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Business Costs and Consumer Price Inflation in Ireland

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How do consumer prices respond as costs for businesses in Ireland change? In this *Letter*, we seek to answer this question by examining macroeconomic data. The response of profits, wages and productivity levels to a given rise in other input costs determines the extent of cost-push pass-through to consumer prices. We find that output prices of domestically-dominated sectors of the economy, which captures the dynamics of businesses responses to higher input costs, typically do play a role in explaining consumer price inflation in Ireland. Recent cost increases for businesses are expected to contribute to inflation remaining above pre-pandemic levels for the foreseeable future given the likely capacity of labour costs and profits to adjust.

1. Introduction

Consumer price inflation in Ireland accelerated sharply during the second half of 2021 and into early 2022. By April 2022, the Harmonised Index of Consumer Prices (HICP) stood over 8 per cent higher than pre-pandemic levels. The primary driver of the recent pickup in inflation has been higher energy prices, which has been amplified by the war in the Ukraine, supply bottlenecks and surging demand as economies recover from the initial shock of the pandemic.² Uncertainty as to how these factors will evolve is particularly high at present, especially with regard to the future path of energy prices.³ Attention has also turned to the risk of cost-push inflation as a so-called “second-round” effect. Broadly, this refers to the extent to which higher labour and other input costs faced by businesses as a result of current price pressures are passed-through to further rises in consumer prices. The second [Central Bank Quarterly Bulletin](#) of 2022 noted the rise in input costs being reported by Irish businesses through the second half of 2021 and into 2022. In this *Letter* we examine the mechanism through which such business costs can influence Irish consumer price inflation,

¹ Irish Economic Analysis Division, Central Bank of Ireland. The views expressed in this paper are those of the authors only and do not necessarily reflect the views of the Central Bank of Ireland. We would like to thank colleagues in the Central Bank for comments on an earlier draft.

² See [Byrne and Zekaite \(2021\)](#).

³ See [Box A: Central Bank Quarterly Bulletin 2 2022](#).

with a view to understanding what recent developments in these costs may mean for the persistence of consumer price growth.

Numerous studies have examined the drivers of Irish inflation, but relatively little recent attention has been paid to the specific cost-push channel. As a small, open economy, with a high import content of consumption, inflation in Ireland is significantly driven by external factors. However, there has been an increased awareness of the role domestic factors play in explaining Irish inflation. [Gerlach et al \(2015\)](#) show that the gap between the actual unemployment rate and the NAIRU has been a significant determinant of inflation in Ireland since the 1920's.⁴ Similarly [Bermingham et al \(2012\)](#) find that domestic measures of slack in the economy are related to subsequent consumer price inflation, but that the relationship differs at different points in the business cycle.⁵ Using a suite of models approach, [Byrne and Zaki-pour-Saber \(2020\)](#) find that domestic determinants of inflation have become more relevant in Ireland since the Global Financial Crisis. An explicit role for some measures of business costs is included in [Faubert \(2020, 2021\)](#), who finds that while domestic factors are important, a large portion of Irish consumer price inflation is ultimately imported. However, a significant international literature has also emerged showing that the general role of cost-push factors had diminished somewhat over time up to 2019. Globalisation of production and consumption, a reduction in wage bargaining power of workers and local pricing power of firms, and the anchoring of inflation expectations have all been cited as reasons for this smaller role of domestic cost-push drivers of inflation ([Belz et al, 2020](#); [Koester et al, 2021](#)). The extent to which some of these general drivers of lower inflation will remain over the decades ahead is a live topic of debate, especially where they have related to the joint incidence of globalisation and benign demographic trends ([Goodhart and Pradhan, 2017](#)).

The prominent role of foreign-owned and exporting multinational enterprises (MNEs) in Ireland makes it difficult to isolate the relevant domestic business costs that may affect consumer price inflation. Standard macroeconomic measures of business output prices and their main drivers are heavily distorted by the activities of high value added, high productivity MNEs in various manufacturing and computer services sectors. In this *Letter* we make use of the recent disaggregation of the output side of the National Accounts by the Central Statistics Office (CSO) to overcome these distortions. Our measure of domestically relevant business output prices – the gross value added deflator of the domestically dominated economic sectors (GVAD*) – aims to capture developments in output prices that are most likely to influence the pricing decisions of firms supplying Irish consumers with goods and services. We find that this measure has a significant, but not dominant role in determining headline HICP inflation in Ireland. At a macro level, developments in this measure of business output prices are a combination of changes in input costs, wages, productivity and profit margins.

⁴ NAIRU is the Non-Accelerating Inflation Rate of Unemployment. When the actual unemployment rate is above (below) the NAIRU, the expectation would be that inflationary pressures would be decreasing (increasing).

⁵ [Galstyan \(2021\)](#), in a cross-country analysis, finds that as inflation picks up, the role domestic slack has in determining inflation becomes stronger.

Given the interaction of those underlying factors, our findings suggest a degree of persistence in inflation developments in Ireland over the near-to-medium term can be expected, albeit that the pace of growth in headline HICP will likely be dominated by developments in externally-determined energy prices.⁶

2. Using National Accounts to Understand Business Costs and Prices

In this section we describe our main measure of domestically relevant business output prices, the Gross Value Added Deflator of the domestically-dominated economic sectors (GVAD*). This measure reflects the price changes in business output that covers the remuneration of labour and capital (the employees and the owners of the business, respectively) after the input costs of intermediate consumption are accounted for (raw materials, professional services, etc.).⁷ Our working hypothesis is that this measure captures an important transmission channel of broad price and cost developments that filter through to consumer prices in Ireland. An increase in global energy prices may have a more direct effect on consumer prices through the price of home heating oil or petrol and diesel. However, it will also influence the costs of producing or providing other consumer goods and services. For example, a restaurant owner pays for electricity and their suppliers pay for fuel to transport produce to the restaurant. Businesses can respond to these cost increases by accepting lower profit margins, reducing labour input costs per unit of output, or increasing their prices per unit of output. The degree and relative weighting between these responses across all firms will determine the pass through of input cost shocks to consumer prices. Chart 1 shows that input costs have increased substantially in recent quarters. As a result, we expect changes in GVAD* to pass through to some degree to changes in HICP.

CHART 1: PMI INPUT COSTS



Source: Markit

⁶ See the [Central Bank Quarterly Bulletin, April 2022](#) for the latest forecasts on inflation.

⁷ The remuneration of capital in this context includes the final return to the business owner, depreciation on assets, debt servicing costs and taxes net of subsidies paid by the business.

To illustrate the framework through which we summarise this, it is useful to first set out the identities in the national accounts which underpin our analysis. Table 1 sets out these identities, and the broad equivalent from individual business' financial accounts.

TABLE 1: ANALYTICAL FRAMEWORK

	Business Financial Accounts	National Accounts
<i>Identity</i>	Turnover – Non-Labour Input Costs – Labour Costs – Earnings before Interest, Tax and Depreciation = 0	Output – Intermediate Consumption – Labour Costs – Gross Operating Surplus = 0
<i>Re-arrange</i>	Turnover – Non-Labour Input Costs = Labour Costs + Earnings before Interest, Tax and Depreciation	Output – Intermediate Consumption = Labour Costs + Gross Operating Surplus = GVA
<i>Divide by real GVA</i>		Price per unit – Intermediate Consumption per unit = Unit Labour Costs + Unit Profits = GVAD

Given these identities, changes in the GVA deflator (GVAD) captures holistically the effect of changes in any of the underlying components and how the domestically-relevant business sectors can respond. For example, an increase in energy input costs (intermediate consumption per unit) will have to be accompanied by a reduction in unit labour costs or unit profits or an increase in unit prices. Depending on a number of factors, businesses will have different degrees of control at any point in time over labour costs, required profits, and prices that they charge, but all of these components interact and can in part offset each other. Aggregating across the whole economy and over time, these dynamics are captured in changes in GVAD, which we hypothesise summarises the net transmission of shocks to business input costs that are most relevant for consumer prices.

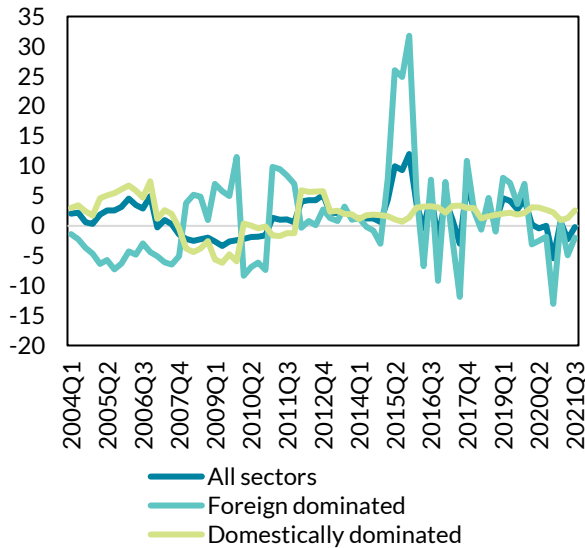
The CSO now produce nominal and real GVA for “foreign-dominated” and “other” sectors of the economy on a quarterly basis, the latter corresponding to domestically-dominated sectors.⁸ The benefits of having this measure for the domestically dominated sectors is clear in Chart 2, which shows the volatility of the economy-wide GVA deflator, dominated by developments in the MNE sectors, which clearly have no corresponding link to broader domestic developments.

In contrast, changes in GVAD* are more consistent and, on initial reflection, have some relationship with domestic consumer price developments (Chart 3). The contemporaneous correlation between GVAD* inflation and consumer price inflation ranges from 0.45 to 0.73. Measures of consumer price inflation that are more likely to have a larger domestic component (services, overall HICP and PCD measures) show higher degrees of correlation with GVAD*. Comparing the lead/lag properties of the various price measures also show that changes in GVAD* tend to lead changes in consumer prices out to eight quarters. This provides some validity for our working hypothesis that domestically relevant business output

⁸ See the [Background Notes](#) to the CSO Q3 2020 Quarterly National Accounts release. Foreign-dominated sectors are concentrated in certain Manufacturing and Information and Communication sectors, identified by the CSO as NACE Rev.2 sectors 18.2, 20, 21, 26, 27, 32.5, and 58-63.

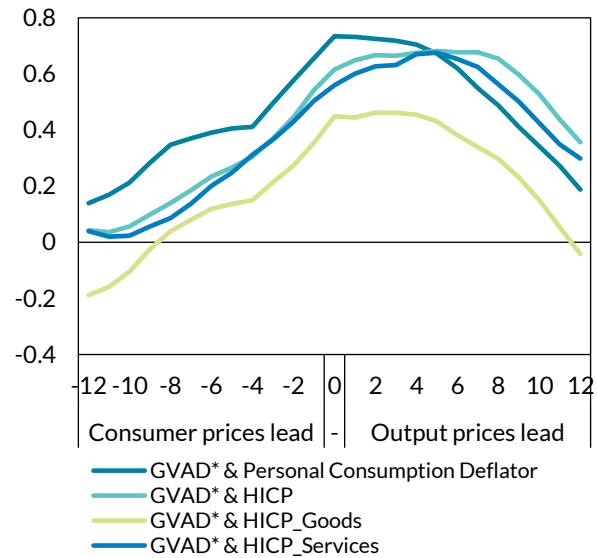
prices, which in turn reflect the response of businesses to their own costs, pass-through to a degree to consumer prices in Ireland, which we examine more formally in Section 3.

CHART 2: Annual % change in GVA Deflator



Source: CSO, author calculations

CHART 3: Cross-correlation between business output costs and consumer prices



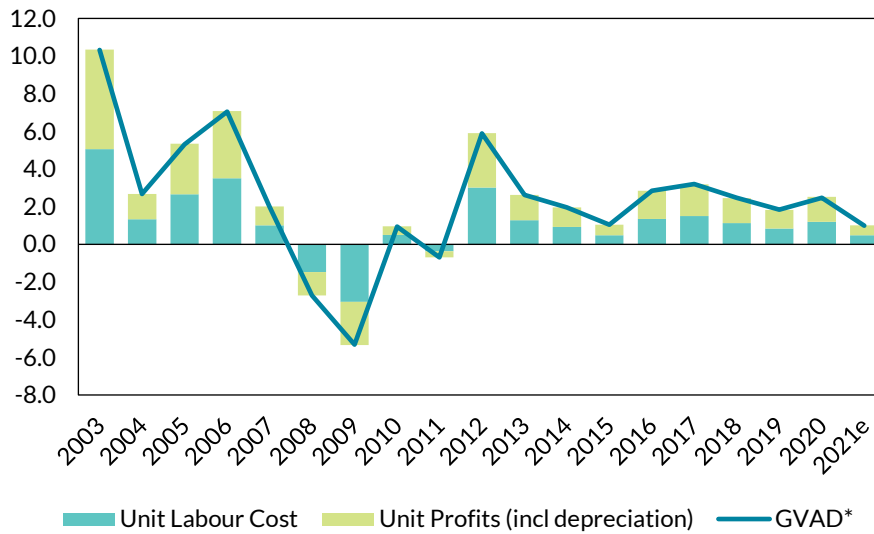
Source: CSO, author calculations

2.1 Drivers of GVAD*

It is possible to look at the drivers of changes in GVAD* using national accounts data.⁹ By dividing the compensation of employees and the remuneration of capital by the value of real value added we can get a sense of the relative role of changes in labour costs and profits per unit of output in determining changes in GVAD*. Over recent years, there has been a relatively equal contribution of these factors in driving this measure of business output costs (Chart 4), with GVAD* increasing by approximately 2-3 per cent per year since 2016. Initial estimates for 2021 indicated that the pace of increase in GVAD* eased, suggesting businesses at the time were mostly absorbing higher input costs instead of passing it on to consumer prices.

⁹ The discussion in this sub-section relies on annual national accounts data from Eurostat (Tables NAMA_10_A64 and NAMA_10_A64_E). These do not allow for the same level of disaggregation to map exactly to the CSO designation of “foreign-dominated” and “other” sectors, but are highly comparable. For “domestically-dominated sectors” in this sub-section we exclude NACE Rev.2 sectors 18-21, 26-28, 31-33, and 58-63 from overall GVA. In 2020, nominal GVA for domestically-dominated sectors according to the CSO was €172.8bn, with the equivalent data we source from Eurostat being €171.1bn, a variance of just 1 per cent.

CHART 4: DECOMPOSITION OF ANNUAL CHANGE IN GVAD*



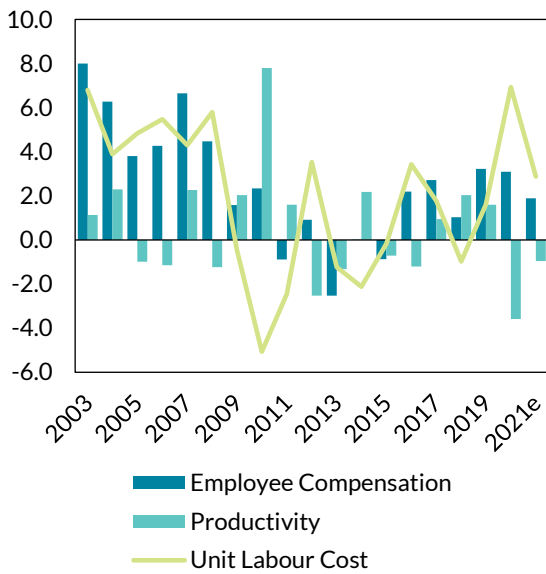
Source: Eurostat, author calculations

Note: Domestically-dominated sectors only.

Charts 5 and 6 further decompose unit labour costs (ULC) and unit profits for the domestic sectors. Increases in ULC in 2020 and 2021 have been predominantly driven by overall employee compensation per hour, which has continued to grow. In contrast, the level of output per hour worked remained below pre-pandemic levels. This was especially the case in 2020 when the initial public health restrictions were introduced, businesses and workers had to adapt to new ways of working, and the prevalence of the virus absent the benefits of vaccination was higher. During 2020 there was a proportionately larger fall in output relative to the fall in hours worked in the domestically-dominated sectors (Chart 5). Our provisional estimates for 2021 indicate that productivity growth in aggregate was yet to emerge. The nature of productivity developments over 2020 and 2021 also coincide with the wage subsidy schemes, which have likely led to a higher degree of labour hoarding than what would have been experienced in Ireland during previous downturns. These schemes in general are acknowledged as being a successful way of minimising the damage of temporary demand-side shocks, with their appropriateness in the face of more persistent supply-side shocks being less clear, especially where they disrupt the normal rate of churn in the labour market.¹⁰

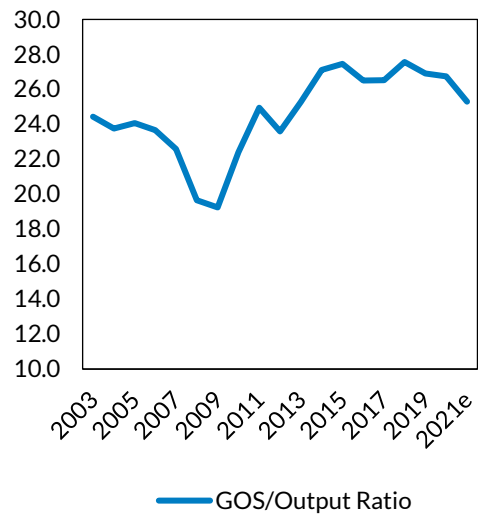
¹⁰ See [Lydon et al \(2018\)](#), [Giupponi and Landais \(2018\)](#) and [Cooper et al \(2017\)](#).

CHART 5: Decomposition of annual change in ULC



Source: Eurostat, author calculations
 Note: Domestically-dominated sectors only. Employee compensation and productivity are measured on a per hour basis.

CHART 6: Gross operating surplus margin



Source: Eurostat, author calculations
 Note: Domestically-dominated sectors only.

The profit metric we examine in the National Accounts is loosely equivalent to earnings before interest, taxes, depreciation and amortization (EBITDA) in company financial accounts.¹¹ We consider the gross operating surplus margin, expressed as a proportion of total turnover or output (GOS/Output ratio in Chart 6). This margin had averaged around 27 per cent in the five years leading up to the pandemic for the domestically-dominated sectors.¹² However, underlying this is significant differences across the economy. Sectors such as *Construction* and *Accommodation and Food Services* had typically lower margins of circa 15 per cent, *Wholesale and Retail Trade* were broadly in-line with the average of 27 per cent, whereas *Real Estate Activities* (72 per cent) certain professional services and *Administration and Support Service Activities* (49 per cent) were typically above average. These differences reflect different norms and business models across sectors, including required rates of return for financing purposes and the use of physical and intangible capital. Our preliminary estimates point to a reduction in this margin in 2020 and 2021 for the domestically-dominated sectors overall. For margins to be maintained in light of higher input costs, businesses would have to increase output prices, reduce per hour wage rates, or increase per hour labour productivity. The capacity of individual businesses and sectors to take these actions differs, and each would have a minimum degree of profitability that would be necessary to be maintained over the medium-term to continue in operation.

¹¹ The formal National Accounts measure is known as Gross Operating Surplus (GOS).

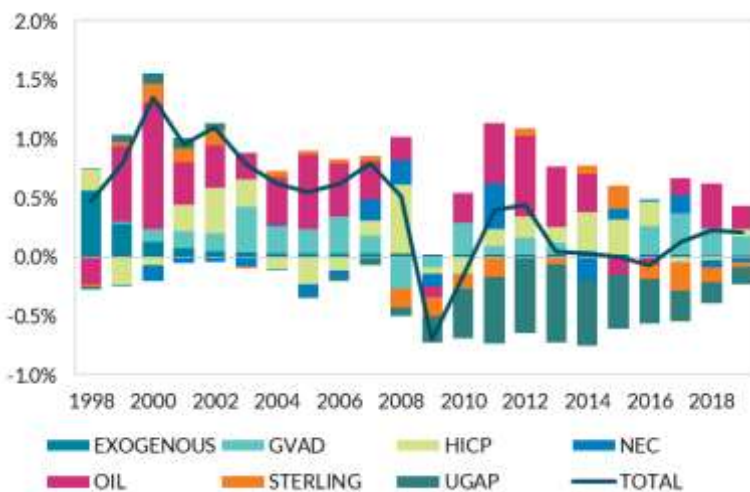
¹² This was fourth highest in the EU+UK for those combined sectors.

3. Empirical analysis – an augmented Phillips curve

In this section we examine the role of business output costs in driving consumer price inflation more formally. The Phillips curve is the standard model used to understand the relationship between consumer prices and economic activity such as unemployment or the output gap.¹³ To examine the impact of changes in business output costs on inflation, we add GVAD* to a standard Phillips curve specification. For full details on the data and methodology see Appendix A. The main regression results are presented Appendix B.

Our model includes lags of inflation, ILO Unemployment Gap measures as measures of overall slack in the economy, the sterling exchange rate, the global crude oil price, and our variable of interest: GVAD*. Historically, GVAD* has been an important, but not the main driver of the changes in the growth rate of inflation. Oil has historically been a more important component in determining shocks to inflation, with general persistence also playing a significant role. GVAD* only becomes prominent when the economy nears capacity. As the economic cycle turns, firms appear to absorb losses either through decreased profit margins or wage cuts, before workers are laid off. Thereafter, increased unemployment induces deflationary pressures with some possible evidence of scarring. As the economy recovers, firms try to increase margins and “make up for lost time” before returning to the status quo, with GVAD* becoming prominent again later in the cycle. Imported inflation via Sterling also follows the business cycle, with imported deflation being a factor post-Brexit.

CHART 7: Historical decomposition of annual changes in HICP.

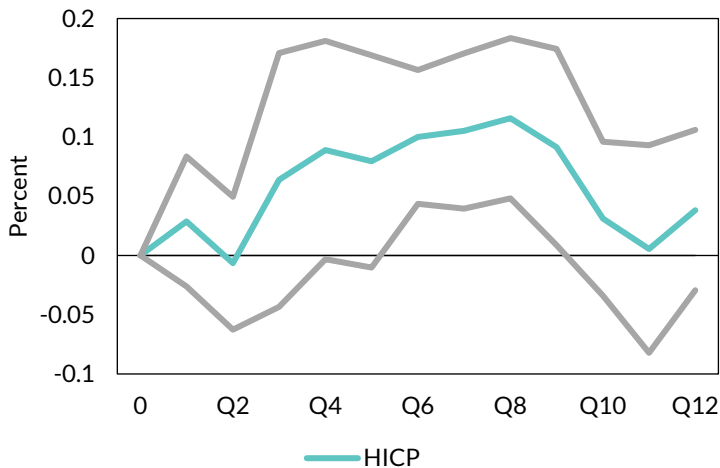


Overall, from a static perspective, we find that a 1 per cent increase in GVAD* is associated with higher headline HICP (c. + 0.05%). We find that there is persistence in headline HICP, with domestic cyclical and non-cyclical factors, as well as external elements having a significant role in predicting inflation.

¹³ The model ultimately derives from the original work of [Phillips \(1958\)](#).

From a dynamic point of view, increases to GVAD* are associated with higher headline inflation, about six to nine quarters after an initial shock (Chart 8).¹⁴ This reflects both the independent role of changes in non-labour business output costs, and the feedback and interaction between those costs, headline inflation, and labour costs over time.

CHART 8: Impulse response of HICP to 1 % shock to GVAD*.



Source: Author calculations from baseline model (Appendix B – Table 1)

Note: 90% Confidence Interval displayed

In terms of the other variables included in the model, a one percentage point increase in the unemployment gap, appears to be associated with a small percentage decrease in the growth rate of inflation. There does appear to be a case for non-linearity in some specifications, in-line with previous studies.¹⁵ The explanatory power of our slack measure associated with changes in the growth rate of inflation are more pronounced around turning points in the business cycle, which explains the observed sign.¹⁶

Imported inflation, as seen in the coefficient on oil prices, also plays a key role in predicting headline HICP. This effect is evident throughout all model specifications and throughout time. Over our sample, the euro appreciated vis-à-vis sterling, resulting in deflationary pressures via cheaper import costs. It appears that our variable of interest (GVAD*) reduces the explanatory power of sterling due to the import content of business' intermediate inputs. When we excluded GVAD*, our results were more in keeping with past literature (Appendix B).¹⁷

Overall, our results point toward an independent role of cost-push factors in explaining Irish consumer price inflation in general. However, it is the interaction between externally driven

¹⁴ Refer to authors for LLPs of other control variables.

¹⁵ See [Byrne and Zekaite \(2021\)](#).

¹⁶ See [Bermingham et al \(2012\)](#) & [Stock and Watson \(2010\)](#)

¹⁷ See [Faubert \(2021\)](#)

costs, the tightness of the labour market and the responsiveness of productivity and profit margins that ultimately determine the magnitude of cost-push pass-through. It is also evident that HICP inflation typically has some elements of underlying persistence in it.

4. Conclusion

In this *Letter*, we examine the transmission of rising business input costs to Irish consumer price inflation, particularly relevant given the reported rise in input costs being faced by businesses in recent months. We proxy cost-push drivers of inflation by using the CSO's new disaggregation of gross value added, which allows us to derive business output prices for domestically-dominated sectors of the economy. We find that an increase in GVAD* is associated with higher headline HICP inflation over subsequent quarters. Combined with the relative role of domestic cyclical and external drivers of inflation, our results are broadly in-line with past literature. They point to some degree of persistence in Irish consumer price inflation over the coming quarters, albeit that headline HICP inflation may still be more directly determined by the dynamics of energy prices in particular. Importantly, the extent to which cost-push factors present in future inflation is determined by businesses ability to absorb higher input costs through reduced profit margins, reductions in hourly wage rates or increases in productivity. With an increasingly tight labour market expected out to the middle of the decade, adjustment through the wage channel is unlikely. If profit margins are to be maintained at rates similar to previous years, more businesses may resort to increasing output prices, which in turn would pass-through to consumer price inflation. Inability to absorb higher input costs through lower profit margins or higher output prices would pose challenges for businesses, which may ultimately result in some further reduction in their activity. Consequently, the extent to which activity in the domestically-dominated economic sectors is supported by a return to productivity growth will be an important factor in minimising the scope for cost-push inflation in Ireland and maximising sustainable economic growth.

Appendix A – Data and Methodology

TABLE A1: DATA USED IN REGRESSION ANALYSIS – 1998Q1 TO 2019Q4

Block		No.	Variable	Source
Measures of slack in the economy	Output Gap	1	Hamilton Filtered QoQ Real GDP	Own calculation based on CSO data
		2	Hamilton Filtered QoQ Real MDD	Own calculation based on CSO data
		3	Unobserved Component Model GDP Gap	Central Bank calculation based on CSO data
	Labour	4	Unemployment Rate (ILO)	CSO
		5	Non-Accelerating Inflation Rate of Unemployment (NAIRU)	OECD
		6	Hamilton Filtered Unemployment Gap	Own Calculation based on CSO data
Cost-Push		7	GVAD*	CSO
Prices		8	HICP	Eurostat
Exchange Rates		9	EUR/GBP FX rate	Eurostat
Commodities		10	Euro Crude Oil Price	Own Calculation based on Bloomberg data
		11	Non-energy commodity prices	ECB assumptions based on futures data

Note: Data seasonally adjusted using Census X-12

We estimate a Philips curve of the specification outlined below via generic OLS methods using Newey-West HAC standard errors.¹⁸ All variables except the slack measures are in log differences. We define our gap measures as the contemporaneous slack measure minus its trend value. Our baseline specification is outlined below. Other models were examined¹⁹ whereby we changed our slack measure and excluded its square. All models were estimated up until Q4 2019, to avoid pandemic related noise and to observe the effect of cost-push inflation in “normal times”.

Our results are presented by way of local linear projections ([Jorda, 2005](#); [Plagborg-Møller & Wolf, 2021](#)).

$$\begin{aligned}
 HICP_t = & \alpha + \pi_{i,1}HICP_{t-1} + \beta_i ILO \text{ Unemployment Gap}_{t-1} + \\
 & \lambda_i ILO \text{ Unemployment Gap Squared}_{t-1} + \psi_i \text{Sterling}_t + \omega_i \text{Oil}_t + \\
 & \rho_i \text{Non – Energy Commodity Prices}_t + \delta_i \text{GVAD}^*_{t-1} + \varepsilon_t
 \end{aligned}$$

¹⁸ Following [Rudd \(2021\)](#) and [Stock and Watson \(2007\)](#) we do not explicitly model anchored inflation expectations. Preliminary examinations of anchored expectations did not dramatically improve the model fit. Therefore, we abstracted from a New Keynesian version of the model, focusing more explicitly on the direct dynamics of GVAD* over the sample period.

¹⁹ Refer to authors for results.

Appendix B – Regression results

TABLE B1: REGRESSIONS ON HICP INCLUDING & EXCLUDING GVAD*

HICP _t	Including GVAD*	Excluding GVAD*
HICP _{t-1}	0.476***	0.518***
	(0.0917)	(0.104)
ILO Unemployment Gap _{t-1}	-0.00000547***	-0.00000590***
	(0.00000188)	(0.00000191)
ILO Unemployment Gap Squared _{t-1}	1.01e-08**	1.09e-08**
	(4.12e-09)	(4.15e-09)
Sterling _t	-0.0258**	-0.0285**
	(0.0126)	(0.0115)
Oil _t	0.0190***	0.0178***
	(0.00356)	(0.00331)
Non-Energy Commodity Prices _t	-0.000236***	-0.000216***
	(0.0000810)	(0.0000764)
GVAD* _{t-1}	0.0504**	
	(0.0216)	
Constant	0.0000900	0.000188
	(0.000577)	(0.000649)
N	86	86
R squared	0.767	0.753
Adjusted R squared	0.746	0.734
AIC	-761.4	-758.4
BIC	-741.8	-741.2
Pseudo out-of-sample: 2016Q1 – 2019Q4		
MSFE	0.00000486	0.00000588
MAE	0.0018496	0.0019289
MAPE	17.5676	30.56999

