# Impact of the state of the economy on consumption of fine-cut tobacco (FCT) and excise revenues

## Final Report for ESTA

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# Executive Summary

## Introduction

This analysis is a continuation of previous studies[1] London Economics has conducted on the taxation of fine-cut tobacco (FCT) in Europe, building on the experience of several markets such as **Belgium**, **Germany**, **the Netherlands** and the **United Kingdom**. The 2018 Study on FCT excise structure in the European Union demonstrated the key economic principles underlying a successful fiscal policy, establishing amongst others, **the importance of recognising the specific characteristics of FCT and its consumers in each market**, making a EU-wide one-size fits all fiscal policy unrealistic and undesirable.

The previous analyses also established that FCT can, under the right conditions, fulfil a **'buffer function' against illicit trade of tobacco products**. Whilst overall demand for tobacco products is highly inelastic[2], the demand for duty-paid tobacco products is much more responsive to changes in price. In economic terms, the buffer function associated with FCT reflects the fact that **FCT acts as a potential and legal alternative to consumers who are priced out of the market**. Maintaining an excise duty and price differential between domestic factory-made cigarettes (FMC) and FCT incentivises consumers to switch to legal domestic FCT rather than purchasing cross-border or illicit tobacco products.

Whilst previous works established economic principles, this study focuses on the specific scenario of **economic downturns**, and examines how consumers are likely to react to a deterioration of economic conditions and a reduction in disposable income. This study is divided in three sections:

1. **Understanding the impact of an economic downturn on FCT consumption**: the focus of this component of the analysis is to determine whether the relative consumption of FCT (as a percentage of the total legal FCT and FMC volume) changes during an economic downturn.

2. **Understanding the impact of an economic downturn on tax revenues**: this section quantifies the monetary value that the FCT 'buffer function' has during economic downturns by using the results from the econometric analysis of the first section.

3. **Understanding the relationship between an economic downturn and the illegal cigarette markets:** the focus of this third section is to assess the impact of the economic cycle on the consumption of illegal cigarettes.

This analysis demonstrates that during economic downturns, smokers are more likely to **switch to illicit consumption**, unless FCT is relatively more affordable than domestic cigarettes (FMC), in which case FCT can capture priced-out consumers and **mitigate the negative financial impact** of reduced duty-paid consumption on government revenues.

[1] https://www.esta.be/wp-content/uploads/2019/01/London-Economics-ESTA-Report-Excise-Duties-on-FCT.pdf
[2] https://www.who.int/tobacco/economics/2_2estimatingpriceincomeelasticities.pdf

## Findings and implications

### Impact of an economic downturn on FCT consumption

The first section of the analysis reports the results of an econometric analysis that was undertaken to investigate the relationship between the share of FCT and the unemployment rate in seven Member States characterised by different levels of FCT market maturity: **Belgium**, **Czech Republic**, **France**, **Germany**, **Italy**, **the Netherlands** and **Spain**. The regression analysis also includes other control variables that potentially affect consumers' purchasing power (such as the tax rates), and allows for the identification of how changes in macroeconomic conditions (for example the unemployment rate) affect the relative consumption of FCT (as a proportion of total legal tobacco consumption). The findings from this first analysis clearly show that during an economic downturn, smokers are more likely to switch from FMC to FCT. This effect is likely driven by affordability constraints.

Findings from this first analysis further support the concept of the buffer function associated with FCT. In particular, **substitution in this instance is not "tax-induced", as the difference in tax levels is not the factor that drives switching behaviours, but rather affordability constraints**.

### Impact of an economic downturn on tax revenues

The second part of the analysis builds on the regression results identified in the first stage of the analysis, using historical data for 2020 and independent forecasts of the unemployment rates for 2021 to estimate the impact of change in unemployment in both years on FCT tax revenues. This approach provides an overview of the **additional tax revenues** that might be expected to be collected from FCT purchases in each market following forecasted increases in unemployment.

The findings suggest that following the expected increase in the share of FCT consumption, tax revenues - that might otherwise have been lost if consumers were to switch to illicit or non-domestic products - will be maintained. Governments' revenues from FCT could increase by **1.3%** to more than **7%** in the countries and years analysed. This additional revenue can significantly mitigate the negative financial impacts of reduced consumption of duty-paid cigarettes, whilst limiting the otherwise expected growth of non-duty paid consumption. Such an outcome assists fiscal authorities in their efforts to **overcome the forecasted and long-lasting economic downturn**.

### Relationship between an economic downturn and the illegal cigarette markets

In the last section of the study, the econometric analysis focuses on the relationship between illegal cigarette consumption and changes in unemployment rate, incorporating variables such as the price differential between FMC and FCT. The analysis covered the same countries as in in the first two stages of the analysis, with the addition of **Ireland**, **Poland**, **Portugal**, **Slovenia**, and the **United Kingdom**. The underlying hypothesis was that changes in macroeconomic conditions (as identified in the first section) result in consumers shifting from legal FMC to illegal FMC. The results of the analysis support the hypothesis and allow for the identification of a set of key economic principles of relevance when developing fiscal policies for tobacco products.

In essence, during economic downturns, smokers are more likely to resort to illicit products; however, this relationship is less pronounced in those markets where FCT is more affordable (i.e. where the price differential to FMC is greater). The analysis also demonstrates that **a FCT tax increase is associated with a larger increase in the prevalence of illicit products compared to an increase of FMC tax levels**, highlighting the importance of affordability constraints for FCT consumers.

## Recommendations

Based on independent datasets covering the experience in several European markets over time, this analysis provides evidence that:

- FCT consumption is typically more price-sensitive compared to FMC consumption, even though Member States' markets are often very distinct in terms of the prevalence of FCT, as well as the characteristics of FCT consumers;
- During economic downturns when consumers' disposable incomes are under increased pressure, smokers are likely to seek cheaper alternatives; and
- Acknowledging and understanding the buffer function of FCT is crucial for safeguarding government revenues, as well as to containing illicit trade.

Therefore, the **relative affordability of FCT** compared to FMC should be maintained, which will mitigate the negative impact of a long-lasting economic downturn on the contribution of tobacco products to public finances. This supports the continued need for a **meaningful tax differential** between FCT and FMC. In absence of such, FMC consumers may not down-trade to FCT, but will seeking other, mainly illegal alternatives. Similarly, and exacerbating the pressures on public finances, existing FCT smokers will also be driven to seek alternatives.

# 1 Impact of an economic downturn on FCT consumption

The focus of this analysis is to determine **whether the consumption of fine-cut tobacco (FCT) changes during periods of economic downturn**, and in particular, whether consumers shift their consumption from factory-made cigarettes (FMC) to FCT over the course of an economic cycle. The underlying hypothesis is that because FCT is relatively less expensive compared to FMC, consumers are likely to switch to FCT when their budget is more constrained as a result of worsening economic circumstances.

In order to test this hypothesis, an econometric analysis was undertaken to investigate the relationship between FCT consumption (as the share of the total legal tobacco consumption) and the unemployment rate. The analysis was undertaken independently for seven EU Member States with a relatively mature tobacco market, and for which consistent data was available over time. The countries included as part of this analysis were **Belgium**, the **Czech Republic**, **France**, **Germany**, **Italy**, **the Netherlands** and **Spain**.

## 1.1 Data

A dataset has been constructed for the analysis that draws on various data, including tobacco consumption (by product type), excise duties and a range of macroeconomic variables. The dataset contains annual observations for each country of interest and covers the period from 2005 to 2019.[3]

- The data for **tobacco consumption** was retrieved from Euromonitor, an international market research company. The database provides annual data on both sales volume by product type (measured in 'sticks' in the case of FMC and in 'stick equivalent'[4] in the case of FCT) as well as the nominal value of sales (in EUR[5]).
- **Excise duties data** were drawn from the European Commission's online tax database. This data is available bi-annually with figures from January and July of each year. Ad valorem, specific excise duty and VAT have been transformed and combined into a tax rate for FMC and FCT.
- **Macroeconomic measures** (e.g. for unemployment) were also drawn from the European Commission, in this instance from their annual macroeconomic (AMECO) database.

## 1.2 Descriptive figures

Figure 1 presents descriptive figures of the variables of interest over time. The graphs map the relative share of total legal tobacco consumption attributed to FCT consumption alongside the unemployment rate of the respective jurisdiction. It is important to note that the axes have different scales across all countries.

The general trend amongst the seven countries under consideration is that the **FCT share of total legal consumption moves in line with the unemployment rate**. Specifically, as unemployment increases, the share of FCT consumption increases in a given country. This relationship appears to

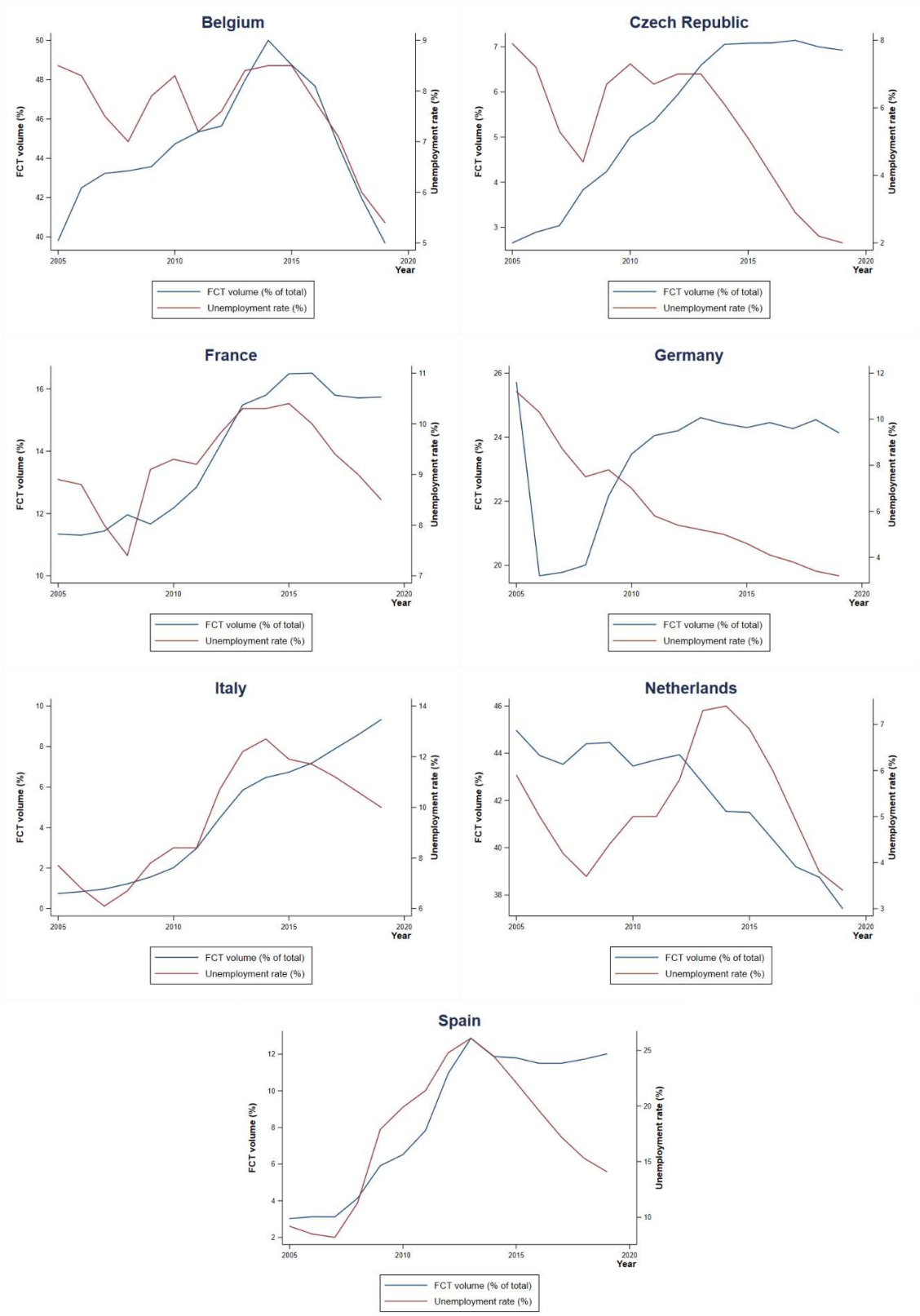
[3] Summary statistics on the variables included in the analysis are presented in the Annex.
[4] The standard conversion rate of 1kg = 1,000 sticks has been applied to derive the stick equivalent of FCT.
[5] In those jurisdictions not part of the Eurozone, the value of legal consumption in the relevant domestic currency has been converted to EUR based on yearly exchange rates provided by Euromonitor.

be particularly strong for **Belgium**, **France**, **Italy** and **Spain**[6], whereas the **Czech Republic** and **Germany** display different trends.

While the graphs allow a visual investigation of trends in the data, the legal consumption share of FCT is likely to be driven by a number of different factors and not just the position in the economic cycle. For example, the **reclassification of 'StiX'** as FMC rather than FCT in **Germany** in the early 2000s caused the significant drop in the share of FCT in 2006 (see London Economics, 2018) and might have affected the trend thereafter. Some countries like **the Netherlands** might also be impacted by **developments in neighbouring countries**. In particular, the geographical proximity of the Benelux countries makes it easier for consumers to legally purchase tobacco in neighbouring jurisdictions, and as such some consumers are significantly impacted by both the economic and tax environment domestically, but also internationally. Finally, the consumption of FCT is likely to be impacted by more general **preferences in society**, which might differ substantially across countries and vary over time. The econometric analysis presented here provides a better understanding of the impact of unemployment by controlling for some of these factors.

[6] The Netherlands shows a similar trend, however only from 2013 onwards.

## Figure 1 Descriptive figures of the FCT share and the unemployment rate by country




*Source: London Economics' analysis based on Euromonitor and AMECO*

## 1.3 Methodological approach

The econometric analysis undertaken followed an **ordinary least squared regression model**, with the following estimation equation:

$$Eq.1: FCT\ share_t = \alpha + \beta * Unemployment_t + \theta_1 * FCT\ Tax_t + \theta_2 * FMC\ Tax_t + \partial * Time\ trend_t + \epsilon_t$$

where:

- *FCT share* is the share of FCT volume as a percentage of the total legal FCT and FMC volume purchased in a specific jurisdiction.
- *Unemployment* is the annual unemployment rate in percent;
- *FCT Tax* is the tax rate of FCT, which includes ad valorem, specific excise duty and VAT;
- *FMC Tax* is the tax rate of FMC, which includes ad valorem, specific excise duty and VAT;
- *Time trend* is a linear time trend; and
- $\epsilon$ is the error term.

**FCT share** is the dependent variable in the equation. As such, by estimating the β coefficient, the regression identifies **how changes in the unemployment rate affect the relative consumption of FCT**. Specifically, the estimated value of the β coefficient measures the effect of a 1 percentage point rise in the unemployment rate on share of FCT consumption as a proportion of total legal consumption. The effect on the share is expressed in percentage points.

The regression specification also includes control variables in order to account for the fact that there are **other determinants that influence the relative consumption of FCT**. In most countries, tobacco excise makes up a large share of the retail price. This highlights that changes in the tax rate have a significant impact on the prices that consumers face (i.e. are highly correlated), which clearly impacts consumers' purchasing behaviour. As such, FCT and FMC tax rates can be used as an indirect measure to control for changes in the domestic price. By including the tax rate rather than the price, the variable also controls for the monetary incentive that consumers might have to switch from the legal to the illegal (or non-domestic) market.

In addition to the tobacco prices, there are likely to be other **factors that are unobservable or difficult to measure**. For example, preferences for FCT relative to FMC are different across countries and can vary over time.[7] In order to account for these unobservable variables, a linear time trend has been included in the regression.[8]

[7] The regression does not have to account for the general decline in smoking over time, as FCT volume is not measured in absolute terms but as a share of the total legal market size. This assumes that the decline in smoking affects FCT and FMC in a relatively similar manner.
[8] The regression does not include additional control variables due to the small number of observations per country. The number of observations in the dataset defined the 'degrees of freedom', which determine the number of variables that a regression can support.

## 1.4 Findings and implications

Table 1 displays the regression results from the econometric analysis. The results are presented separately for each country.

As can be seen from the table, in all but one of the jurisdictions (where other factors may be at play), the model produces a **positive coefficient estimate associated with the unemployment rate**. In other words, the results indicate that as the unemployment rate increases, the relative share of FCT as a proportion of total legal tobacco consumption increases. Specifically, a one percentage point rise in the unemployment rate increases the share of FCT between **0.237 percentage points (in the Netherlands)** and **1.667 percentage points (in Belgium)**.

This finding implies that **during an economic downturn, smokers in the substantial majority of countries considered switching from consuming FMC to FCT.** The most likely driver behind this relationship is the fact that FCT is relatively less expensive compared to FMC and that consumers are more likely to choose the more affordable option in periods of economic slowdown. As such, FCT is clearly identified as a legal alternative for consumers who might otherwise have opted for illegal tobacco consumption. The analysis supports the hypothesis that **FCT acts as a 'buffer function'**, prevents consumers from switching to illicit sources, and maintains the taxation revenues accruing to the public purse.

The coefficient estimates for the **FCT tax rate are negative** for most countries. This suggests that as FCT becomes more expensive, unsurprisingly, the share of FCT decreases. This relationship is in line with general economic theory. Tobacco is a so called 'ordinary good', which means that consumption decreases if the price for tobacco increases.

The estimates for the **FMC tax rate are mostly positive**, which implies that the share of FCT increases as the price for FMC increases (as would be expected from standard economic theory and the concept of 'cross-price elasticity'). A change in FMC prices can be interpreted as a change in the relative price of FCT: as FMC becomes more expensive, FCT becomes relatively less expensive. This relationship suggests that **people switch from FMC to FCT in consequence of the increasing price differential**. It also supports the findings relating the unemployment rate and corroborates the 'buffer function' hypothesis, as it again illustrates the fact that consumers consider the price difference between FCT and FMC when selecting alternative tobacco products.

It is important to note that causality cannot be inferred from the estimated relationships. The **regressions identify correlations** while controlling for some of the most important independent variables. The limited amount of observations for each jurisdiction does not allow to perfectly control for all possible factors that might affect the choice of FCT consumption. However, the consistency of the findings across jurisdictions, as well as the fact that the coefficients for the control variables are generally in line with the underlying assumptions, provides a strong empirical support for the identified relationships.

The most striking outlier in the regressions, similar to the visual inspection of the descriptive figures, is **Germany**. Germany is the only jurisdiction that has a negative coefficient associated with the unemployment rate; however, it also stands out because the magnitude of the coefficient is much larger compared to all other jurisdictions. The outlier status is further underlined by the fact that the adjusted R-squared is particularly low for Germany. The adjusted R-squared provides information on the share of variation explained by the variables in the regression. A low value indicates that a large share of the changes in the share of FCT is driven by factors other than the

variables included in the regressions. There are, in fact, several possible explanations for these outliers in the data and the results for Germany:

1. The period covered by the analysis starts in 2005, which coincides with regulatory measures that disrupted the FCT market in Germany. In particular, from 2002 to 2005, FCT was subject to a number of **consecutive sharp tax increases**[9] that considerably reduced its affordability compared to other products available on the German market. This effect was combined with a widespread consumption of "**Stix**" in the early 2000s, causing a different consumption pattern compared to other European countries. The reclassification of "StiX" as FMC rather than FCT further explains the significant drop in the share of FCT to 2006, despite a relatively high unemployment rate. The effects of these measures were further described in the **2018 London Economics study on fine-cut tobacco excise structure in the European Union**[10];
2. The continuous decline of the unemployment rate observed during the period does not necessarily translate into an equivalent increase of disposable income for the consumers. This is particularly relevant in the case of Germany, in comparison to other EU countries in this analysis, due to the characteristics of the "**Hartz IV**" employment policy introduced in 2005, which was demonstrated to have significant remedial effects on unemployment, but only marginally alleviated households' income pressure[11]; and
3. One could therefore assume that the rapid growth of FCT share starting in 2006 was the result of product reclassification and the **market recovering from the tax shock** returning to its previous state, rather than being driven by changes in macroeconomic conditions.

The latest figures published by the German statistical office actually show that the volume of FCT has increased by **10.6%** from 2019 to 2020.[12] The unemployment rate increased at the same time[13], suggesting a positive relationship between the two variables. The statistical office in Germany has suggested that a part of **the increase in demand for fine-cut tobacco is driven by the search for cheap alternatives to non-domestic products**, which were not available because of the national lockdowns during the pandemic in 2020. This means that the increase cannot solely be attributed to the increase in unemployment. However, it provides further support for the concept of FCT acting as a 'buffer function', which is the underlying driver of a positive relationship between unemployment and the relative consumption of FCT. This suggests that the **outliers in the data during the early 2000s distorted the results of the econometric analysis for Germany**.

## 1.5 Conclusions

The findings in this first section demonstrate that a **deterioration in economic conditions drives smokers to look for cheaper alternatives** and to **switch from FMC to FCT** when their disposable income is under sustained pressure. Substitution effects in this instance are not "tax-induced", as differences in tax levels are not driving the switching behaviours but are mainly **"affordability-driven"**. Differences in tax levels, however, are a pre-requisite for FCT to successfully capture priced-out FMC consumers that seek more affordable alternatives. In absence of cheaper legal alternatives, consumers may resort to buying non-duty paid products as illustrated in Section 3 of this report.

[9] The specific excise for FCT tobacco increased by approximately 60% from 2002 to 2005.
[10] https://www.esta.be/wp-content/uploads/2019/01/London-Economics-ESTA-Report-Excise-Duties-on-FCT.pdf
[11] https://www.iza.org/publications/dp/12260/hartz-iv-and-the-decline-of-german-unemployment-a-macroeconomic-evaluation
[12] https://www.destatis.de/DE/Presse/Pressemitteilungen/2021/01/PD21_N003_799.html
[13] https://www.destatis.de/DE/Themen/Wirtschaft/Konjunkturindikatoren/Arbeitsmarkt/arb210a.html

The above description and identification of **the FCT buffer function, if translated into fiscal policies, could have significant positive effects on government revenues** accrued during economic downturns, as the next section demonstrates.

The partial deviation observed in Germany in the early 2000s from the general trend in other European jurisdictions also suggests that national markets, when it comes to FCT, may react very differently to changes in economic conditions. Unlike some other tobacco products, there is not one single European market for FCT but rather many interconnected national ones.

## Table 1 Econometric results – Share of FCT consumption

| VARIABLES | (1) Belgium | (2) Czechia | (3) France | (4) Germany | (5) Italy | (6) Netherlands | (7) Spain |
|---|---|---|---|---|---|---|---|
| Unemployment rate | 1.667* | 0.285*** | 0.466* | -2.423*** | 0.289** | 0.237* | 0.293*** |
| | (0.108) | (0.00400) | (0.156) | (0.0416) | (0.0566) | (0.189) | (0.000135) |
| FCT tax rate (incl. VAT) | -0.0114*** | 0.00135 | -0.0138 | -0.0841*** | 0.00945 | -0.0263* | -0.0104 |
| | (0.00982) | (0.435) | (0.222) | (0.0240) | (0.537) | (0.132) | (0.471) |
| FMC tax rate (incl. VAT) | 0.0333 | 0.00408* | 0.0131 | -0.0407* | 0.0957*** | -0.00324 | -0.0170 |
| | (0.470) | (0.164) | (0.613) | (0.120) | (0.0338) | (0.674) | (0.217) |
| Time trend | 0.672*** | 0.380*** | 0.440*** | -1.392*** | 0.258** | -0.401*** | 0.839*** |
| | (0.000553) | (0.000211) | (4.57e-05) | (0.0419) | (0.0535) | (0.0185) | (0.00287) |
| Constant | 18.63 | -0.694 | 4.854 | 78.73*** | -32.51*** | 50.14*** | 4.898 |
| | (0.362) | (0.363) | (0.620) | (0.00128) | (0.0113) | (6.64e-09) | (0.276) |
| Observations | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Adjusted R-squared | 0.793 | 0.961 | 0.911 | 0.594 | 0.981 | 0.894 | 0.954 |

Note: p-value in parentheses *** p<0.05, ** p<0.1, * p<0.2

*Source: London Economics' analysis*

# 2 Impact of an economic downturn on tax revenue

The above analysis has identified that FCT acts a 'buffer function' during economic downturns. As such, the various countries' finance ministries benefit because FCT consumption continues to generate tax revenues that would otherwise be lost if consumers turn to illicit or non-domestic consumption instead.

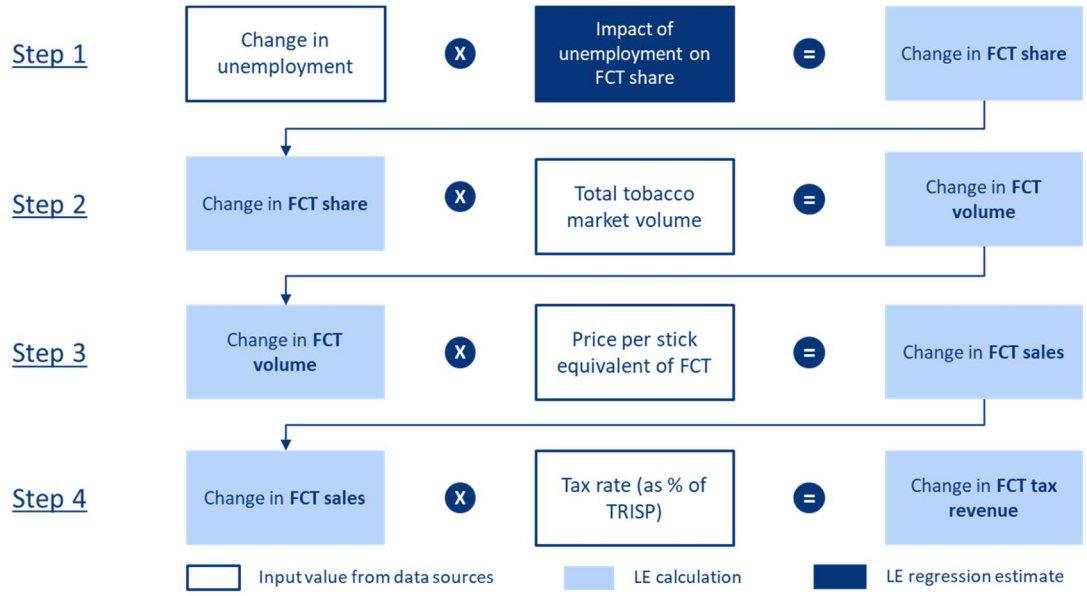
This section **quantifies the monetary value that the FCT 'buffer function' has during economic downturns** by using the results from the econometric analysis. The model estimates the impact of changes in unemployment on tax revenues in 2020 and 2021 by drawing on independent forecasts of the unemployment rate.

## 2.1 Data and methodological approach

The data sources used in this modelling component are the same as the ones outlined in the econometric analysis. While the tax rates are assumed to remain constant at 2019 levels, forecasts for the unemployment rate[14] and the growth rate of the tobacco market have been obtained from the European Commission's AMECO database. Forecasts for the price per stick have also been derived from the Euromonitor data.

Figure 2 illustrates the calculations that were undertaken to estimate the impact of the forecasted change in unemployment on FCT tax revenue. In order to derive the change in tax revenue, the change in the share of FCT, in FCT volume and in FCT sales have been calculated as intermediate steps.

**Figure 2 Calculation steps for modelling the monetary value**




***Source: London Economics' analysis***

**Step 1**

The **change in the FCT share** (in percentage points) has been calculated by multiplying the forecasted change in unemployment by the estimated coefficient associated with the

[14] The unemployment rates for 2021 are forecasts (as of February 2021), while the unemployment rates for 2020 are historical figures.

unemployment rate from the econometric analysis. The change in unemployment for 2020 and 2021 is expressed relative to the base year 2019. Consequently, all model estimates are expressed relative to 2019.

**Step 2**
In order to obtain the **change in FCT volume** (in sticks equivalent using the standard conversion rate), the change in the FCT share has to be multiplied by the forecasted size of the tobacco market. The volume of the total tobacco market in 2020 and 2021 is estimated using a separate ordinary least squares regression model.[15]

**Step 3**
The **change in FCT sales** (in EUR) can be calculated by applying the price per stick times the number of sticks equivalent. The forecasts for the price per FCT stick equivalent has been calculated based on the Euromonitor data, by dividing the 2020 and 2021 FCT volume by the respective sales value.[16]

**Step 4**
For the purpose of the study, the tax rate was assumed to be unchanged from 2019 onwards and has been transformed into a percentage of the tax including retail selling price (TRISP). Applying this tax rate to the change in FCT sales following a change in unemployment yields the **change in FCT tax revenue** (in EUR).

## 2.2 Findings and implications

The European Commission estimates that the unemployment rates will increase by 0.0 - 4.8 percentage points in 2020[17] and by 0.9 – 3.8 percentage points in 2021 in the jurisdictions of interest (both compared to 2019). Given that the regressions have identified a positive relationship between unemployment and the share of FCT in all countries (with the exception of Germany, for which explanations were provided in Section 1.4), this suggests that there will be a relative **increase in the share of FCT consumed**, which will **maintain tax revenues that might otherwise have been lost**. 0 presents the change in the unemployment rate and the FCT tax revenue modelled for each country. The analysis identifies that the additional tax revenue over the two years is greatest in France (standing at **€123.7 million**), while Spain will experience the largest relative increase in the contribution of FCT tax revenues (7.2% of total FCT tax revenue in 2020 and 2021).

Given that the estimated coefficient for the unemployment rate was an outlier in Germany, the change in tax revenue is estimated to be negative. However, figures published by the German statistical office suggest that FCT tax receipts have increased by **15.7%** from 2019 to 2020. While a part of this increase derives from the search for cheap alternatives for non-domestic products during the pandemic (as outlined in Section 1.4), the increase in unemployment in the same year is likely to be a contributing factor. The data for Germany in 2020 is, thus, in line with the predictions for the other countries in this study.

[15] More detailed information on the forecasting of the size of the tobacco market volume are presented in the Annex.
[16] This approach allows the use of Euromonitor's price forecast for 2020 and 2021 without relying on their forecast assumptions for the total market size of tobacco consumption.
[17] In Italy the unemployment rate has decreased by 0.1 in 2020.

**Table 2 Impact of unemployment on FCT taxation receipts, by jurisdiction**

| | | *Change (relative to 2019)* | | |
|---|---|---|---|---|
| | | **Unemployment rate** | **FCT tax revenue** | |
| | | **(pp)** | **(million EUR)** | **(% of total FCT tax revenue[18])** |
| **Belgium** | 2020 | 0.5 | 13.8 | 2.1 |
| | 2021 | 1.6 | 44.9 | 6.3 |
| | **Total** | --- | **58.8** | **4.2** |
| **Czech Republic** | 2020 | 0.7 | 4.9 | 2.8 |
| | 2021 | 1.3 | 9.3 | 5.1 |
| | **Total** | --- | **14.2** | **4.0** |
| **France** | 2020 | 0.0 | 0.0 | 0.0 |
| | 2021 | 2.2 | 123.7 | 6.1 |
| | **Total** | --- | **123.7** | **6.1** |
| **Germany** | 2020 | 0.9 | -191.2 | -10.0 |
| | 2021 | 0.9 | -204.2 | -10.0 |
| | **Total** | --- | **-395.4** | **-10.0** |
| **Italy** | 2020 | -0.1 | 0.0* | 0.0* |
| | 2021 | 1.6 | 50.5 | 4.7 |
| | **Total** | --- | **50.5** | **4.7** |
| **Netherlands** | 2020 | 1.0 | 6.9 | 0.6 |
| | 2021 | 3.0 | 22.2 | 1.9 |
| | **Total** | --- | **29.1** | **1.3** |
| **Spain** | 2020 | 2.6 | 48.0 | 6.0 |
| | 2021 | 3.8 | 68.1 | 8.5 |
| | **Total** | --- | **116.0** | **7.2** |

Note: * The negative change in unemployment rate implies a reduction in FCT tax revenues. The figures in the table have been set to zero because the fiscal authorities would not lose out on tax revenues in this case. Smokers with more disposable income are more likely to purchase domestic cigarettes, which generate tax revenues.

***Source: London Economics' analysis***

## 2.3 Conclusions

If FCT can fulfil its buffer function in the coming years, governments' revenues from FCT could increase **from 1.3% to more than 7%** as a result of the economic downturn in 2020 and 2021 in the observed jurisdictions. This additional revenue can significantly mitigate the negative financial impact of a reduced consumption of duty-paid FMC, whilst limiting the otherwise expected growth of non-domestic or illegal consumption. Such an outcome clearly supports fiscal authorities in their efforts to maintain government revenues when many other revenue sources are under considerable strain. To achieve the results identified in the analysis presented, the **relative affordability of FCT compared to FMC** needs to be maintained which presupposes that the tax differentials currently in place in these countries remain unchanged. If not, consumers may not down-trade to FCT and rather seek non-revenue-generating alternatives, which is detailed in the next section.

[18] The figures indicate the change in FCT tax revenue (relative to 2019) as a percentage of the total FCT tax revenue in the respective year(s).

# 3 Relationship between an economic downturn and the illegal cigarette markets

The focus of this component of the analysis is to assess the impact of the economic cycle on consumption of illegal FMC. Similar to the identified shift from FMC to FCT in the legal market during a period of economic downturn, the **underlying hypothesis in this analysis is that consumers will substitute away from legal FMC consumption towards illegal FMC consumption** during economic downturns.

The econometric analysis focusses on the relationship between illegal FMC consumption and the unemployment rate, but also includes total tobacco consumption, tax rates imposed on FMC and FCT, as well as the absolute price difference between FMC and FCT as control variables. The analysis was undertaken on the same set of countries used in the first analysis, with the addition of **Ireland**, **Poland**, **Portugal**, **Slovenia** and the **United Kingdom** (given the availability of relevant information). In the first analysis presented in Section 1.3, the econometric analysis was undertaken for each country separately, while the econometric analysis in this Section combines the information from all countries. As such, the data from each of the jurisdictions over the 14-year period (2006-2019) was combined into a single, panel dataset to undertake the analysis.[19]

## 3.1 Data

The analysis relies on data for legal and illicit tobacco consumption, excise duties and macroeconomic variables. Like the first analysis in Section 1.3, the data on the volume and sales of legal FMC originates from Euromonitor. Based on this data, it is also possible to derive the price per stick of FMC and the per stick equivalent of FCT. The price for each type of tobacco product is calculated by dividing the total value of sales of FMC or FCT by the respective total volume.

- Figures on the **illicit FMC consumption, which only include counterfeit and contraband,** are based on a collection of data from various projects[20], which have been commissioned by the European Commission and by major tobacco companies.
- **Excise duties data** were drawn from the European Commission's online tax database, as in the first analysis.
- **Macroeconomic variables** were again retrieved from the European Commission's AMECO database.

[19] Summary statistics on the variables included in the analysis are presented in the Annex.
[20] Project Star (2008 - 2012) / Project Sun (2013 - 2017) / Project Stella (2018) / KPMG Illicit Cigarette Consumption in Europe (2019)

## 3.2 Methodology

The following equation was used in the econometric analysis, which followed a **fixed-effects general least squares regression model** using panel data. Using a panel approach does not distinguish the effects across jurisdictions but it has been chosen for this analysis because the higher number of observations allows to include more control variables in the regression. This approach is in line with the econometric analysis in the Study on Council Directive 2011/64/EU on the structure and rates of excise duty applied to manufactured tobacco published by the European Commission (2019)[21]:

$$Eq.2: Illegal\ FMC\ share_{c,t} = \alpha + \beta_1 * Unemployment_{c,t} + \beta_2 * Total\ tobacco\ consumption_{c,t} + \beta_3 * (Unemployment * Total\ tobacco\ consumption)_{c,t} + \sigma * Price\ difference_{c,t} + \theta_1 * FCT\ Tax_{c,t} + \theta_2 * FMC\ Tax_{c,t} + \sum \delta_t * Year_t + \sum \mu_c * Country_c + \epsilon_{c,t}$$

where:

- *Illegal FMC share* is the share of illicit FMC consumption as a percentage of all tobacco consumption (legal FMC + legal FCT + Illicit FMC consumption)[22];
- *Unemployment* is the annual unemployment rate in percent;
- *Price difference* is the absolute difference in the price (in EUR cent) between FMC and the equivalent volume of FCT (FMC price minus FCT price[23]);
- *FCT tax rate* is the total tax rate on FCT (VAT + ad valorem tax + specific excise duties);
- *FMC tax rate* is the total tax rate on FMC (VAT + ad valorem tax + specific excise duties);
- *Total tobacco consumption* is the total legal tobacco consumption, plus the illicit FMC consumption;
- *Year* is a vector of dummy variables for each of the years in the sample;
- *Country* is a vector of dummy variables for each of the countries in the sample; and
- $\epsilon$ is the error term.

The specification outlined above identifies how **changes in the unemployment rate may impact the consumption of illicit FMC**.

In contrast to the first analysis, this panel regression includes the absolute price difference between FMC and FCT as a control variable in addition to the tax rates on FMC and FCT. This allows a more direct **identification of the buffer function** driven by the relative price of FCT.

Furthermore, the regression includes an **interaction term** between the unemployment rate and the volume of total tobacco consumption. This term identifies whether the effect of unemployment varies based on the underpinning level of tobacco consumption (i.e. the absolute size of the market in a particular jurisdiction).

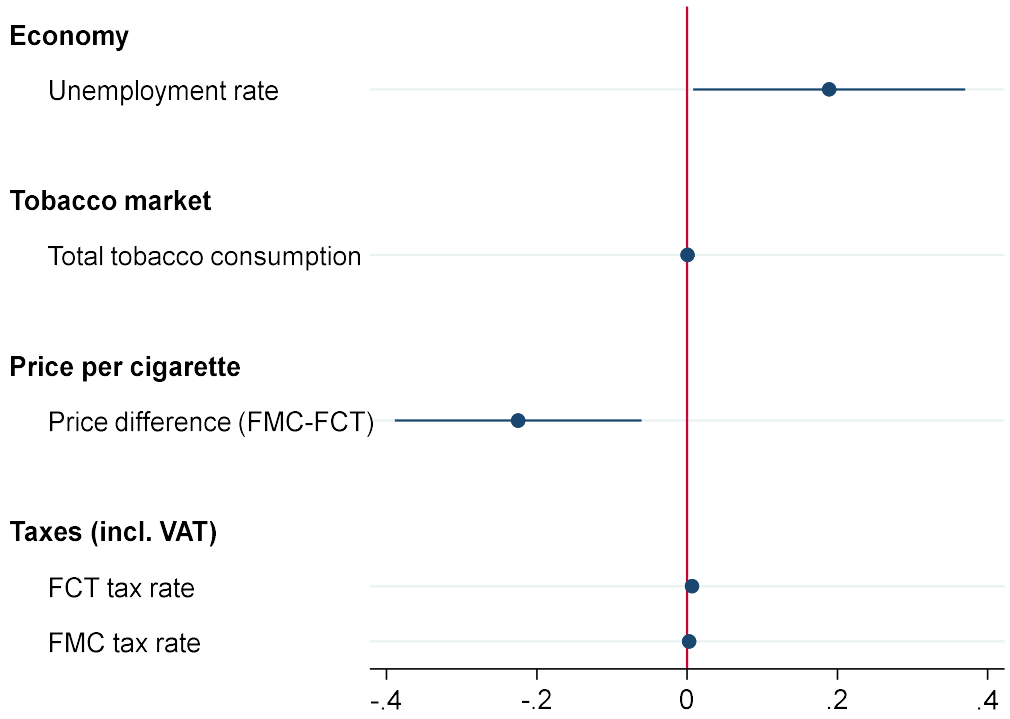
Country and year dummy variables were included to control for country-specific and time-specific fixed effects within the model.

[21] https://ec.europa.eu/taxation_customs/sites/taxation/files/annexes-to-the-study-on-the-tobacco-taxation-directive-2019_en.pdf
[22] The Illegal FMC variable does not include legal cross border purchases
[23] The price difference will be greater than zero as FMC is more expensive than FCT. An increase in the variable, thus, identifies a widening of the price difference.

## 3.3 Findings and implications

Table 3 presents the results from the econometric analysis. Column (1) presents results without the interaction term between the unemployment rate and the size of the total tobacco market, whereas column (2) presents the results with the interaction term. It should also be pointed out that this analysis mostly focused on Western and Central European markets, which share no border with non-European countries. Figure 3 provides a visual illustration of the results from Table 3 column (1). The dots represent the point estimates of the regression results, whereas the horizontal lines show the 95% confidence intervals.

**Figure 3 Econometric results – share of illicit FMC consumption**




Note: The dots represent the point estimates of the regression results, whereas the horizontal lines show the 95% confidence intervals.

***Source: London Economics' analysis***

The analysis indicates that the unemployment variable has a positive coefficient. This implies that the **share of illicit tobacco consumption increases as unemployment increases (and more individuals facing financial hardship)**. As the unemployment rate increases by one percentage point, the share of illegal FMC increases by **0.189 percentage points** (Column 1). This **relationship appears to be weaker for larger markets**, as the interaction term is negative and significant (Column 2). In order to identify the effect of unemployment for markets of different sizes, the interaction term has to be multiplied by the market size and added to the coefficient for the unemployment rate. Since the interaction term has a negative coefficient, the sum of both decreases with the market size.[24] This means that in jurisdictions where there is a higher prevalence of tobacco consumption, increases in unemployment has a smaller effect on the purchase of illegal FMC

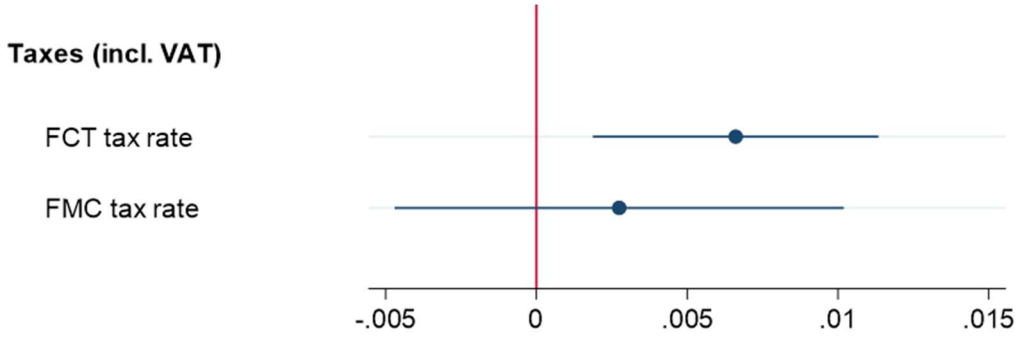
[24] The effect of a one percentage point change in the unemployment rate is correlated with a 0.675 percentage point change in the share of illicit FMC consumption for a hypothetical market of size zero. As the market size increases, the effect decreases due to the addition of the negative interaction term that has to be multiplied by the market size. This explains the difference in the coefficient for the unemployment rate in column (1) and Column (2).

compared to jurisdictions with a lower prevalence. This finding could be driven by factors related to the overall size of the jurisdiction or it could be that consumers in larger tobacco markets are less likely to opt for illicit tobacco as a result of the fact that markets are more established. For some of these markets, the relatively lower likelihood that consumers switch to illicit product as unemployment increases might also be as result of the possibility that the purchase of products in neighbouring countries where prices are lower is an alternative consumers may be more likely to consider.

The coefficient on the price difference between FCT and FMC is negative. This suggests that **fewer people switch from legal tobacco consumption to illegal FMC consumption as FCT becomes relatively more affordable**. To illustrate the effect, an increase in the price difference between FMC and FCT by 5 cents (per stick equivalent) results in a decrease of the share of illicit FMC of **1.125 percentage points**.

The coefficients associated with the FCT tax rate and the FMC tax rate are smaller (in absolute terms) compared to the impact of the unemployment rate. However, the analysis suggests that higher taxes are correlated with a higher incidence of illicit FMC. Since illicit consumption is not taxed, higher tax rates increase the incentive to opt for illegal products. This effect appears to be stronger for the tax rate associated with FCT compared to the FMC tax rate. The coefficient of the FCT tax rate is **0.00661** compared to the coefficient of **0.00275** on the FMC tax rate. Figure 4 presents the results for the tax rate variables from Figure 3 on a different scale but also illustrates that the 95% confidence interval (illustrated by the horizontal line) is larger for the FMC tax rate. This means that the coefficient is statistically insignificant (and not differentiable from zero), while the positive coefficient for the FCT tax is significant at the 5% level. From a fiscal policy perspective, this suggests that **raising tax rates for both categories with the same proportion will not result in comparable effects**. As FCT consumers are typically more price-sensitive, a tax increase on FCT is likely to drive more illicit consumption than an identical increase on FMC.

**Figure 4 Econometric results (tax rate variables only) – share of illicit FMC consumption**




Note: The dots represent the point estimates of the regression results, whereas the horizontal lines show the 95% confidence intervals.

***Source: London Economics' analysis***

The findings from this analysis are in line with and corroborate those identified in the initial analysis: essentially that **higher levels of unemployment cause consumers to search for more affordable tobacco alternatives**. Some consumers choose products from the illegal market (as shown in this component of the analysis), while other consumers switch from FMC to FCT (as shown in the initial analysis). These findings clearly demonstrate the **'buffer function' of FCT**, which is further corroborated by the finding that the shift from legal tobacco is determined by the price difference between FCT and FMC.

As a more affordable product, during economic downturns, FCT enables national finance ministries to **maintain tax receipts from consumers that might otherwise have chosen illicit products**.

It is worth noting that the regression estimates do not change substantially when including the interaction term in the regression, which adds to the robustness of the results.

**Table 3 Econometric results – share of illicit FMC consumption**

| Variables | (1) **Without** interaction term | (2) **With** interaction term |
|---|---|---|
| Unemployment rate | 0.189***<br>(0.0406) | 0.675***<br>(0.0135) |
| Total tobacco consumption | 0.000685***<br>(0.0415) | 0.00135***<br>(0.00535) |
| Interaction term | ---<br>--- | -7.33e-05**<br>(0.0590) |
| Price difference per cigarette (FMC-FCT) | -0.225***<br>(0.00726) | -0.207***<br>(0.0134) |
| FCT tax rate (incl. VAT) | 0.00661***<br>(0.00627) | 0.00654***<br>(0.00629) |
| FMC tax rate (incl. VAT) | 0.00275<br>(0.470) | 0.00268<br>(0.477) |
| Constant | -3.802<br>(0.350) | -8.799**<br>(0.0680) |
| Observations | 168 | 168 |
| Number of countries | 12 | 12 |

Note: p-value in parentheses *** p<0.05, ** p<0.1, * p<0.2

***Source: London Economics' analysis***

## 3.4 Conclusions

This third section establishes a set of key relevant economic principles when developing fiscal policies for tobacco products. **During economic downturns, smokers are more likely to resort to illicit products**. This relation is, however, less pronounced in markets where FCT is relatively more affordable (i.e. where the price difference with cigarettes is higher). It also demonstrates that a tax increase on FCT is associated with a larger increase in prevalence of illicit products compared to an increase of FMC tax levels, demonstrating the importance of **affordability constraints** for FCT consumers. Ignoring such economic evidence results in deterring priced-out FMC smokers from seeking legal alternatives and driving existing FCT smokers to seek illegal ones.

# ANNEXES

# Annex 1 Additional information on the methodology

## A1.1 Impact of an economic downturn on FCT consumption

Table 4 provides an overview of the data used in the regressions by jurisdiction. The table shows summary statistics for each variable over the time period of analysis.

**Table 4 Summary statistics by jurisdiction**

| | | Obs | Mean | Standard Deviation | Min | Max |
|---|---|---|---|---|---|---|
| Belgium | FCT share | 15 | 44.592 | 3.069 | 39.691 | 50.005 |
| | Unemployment rate | 15 | 7.6 | .94 | 5.4 | 8.5 |
| | FCT tax rate (incl. VAT) | 15 | 244.657 | 225.605 | 121.059 | 964.686 |
| | FMC tax rate (incl. VAT) | 15 | 320.552 | 17.283 | 288.922 | 353.93 |
| Czech Republic | FCT share | 15 | 5.456 | 1.718 | 2.658 | 7.145 |
| | Unemployment rate | 15 | 5.453 | 1.949 | 2 | 7.9 |
| | FCT tax rate (incl. VAT) | 15 | 283.624 | 144.152 | 87.318 | 521.662 |
| | FMC tax rate (incl. VAT) | 15 | 287.71 | 54.838 | 161.593 | 335.866 |
| | FCT share | 15 | 5.456 | 1.718 | 2.658 | 7.145 |
| France | FCT share | 15 | 13.895 | 2.108 | 11.303 | 16.508 |
| | Unemployment rate | 15 | 9.227 | .861 | 7.4 | 10.4 |
| | FCT tax rate (incl. VAT) | 15 | 307.334 | 32.525 | 255.846 | 399.732 |
| | FMC tax rate (incl. VAT) | 15 | 416.694 | 9.822 | 402.584 | 432.766 |
| | FCT share | 15 | 13.895 | 2.108 | 11.303 | 16.508 |
| Germany | FCT share | 15 | 23.322 | 1.952 | 19.677 | 25.714 |
| | Unemployment rate | 15 | 6.2 | 2.475 | 3.2 | 11.2 |
| | FCT tax rate (incl. VAT) | 15 | 198.155 | 22.194 | 146.195 | 224.135 |
| | FMC tax rate (incl. VAT) | 15 | 308.62 | 32.198 | 247.457 | 378.294 |
| | FCT share | 15 | 23.322 | 1.952 | 19.677 | 25.714 |
| Italy | FCT share | 15 | 4.456 | 3.13 | .746 | 9.331 |
| | Unemployment rate | 15 | 9.527 | 2.222 | 6.1 | 12.7 |
| | FCT tax rate (incl. VAT) | 15 | 293.436 | 31.47 | 240.948 | 326.076 |
| | FMC tax rate (incl. VAT) | 15 | 306.792 | 12.421 | 292 | 331.884 |
| | FCT share | 15 | 4.456 | 3.13 | .746 | 9.331 |
| Netherlands | FCT share | 15 | 42.258 | 2.354 | 37.422 | 44.963 |
| | Unemployment rate | 15 | 5.247 | 1.279 | 3.4 | 7.4 |
| | FCT tax rate (incl. VAT) | 15 | 188.302 | 26.154 | 155.972 | 235.012 |
| | FMC tax rate (incl. VAT) | 15 | 296.856 | 58.527 | 251.435 | 444.32 |
| | FCT share | 15 | 42.258 | 2.354 | 37.422 | 44.963 |
| Spain | FCT share | 15 | 8.53 | 3.838 | 3.025 | 12.874 |
| | Unemployment rate | 15 | 17.34 | 6.059 | 8.2 | 26.1 |
| | FCT tax rate (incl. VAT) | 15 | 190.681 | 59.699 | 109.424 | 262.966 |
| | FMC tax rate (incl. VAT) | 15 | 362.222 | 35.429 | 256.048 | 390.622 |
| | FCT share | 15 | 8.53 | 3.838 | 3.025 | 12.874 |

***Source: London Economics' analysis***

## A1.2 Impact of an economic downturn on tax revenue

The size of the total legal tobacco market in 2020 and 2021 has been forecasted based on historical data from Eurostat's COICOP, the European Commission's AMECO and Euromonitor and outlooks from the AMECO database:

- In a first step, an Ordinary Least Squares regression model has been used to forecast tobacco sales. The dependent variable is tobacco sales from COICOP. The independent variables include total population, real compensation per employee, the unemployment rate and the real prices of FCT and FMC in each of the jurisdictions from AMECO.
- The regression estimates from this panel regression and AMECO's forecasts of the independent variables have then been used to forecasts tobacco sales in 2020 and 2021.
- The resulting growth rates between 2019-2020 and 2020-2021 have subsequently been applied to the 2019 Euromonitor data in order to obtain forecasts for tobacco volume in 2020 and 2021. Consequently, the assumptions for these forecasts are similar to the ones applied in the AMECO database.

The analysis uses forecasts based on the AMECO database, as it is unclear what assumptions regarding the economic downturn are underpinning the Euromonitor data. However, the forecasted growth rates based on the AMECO data have been applied to the Euromonitor data in order to ensure internal consistency in the analysis.

## A1.3 Relationship between an economic downturn and the illegal FMC markets

Table 5 provides an overview of the data used in the fixed effects panel regression. The table shows summary statistics, which provide information on the range of each variable.

**Table 5 Summary statistics for panel data**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Share of illegal FMC | 168 | 7.589 | 5.295 | .251 | 23.711 |
| Unemployment rate | 168 | 8.519 | 4.306 | 2 | 26.1 |
| Total tobacco consumption | 168 | 7,189.187 | 1,933.171 | 4,062.55 | 13,804.322 |
| Price difference per cigarette (FMC-FCT) in cent | 168 | 6.464 | 5.907 | -8.896 | 21.38 |
| FCT tax rate (incl. VAT) | 168 | 260.404 | 140.069 | 89.089 | 1,009.141 |
| FMC tax rate (incl. VAT) | 168 | 346.4 | 74.549 | 161.593 | 897.79 |

***Source: London Economics' analysis***

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