- ❑ Don't know

Question 17

How important or unimportant are the following factors in a decision is made to LOWER the price of the principal product?

Reduced expense

Competitor lowers prices

Demand declines

ISK exchange rate changes

- ❑ Very important
- ❑ Somewhat important
- ❑ Neither likely nor unlikely
- ❑ Somewhat unimportant
- ❑ Very unimportant
- ❑ Do not wish to answer
- ❑ Don't know

Question 18

How likely or unlikely do you consider it to be that inflation will be close to the Central Bank's 2,5% inflation target in five years' time?

- ❑ Very likely
- ❑ Rather likely
- ❑ Neither likely nor unlikely
- ❑ Rather unlikely
- ❑ Very unlikely
- ❑ Do not wish to answer
- ❑ Don't know

Question 19

Which of the following actions is your company most likely to take in order to protect profits following a depreciation of the Icelandic króna?

- ❑ Raise prices
- ❑ Increase productivity or production volume
- ❑ Cut costs
- ❑ Switch suppliers
- ❑ Other actions; please specify:
- ❑ Do not wish to answer
- ❑ Don't know

Question 20

There may be various reasons why a company does not lower its prices to accord with the impact an appreciation of the króna may have on its costs. Which of the following reasons do you consider most important under those circumstances?

- ❑ Appreciation is too small
- ❑ Appreciation is transitory
- ❑ Strong demand for principal product
- ❑ Competitors do not lower prices
- ❑ Other costs have risen
- ❑ Not applicable to my company
- ❑ Do not wish to answer
- ❑ Don't know

Question 21

How much does must the króna depreciate in one quarter in order for your company to raise the price of its principal product?

- ❑ Less than 10%
- ❑ 10-15%
- ❑ More than 15%
- ❑ Do not wish to answer
- ❑ Don't know

Question 22

How much does must ISK appreciate in one quarter in order for your company to lower the price of its principal product?

- ❑ Less than 10%
- ❑ 10-15%
- ❑ More than 15%
- ❑ Do not wish to answer
- ❑ Don't know

Question 23

Which of the following factors is most important in your company's decision to defer price changes or to change prices only slightly even though there are grounds for a larger change?

- ❑ The cost of price changes
- ❑ Competitor does not change prices
- ❑ Do not want the price to exceed a given threshold (e.g., 1,999 kr.)
- ❑ Contractual agreements with customers
- ❑ Customers want price stability
- ❑ The grounds for a price change are not lasting
- ❑ Lower price interpreted as lesser product quality
- ❑ Instead of changing prices, we change other factors such as quality or service level
- ❑ Do not wish to answer
- ❑ Don't know

Question 24

Which factor is second most important?

- ❑ The cost of price changes
- ❑ Competitor does not change prices
- ❑ Do not want the price to exceed a given threshold (e.g., 1,999 kr.)
- ❑ Contractual agreements with customers
- ❑ Customers want price stability
- ❑ The grounds for a price change are not lasting
- ❑ Lower price interpreted as lesser product quality
- ❑ Instead of changing prices, we change other factors such as quality or service level
- ❑ Do not wish to answer

- ❑ Don't know

Question 25

What digital technology, if any, has your company implemented or plans to implement?

- ❑ Cloud computing
- ❑ Online shopping (e-commerce)
- ❑ The internet of things
- ❑ Artificial intelligence
- ❑ Robotics
- ❑ Big data
- ❑ 3-D printing
- ❑ Other
- ❑ None
- ❑ Do not wish to answer
- ❑ Don't know

Question 26

How large a share of your company's goods or services sales take place via e-commerce?

- ❑ X%
- ❑ Do not wish to answer
- ❑ Don't know

Question 27

What impact does e-commerce have on the price of your company's goods and services?

- ❑ Significant reduction
- ❑ Modest reduction
- ❑ Little or no impact
- ❑ Modest increase
- ❑ Significant increase
- ❑ Do not wish to answer
- ❑ Don't know

Question 28

Has implementation of digital technology lowered your operating expense?

- ❑ No; it has increased operating expense
- ❑ No; it has had no effect on operating expense
- ❑ Yes, to some extent
- ❑ Yes, to a large extent
- ❑ Do not wish to answer
- ❑ Don't know

Question 29

In general, what impact, if any, do you think implementation of digital technology by other companies in your sector (competitors, suppliers, and customers) has on the price of your company's goods and/or services?

- ❑ Significant reduction
- ❑ Modest reduction
- ❑ Little or no impact
- ❑ Modest increase
- ❑ Significant increase
- ❑ Do not wish to answer
- ❑ Don't know

Question 30

Has competition increased in your company's sector in recent years?

- ❑ No; competition has not increased
- ❑ Yes, to some extent
- ❑ Yes, to a large extent
- ❑ Do not wish to answer
- ❑ Don't know

Question 31

How much impact has increased competition had on the price of your company's goods and/or services?

- ❑ Little or no impact
- ❑ Modest reduction
- ❑ Significant reduction
- ❑ Do not wish to answer

- ❑ Don't know

Question 32

Under what industrial sector are your company's activities classified?

- ❑ Manufacturing
- ❑ Agriculture, forestry, and fishing
- ❑ Industry and utilities
- ❑ Retail and wholesale trade
- ❑ Hotels/guesthouses and restaurants
- ❑ Transit, IT, and telecom
- ❑ Specialised and scientific operations
- ❑ Other services
- ❑ Public administration
- ❑ Education, culture, recreation, and non-governmental organisations
- ❑ Do not wish to answer
- ❑ Don't know

Question 33

How many permanent employees worked for your company as of year-end 2018?

- ❑ X employees
- ❑ Do not wish to answer
- ❑ Don't know

Question 34

What was your company's turnover in ISK millions in 2018?

- ❑ ISK X million
- ❑ Do not wish to answer
- ❑ Don't know

Question 35

What was your company's turnover from your principal product in ISK millions in 2018?

- ❑ ISK X million
- ❑ Do not wish to answer
- ❑ Don't know

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