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Brandenburg Institute for SOCIETY and SECURITY

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BRANDENBURGISCHES INSTITUT für GESELLSCHAFT und SICHERHEIT

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Report

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ABSTRACT

Illicit trade is often considered in terms of shadowy, small-scale, informal merchants and the costs of such activities, when considered beyond lost profits to intellectual property holders at all, are typically thought of via the lens of national accounting. Taxation and government spending are foregone and illicit purchases do not appear in official consumption figures, lowering reported GDP. Such estimates, however, estimate the impact on national accounting and not on economic activity more generally. In this article, we seek more directly to estimate the costs of illicit trade, proxied via drugs seizures data at the country-level, via its statistical relationship with a range of macroeconomic outcomes in contiguous continental Europe. Using coarsened exact matching and dynamic panel approaches to overcome the usual biases, we show that marginal increases in illicit trade are associated with reductions in economic growth, tertiary education enrolment and in research and development spending. Proportionally, costs are small, comprising a bit more than a fifth of a percent of GDP on average – quite a bit lower than national-accounting-based estimates. In absolute terms, however, costs from foregone growth remain beyond the pale – running to hundreds of millions and even billions of Euro.

TABLE OF CONTENT

LIST OF FIGURES AND TABLES

1 INTRODUCTION

The Brandenburg Institute for Society and Security (BIGS) was commissioned by Philip Morris GmbH (PMG) to conduct a quantitative analysis of the impact of illicit trade on economic growth and other macroeconomic factors in Europe. This study is motivated by the fact that illicit trade comes with a variety of hazards, which so far have not been adequately analyzed.

This study contributes a new perspective to the research field of illicit trade. Due to the need to ensure that the available data[1] are as complete as possible, the study only looks at a subset of the effects of the phenomenon. Since observations from a large number of countries and years were used for econometrically robust statements, the demands on the data were high. Only for the selected areas were these data available. For this reason alone, this study cannot claim absolute validity. However, to our knowledge, it is currently the only empirical study of this kind.

According to our definition, *illicit trade includes the production, distribution and exchange of goods and services between individuals or organizations if either the goods or the manner of exchange is illegal in the relevant jurisdiction.* This may involve substances that are banned outright, such as narcotics, or products that are legally manufactured but not authorized in the respective market (so-called illicit whites, e.g. certain cigarettes or pharmaceuticals that are not authorized in the EU), including products and services that are actually permissible but are illegally distributed to the customers without taxation. And then there are products that have a legitimate appearance, but were produced illegally: counterfeits. The latter are often smuggled into jurisdictions of the European Union and do not undergo quality controls as legally imported products have to.

Counterfeit products and components often harm customers because they are not subject to legal quality controls – think of electronics that cause fires, or stimulants such as alcohol, and medicines that make people sick. And it is not only the end customers who are the injured parties here. Quality defects in branded products often have a negative impact on the brand manufacturers and significantly affect their sales. Counterfeits that make their way into the supply chain create the same problem. For example, counterfeit spare parts of inferior quality can damage the reputation of an impeccable manufacturer, and are conducive to market failure in the sense of Akerlof's[2] Market for Lemons.

Furthermore, obvious economic damage comes to one's mind right away, as the immediate effects from tax losses for governments, which are immense,[3] or the displaced and eliminated legal jobs. But there is more to it. Entrepreneurship and growth associated with innovation are weakened by illicit trade. With a higher share of illicit trade, a lower per capita amount is also spent on research and development, as we show below. And at the same time, there are more complex interactions, as illegally generated income also flows back into the economic cycle.

Illicit trade comprises a large component of global economic activity[4]. In 2011, it was estimated that illicit trade accounted for 1.5% of global gross domestic product (GDP)[5], while almost 13% of economic transactions in the EU are estimated to

1 One of the challenges is that "available data is often fragmented" (Franke et al., 2019, p.2).
2 Cf. Akerlof (1970) The Market for *"Lemons": Quality Uncertainty and the Market Mechanism.*
3 Cf. Spacie and Stuchtey (2021), p.25. Tobacco tax fraud alone has cost EU governments around ten billion euros a year in revenue in the past. The European Union Intellectual Property Office (OECD/EUIPO, 2019) estimates that in 2019, authorities will have lost around 15.5 billion euros in tax revenue from eleven other sectors. This is a result of the loss of 52 billion euros in corporate revenue, as Spacie and Stuchtey point out. In addition, up to 500,000 jobs may have been lost or eliminated due to lost revenue.
4 OECD/EUIPO (2016): Trade in Counterfeit and Pirated Goods: Mapping the Economic Impact; OECD/EUIPO (2019) *Trends in Trade in Counterfeit and Pirated Goods.*
5 World Economic Forum (2019) *Illicit trade endangers the environment, the law and the SDGs. We need a global response.*

be illicit. Despite the scale of the market, however, its costs[6] are mostly considered in terms of taxation income foregone, or in the more general absence of illicit trade from official economic statistics. Based on these national accounting approaches, illicit trade has been estimated to deprive the global economy of €1.96tn each year – accounting for almost 3% of global GDP[7]. While losses on this scale are clearly problematic, these measures do not, strictly, capture the true extent of economic harm. Economic activity, even when it takes place off the books, is still

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6 Of course, there are the investigation and prosecution costs incurred by security agencies and the judiciary. and private business against illicit trade And there are the costs incurred by private companies in trying to curb illegal trade, e.g. costs for contracts, lawyers, investigations, patent applications. For lack of suitable data, however, these cost categories do not play a role in our quantitative analysis.

7 A calculation using the total discussed in the following article, multiplying the USD total by the 2019 average spot price of USD to EUR – 0.89 EUR: Oxford Economics (2018).

economic activity, after all. Foregone taxation implies reductions in government spending but – were it possible to account for it – there could be associated increases in other components of the standard Keynesian GDP equation, such as in consumption.

In this document, we seek to understand, more directly, the economic costs associated with illicit trade. To do so, we first operationalise a proxy for the extent of illicit trade in the absence of year-by-year country-level estimates. Specifically, we focus on annual drug seizures at the national level as such a proxy. Implicit in this are two assumptions[8]:

The first is that the drugs trade is highly correlated with broader illicit trade, which is intuitive – if it is easy to distribute illegal drugs in a market, it is also likely easy to distribute other illicit goods.

The second, which is more difficult to justify, is that the extent of drugs seizures captures, both, the extent of the drugs trade in a country and that country's capacity to seize illegal drugs.

The latter – directly or indirectly – could easily be determined by the level of illicit trade in a country. Low seizure rates, therefore, could capture a small market for illegal drugs, low willingness to attempt to seize illegal goods, or both. In situations where capacity, or willingness, to seize drugs is low, we might intuitively expect higher (not lower) levels of illicit activity.

We do not use other conceivable proxies for the extent of illicit trade, as illegal arms trafficking, or illegal trade in cigarettes[9], as we lack data sufficient in quality and quantity – observation points, that is, the product of countries and years with data – to enable us conducting advanced econometric analyses as we can using the drug seizures data. It is entirely possible that other branches of illicit trade[10] – say, counterfeit pharmaceuticals, perfumes and cosmetics, watches, audio and video media, and textiles; contraband tobacco products or alcohol – for which we lack suitable data may have a more pronounced negative impact on the socioeconomic indicators we choose for our analysis. These indicators are listed in the next paragraph. In this case, using drug seizures as a proxy will entail a systematic underestimation of the actual harm incurred by presence of illicit trade. Our results must therefore be regarded as conservative.[11]

We focus on drug seizures on the assumption that those seizures are positively correlated with consumption and that illegal drug consumption is correlated with wider illicit trade. On the former, we note that the interaction of two components likely influence seizures: the amounts of drugs passing through the country and the desire of authorities to capture them. In this sense, the first component of this variable, certainly, will be correlated with consumption. On the latter, we note that demand can flourish in places with, for example, weaker enforcement of laws, which is true not only of the market for illegal drugs but also other illicit goods. We then statistically analyse the relationship between this measure on four socioeconomic indicators: GDP growth; tertiary education enrolment; research and development (R&D) expenditures; and the number of patents filed.[12]

GDP levels and GDP growth are strongly influenced by tertiary education enrolment and R&D expenditures. But what are the potential causal channels, how might illicit trade hamper these?

8 It should be noted we do not take into consideration other potential factors of influence here, e.g. the demand for drugs, or the prioritization of controls: harsh controls in some controls related to drugs but negligence related to other illicit goods, as for example counterfeit music CDs. The intensity of enforcement varies over space and time. A catchy example: in some Southeast Asian countries, drug possession is severely punished, while copyright infringement is de facto not tackled. In the Netherlands, it was rather the other way around until recently.

9 Tobacco products compose an important share of smuggled and counterfeit goods seized per year, according to OLAF (2021, p. 24). See OLAF (2016, p. 22) for information on the changing nature within tobacco counterfeits. Please note that the OLAF reports rather count seizures, without analysing them by econometric methods, as we do here.

10 This is possible regardless the distribution channel, which could, for example, be a seedy shadow market in close vicinity of the border, or a sophisticated darknet webshop.

11 No direct impact, on the other hand, should be expected from illicit drug trade on foregone tax revenue. There might be indirect causal channels, as will be discussed below.

12 To keep the paper reasonable in length, this study does not analyse effect of illicit trade on health, life expectancy, or good governance, as considered by Spacie and Stuchtey (2021, p.29).

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Education, particularly advanced education, is a choice: in economic terms, a choice to maximize utility, both on the part of those who provide education and those who learn and (are) educated. Opportunity makes thieves - and potentially deprives universities of students. If there is opportunity for illicit trade everywhere, that is likely to distort individual decisions to maximize the benefits of supply and demand in education. Good mafia movies like "Goodfellas" often have a similar plot: the seductive powers and fast money of the criminal milieu draw a young - usually male - actor into a life of crime. And particularly in countries with abundance of illicit trade and low prosecution pressure, it will seem low-risk and profitable to young people facing decisions about their further education and career paths to try their hand at petty crime. Formal training is not required, and the net income is usually higher than from alternative occupations.[13] Illegal trafficking[14], as a lower-risk activity compared to other crimes, may well be an attractive alternative to years of lecturing for risk-averse, non-violence-oriented offenders.

This then, taken further, also leads to a lower number of researchers, engineers and developers in society. However, research and development can also be affected by illegal trade through another channel of impact, namely the expectation of significant copyright infringement. If companies have to protect their intellectual property, developed for a lot of money, with expensive patents as well as processes, and the effectiveness of this protection is nevertheless called into question by illegal trade, this considerably reduces the business incentive for innovation. After all, companies do this to make money under competitive conditions. This works if, after a product has been developed, a temporary monopoly rent can be expected until the patent expires and competitors catch up. However, if a product were copied immediately and the offenders could not be prosecuted, the company would be left with its research and development costs and would therefore be at a serious competitive disadvantage. In that case, it would be better not to make any innovation efforts, and that would cost the economy growth and gross domestic product.

13 And, of course, these shadow traders pay no taxes. The revenue that the treasury lacks cannot be reinvested in the education sector.

14 The proxy we use for illegal trafficking – namely, annual drug seizures at the national level – might also have a negative effect on tertiary education through another channel. Drug seizures are likely to be correlated with the prevalence of drug addiction. These, in turn, are considered to be a reason for dropping out of education and the failure of livelihoods.

In these analyses, we seek to study two things: first of all, to test some of the array of domains in which the costs of illicit trade might arise; and secondly, to understand the impact of foregone growth – that is, the economic growth that never happened, because illicit trade flourished –, to provide a basis for understanding the true economic costs associated with illicit trade.

Growth relates the level of GDP in one year to the level of GDP in the next year. In focussing on growth as a measure of prosperity, rather than on simply GDP, we can – to some degree – partial out the fact that illicit trade does not appear in GDP statistics. In other words, the omission of illicit trade is common to both components of the equation[15], meaning that growth from one year to another should not be substantially influenced by its omission from national statistics.

Given data restrictions, even on drug seizures, we focus our analysis on contiguous, continental Europe, using a time-series running from 1990, when the data become available, until 2018, when the most recent data is available. We remove major outlying nations – typically, small countries with very high GDP per capita. This generates an unbalanced longitudinal dataset of 1,120 country-year observations upon which to conduct our analysis. Noting potential omitted variable biases and reverse causality issues, we correct our analyses using coarsened exact matching, which ensures we compare countries with differing levels of illicit trade that are, otherwise, similar. We use Arrelano-Bond system GMM approaches to overcome dynamic panel biases that arise in our data.

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15 With growth, it is effectively: (GDP+Illicit) in time period t - (GDP+Illicit) time period t-1, so a fair component of illicit trade is differenced out in the growth equation. It might be regarded a strong assumption, but we assume here that illicit trade is the same in t and t-1. Therefore, by focussing on that indicator, we are seeing real harm to the economy that goes beyond how economic activity is accounted.

These analyses show a negative and statistically significant impact of increases in illicit trade on GDP growth, tertiary education enrolment and R&D spending. These findings suggest at least two things: the first is that illicit trade has real, adverse, economic effects beyond their impact on taxation and national accounting. Secondly, that these adverse effects impact multiple economic domains, with particular effects in leading sectors and more highly technical domains. Specifically, an increase in drug seizures of 1000kgs is associated with a reduction in growth of 0.1%[16] and a reduction in tertiary education enrolment of 0.02%. Perhaps surprisingly, we see no corresponding statistical impact of increased illicit trade on registration of intellectual property rights, via patents registered. It is, perhaps, plausible, that the depressing effect of illicit trade in other areas of the economy is traded-off with an increased desire to seek protection for the intellectual property that is produced.

The small coefficients suggest that the costs of illicit trade are lower than prior estimates.[17] Across a basket of eight central European countries, illicit trade, on average, costs approximately 0.22% of GDP. At the same time, both the realised level of illicit trade and the macroeconomies they impact (for example, Germany, Switzerland, Poland, Ukraine) are large. Post-estimation analyses of growth foregone show absolute costs of illicit trade that run to hundreds of millions, and even billions, of euro.

While proving that illicit trade has significant and large adverse economic effects, these figures also suggest that expenditures in illicit markets do not disappear from the economy entirely. This, in turn, shows the limitations of national-accounting-based approaches to the problem. These approaches systematically disregard the off the book areas, the informal and shadow economy – which still contribute to a population's wealth despite the countervailing harmful effects of illicit trade – and have offered much higher estimates of the costs of illicit trade.

The rest of the document is set out as follows: next, we discuss our data, followed by our methods and results respectively, before offering conclusions and discussion.

16 Please note that this implies by no means a direct effect. A sudden drop of drug seizures to zero due to cessation of all customs and police activities would not increase GDP growth. The level of drug seizures serves as a proxy for the overall level of illicit trade, as described above.

17 For comparable approaches check: Tracit (2019); Economic Intelligence Unit (2018); OECD/EUIPO (2019;); KPMG (2016). There are not too many comparable econometric studies, though. This is widely unchartered territory. Our approach is more puristic in its econometric methodology than other studies. It should be noted that our study works with macro variables, and is slightly more elaborate in terms of econometric methodology compared to, for instance, the KPMG studies. Also, due to reasons of sample size and composition – namely, geographic and year limitations – the raw data used by KPMG were not be used in our study. Nonetheless, KPMG's publications, particularly in the area of illicit trade in tobacco products, are well worth reading.

2 DATA

At the heart of these questions is the impact of national-level illicit trade – proxied by annual seizures of illegal drugs on national level, as described above – on macroeconomic indicators. Specifically, we look at the impact of illicit trade on: GDP growth; the proportion of the population enrolled in tertiary education; the level of R&D expenditures; and the number of patents filed. Due to data reliability issues throughout much of the world, we focus our attention on Europe. We focus on a list of 47 countries that sit, wholly or partially, on the European continental shelf. From this list of countries, we remove major outliers from the analysis. Typically, these are tiny countries (population <500,000) with incredibly low levels of reported illicit trade (specifically: Andorra, Iceland, Liechtenstein, Malta, Monaco and San Marino; and drug seizures as proxy for illicit trade). We construct our dataset from the remaining 41 European countries.

More specifically, we are interested in tracking the impact of changes in illicit trade at to changes in major macroeconomic indicators. In order to conduct this analysis, we generate a longitudinal dataset, that tracks drug seizures in these countries over time. While major macroeconomic data are typically available for longer time-series, our operation of illicit trade – using information on seizures of illegal drugs – are only available from 1990[18] up until 2018. This constricts our time series to these 29 years. Accounting for missing data (e.g. the series in Albania only begins in 1999), this gives an unbalanced panel of 1,120 observations.

This approach, undertaken in the absence of estimates of overall illicit trade by country-year, relies on two assumptions: first, that drug seizures are highly correlated with the overall level of demand for illegal drugs in an economy; and second, that the dynamics of drugs seizures are associated with overall dynamics of illicit trade[19]. Two components are relevant for this assumption. The first is that the illegal drugs trade is a sub-component of overall illicit trade – in other words, all other things constant, an increase in the illegal drugs trade results in an increase in the overall illicit trade market in a country. Second, the conditions that are conducive to a high level of illegal drugs trade are likely conducive to a range of other[20] illicit activities.[21]

We match this to a range of macroeconomic indicators. Specifically, we collect information on GDP, GDP per capita; GDP growth and the inflation rate from the World Bank[22]; information on population and population density, also from World Bank[23]; and information on tertiary education enrolment, live expectancy, patents filed and research and development expenditures from the World Bank[24] as well. In each of these indicators, a small about of data is missing. We interpolate these missing observations as follows: First, we regress each indicator with one or more missing values on all indicators for which we have a complete record. Second, we replace the missing values in these indicators with the predicted values from the regression. Third, we iteratively repeat this process, running the regression on the interpolated regression, and replacing the original missing values with the new predicted values.

18 We source the data from UNODC (2021) *Annual Drug Seizures.* Another source which has been considered is EMCDDA (European Monitoring Centre for Drugs and Drug Addiction) statistics. EMCDDA data unfortunately only go back to 2014, which is nowhere near enough data for what we do, so we have to reject it as a potential source.

19 For example, check UNODC (2021) Arms seized by type. WCO (2020, p. 17) does not differentiate between drugs and other illicit products.

20 Illicit trade in different industries than illegal drugs, for instance counterfeit textiles, may well follow other rules, though. But the trends regarding volumes smuggled seem to be similar, as can be seen in customs statistics (Federal Ministry of Finance, 2020, pp.10 ff.).

21 Despite this, however, we note that the drugs trade is only one component of overall illicit activities, which means that any coefficients derived from this approach will be a factor greater than it would be, should we analyse indicators for all illicit trade. In the absence of alternative options with sufficient time-series and geographic spread, this indicator offers the best opportunity to understand the relationships at hand.

22 World Bank (2021) GDP (current US$).; World Bank (2021) *GDP Growth (annual %).*; World Bank (2021) *GDP per Capita (current US$).*; World Bank (2021) *Inflation, consumer prices* (annual %)

23 World Bank (2021) *Population, total.*; World Bank (2021) *Population Density (people per sq. km of land area).*

24 World Bank (2021) *School enrolment (tertiary)*; World Bank (2021) *Life Expectancy at birth, total (years)*; World Bank (2021) *Patent applications, residents;* World Bank (2021) *Research and Development Expenditure (% of GDP).*

3 METHODS

We are interested in the impact of illicit (drugs) trade on four sets of outcomes: impact on GDP growth; impact on tertiary education enrolment; impact on R&D expenditures; and impacts on the number of patents filed. The first thing that is clear from these indicators is that they are likely highly sticky in time. That is, the level of an indicator in year t will, in part, be determined by the level of that indicator in the year before, year t-1. For example, research and development expenditure is likely to be high in all years for a highly technical economy. We therefore model the basic relationship dynamically as follows:

$$Outcome_{it} = a+\beta_1 Outcome_{t-1}+\beta_2 IllicitTrade_{it}+\beta_3 X_{it}+\varepsilon \quad (1)$$

where: *Outcome* is the outcome variable of interest (growth; tertiary education enrolment; R&D expenditure; and patents filed) in country *i* in year *t*. In Equation (1), *Outcome* in country *i* in year *t* is partly determined by *Outcome* in country *i* in year *t*-1. *IllicitTrade* is the level of illict trade, proxied by drugs seizures, in country *i* in year *t*. *X* is an $n \times k$ matrix of control variables (specifically, the non-included outcome variables, population and population density, inflation rate and life expectancy). a is the regression constant and β_i a vector of regression coefficients. ε is the idiosyncratic error.

In order to account for time-invariant unobservables, such as tastes and preferences and other cultural factors specific to each country, we run fixed effects models. However, due to the dynamic nature of Equation (1), standard FE models will be biased, as a component of the error term ε in *t*-1 will appear in the error at time *t*. To overcome these potential biases, we use an Arrelano-Bond system GMM approach. In this approach, we instrument the endogenous lag with higher order lags – specifically, those from *t*-2 and *t*-3. The dynamic nature of the analysis ensures that the second lag is highly correlated with the first lag, but because Equation (1) only contains one lag, does not bias the error term.

A second concern arises due to more typical forms of endogeneity. For example, it is possible that illicit trade is high because growth is sluggish, rather than illicit trade causing sluggish growth. Low R&D expenditure and high illicit trade might, both, be the product of some omitted process, like weak governance. Consequently, further corrections are needed. Specifically, we undertake "coarsened exact matching" (CEM). To conduct a CEM, we first specify a set of criteria on which countries should be similar. Second, we "coarsen" these variables into "bins", which categorise the variable in question (e.g. by turning a continuous variable into quantiles). Third, we generate a group variable, across which we seek to match the observations – in our case, whether a country-year has a high level, or low level, of illicit trade, which we define by a country's position in the distribution of illicit trade for that year. Finally, we "match" countries in the high illicit trade group to identical countries in the low illicit trade group on the coarsened variables. This ensures, for example, that we are not comparing a rich country with low illicit trade to a poorer one with high illicit trade. Countries that are more frequently "good" matches for others, consequently, are given a higher importance in the analysis. Those that are "poor" matches, consequently, are given a lower importance. We therefore implement Equation (1) using the Arrelano-Bond System GMM approach, weighted according to the outcomes of the CEM.

4 RESULTS

4.1 Main Findings

We present results from these analyses in Table 1. In Column (1), we present the outcomes for the impact of illicit trade on GDP growth; in Column (2) on impact on tertiary education enrolment; in Column (3) on R&D expenditure; and in Column (4) on patents filed.

Table 1: Impact of Illicit Trade on Outcomes of Interest

VARIABLES	(1) GDP Growth	(2) Tertiary Enrolment	(3) R&D Expenditure	(4) Patents Filed
Illicit Trade (Proxy)	-9.77e-06** (4.46e-06)	-1.30e-06* (7.11e-07)	-7.75e-07* (4.19e-07)	0.000571 (0.00147)
Lagged Dependent Var	0.104** (0.0475)	0.831*** (0.0200)	0.674*** (0.103)	0.0933 (0.0815)
Country Fixed Effect	YES	YES	YES	YES
Controls	YES	YES	YES	YES

Note: Analyses conducted using Arrelano-Bond System GMM, weighted using weights derived from the coarsened exact matching. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In Table (1), we see three findings that are negative and significant at, at least, the 10% level. First, a marginal increase in the level of illicit trade is, significantly, associated with a reduction in GDP growth by just under 0.00001 percentage points. Second, a marginal increase in illicit trade is associated with a reduction in tertiary education by just over 0.000001 percentage points. Third, a marginal increase in illicit trade is associated with a reduction in R&D expenditure of 0.00000075 euro. While statistically significant, these numbers are small in absolute terms.

However, two things are important here. First, our measure of illicit trade is denominated in kilograms (kg) of drugs.[25] That is, therefore, a one kg increase in illicit trade as associated with these reductions. Seizures in our countries of interest go as high as five million kg , suggesting more pronounced effects at the scale at which illicit trade actually takes place. Second, our outcome indicators are also vast. GDP can run to trillions of euro, R&D expenditure to the billions.

While the impacts found in Columns (1) – (3) show the expected signs and significance levels, however, we do not find adverse impacts on the number of patents filed. Here, the coefficient is actually positive although very close to zero and highly statistically insignificant. This means, illicit trade seems not to have any notable effect on patents. On one level, this is perhaps surprising – the effect from R&D expenditure might suggest lower innovation in places with higher levels of illicit trade would result in fewer patentable ideas. On the other hand, however, perhaps high levels of illicit trade have the antipodal effect of encouraging individuals to seek to legally enforce their intellectual property. These two opposing effects could well cancel each other out.

In the following section, we interest ourselves in translating these marginal effects determined in the analysis into some (post-estimation) understanding of the costs of illicit trade in a broader economic sense.

25 This is a simplification insofar as soft drugs like marijuana are usually trafficked and seized in large (weight) quantities, whereas hard drugs and especially synthetic drugs are hardly ever seized in large quantities of many kg.

4.2 Post-Estimation Analyses

To do so, we interest ourselves in the impact on GDP growth foregone. While it is possible to derive such estimates, also, for the impact on tertiary education and R&D expenditure, both are subsets of impacts on GDP growth. Both tertiary education enrolment and R&D expenditures are strong predictors of GDP and GDP growth and their costs, therefore, transmit themselves via GDP and GDP growth.

In the sections below, we derive two sets of outcomes. The first is an overview of the costs of illicit trade in terms of economic growth foregone; the second is a discussion of the trends in these costs in recent years.

4.3 Costs

In order to calculate an estimate of the costs, we first interact the coefficient from the analysis with the realised level of illicit trade (proxied by drug seizures) in each country-year combination. This provides understanding of the overall growth-reducing impact of illicit trade in that country. Second, we then multiply the overall reduction in growth in each country-year combination with the previous year's GDP, the level from which growth has taken place. We, therefore, define the costs if illicit trade as follows:[26]

$$Cost_{it} = \beta_2 * IllicitTrade_{it} * GDP_{t-1} \quad (2)$$

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26 We note two factors are important in the derivation of Equation (2). The first is that because our proxy of illicit trade captures some component, the coefficients presented in Table 1 are higher for our proxy than they would be for a more direct measure of illicit trade. This, however, is countered in Equation 2 by the fact that the level of illicit trade is proportionally lower, due to this measure. In other words, these contrasting effects cancel each other out in Equation (2).

In Table 2, we present the results[27] from these analyses for a range of eight central European countries, averaged across the period from 1990 until 2018: Austria, Czechia, Germany, Hungary, Poland, Slovakia, Switzerland and Ukraine. We depict this subset of the full table for sake of lucidity. Even taking into account the in part significantly different gross domestic products, these eight contiguous countries out of 41 are of particular interest due to their geographic location, and plenty of anecdotal evidence about the role illicit trade plays there.

Table 2: Average Cost of Illicit Trade in Terms of GDP Growth Foregone[28]

VARIABLES	(1) Cost (€)	(2) Cost (% GDP)
Austria	€63,656,000.00	0.037449
Czechia	€122,202,000.00	0.027156
Germany	€9,869,600,000.00	0.5483176
Hungary	€15,476,000.00	0.0034456
Poland	€427,780,000.00	0.6481524
Slovakia	€62,634,000.00	0.0139138
Switzerland	€767,960,000.00	0.2953726
Ukraine	€268,640,000.00	0.344414

4.4 Trends

Two trends are clear from these analyses. The first is that the costs of illicit trade tend to be higher in larger economies than small ones. This is intuitive – larger countries likely have larger absolute seizures (even if they do not have more seizures per capita) and, thus, experience higher costs. Similarly, foregone growth is significantly costlier for countries starting from a higher level of GDP. At the same time, however, the results also show that despite costing large amount, in absolute numbers, the costs of illicit trade are small in relative terms. In no focus country does GDP cost a country more than even half a percent of GDP. On average, across the list, the overall cost is about 0.22% of GDP but with significant variation within. In Poland, for example, according to our calculations illicit trade costs almost 0.65% of GDP; in Austria, the impact is over 17 times lower.

Second, we consider whether the costs of illicit trade are increasing or decreasing over time. To do so, for each country we simply plot a scaled transformation of the (absolute) cost of illicit trade each year over the available time series in each country. Results are shown in Figure 1 (for each country, individually) and, in overlay, in Figure 2. These graphs, generally, suggest that the costs of illicit trade have been fairly constant in most countries. In Germany, however, there has been a general – if very choppy – increase in the costs over time. In recent years, a similar trend seems to have emerged in Poland. While there are small blips in other countries, costs are almost identical at the beginning and end of the series. This suggests that the degree of illicit trade, and the costs of illicit trade, are quite stable in most countries. Where trends do emerge, they paint a picture of a situation that is, in a relative sense, getting worse.

27 To our knowledge, there are still hardly any comparable empirical studies on the costs of illegal trafficking whose figures could be compared with the figures given here for the purpose of a plausibility assessment. This is largely uncharted scientific territory. Existing literature tends to focus on tax evasion.

28 Note that we look at average figures here: the figures are not the costs of illicit trade in the most recent year divided through by GDP in the most recent year but, rather, the average cost of illicit trade since 1990 divided by the average GDP since 1990.

Figure 1: Cost of Illicit Trade (1990 – 2018) – Scaled

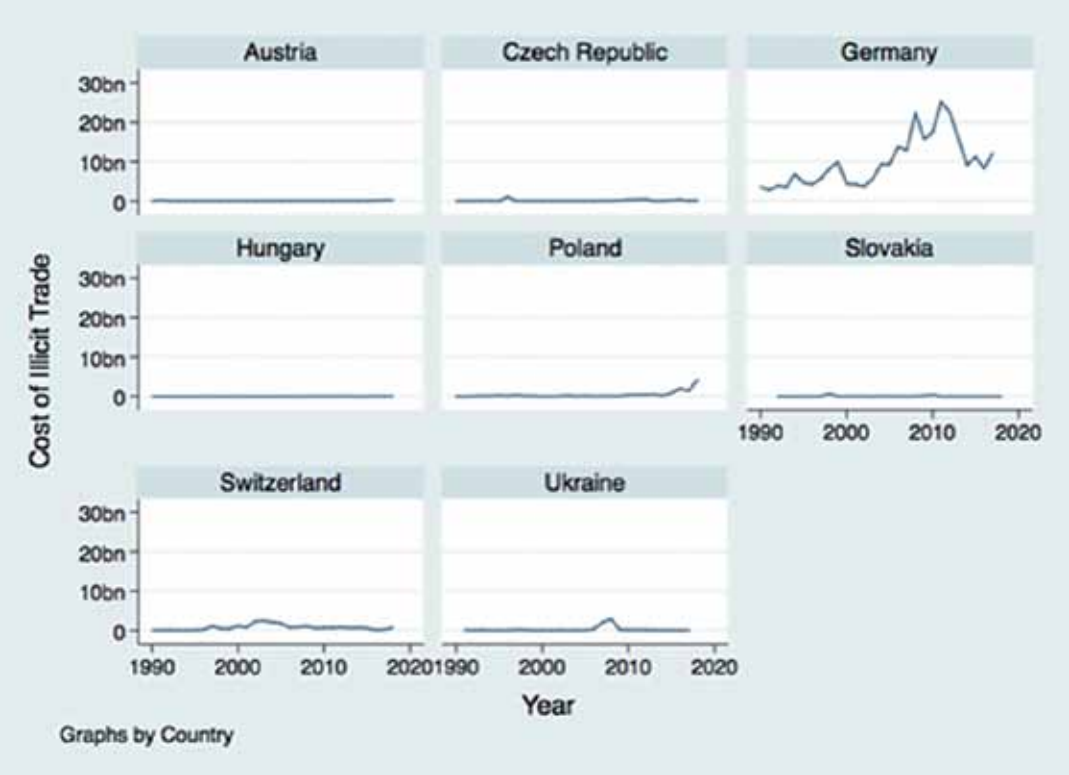
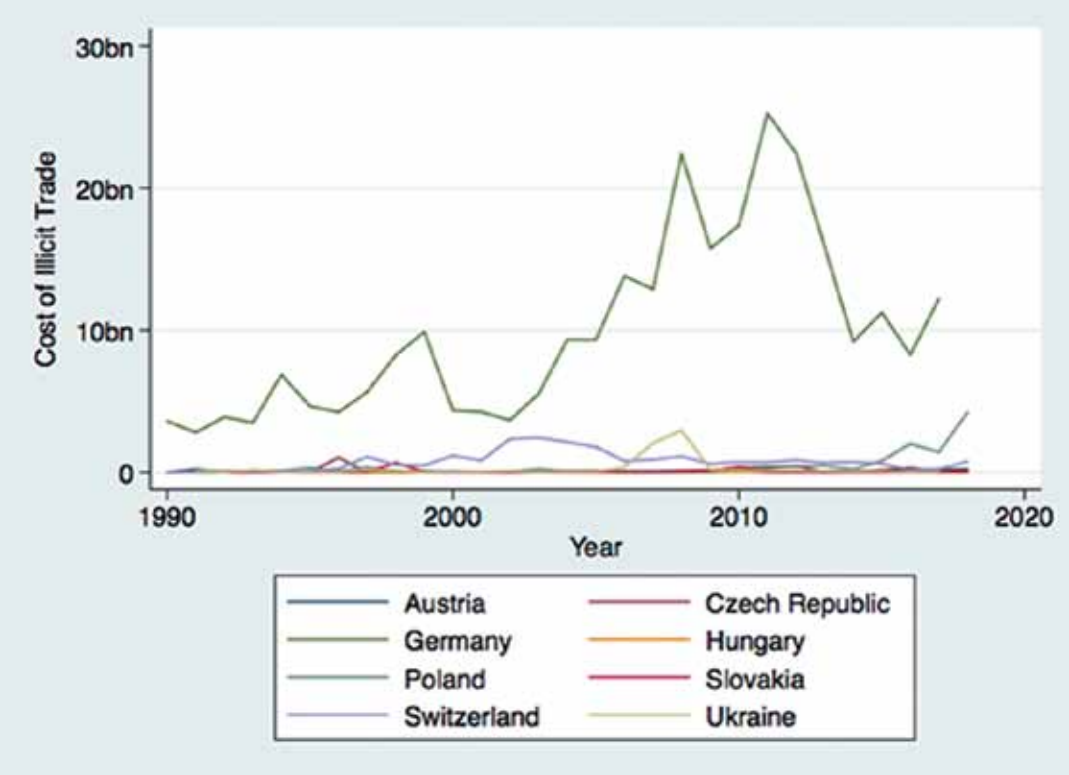


Figure 2: Cost of Illicit Trade (1990 – 2018) Overlay – Scaled



5 CONCLUSIONS

That illicit trade harms economies at the micro-level is no surprise – licit firms face reduced demand and have their intellectual property undermined. While macroeconomic effects are understood, they are mostly considered in terms of national accounting, specifically in terms of foregone taxation (and associated government spending capacity), or in terms of the impact of illicit trade on official statistics.

In this document, though, we conduct a series of analyses which suggest that these effects impact, more broadly, the macroeconomy. Specifically, we show that increases in **illicit trade have significant and negative effects on GDP growth, tertiary education enrolment and investment in research and development**. Perhaps surprisingly, these findings are not replicated when we look at the number of patents filed.

Despite strong statistical relationships, however, we note that these relationships sum up to fairly modest effects, when considered on the macroeconomic scale. On average, these figures sum up to just over 0.22 percent of GDP. In Europe, large macroeconomies are affected, and therefore this seemingly small number comes with severe real world losses - in nominal terms, costs in terms of foregone GDP can run to hundreds of millions, and even billions, of euro.

While this importantly confirms that illicit trade does measurable and notable harm to economies, the scales of these effects are significantly lower than those estimated from national-accounting-based processes. Historically, these processes have estimated costs of up to 3% of GDP. Our findings are a factor of 14 smaller than these costs, on average. This suggests that many of the losses shown by analysis of official national accounts find their way back into the economy in some way or other.

Despite the intuitiveness of these findings and our work to overcome the typical statistical biases that could arise in such analyses and to causally attribute these outcomes, we note a small number of limitations of the study.

First, drugs seizures might be an imperfect proxy for illicit trade more broadly and our results should be understood in that context.

Second, our work has a relatively limited geographic focus, partly enforced by the domains of the project and partly by data availability weaknesses. Given a focus on, comparatively, rich European countries, there is no guarantee that the structure of the illicit demand in our sample is the same as it is globally. Results, therefore, should be understood as pertaining to relative differences within Europe, rather than absolutely differences across the globe. Illicit trade furthermore carries goods from states of origin to states of consumption via transit states, and states can also have several of these roles. Depending on the type of state, shadow trade has very different effects on the population - and the political consequences must also differ. We can only take this into account to a limited extent in our quantitative analysis due to the available data.

Finally, we note that illegal drugs trade is a market that is, by its very definition, illegal. Demand for illegal drugs, therefore, might exhibit structural differences to other forms of illicit demand for goods of a different nature. Of course, there is the aspect of physical and psychological addiction, which significantly influences the demand of many consumers[29]. They cannot easily do without the product or switch to another one. In other markets (e.g. for counterfeit designer goods), the good itself is legal, even if the counterfeit good is illicit. Those who wish to consume illegal drugs have no option but to purchase on illicit markets. Those who seek counterfeit goods, on the other hand, face a choice between purchases in licit and illicit markets. The market for counterfeit goods tends to follow the operating principles of the legal economy. Again, results should be understood in this context.[30]

29 And, of course, it negatively affects the human capital of the affected labor force.
30 Regarding the assumptions why trade in illegal drugs, and drug seizures, might be a decent proxy for illicit trade in general, see pp. 3f., and 6.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6 IMPLICATIONS

We note six key domains in which these results of our quantitative analysis sit:

• First, the costs of illicit trade derived from this approach are at a cursory glance lower than those estimated from national-accounting-based approaches. It must be kept in mind here, though, that – focusing on growth, tertiary education enrolment and R&D expenditure – we look at an accumulating problem here. All three dimensions capture dynamic effects, which perpetuate into the future with compound interest, as it were. National-accounting-based approaches tend to give a snapshot of the annual situation, in a manner of speaking in terms of size of stock. Education and R&D expenditures, of course, only look at a small part of the overall picture anyway.

• Second, this carries the implication that at least some of the money exchanged in a primary illicit transaction finds its way back into the licit economy.

• Third, despite this, our results also confirm that illicit trade causes real economic losses that go beyond what is officially captured in national accounting.

• Fourth, while these real costs are lower than previous estimates, they still amount to losses of **hundreds of millions and probably even billions of euro in absolute terms.**

• Fifth, at least a part of this sum – as small as the sum may seem comparatively, it is huge in abso-

lute terms – is missing for economic and fiscal reasons in R&D and tertiary education, which in turn leads to adverse economic and social consequences. The resulting shortage of innovation and human capital in the medium term will particularly affect leading sectors and highly technical areas. Losses exist in multiple domains that, in the context of tertiary education enrolment and R&D expenditure, suggests increasingly pernicious costs in advanced economies; but the potential for longer-term damage in less advanced economies.

• Sixth, it could also be that the possibly limited suitability of the proxy variables used in our study leads to an underestimation of the total costs. Further studies and empirical research based on granular, spatially comprehensive data over many years and from other fields of trafficking are advised.

At the headline level, this derives the following takeaway: although the costs of illicit trade seem to be smaller than previous studies suggested, illicit trade should under no circumstances be dismissed as unimportant or negligible, as even impacts which are relatively small compared to other sectors of trade sum up to significant realised costs in absolute terms.

And it must be remembered that even in the overall economic picture, relatively low costs for individual sectors and, above all, for individual companies can turn out to be immense, can threaten the economic existence of the company, and can then also have negative effects on employment that can be felt regionally in the economy. Moreover, at least part of these costs correspond to the profits of criminal actors, from whom funding should be withdrawn whenever possible.

Our study suggests trade-offs between 1) the undesirable negative effects of illicit trade and 2) the expense of targeting. The latter must be properly considered and contextualised in the absolute costs involved, in order to optimise the efficiency of the use of funds.

Instead of focussing directly on these costs, however, our results note some particular domains in which adverse effects also arise. Activities might, additionally, have to be focussed on counteracting adverse effects in these domains.

In particular, noting both the adverse effects on R&D expenditure and tertiary education enrolment, governments might like to consider policies that focus on reducing harm in these domains. In the former case, this could include, for example, support for R&D within wider taxation systems, and the provision of other incentives to boost R&D expenditure, along with moves to more strongly protect intellectual property.

It might be that our results give cause to rethink the cost-benefit analysis of costly policies. Further research seems appropriate to test the effectiveness of various measures in a targeted manner.

On the one hand, the differences in the effects of regulation[31] in comparable countries should be analysed. If, for example, well-regulated states show the highest positive effects on innovation, this could lead to the conclusion that more pressure on countries of origin and transit might be appropriate, or to provide them with stronger incentives to improve regulation there. On the other hand, the magnitude of the actual impact of illicit trade should be carefully and impartially examined in further areas as well. You cannot manage what you do not measure.

In our view, there is a need for further research in these areas. This includes an improved statistical basis to measure the damage done by illicit trade.

A **key component of an effective global dialogue and policy response to illicit trade is to have a clear understanding** of the fiscal, economic, educational, and societal implications

31 Our methodological approach - based on fixed effects as it is - basically puts factors of influence like regulation into a black box and hides them from view. We therefore cannot derive any conclusions about the effectiveness or efficiency of regulation in any of the countries covered in the analysis.

of the problem. This also relates to longer-term sustainable development goals as articulated by the United Nations.

At present, neither the media nor the political establishment seem to be sufficiently aware of the significance of the problem of illegal trade for individual companies and the corresponding effects on regional employment and tax revenues, for entire production and trade sectors, and in absolute terms also for the national economy as a whole. **The problem of illegal trade and its negative consequences have so far been underestimated.** It is time for a public, academic and political debate as well as a corresponding focus in the resource management of state and economy on this topic.

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