sociological science

Supplement to:

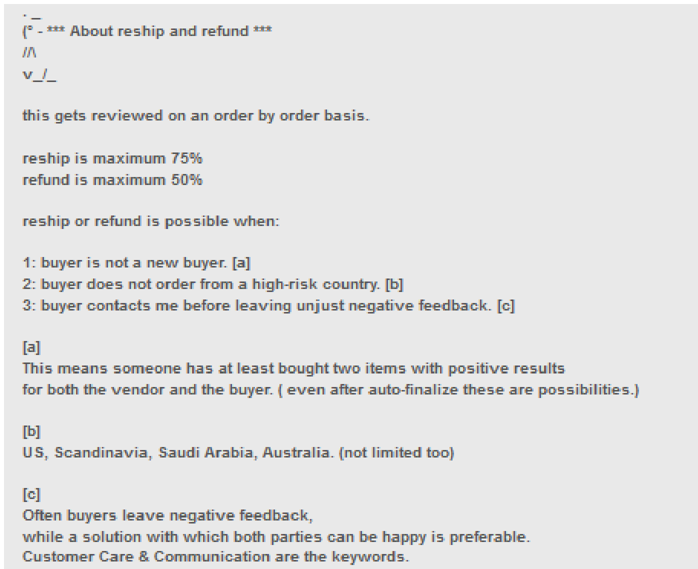
Holtkamp, William, Scott Duxbury, Dana L. Haynie. 2025. “The Risk Creates the Reward: Reputational Returns to Legal and Quality Risks in Online Illegal Drug Trade” Sociological Science 12: 1-25.

Online Supplement for The Risk Creates the Reward: Reputational Returns to Legal and Quality Risk in Online Illegal Drug Trade

Table of Contents:

Appendix A: Negative Feedback and Vendor Threats

Figure 3. Vendor Profile With Retaliatory Statement



```
. _
(° - *** About reship and refund ***
//\
v_/_
```

this gets reviewed on an order by order basis.

reship is maximum 75%
refund is maximum 50%

reship or refund is possible when:

1: buyer is not a new buyer. [a]
2: buyer does not order from a high-risk country. [b]
3: buyer contacts me before leaving unjust negative feedback. [c]

[a]
This means someone has at least bought two items with positive results
for both the vendor and the buyer. (even after auto-finalize these are possibilities.)

[b]
US, Scandinavia, Saudi Arabia, Australia. (not limited too)

[c]
Often buyers leave negative feedback,
while a solution with which both parties can be happy is preferable.
Customer Care & Communication are the keywords.

Figure 3 presents an example of a vendor profile that describes their policies for refund and reship of intercepted or otherwise lost orders, including retaliatory policies for buyers who leave negative feedback. In this case the vendor explicitly states that leaving negative feedback prior to contacting them and working towards a solution will result in no reship or refund being issued.

Appendix B: Size in Grams Discussion and Sensitivity Checks

Models 6 and 7 in table 3 show results of our key models that use log price per microgram, as a measure of price per size, rather than log price as the dependent variable. Price per size as a dependent variable is a standard approach to take into account the volume of a sale when the drugs under analysis are limited in scope and authors are able to stratify models by drug. The ability to stratify models is key to a price per size dependent variable as the meaning of a sale size is highly variable between drugs. To highlight the scale differences, herbal marijuana is commonly sold by the ounce, which is about 28 grams, and LSD is sold by the microgram. One ounce is approximately 28,000,000 micrograms. Comparisons between these drugs in terms of price per size is difficult as the measurement of price per size is incommensurate between drug types. The common solution to this is to stratify models by drug type such that comparisons are made within category. Moeller, Munksgaard and Demant, for example, stratify models by herbal cannabis, hashish which is a cannabis resin, and cocaine (2021). The stratification is useful in this case because while both herbal cannabis and hashish are forms of cannabis, one gram of hashish and one gram of cocaine are relatively much larger quantities of product than one gram of herbal cannabis.

The same strategy can be seen used by Munksgaard and Tzanetakis (2022) who stratify by cannabis, cocaine, and heroin; Rosenblum, Unick, and Cicarone (2014) and Rosenblum et al. (2014) limit analysis to heroin only; Caulkins and Padman (1993) stratify by cannabis type across imported marijuana, domestic marijuana, sinsemilla which is un-pollinated seedless female cannabis, and hashish. Wilkins et al. (2020) use a similar approach and both stratify their models by drug type across methamphetamine, cannabis, ecstasy, and LSD, and vary the denominator of the price per size variable by type where methamphetamine is in grams, cannabis in ounces, ecstasy by pill, and LSD by tab. Przepiorka (2017) does not stratify but limits analysis to weed, hashish, cocaine, ketamine, MDMA, heroin, and meth while dropping all non-standard size units to increase measurement coherence across types. Our data have 10 top level drug categories, with large size differentiation between them, and potential for substantial differentiation within each category. Stratification solves the issue of price per gram comparisons, however if we stratify our key independent variable of prescription manufacturing becomes non-estimable as it requires a jointly estimated model. It is only when comparing across the drug types that prescription manufacturing's variation is able to emerge.

A dependent variable of price per size across all drug types estimated concurrently on our data is subject to a considerable amount of measurement error due to the incommensurability of the different drug types. Stratification, the primary strategy for solving this, eliminates a key variable of interest. Nonetheless, size of sale is a critical variable to account for when considering pricing. To solve this, in addition to inclusion of size in grams as a control variable in our primary models, we additionally include models 8 and 9 in Table 3 which interact our drug category variable with size of sale in grams as a control variable. This still takes into account both the size of the sale as well the different meanings of sizes as they vary across drug types. In addition, we include models 6 and 7 for the sake of completeness which assess log price per microgram as the dependent variable. Analysis must be done per microgram rather than gram due to the large size differences between sales, which range from 100 micrograms to four pounds, and the required log transformation

Models 8 and 9 use log price as the dependent variable and interact drug type of size in grams. Model 8 assesses the interaction of our UN Schedule legal risk variable with our reputation measures, and model 9 assesses the interaction of our prescription product quality risk variable with our reputation measures. Models 8 and 9 show little change from models 3 and 4. The sign remains negative on the primary effects of numeric and discursive reputation across both models 8 and 9 and attains statistical significance in model 9, however the effect size of numeric reputation in model 9 decreases by over 90% and the effect size of discursive reputation decreases by 50%. While the effect is statistically significant in model 9, it is substantively much smaller. The interactions of numeric and discursive reputation with our legal risk and prescription indicators are substantively unchanged in models 8 and 9.

Models 6 and 7 change the dependent variable from log price to log price per microgram. Model 6, which examines the interaction between legal risk as measured by UN schedule and our reputation variables, shows little change from model 3. Legal risk shows no coherent interaction with either numeric or discursive reputation. Model 7, which examines the interaction between our product quality risk as measured by our prescription indicator, does experience some change from model 4. The interaction with discursive reputation retains its direction and significance, which follows our prediction that non-prescription drugs gain more from reputation than prescription drugs. The interaction with numeric reputation however loses its significance. We interpret this as an artifact of measurement error due to the price per microgram dependent variable. We find it unlikely that when interpreting the primary effect and interaction effects of numeric and discursive reputation, increases in reputation would decrease the price overall that vendors are able to sell their goods at per size.

Table 3. Fixed Effect Models of Drug Transactions Sensitivity Checks, Price Per Microgram and Drug Type x Size in Gram interactions, *Silk Road 3.1* January, 2017-February 2018.

	Model 6	Model 7	Model 8	Model 9
	Log Price Per Microgram, Legal	Log Price Per Microgram, Rx	Log Price, Legal, Drug Type x Size in Grams	Log Price, Rx, Drug Type x Size in Grams
Numeric Reputation	-0.006	-0.000	-0.004	-0.007*
	(0.006)	(0.004)	(0.005)	(0.003)
Discursive Reputation	-0.013*	-0.028***	-0.000	-0.007***
	(0.005)	(0.002)	(0.004)	(0.002)
Non-Prescription	-1.625***	-2.217***	-0.453*	-1.297***
	(0.257)	(0.404)	(0.188)	(0.297)
UN Schedule, Low Risk	3.142***	2.391***	0.952*	0.412***
	(0.585)	(0.109)	(0.427)	(0.084)
UN Schedule, Medium Risk	1.748**	2.354***	0.238	0.939***
	(0.548)	(0.184)	(0.403)	(0.139)
UN Schedule, High Risk	1.420**	1.888***	0.737	1.024***
	(0.537)	(0.201)	(0.395)	(0.152)
Months Active on Market	-0.025	-0.038	0.141***	0.141***
	(0.053)	(0.052)	(0.038)	(0.038)
Opiate	0.392	0.372	0.381*	0.424*
	(0.251)	(0.250)	(0.183)	(0.183)

Heroin	1.049***	1.050***	-0.359***	-0.370***
	(0.064)	(0.064)	(0.054)	(0.054)
Meth	-0.449***	-0.481***	0.024	0.029
	(0.099)	(0.098)	(0.072)	(0.072)
Rx Stimulants	-0.592	-1.115***	0.634**	0.426
	(0.309)	(0.308)	(0.234)	(0.234)
Cocaine	1.235***	1.182***	0.646***	0.650***
	(0.096)	(0.094)	(0.070)	(0.069)
MDMA/Ecstasy	0.534***	0.538***	-0.136***	-0.140***
	(0.050)	(0.050)	(0.037)	(0.037)
Psychedelic	5.260***	5.300***	-0.151**	-0.150**
	(0.068)	(0.068)	(0.050)	(0.050)
Dissociative	1.252***	0.947**	-0.128	-0.184
	(0.295)	(0.288)	(0.217)	(0.213)
Other	0.849*	0.626	-0.352	-0.429
	(0.393)	(0.390)	(0.371)	(0.369)
Repeat Sale	-0.547***	-0.565***	-0.010	-0.018
	(0.049)	(0.049)	(0.036)	(0.036)
Cumulative Sales	0.000	0.000	-0.000*	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Canada	0.065	0.188	-0.397***	-0.337***
	(0.134)	(0.133)	(0.098)	(0.098)
Netherlands	-0.616***	-0.549***	-0.612***	-0.588***
	(0.088)	(0.086)	(0.064)	(0.063)

United Kingdom	-0.692***	-0.655***	0.087	0.112
	(0.101)	(0.100)	(0.074)	(0.074)
Europe	-0.046	-0.009	-0.928***	-0.894***
	(0.141)	(0.140)	(0.103)	(0.102)
France	-1.438***	-1.434***	0.173	0.222
	(0.163)	(0.163)	(0.126)	(0.126)
Spain	-0.425	-0.368	-0.588	-0.546
	(0.980)	(0.978)	(0.714)	(0.715)
Unknown	0.291**	0.367***	-0.449***	-0.407***
	(0.104)	(0.103)	(0.076)	(0.076)
Worldwide	-0.344	-0.281	-0.884***	-0.849***
	(0.245)	(0.244)	(0.178)	(0.178)
Other	-1.829***	-1.976***	-0.279	-0.106
	(0.317)	(0.312)	(0.231)	(0.229)
Size in Grams	-0.006***	-0.006***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Non-Prescription x Discursive Reputation		0.025***		0.009***
		(0.002)		(0.002)
Non-Prescription x Numeric Reputation		-0.002		0.007**
UN Schedule Low Risk x Discursive Reputation	-0.019**		-0.016***	
	(0.006)		(0.004)	
UN Schedule	0.011*		0.001	

Medium Risk x Discursive Reputation				
	(0.005)		(0.004)	
UN Schedule High Risk x Discursive Reputation	0.006		0.003	
	(0.005)		(0.004)	
UN Schedule Low Risk x Numeric Reputation	-0.005		-0.003	
	(0.007)		(0.005)	
UN Schedule Medium Risk x Numeric Reputation	0.004		0.007	
	(0.006)		(0.005)	
UN Schedule High Risk x Numeric Reputation	0.004		0.002	
	(0.006)		(0.005)	
Opiate x Size in Micrograms			-0.002	-0.002
			(0.002)	(0.002)
Heroin x Size in Micrograms			0.255***	0.256***
			(0.014)	(0.014)
Meth x Size in Micrograms			0.000	0.000
			(0.001)	(0.001)
Rx Stimulants x Size in Micrograms			-0.156	-0.181

			(0.127)	(0.127)
Cocaine x Size in Micrograms			-0.001***	-0.001***
			(0.000)	(0.000)
MDMA/Ecstasy x Size in Micrograms			0.014***	0.014***
			(0.001)	(0.001)
Psychedelic x Size in Micrograms			-0.002	-0.003
			(0.003)	(0.003)
Dissociative x Size in Micrograms			0.319***	0.304***
			(0.030)	(0.030)
Other x Size in Micrograms			1.319	1.335
			(0.684)	(0.684)
AIC	29087	29039	22464	22491
BIC	29406	29329	22848	22847
Within R2	0.6034	0.6049	0.4255	0.4235
Constant	-7.520***	-7.743***	6.410***	6.737***
	(0.667)	(0.528)	(0.489)	(0.388)
Observations	10465	10465	10465	10465

Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Appendix C: Sensitivity Checks of Standard Measures of Reputation and Sales History.

Table 4 presents the results of sensitivity analyses that test the inclusion of a series of standard reputational measures. Model 10 takes into account that the effect of numeric reputation may be dependent on how many sales a vendor has made. A cumulative sum of sales cannot be interacted with our numeric EPP measure, as the cumulative sum of sales appears in the denominator of the EPP measure. To avoid this, we compute the sales quantile of each vendor to capture when within each vendor's history a sale occurs within. We then interact the sales quantile variable with numeric reputation. Model 10 shows non-coherent results and does not change our interpretations within table 2. Model 11 introduces a standard measure of reputation, the cumulative sum of positive and negative rated sales, to our model that tests the role of UN schedule as a measure of legal risk with our measures of reputation. Model 11 similarly does not change our interpretations of our results. Models 12 and 13 repeat these tests with discursive reputation, which result in no substantive changes to our models or interpretations of our results.

Table 4. Fixed Effect Models of Drug Transactions Sensitivity Checks Cumulative Sales Quantile, Positive and Negative Evaluation Counts *Silk Road 3.1* January, 2017-February, 2018.

	Model 10	Model 11	Model 12	Model 13
	UN Schedule Interactions, Numeric Reputation x Sales Quantile	UN Schedule Interactions, Positive and Negative Sales Count	Rx Interactions, Numeric Reputation x Sales Quantile	Rx Interactions, Positive and Negative Sales Counts
Numeric Reputation	-0.003	0.001	-0.007*	-0.004
	(0.005)	(0.005)	(0.003)	(0.003)
Discursive Reputation	-0.001	-0.001	-0.007***	-0.007***
	(0.004)	(0.004)	(0.002)	(0.002)
Non-Prescription Drug	-0.384*	-0.398*	-1.180***	-1.243***
	(0.193)	(0.193)	(0.305)	(0.307)
UN Schedule, Low Risk	0.839	0.902*	0.144	0.152
	(0.439)	(0.439)	(0.082)	(0.082)
UN Schedule, Medium Risk	0.176	0.144	0.795***	0.809***
	(0.413)	(0.413)	(0.139)	(0.139)
UN Schedule, High Risk	0.764	0.762	0.850***	0.862***
	(0.404)	(0.403)	(0.152)	(0.152)
Months Active on Market	0.160***	0.114**	0.161***	0.122**
	(0.041)	(0.038)	(0.041)	(0.038)
Positive Sales		-0.450*		-0.343
		(0.217)		(0.218)
Negative Sales		0.460*		0.329

		(0.224)		(0.225)
Opiate	0.354	0.348	0.389*	0.379*
	(0.188)	(0.188)	(0.188)	(0.188)
Heroin	0.142**	0.144**	0.129**	0.133**
	(0.048)	(0.048)	(0.048)	(0.048)
Meth	0.002	0.003	0.002	0.005
	(0.074)	(0.074)	(0.074)	(0.074)
Rx Stimulants	0.567*	0.561*	0.347	0.333
	(0.232)	(0.232)	(0.232)	(0.232)
Cocaine	0.625***	0.623***	0.620***	0.620***
	(0.072)	(0.072)	(0.071)	(0.071)
MDMA/Ecstasy	-0.050	-0.047	-0.054	-0.050
	(0.038)	(0.038)	(0.038)	(0.038)
Psychedelic	-0.188***	-0.181***	-0.188***	-0.181***
	(0.051)	(0.051)	(0.051)	(0.051)
Dissociative	0.166	0.166	0.118	0.117
	(0.221)	(0.221)	(0.217)	(0.217)
Other	0.196	0.199	0.112	0.108
	(0.295)	(0.295)	(0.294)	(0.294)
Repeat Sale	0.026	0.024	0.018	0.017
	(0.037)	(0.037)	(0.037)	(0.037)
Cumulative Sales	-0.000*		-0.000*	
	(0.000)		(0.000)	
Canada	-0.485***	-0.485***	-0.429***	-0.432***

	(0.101)	(0.101)	(0.100)	(0.101)
Netherlands	-0.683***	-0.678***	-0.667***	-0.664***
	(0.066)	(0.066)	(0.065)	(0.065)
United Kingdom	-0.017	-0.015	0.005	0.005
	(0.076)	(0.076)	(0.076)	(0.076)
Europe	-1.002***	-0.991***	-0.973***	-0.967***
	(0.106)	(0.106)	(0.106)	(0.106)
France	0.036	0.044	0.087	0.087
	(0.123)	(0.123)	(0.123)	(0.123)
Spain	-0.671	-0.623	-0.633	-0.592
	(0.736)	(0.736)	(0.737)	(0.737)
Unknown	-0.561***	-0.556***	-0.523***	-0.521***
	(0.078)	(0.078)	(0.078)	(0.078)
Worldwide	-0.980***	-0.977***	-0.956***	-0.959***
	(0.184)	(0.184)	(0.183)	(0.184)
Other	-0.392	-0.372	-0.242	-0.232
	(0.238)	(0.238)	(0.235)	(0.236)
Size in Grams	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)
Non-Prescription Drug x Discursive Reputation			0.008***	0.008***
			(0.002)	(0.002)
Non-Prescription Drug x Numeric Reputation			0.007*	0.007**
			(0.003)	(0.003)

UN Schedule, Low Risk x Discursive Reputation	-0.014**	-0.014**		
	(0.004)	(0.004)		
UN Schedule, Medium Risk x Discursive Reputation	0.001	0.001		
	(0.004)	(0.004)		
UN Schedule, High Risk x Discursive Reputation	0.003	0.002		
	(0.004)	(0.004)		
UN Schedule, Low Risk x Numeric Reputation	-0.005	-0.006		
	(0.005)	(0.005)		
UN Schedule, Medium Risk x Numeric Reputation	0.006	0.007		
	(0.005)	(0.005)		
UN Schedule, High Risk x Numeric Reputation	-0.000	0.000		
	(0.005)	(0.005)		
Cumulative Sales Quantile 2 x Numeric Reputation	-0.001		-0.001	
	(0.000)		(0.000)	
Cumulative Sales Quantile 3 x Numeric Reputation	-0.001		-0.001	
	(0.000)		(0.000)	
Cumulative Sales Quantile 4 x Numeric Reputation	-0.001		-0.001	

	(0.001)		(0.001)	
AIC	23093	23091.64	23114	23115
BIC	23434	23418	23426	23412
Within R2	0.3892	0.3891	0.3875	0.3872
Constant	6.321***	6.192***	6.776***	6.740***
	(0.501)	(0.505)	(0.399)	(0.404)
Observations	10465	10465	10465	10465

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix D: Marginal Predictions Plots of UN Scheduling

Figures 4 and 5 present the average marginal predictions of UN Scheduling levels for both quantitative numeric reputation and qualitative discursive reputation. The slopes across both forms of reputation show no coherent effect. In figure 4, low risk drugs have a negative slope across quantitative numeric reputation, which shows that low risk drugs gain less from increased reputation than unscheduled drugs. Further, medium risk drugs have a steeper slope than high risk drugs. In addition, the confidence intervals of medium and high risk scheduled drugs overlap across the entirety of the range of numeric reputation. The overall incoherence of slopes and overlap of confidence intervals run counter to our predicted relationship. We find similar results in figure 5. Low risk drugs have a decreasing effect across qualitative, discursive reputation. Medium and high-risk drugs are effectively flat across discursive reputation and again overlap in their confidence intervals. These results also run counter to our predicted relationship and show no coherent relationship of legal risk and reputation.

Figure 4. Marginal Predictions of UN Schedule on Log of Sales Price by Quantitative Numeric Reputation, *Silk Road 3.1* January, 2017-February, 2018.

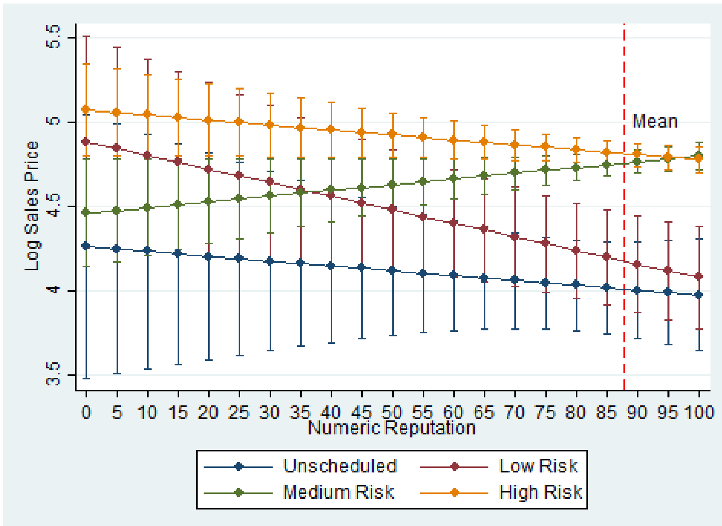
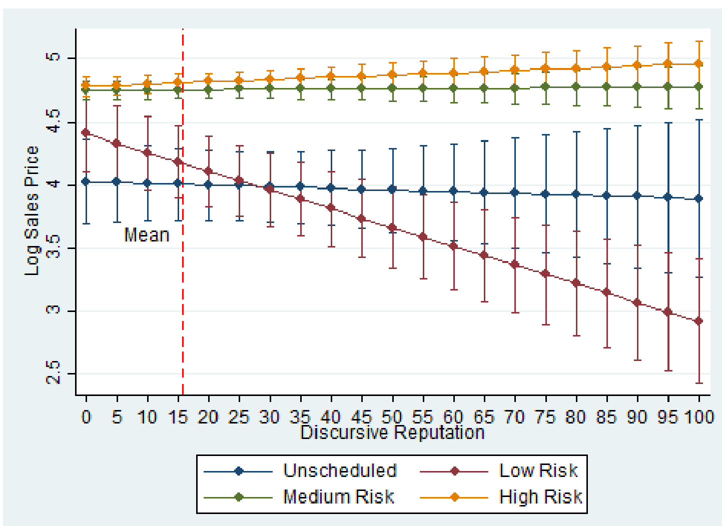


Figure 5. Marginal Predictions of UN Schedule on Log of Sales Price by Qualitative Discursive Reputation, *Silk Road 3.1* January, 2017-February, 2018.



References

Caulkins, Jonathan P., and Rema Padman. 1993. "Quantity Discounts and Quality Premia for Illicit Drugs." *Journal of the American Statistical Association* 88(423):748–57.

Moeller, Kim, Rasmus Munksgaard, and Jakob Demant. 2021. "Illicit Drug Prices and Quantity Discounts: A Comparison between a Cryptomarket, Social Media, and Police Data." *International Journal of Drug Policy* 91:102969. doi: 10.1016/j.drugpo.2020.102969.

Munksgaard, Rasmus, and Meropi Tzanetakis. 2022. "Uncertainty and Risk: A Framework for Understanding Pricing in Online Drug Markets." *International Journal of Drug Policy* 101:103535. doi: 10.1016/j.drugpo.2021.103535.

Przepiorka, Wojtek, Lukas Norbutas, and Rense Corten. 2017. "Order without Law: Reputation Promotes Cooperation in a Cryptomarket for Illegal Drugs." *European Sociological Review* 33(6):752–64. doi: 10.1093/esr/jcx072.

Rosenblum, Daniel, Fernando Montero Castrillo, Philippe Bourgois, Sarah Mars, George Karandinos, George Jay Unick, and Daniel Ciccarone. 2014. "Urban Segregation and the US Heroin Market: A Quantitative Model of Anthropological Hypotheses from an Inner-City Drug Market." *International Journal of Drug Policy* 25(3):543–55. doi: 10.1016/j.drugpo.2013.12.008.

Rosenblum, Daniel, George Jay Unick, and Daniel Ciccarone. 2014. "The Entry of Colombian-Sourced Heroin into the US Market: The Relationship between Competition, Price, and Purity." *International Journal of Drug Policy* 25(1):88–95. doi: 10.1016/j.drugpo.2013.10.003.

Wilkins, Chris, Jose S. Romeo, Marta Rychert, Jitesh Prasad, and Thomas Graydon-Guy. 2020. "Determinants of the Retail Price of Illegal Drugs in New Zealand." *International Journal of Drug Policy* 79:102728. doi: 10.1016/j.drugpo.2020.102728.