Annex A. Methodological appendix

Annex A.1. Construction of the GTRIC for imports

Construction of GTRIC-p

GTRIC-p is constructed through three steps:

1. For each product category, the seizure percentages for sensitive goods are formed.
2. From these, a counterfeit a source factor is established for each industry, based on the industries' weight in terms of UK total imports.
3. Based on these factors, the GTRIC-p is formed.

Step 1: Measuring product seizure intensities

v_p and m_p are, respectively, the seizure and import values of product type p (as registered according to the HS on the two-digit level) shipped to the UK from *any* provenance economy in a given year. The relative seizure intensity (seizure percentages) of good p, denoted below as γ_p, is then defined by:

$$\gamma_p = \frac{v_p}{\sum_p v_p}, \text{ such that } \sum\nolimits_p \gamma_p = 1$$

Step 2: Measuring product-specific counterfeiting factors

$M = \sum_p m_p$ is defined as the total registered imports by the UK of all sensitive goods.

The import share of good p, denoted s_p, is therefore given by:

$$s_p = \frac{m_p}{M}, \text{ such that } \sum\nolimits_p s_p = 1$$

The counterfeiting factor of product category p, denoted C_p, is then determined as the following.

$$C_p = \frac{\gamma_p}{s_p}$$

The counterfeiting factor reflects the sensitivity of product infringements occurring in a particular product category, relative to its share in UK imports. These constitute the foundation of the formation of GTRIC-p.

Step 3: Establishing GTRIC-p

GTRIC-p is constructed from a transformation of the counterfeiting factor and measures the relative propensity to which different types of product categories are subject to counterfeiting and piracy in UK imports. The transformation of the counterfeiting factor is based on two main assumptions:

1. The first assumption (A1) is that the counterfeiting factor of a particular product category is positively correlated with the actual intensity of trade in counterfeit and pirated goods covered by that chapter. The counterfeiting factors must thus reflect the real intensity of actual counterfeit trade in the given product categories.

2. The second assumption (A2) acknowledges that the assumption may not be entirely correct. For instance, the fact that infringing goods are detected more frequently in certain categories could imply that differences in counterfeiting factors across products merely reflect that some goods are easier to detect than others, or that some goods, for one reason or another, have been specially targeted for inspection. The counterfeiting factors of product categories with lower counterfeiting factors could therefore underestimate actual counterfeiting and piracy intensities in these cases.

In accordance with assumption A1 (positive correlation between counterfeiting factors and actual infringement activities) and assumption A2 (lower counterfeiting factors may underestimate actual activities), GTRIC-p is established by applying a positive monotonic transformation of the counterfeiting factor index using natural logarithms. This standard technique of linearisation of a non-linear relationship (in the case of this study between counterfeiting factors and actual infringement activities) allows the index to be flattened and gives a higher relative weight to lower counterfeiting factors (see Verbeek, 2000)

In order to address the possibility of outliers in both ends of the counterfeiting factor index; i.e. some categories may be measured as particularly susceptible to infringement even though they are not, whereas others may be measured as insusceptible although they are; it is assumed that GTRIC-p follows a left-truncated normal distribution, with GTRIC-p only taking values of zero or above.

The transformed counterfeiting factor is defined as:

$$c_p = \ln(C_p + 1)$$

Assuming that the transformed counterfeiting factor can be described by a left-truncated normal distribution with $c_p \geq 0$; then, following Hald (1952), the density function of GTRIC-p is given by:

$$f_{LTN}(c_p) = \begin{cases} 0 & if\, cf_p \leq 0 \\ \dfrac{f(c_p)}{\int_0^\infty f(c_p)\, dc_p} & if\, cf_p \geq 0 \end{cases}$$

where $f(c_p)$ is the non-truncated normal distribution for c_p specified as:

$$f(c_p) = \frac{1}{\sqrt{2\pi\sigma_p^2}} \exp\left(-\frac{1}{2}\left(\frac{c_p - \mu_p}{\sigma_p}\right)^2\right)$$

The mean and variance of the normal distribution, here denoted μ_p and σ_p^2 , are estimated over the transformed counterfeiting factor index, c_p, and given by $\hat{\mu}_p$ and $\hat{\sigma}_p^2$. This enables the calculation of the counterfeit import propensity index (GTRIC-p) across HS chapters, corresponding to the cumulative distribution function of c_p.

Construction of GTRIC-e

GTRIC-e is also constructed in three steps:

1. For each provenance economy, the seizure percentages are calculated.
2. From these, each provenance economy's counterfeit source factor is established, based on the provenance economies' weight in terms of UK total imports.
3. Based on these factors, the GTRIC-e is formed.

Step 1: Measuring seizure intensities from each provenance economy

v_e is UK's registered seizures of all types of infringing goods (i.e. all p) originating from economy e at a given year in terms of their value.

γ_e is UK's relative seizure intensity (seizure percentage) of all infringing items that originate from economy e, in a given year:

$$\gamma_e = \frac{v_e}{\sum_e v_e}, \text{such that} \sum_e \gamma_e = 1$$

Step 2: Measuring partner-specific counterfeiting factors

m_e is defined as the total registered UK imports of all sensitive products from e, and $M = \sum_e m_e$ is the total UK import of sensitive goods from all provenance economies.

The share of imports from provenance economy e in total UK imports of sensitive goods, denoted s_e, is then given by:

$$s_e = \frac{m_e}{M}, \text{such that} \sum_e s_e = 1$$

From this, the economy-specific counterfeiting factor is established by dividing the general seizure intensity for economy e with the share of total imports of sensitive goods from e.

$$C_e = \frac{\gamma_e}{s_e}$$

Step 3: Establishing GTRIC-e

Gauging the magnitude of counterfeiting and piracy from a provenance economy perspective can be undertaken in a similar fashion as for sensitive goods. Hence, a general trade-related index of counterfeiting for economies (GTRIC-e) is established along similar lines and assumptions:

1. The first assumption (A3) is that the intensity by which any counterfeit or pirated article from a particular economy is detected and seized by customs is positively correlated with the actual amount of counterfeit and pirate articles imported from that location.
2. The second assumption (A4) acknowledges that assumption A3 may not be entirely correct. For instance, a high seizure intensity of counterfeit or pirated articles from a particular provenance

economy could be an indication that the provenance economy is part of a customs profiling scheme, or that it is specially targeted for investigation by customs. The importance that provenance economies with low seizure intensities play regarding actual counterfeiting and piracy activity could therefore be under-represented by the index and lead to an underestimation of the scale of counterfeiting and piracy.

As with the product-specific index, GTRIC-e is established by applying a positive monotonic transformation of the counterfeiting factor index for provenance economies using natural logarithms. This follows from assumption A3 (positive correlation between seizure intensities and actual infringement activities) and assumption A4 (lower intensities tend to underestimate actual activities). Considering the possibilities of outliers at both ends of the GTRIC-e distribution; i.e. some economies may be wrongly measured as being particularly susceptible sources of counterfeit and pirated imports, and vice versa; GTRIC-e is approximated by a left-truncated normal distribution as it does not take values below zero.

The transformed general counterfeiting factor across provenance economies on which GTRIC-e is based is therefore given by applying logarithms onto economy-specific general counterfeit factors (see, for example, Verbeek, 2000):

$$c_e = \ln(C_e + 1)$$

In addition, following GTRIC-p it is assumed that GTRIC-e follows a truncated normal distribution with $c_e \geq 0$ for all e. Following Hald (1952), the density function of the left-truncated normal distribution for c_e is given by

$$g(c_p) = \begin{cases} 0 & if cf_e \leq 0 \\ \dfrac{g(e)}{\int_0^\infty g(c_e)\ dc_e} & if cf_e \geq 0 \end{cases}$$

where $g(cf_e)$ is the non-truncated normal distribution for c_e specified as:

$$g(c_e) = \frac{1}{\sqrt{2\pi\sigma_e^2}} \exp\left(-\frac{1}{2}\left(\frac{c_e - \mu_e}{\sigma_e}\right)^2\right)$$

The mean and variance of the normal distribution, here denoted μ_e and σ_e^2, are estimated over the transformed counterfeiting factor index, c_e, and given by $\hat{\mu}_e$ and $\hat{\sigma}_e^2$.. This enables the calculation of the counterfeit import propensity index (GTRIC-e) across provenance economies, corresponding to the cumulative distribution function ofc_e.

Construction of GTRIC

The combined index of GTRIC-e and GTRIC-p, denoted GTRIC, is an index that approximates the relative propensities to which particular product types, imported by the UK from specific trading partners, are counterfeit and/or pirated.

Step 1: Establishing propensities for product and provenance economy

In this step the propensities to contain counterfeit and pirated products will be established for each trade flow from a given provenance economy and in a given product category.

The general propensity of importing infringed items of HS category p, from any economy, is denoted P_p and be given by GTRIC-p so that:

$$P_p = F_{LTN}(c_p)$$

where $F_{LTN}(c_p)$ is the cumulative probability function of $f_{LTN}(c_p)$.

Furthermore, the general propensity of importing any type of infringing goods from economy e is denoted P_e, and given by GTRIC-e, so that:

$$P_e = G_{LTN}(c_e)$$

where $G_{LTN}(c_e)$ is the cumulative probability function of $g_{LTN}(c_e)$.

The general propensity of importing counterfeit or pirated items of type p originating from economy $e$is then denoted P_{ep} and approximated by:

$$P_{ep} = P_p P_e$$

Therefore, $P_{ep} \in [\varepsilon_p \varepsilon_e \,; 1]$, $\forall e, p$, with $\varepsilon_p \varepsilon_e$ denoting the minimum average counterfeit export rate for each sensitive product category and each provenance economy.[16] It is assumed that $\varepsilon_e = \varepsilon_p = 0.05$.

Step 2: Calculating the absolute value

α is the fixed point, i.e. the maximum average counterfeit import rate of a given type of infringing good, p, originating from a given trading partner, e. α can therefore be applied onto propensities of importing infringing goods of type p from trading partner e (αP^{jk}).

As a result, a matrix of counterfeit import propensities $\boldsymbol{C}$ is obtained.

$$\boldsymbol{C} = \begin{pmatrix} \alpha P_{11} & \alpha P_{12} & & & \alpha P_{1P} \\ \alpha P_{21} & \ddots & & & \\ & & \alpha P_{ep} & & \\ & & & \ddots & \\ \alpha P_{E1} & & & & \alpha P_{EP} \end{pmatrix} \text{ with dimension } E \times P$$

The matrix of UK imports is denoted by $\boldsymbol{M}$. Applying $\boldsymbol{C}$ on $\boldsymbol{M}$ yields the absolute volume of imports of counterfeit and pirated goods to the UK. In particular, the import matrix $\boldsymbol{M}$ is given by:

$$\boldsymbol{M} = \begin{pmatrix} m_{11} & m_{12} & & & m_{1P} \\ m_{21} & \ddots & & & \\ & & m_{ep} & & \\ & & & \ddots & \\ m_{E1} & & & & \alpha m_{EP} \end{pmatrix} \text{ with dimension } E \times P$$

Hence, the element m_{ep} denotes UK's imports of product category p from trading partner e, with $e = [1, \dots, E]$ and $p = [1, \dots, P]$.

Denoted by $\boldsymbol{\Psi}$, the product-by-economy percentage of counterfeit and pirated imports can be determined as the following:

$$\boldsymbol{\Psi} = \mathbf{C'M} \div \mathbf{M}$$

Total imports in counterfeit and pirated goods, denoted by the scalar $\boldsymbol{TC}$, is then given by:

$$\mathbf{TC} = \mathbf{I_1}'\boldsymbol{\Psi}\mathbf{I_2}$$

where $\mathbf{I_1}$ is a vector of one with dimension $E \times 1$, and $\mathbf{I_2}$ is a vector of one with dimension $P \times 1$.

Then, by denoting total world trade by the scalar $\mathbf{TM} = \mathbf{I_1 M' I_2}$, the value of counterfeiting and piracy in UK imports, $\boldsymbol{S_{TC}}$, is determined by:

$$\boldsymbol{S_{TC}} = \frac{\boldsymbol{TC}}{\boldsymbol{TM}}$$

Annex A.2. Construction of the GTRIC for products infringing UK IPRs

Construction of UK-GTRIC-p

UK-GTRIC-p is constructed of three steps:

1. For each product category, the seizure percentages for sensitive goods are formed.
2. From these, a counterfeit a source factor is established for each industry, based on the industries' weight in terms of total trade.
3. Based on these factors, the GTRIC-p is formed.

Step 1: Measuring product seizure intensities

w_p is the seized value of product type p (as registered according to the HS on the two-digit level) infringing UK residents' IP rights from any provenance economy in a given year. The relative seizure intensity (seizure percentages) of good p, denoted below as η_p, is then defined by:

$$\eta_p = \frac{w_p}{\sum_p w_p}, \text{ such that } \sum_p \eta_p = 1$$

Step 2: Measuring product-specific counterfeiting factors

x_p is the total sales value (exports plus domestic sales) of product of type p, so that $X = \sum_p x_p$ is defined as the total registered sales by the UK industries of all sensitive goods.

The share of good k in UK total sales, denoted ς_p, is therefore given by:

$$\varsigma_p = \frac{x_p}{X}, \text{such that} \sum\nolimits_p \varsigma_p = 1$$

The counterfeiting factor of product category p, denoted F_p, is then determined as the following.

$$F_p = \frac{\eta_p}{\varsigma_p}$$

The counterfeiting factor reflects the sensitivity of infringements of Trademarks and patents of UK residents occurring in a particular product category, relative to its share in UK total sales. These constitute the foundation of the formation of GTRIC-p.

Step 3: Establishing GTRIC-p

GTRIC-p is constructed from a transformation of the counterfeiting factor and measures the relative propensity to which Trademarks and patents of UK residents in different types of product categories are subject to counterfeiting and piracy. The transformation of the counterfeiting factor is based on two main assumptions:

In accordance with assumption A1 (positive correlation between counterfeiting factors and actual infringement activities) and assumption A2 (lower counterfeiting factors may underestimate actual activities) specified in Annex A.1, GTRIC-p is established by applying a positive monotonic transformation of the counterfeiting factor index using natural logarithms. This standard technique of linearisation of a non-linear relationship (in the case of this study between counterfeiting factors and actual infringement activities) allows the index to be flattened and gives a higher relative weight to lower counterfeiting factors (see Verbeek, 2000)

In addition, in order to address the possibility of outliers in both ends of the counterfeiting factor index; i.e. some categories may be measured as particularly susceptible to infringement even though they are not, whereas others may be measured as insusceptible although they are; it is assumed that GTRIC-p follows a left-truncated normal distribution, with GTRIC-p only taking values of zero or above.

The transformed counterfeiting factor is defined as:

$$f_p = \ln(F_p + 1)$$

Assuming that the transformed counterfeiting factor can be described by a left-truncated normal distribution with $f_p \geq 0$; then, following Hald (1952), the density function of GTRIC-p is given by:

$$h_{LTN}(f_p) = \begin{cases} 0 & if\, f_p \leq 0 \\ \dfrac{h(f_p)}{\int_0^\infty h(f_p)\, df_p} & if\, f_p \geq 0 \end{cases}$$

where $h(f_p)$ is the non-truncated normal distribution for cf_p specified as:

$$h(f_p) = \frac{1}{\sqrt{2\pi\sigma_p^2}} \exp\left(-\frac{1}{2}\left(\frac{f_p - \mu_p}{\sigma_p}\right)^2\right)$$

The mean and variance of the normal distribution, here denoted μ_p and σ_p^2 , are estimated over the transformed counterfeiting factor index, f_p, and given by $\hat{\mu}_p$ and $\hat{\sigma}_p^2$. This enables the calculation of the counterfeit propensity index (GTRIC-p) across HS chapters, corresponding to the cumulative distribution function of f_p.

Construction of UK-GTRIC-e

GTRIC-e is also constructed in three steps:

1. For each provenance economy, the seizure percentages are calculated.
2. From these, each provenance economy's counterfeit source factor is established, based on the provenance economies' weight in terms of UK total sales.
3. Based on these factors, the GTRIC-e is formed.

Step 1: Measuring seizure intensities to each destination economy

w_e is the registered seized value of all types of goods infringing British residents'IP rights (i.e. all p) exported to economy e from any provenance economy at a given year. η_e is the relative seizure intensity (seizure percentage) of all products infringing Trademarks and patents of UK residents that are shipped to country e, in a given year:

$$\eta_e = \frac{w_e}{\sum_e w_e}, \text{ such that } \sum\nolimits_e \eta_e = 1$$

Step 2: Measuring destination-specific counterfeiting factors

x_e is defined as the total registered UK sales value (exports plus domestic sales) of all sensitive products shipped to e and X is the total UK sales value of sensitive goods to all destination economies.

The share of sales to destination economy e in UK total sales of sensitive goods, denoted ς_e, is then given by:

$$\varsigma_e = \frac{x_e}{X}, \text{ such that } \sum\nolimits_e \varsigma_e = 1$$

From this, the economy-specific counterfeiting factor is established by dividing the seizure intensity for economy *d* with the share of total sales of sensitive goods to e.

$$F_e = \frac{\eta_e}{\varsigma_e}$$

Step 3: Establishing GTRIC-e

Gauging the magnitude of counterfeiting and piracy targeting Trademarks and patents of UK residents in a given destination economy can be undertaken in a similar fashion as for Annex A.1. Thus, a general trade-related index of counterfeiting for economies (GTRIC-e) is established along similar lines and assumptions than A3 and A4 specified in Annex A.1.

The transformed general counterfeiting factor across destination economies on which GTRIC-e is based is therefore given by applying logarithms onto economy-specific general counterfeit factors (see, for example, Verbeek, 2000):

$$f_e = \ln(F_e + 1)$$

In addition, following GTRIC-p it is assumed that GTRIC-e follows a truncated normal distribution with $f_e \geq 0$ for all j. Following Hald

(1952), the density function of the left-truncated normal distribution for $f_e \geq 0$ is given by

$$i_{LTN}(f_e) = \begin{cases} 0 & if f_e \leq 0 \\ \dfrac{i(f_e)}{\int_0^{\infty} i(f_e)\ df_e} & if f_e \geq 0 \end{cases}$$

where $i(f_e)$ is the non-truncated normal distribution for f_e specified as:

$$i(f_e) = \frac{1}{\sqrt{2\pi\sigma_e^2}} \exp\left(-\frac{1}{2}\left(\frac{f_e - \mu_e}{e}\right)^2\right)$$

The mean and variance of the normal distribution, here denoted μ_e and σ_e^2, are estimated over the transformed counterfeiting factor index, f_e, and given by $\hat{\mu}_e$ and $\hat{\sigma}_e^2$. This enables the calculation of the counterfeit import propensity index (GTRIC-e) across provenance economies, corresponding to the cumulative distribution function of f_e.

Construction of UK-GTRIC

The combined index of GTRIC-e and GTRIC-p, denoted GTRIC, is an index that approximates the relative propensities for goods associated with UK residents' IP rights in a given product category and a given destination economy to be counterfeit and/or pirated.

Step 1: Establishing propensities for product and destination economy

The general propensity for Trademarks and patents of UK residents to be counterfeit or pirated in HS category p, is denoted Q_p, and is given by GTRIC-p so that:

$$Q_p = H_{LTN}(f_p)$$

where $H_{LTN}(f_p)$ is the cumulative probability function of $h_{LTN}(f_p)$.

Furthermore, the general propensity for all Trademarks and patents of UK residents to be infringed and shipped to economy e is denoted Q_e, and is given by GTRIC-e, so that:

$$Q_e = I_{LTN}(f_e)$$

where $I_{LTN}(cf_e)$ is the cumulative probability function of $i_{LTN}(cf_e)$.

The general propensity for UK residents' IP rights to be counterfeit or pirated in a given product category p and to be shipped to a given destination e from any provenance economy is then denoted Q_{ep} and approximated by:

$$Q_{ep} = Q_e Q_p$$

Therefore, $Q_{ep} \in [\nu_p \nu_e \,; 1]$, $\forall e, p$, with $\nu_p \nu_e$ denoting the minimum average counterfeit export rate for each sensitive product category and each destination economy. It is assumed that $\nu_p = \nu_e = 0.05$.

Step 2: Calculating the absolute value

β is the fixed point, i.e. the maximum average counterfeit rate of Trademarks and patents of UK residents for a given product type p, shipped to a given trading partner, e. β can therefore be applied onto propensities for UK-related IP rights of type p to be counterfeit and shipped to destination partner e (βQ_{ep}).

As a result, a matrix of propensities of counterfeiting F is obtained.

$$F = \begin{pmatrix} \beta Q_{11} & \beta Q_{12} & & & \beta Q_{1P} \\ \beta Q_{21} & \ddots & & & \\ & & \beta Q_{ep} & & \\ & & & \ddots & \\ \beta Q_{E1} & & & & \beta Q_{EP} \end{pmatrix} \text{with dimension } E \times P$$

The matrix of UK total sales is denoted by X. Applying C on X yields the absolute volume of counterfeit and pirated trade in products that infringe UK residents' IP. In particular, the sales matrix X is given by:

$$X = \begin{pmatrix} \beta x_{11} & \beta x_{12} & & & \beta x_{1P} \\ \beta x_{21} & \ddots & & & \\ & & \beta x_{ep} & & \\ & & & \ddots & \\ \beta x_{E1} & & & & \beta x_{EP} \end{pmatrix} \text{with dimension } E \times P$$

Hence, the element x_{ep} denotes UK's sales of products in category p to destination e, including the UK (i.e. domestic sales), with $e = [1, \dots, E]$ and $p = [1, \dots, P]$.

Denoted by Ω, the product-by-economy percentage of counterfeit and pirated imports can be determined as the following:

$$\Omega = \mathrm{F}'\mathrm{X} \div \mathrm{X}$$

Total trade in counterfeit and pirated goods that infringe British trademarks and patents, denoted by the scalar TF, is then given by:

$$\mathrm{TF} = I_1{}'\Omega\, I_2$$

where I_1 is a vector of one with dimension $E \times 1$, and I_2 is a vector of one with dimension $P \times 1$.

Then, by denoting total UK sales by the scalar $\mathrm{TX} = I_1{}'\mathrm{X}\, I_2$, the value of counterfeiting and piracy targeting UK residents' IP rights, ω_{TF}, is determined by:

$$\omega_{TF} = \frac{TF}{TX}$$

Annex A.3. Model to estimate transmission rates between lost sales and lost jobs

Existing economic literature does not determine clear the values of transmission between lost sales and lost jobs for each industry. Consequently, this study develops a simple econometric model to address this issue.

The idea behind the model is to invert a basic production function in a partial equilibrium model in order to estimate the response of employment to a shock on sales. Let $\hat{p}_p$ and $\hat{Q}_P$ denote, respectively, the average unit price and the total production in volume of (genuine) goods in industry p, so that the total sales of (genuine) goods in an industry is defined by

$$\hat{S}_p = \hat{p}_p \times \hat{Q}_P$$

The goods in the industry are produced using labor, $\hat{L}_p$, capital $\hat{K}_p$, and intermediate inputs $\hat{I}_p$, following a Cobb-Douglas production:

$$\hat{Q}_P = A_p\, \hat{L}_p^{\alpha}\, \hat{K}_p^{\beta}\, \hat{I}_p^{\gamma}$$

with A_p the total factor productivity (TFP). In accordance with the traditional economic literature, the firms' profit maximization problem within an industry yield an optimal price which equalizes a markup φ_p, over a marginal cost, here the productivity-adjusted wage w_p :

$$\hat{p}_p = \varphi_p \, w_p$$

Combining equations (1), (2), and (3), and taking the log yields:

$$\ln(\hat{S}_p) = \ln(\varphi_p) + \ln(w_p) + \ln(A_p) + \alpha \ln(\hat{L}_p) + \beta \ln(\hat{K}_p) + \gamma \ln(\hat{I}_p)$$

By inverting equation (4), employment can be expressed as a function of the other variables, including sales. Adding the subscripts $t$for a given year, as well as (i) year-fixed effects, δ_t, to account for common macroeconomic shocks across industries; and (ii) industry-fixed effects, δ_p, to account for the level of mark-up – which depends on the competition within the industry, the price elasticity of demand etc. – and the TFP – which may be considered as constant in the short-run (i.e. in the case of this study three years) – the following econometric specification is obtained:

$$\ln(\hat{L}_{pt}) = \beta_0 + \delta_t + \delta_p + \beta_1 \ln(\hat{K}_{pt}) + \beta_2 \ln(\hat{I}_{pt}) + \beta_3 \ln(\hat{S}_{pt}) + \sum_p \beta_p [\ln(\hat{S}_{pt}) \times \delta_p] + \varepsilon_{pt}$$

with β_0 a constant and ε_{pt} the error term. The estimates of the elasticity of employment with respect to sales for each industry can then be extracted from equation (5), and are given by $\xi_p = \beta_3 + \beta_p$. An estimated elasticity of ξ_p% means that a decrease of 1% in sales is translated into a decrease of ξ_p% in jobs.

The results of the econometric specification (5) for the UK retail and wholesale sector are displayed in Table A.1. below. The first column shows the coefficients estimated without the inclusion of industry fixed-effects, and indicates that an increase in 1% of sales in the retail and wholesale sector implies on average a 0.46% increase of the number of employees within the sector. The second column of Table A.1 adds cross effects between the logarithm of sales and the industry fixed-effects to the econometric specification, which leads to the industry-specific estimates of the elasticity of employment with respect to sales displayed in Table 1.2. of Step 5.

Table A.1. Estimation of sales elasticity of employment, UK wholesale and retail sector

Dependent variable: log employment		
log Capital	0.052	0.066
	(-0.044)	(-0.045)
log Intermediate Inputs	-0.134*	-0.112*
	(-0.071)	(-0.071)
log Productivity	-0.125***	-0.141***
	(-0.021)	(-0.023)
log Wages	-0.146***	-0.134***
	(-0.028)	(-0.029)
log Sales	0.465***	0.532***
	(-0.07)	(-0.072)
_cons	6.039*	5.067***
	(-0.531)	(-0.509)
Industry fixed-effects	Yes	Yes
Year fixed-effects	Yes	Yes
Cross log Sales x Industry fixed-effects	No	Yes
Adjusted R^2	0.871	0.882
Number of observations	45	45

Notes: Standard errors in parentheses. * p<0.05; ** p<0.01; *** p<0.001. The industrial data for UK industries over the period 2009-2014 are provided by Eurostat. Employment is measure by the number of full-time equivalent employees; capital by the gross investment in intangible goods; intermediate inputs by total purchases of goods and services; sales by turnovers; wages by the ratio of total personal costs, including social security costs, to the number of full-time equivalent employees; productivity by labour productivity.

The above present model can be used to perform a similar exercise for the UK manufacturing industries. The results of this estimation are displayed in Table A.2. below. The first column indicates that the transmission rate between changes in sales and changes in the level of employment is on average slightly lower than for the UK retail and whole industries, with an average estimate of 0.43%. Once again, the second column of Table A.2 adds cross effects between industry fixed-effects and the logarithm of sales, which give us the industry-specific estimates of the elasticity of the number of employees with respect to sales that are displayed in Table 1.3. of Step 10.

Table A.2. Estimation of sales elasticity of jobs, UK manufacturing sector

Dependent variable: log employment		
log Capital	0.066***	0.078***
	(-0.017)	(-0.017)
log Intermediate Inputs	-0.071	-0.081
	(-0.073)	(-0.076)
log Productivity	-0.325***	-0.341***
	(-0.044)	(-0.047)
log Wages	-0.945***	-0.949***
	(-0.016)	(-0.017)
log Sales	0.426***	0.643***
	(-0.084)	(-0.086)
_cons	5.281***	4.398***
	(-0.307)	(-0.315)
Industry fixed-effects	Yes	Yes
Year fixed-effects	Yes	Yes
Cross log Sales x Industry fixed-effects	No	Yes
Adjusted R2	0.915	0.925
Number of observations	256	256

Notes: Standard errors in parentheses. * $p<0.05$; ** $p<0.01$; *** $p<0.001$. The industrial data for UK industries over the period 2009-2014 are provided by Eurostat. Employment is measure by the number of full-time equivalent employees; capital by the gross investment in intangible goods; intermediate inputs by total purchases of goods and services; sales by turnovers; wages by the ratio of total personal costs, including social security costs, to the number of full-time equivalent employees; productivity by labour productivity.

Annex A.4. Examples of primary and secondary markets identifications

Specific examples for counterfeit and pirated imports to the UK territory

Example 1

This example considers boots of a brand that is the most frequently seized item in the UK. Figure 1 displayed in the second Step of Part 1 shows the unit price distribution of all boots of that brad that were seized by UK customs authorities between 2011 and 2013.

The identification of primary and secondary market using the methodology described in Step 2 implies that seized shipments of these boots associated with unit values strictly lower than GBP 165 are classified into the secondary market, whereas those associated with unit values larger than GBP 165 are classified into the primary market. This leads to the following results:

Table A.3. Share of the primary and secondary markets for counterfeit boots of the analysed brand, 2011-2013

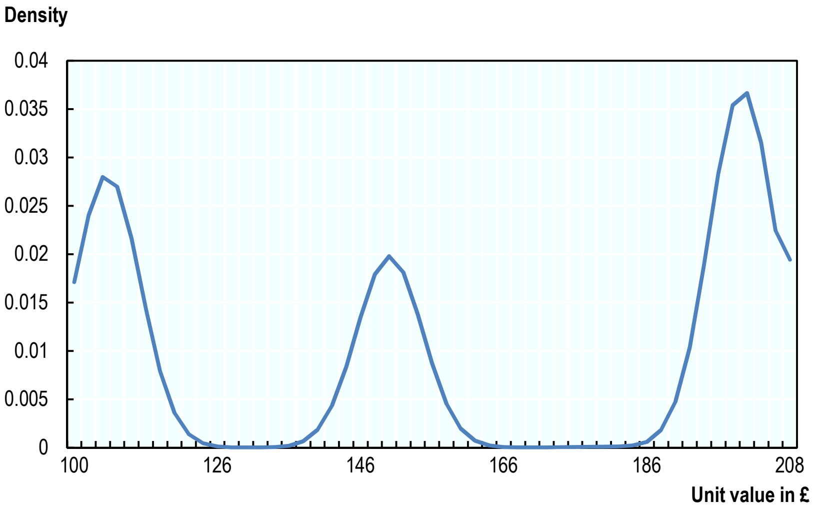
	Freq.	Percent
Primary market	10,902	43.76
Secondary market	14,013	56.24
Total	**24,915**	**100.00**

In words, 56% of the analysed boots shipments seized by UK customs between 2011 and 2013 were intended to be sold in the primary market and the rest of them in the secondary market.

Example 2

Shoes of the analysed brand are the second most frequently seized item in the UK. Figure A.1 below shows the price distribution of counterfeit shoes of the analysed brand exported to the UK territory and that were seized by UK customs authorities between 2011 and 2013:

Figure A.1. Price distribution of counterfeit shoes of the analysed brand seized by UK customs, 2011-2013



StatLink http://dx.doi.org/10.1787/888933553252

The identification of primary and secondary markets using the methodology described in Step 2 implies that seized shipments of shoes of the analysed brand associated unit values strictly lower than GBP 100 are classified into the secondary market, whereas those associated with unit values larger than GBP 100 are classified into the primary market. This leads to the following results:

Table A.4. Share of the primary and secondary markets for counterfeit shoes of the analysed brand seized by UK customs, 2011-2013

	Freq.	Percent
Primary market	3,496	54,50
Secondary market	2,919	45,50
Total	**6,415**	**100**

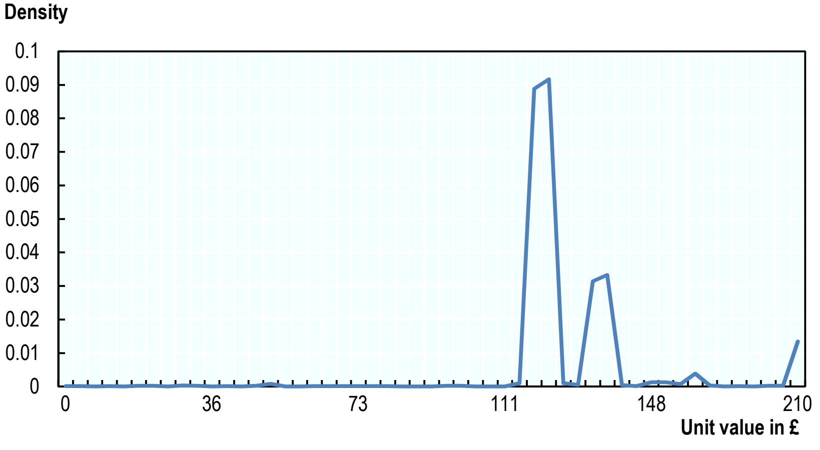
In words, 54.5% of shipments of shoes of the analysed brand seized by UK customs authorities between 2011 and 2013 were intended to be sold in the primary market and the rest of them in the secondary market.

Specific examples for counterfeit and pirated products traded worldwide that infringe UK trademarks

Example 3

The electrical product of a given brand registered by a UK company (H 85) is the most popular UK product seized worldwide. Figure A.2. Price distribution of counterfeit electrical products of a given brand seized by customs authorities worldwide, 2011-2013below reports the price distribution of these products that were seized by customs authorities worldwide between 2011 and 2013.

Figure A.2. Price distribution of counterfeit electrical products of a given brand seized by customs authorities worldwide, 2011-2013



StatLink http://dx.doi.org/10.1787/888933553271

The identification of primary and secondary market using the methodology described in Step 2 implies that seized shipments of fake analysed electrical products associated with unit values strictly lower than GBP 129 are classified into the secondary market, whereas those associated with unit values larger than GBP 129 are classified into the primary market. This leads to the following results:

Table A.5. Share of the primary and secondary markets for counterfeit electrical products of the analysed brand seized by customs authorities worldwide, 2011-2013

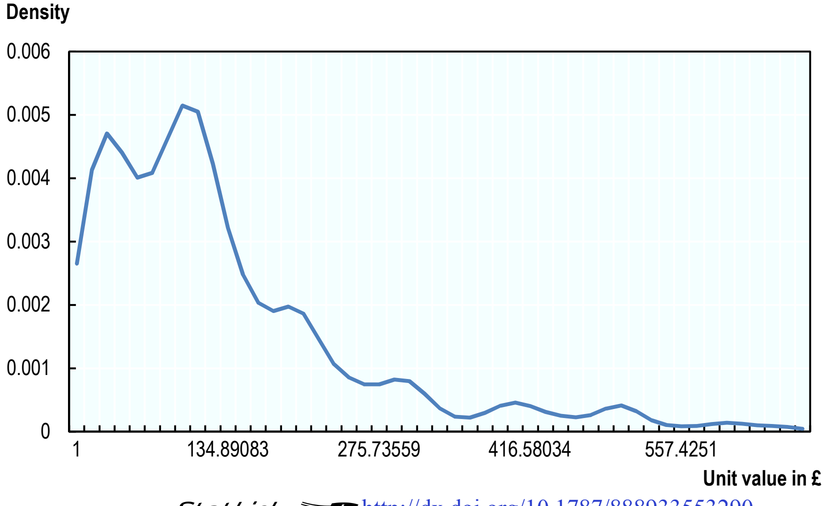
	Freq.	Percent
Primary market	2,018	31.73
Secondary market	4,341	68.27
Total	**6,359**	**100**

In words, 32% of seized shipments of fake analysed electrical products between 2011 and 2013 were intended to be sold in the primary market and 68% in the secondary market.

Example 4

The clothing products of a given brand (HS 61) are the second most popular UK products seized worldwide. Figure A.3 below shows the price distribution of these products that were seized by customs authorities worldwide between 2011 and 2013.

Figure A.3. Price distribution of counterfeit clothes of the analysed brand seized by customs authorities worldwide, 2011-2013



StatLink http://dx.doi.org/10.1787/888933553290

The identification of primary and secondary market using the methodology described previously implies that seized shipments of fake cloths of the analysed brand associated with unit values strictly lower than GBP 183 are classified into the secondary market, whereas those associated with unit values larger than GBP 183 are classified into the secondary market. This leads to the following results:

Table A.6. Share of the primary and secondary markets for counterfeit clothes of the analysed brand seized by customs authorities worldwide, 2011-2013

	Freq.	Percent
Primary market	776	39.19
Secondary market	1,204	60.81
Total	**1,980**	**100**

Thus, 39% of seized shipments of fake clothes of the analysed brand between 2011 and 2013 were intended to be sold in the primary market and 61% in the secondary market.

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