




## How Covid-19 affects prostitution markets in the Netherlands and Belgium: dynamics and vulnerabilities under a lockdown

Anahita Azam<sup>a</sup>, Stef Adriaenssens <sup>b</sup> and Jef Hendrickx<sup>c</sup>

<sup>a</sup>Faculty of Economics and Business, KU Leuven, Leuven, Belgium; <sup>b</sup>Faculty of Economics and Business, Research Centre for Economics (ECON), KU Leuven, Brussels, Belgium; <sup>c</sup>Research Centre for Mathematics, Education, Econometrics and Statistics (MEES), Brussels, Belgium

### ABSTRACT



We document how prostitution markets reacted to the Covid-19 induced lockdown mid-March 2020, based on unique data for the Netherlands and Belgium. Anecdotal evidence indicates that a general glut occurred. Data about who exited from the market indeed reveal a severe downturn. We also show a significant substitution toward less visible forms of sex work after the lockdown too. Furthermore, in the Netherlands compliance was more swift and thorough than in Belgium. For those who kept supplying sexual services, fixed effects hedonic regressions provide evidence that sex workers invested more time per transaction, but this did not translate in a higher income. Existing wage penalties for vulnerable age groups and ethnic minorities stayed in place, but were not exacerbated by the lockdown.


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### Introduction

This contribution aims to document the effects on prostitution markets and sex workers of the short-term political, economic and social fallout of the Covid-19 outbreak starting late 2019. The central research questions are (1) how the market for prostitution responded to the lockdown and (2) whether groups of people supplying sexual services were affected differentially. We focus on the Netherlands and Belgium, the so-called ‘Low Countries’, where the epidemic soared in the spring of

**CONTACT** Stef Adriaenssens  [stef.adriaenssens@kuleuven.be](mailto:stef.adriaenssens@kuleuven.be)  Faculty of Economics and Business, Research Centre for Economics (ECON), KU Leuven, Brussels Campus, Warmoesberg 26, Brussels 1000, Belgium

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2020, with an ensuing government-led lockdown mid-March. This lockdown brought parts of economic activities to a near standstill, with a decrease in individual consumption expenditures of  $-2.3\%$  in the Netherlands and  $-6.0\%$  in Belgium (Eurostat 2020). Apart from the health concern and the economic disruption, the pandemic also triggered serious social–psychological and political aspects, making it a multidimensional crisis.

We apply these questions on the specific group of mostly women that retrieve their income from an oft-stigmatized and predominantly informal economic activity: the selling of sexual physical services, usually called ‘sex work’ or ‘prostitution’. Overall, the lockdown brought prostitution to a mere standstill, with the estimated turnover dropping in March 2020 to 26.8% of that in February, and to a mere 2.7% in April.<sup>1</sup> The little we know of what happens when an economic crisis hits prostitution markets, seems to be a flexible and swift adaptation. Peršak (2014) relates this to the predominantly informal status of sex work, where the general decrease in jobs creates a push factor towards sex work to earn an income. This is particularly true for adaptable segments with a low entry cost, such as sex work on the streets or from home. The general literature on economic crises indeed finds that the informal sector acts as a ‘safety net’ for the formal economy. People are pushed out of formal jobs and compensate their income loss by joining the informal workforce (Loayza and Rigolini 2011). In the short run, however, sex work supply is not expected to expand, in particular because of the pandemic-ensued lockdown. What we expect instead, is a move toward the informal and less visible sex work segments, at the expense of the partially formal and more visible segments, such as clubs and brothels.

What are the relevant traits and institutional setup of prostitution in the Low Countries? First, the ever-increasing role of the internet in information provision gives researchers easier access to broader and large-scale data (Chan *et al.* 2019; Cunningham and Kendall 2011). Further, prostitution is not illegal *per se*, with a so-called ‘abolitionist regime’ in Belgium (David and Loopmans 2018), and a regulated sector in the Netherlands (Post *et al.* 2019). Estimates indicate that annual turnover is substantial, 500 million euro (2010) for the Netherlands (Kazemier *et al.* 2013) and 870 million euro (2015) for Belgium (Adriaenssens and Hendrickx 2019). Nonetheless, a large part

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<sup>1</sup>Own calculations. More information in the data section.

remains underground in both countries. The abolitionist regime in Belgium creates serious barriers to virtually any formal organization. In the Netherlands, a formal sector exists, alongside a large informal sector of premises and sex workers who have not obtained a permit (Nijkamp *et al.* 2014; van Wijk *et al.* 2014).

From the perspective of the decision to enter sex work, it is important that wages in prostitution are above the income opportunities in mainstream labour markets (Peng 2016). Part of this compensation is probably related to the increased burden and risks in sex work, for instance in terms of stigma (Della Giusta *et al.* 2009), violent victimization (Deering *et al.* 2014) or infections (Mc Grath-Lone *et al.* 2014). Within prostitution markets, risky services such as sex without a condom are also compensated (Adriaenssens and Hendrickx 2012; Muravyev and Talavera 2018). Nevertheless, risky practices are typically concentrated in workers who already suffer from a lower quality of work and life, in their legal status and lack of formal protection, or working hours (Adriaenssens *et al.* 2016). Within sex work generally, an ‘inverted gender wage gap’ is at work: women on average have the higher earnings. Mears and Connell (2016) argue that this wage premium is related to the devaluing of male bodies as compared to female bodies.

Overall, commercial sexual markets are strongly stratified. Earnings differ significantly in terms of personal and context characteristics. Hedonic price regressions generally conclude that some ethnicities, in particular those of Asian and African descent, suffer from a wage penalty (Adriaenssens and Hendrickx 2012; Cunningham and Kendall 2011; Peng, 2016). Further, younger sex workers earn more (Egger and Lindenblatt 2015), but the relationship between age and earnings might be convex: earnings are lower for the older and the youngest cohort. Finally, prostitution segments are also strongly stratified. One income study indicated that female street sex workers suffer a 30% penalty compared to sex workers working from home, net of personal features (Moffatt and Peters 2004). In the Netherlands and Belgium, the top income segments are escort and private reception (services in dwellings that look residential), then clubs, saunas and brothels; windows prostitution comes next; street prostitution, finally, bears the highest risk levels and lowest earnings (Adriaenssens and Hendrickx 2019).

The question then is: how did Covid-19 and the lockdown in general affect the functioning of prostitution markets, and did it affect subgroups differentially between countries, ethnicity, age or segment? In general, the

crisis seems to affect poorer and more vulnerable groups disproportionately (Clemens and Heinemann 2020; Decoster *et al.* 2020).

Does this also apply to vulnerable and low-income groups in prostitution markets: are they more often pushed out of business, or forced to accept lower prices? Platt *et al.* (2020) indeed fear that the precarious sex workers' situation may be exacerbated. Jozaghi and Bird (2020) point to increased risks for those in survival sex work after lockdowns, where workers in easily monitored segments (clubs, brothels, street and windows prostitution) are forced toward less secure locations and segments (escort, private reception). Kimani *et al.* (2020) point to increased risks if sex workers go to clients' homes, given the infeasibility of the typical risk reduction strategies. Earlier research supports that negative income shocks (Gong *et al.* 2019) and situations like the post-election violence in Kenya (LoPicallo *et al.* 2016) force sex workers to take more risks.

These contributions basically argue what we will term the 'countercyclical vulnerability thesis': typical vulnerabilities that already existed within the market of sex work, are intensified by a multidimensional crisis like Covid-19. This is in line with research indicating that after downturns, informal wages typically decrease relative to formal wages (e.g. Gasparini and Tornarolli 2009), while vulnerable workers are more often pushed out of formal jobs (Kahanec and Guzi 2017; Kelly and McGuinness 2015). This conjecture will be the working hypothesis in the present paper.

Based on this brief account, we aim to (1) document the overall market reaction to the lockdown and (2) test the countercyclical vulnerability hypothesis. Our core interest is in the exit and price mechanisms. The exit mechanism documents the size of the market and segments and groups surviving after the lockdown. The price analysis compares the transaction price before and during the lockdown.

We start with expected changes in *the market as a whole*. First, we expect the market to plummet in terms of total turnover and transactions (H1.1), potentially with a delay of several weeks after the official start of the lockdown. The price is expected to drop if the clients' willingness to pay decreases more than the sex workers' reservation wage, reflecting their need to gain an income (H1.2). One may also expect that sex workers respond to the altered health risk equation by servicing fewer clients for a longer period (H1.3). The infection risk is determined more by the number of clients than by the time spent with a client. Fewer clients would reduce the contagion risk, while the longer service

time could be partly compensated by a higher price. We also hypothesize that the longer service translates in a higher transaction fee (H1.4). Finally, we expect a sharper decrease in sectors that are more publicly visible (brothels, window prostitution, and other sexual services from recognizable buildings), because of the lower enforcement cost (H1.5).

We should point to a limitation in our analysis for the exit mechanism. We observe who keeps selling physical sex in Belgium and the Netherlands, and who does not. What sex workers do after they exit, remains undocumented. Some may move to work in other countries, or may substitute prostitution for alternative work, potentially other types of sex work. In the latter, the internet may provide sex workers an alternative, replacing prostitution for online sexual services (Sanders *et al.* 2018).

National differences in compliance with Covid-19 measures have been observed already (Becher *et al.* 2020). The big difference between Belgium and the Netherlands is, first and foremost, the difference in legal regimes. In the Netherlands, a regulated sector exists next to an informal one; in Belgium, all commercial sex is in a legal no-man's-land. One can expect that Dutch sex workers have a higher incentive to comply. More generally, there also are much higher levels of trust in official bodies in the Netherlands. Average trust in the legal system is 6.6 (Netherlands) versus 5.3 (Belgium) on ten points<sup>2</sup> (ESS Round 9 2018). Also, the Dutch comply more readily with regulations, for instance in fiscal matters (Poniatowski *et al.* 2018). This makes us expect more compliance in the Netherlands (H1.6).

The countercyclical vulnerability hypothesis, primarily, relates to the exit mechanism. We expect that vulnerable sex workers are more often pushed out of the market at a higher pace (H2.1). This effect depends on the lower willingness of clients to buy services from these groups during a crisis. We thus hypothesize a stronger price penalty for vulnerable sex workers *due to* the lockdown (H2.2).

## Background, data and estimation

### *Background: coronavirus measures*

As the coronavirus spread across Europe, governments enacted nationwide lockdowns. The Netherlands commenced an 'intelligent' lockdown on 15 March 2020, with the closure of all brothels, and a stricter lockdown on 23rd March, ordering all sex workers to stop working. The

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<sup>2</sup>Welch's *t*-test = -14.2; *p* < 0.0001.

authorities in Belgium ordered a nationwide lockdown for all non-essential services on 18th March. Sex work was subsequently banned in both countries until September, but both announced that sex workers would be allowed to resume activities, on 8th June (Belgium) and 1st July (Netherlands).

## Data

Websites with user-generated content about prostitution markets exist across Europe. The market leader in the Low Countries is [hookers.nl](http://hookers.nl) (Adriaenssens and Hendrickx 2012), with rich quantitative and qualitative data that provide a unique opportunity to observe changes in the mainstream prostitution markets during the early phases of the lockdown. It may be that clients who report and assess transactions, are recruited through mechanisms such as intrinsic motivation and repeated interactions. Thus self-selection bias may be a limitation of the data. Nevertheless, it probably does not hamper our analyses much, as the central analysis consists of comparisons over time for the same group.

When the national governments advised in early May that sex workers were not allowed to resume work until September, moderators of [hookers.nl](http://hookers.nl) removed all reviews related to transactions during the lockdown period (mid-March to May). We crawled data on 23rd April, immediately prior to the removal of these 'illegal' reviews, so the dataset provides an exclusive opportunity to document the commercial sex market as it functioned during this period.

Generally, users fill in a standardized review form on the forums to detail the encounter and characteristics of the sex worker. As a result, data are available about the price, duration, and the type of services provided, and the name, age, nationality and various aesthetic features of the sex worker. Some users also post textual comments without necessarily filling in a form.

Forums are arranged as a thread per sex worker, under which reviews and comments are posted. All the reviews were crawled, and reviews that listed a price and duration were considered a transaction. The moderators monitor activity and remove threads for sex workers who have been inactive in the past year, so only data from April 2019 to 2020 are included in the reported estimations to most accurately capture changes in the prostitution markets. Descriptive statistics in Appendices A1 and A2 present the main variables of interest.

To further check the representativeness of our dataset for mainstream prostitution markets, some demographics of sex workers are compared between *hookers.nl* and *kinky.nl*, a leading advertising website (Appendix A3). This before-lockdown comparison shows broad similarities, particularly in the age groups and the overall number of unique sex workers listed: 4824 through reviews versus 4084 through advertisements. As expected, advertisements mainly self-report as simply ‘European’, and not Eastern European as in the client-reported *hookers.nl*, potentially due to the stigma associated with the latter. The lower proportion of Asian sex workers is likely due to the underrepresentation of massage parlours in advertisements. Overall, beyond some expected differences between these sources (mostly self-employed escorts using advertising websites), the comparison confirms that these data describe the mainstream prostitution market quite accurately.

### **Estimation**

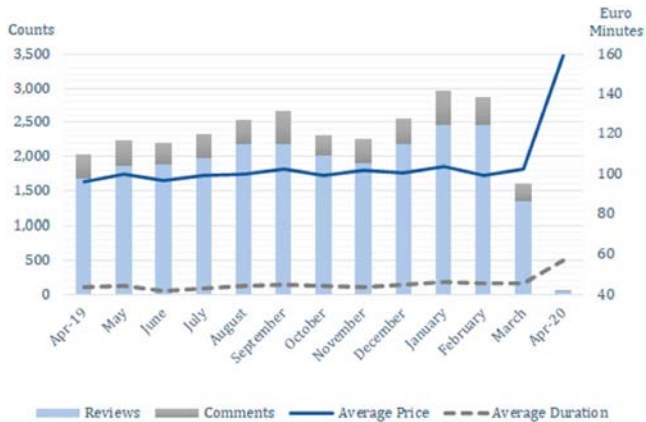
We develop two approaches in order to document who exits and show how transactions differ after the lockdown: chi-square tests and fixed effects regressions. The former test for changes in the distribution of categorical variables after the lockdown (Hypotheses H1.5, H1.6, and H2.1).

To test the price effects and penalties of the lockdown, we perform fixed effects hedonic regressions with the logarithm of the transaction price as the dependent variable. This approach is justified by the fact that we have several observations of transactions per sex worker, before and after the lockdown. Fixed effects regression control for *all* characteristics of the sex worker, observed and unobserved, thus isolating the effect of the lockdown event. The first model tests price change after the lockdown, under control of the duration of the transaction, the number of services provided and the characteristics of the sex worker (H1.2-4). The second model tests whether the effect differs between more and less vulnerable groups, by adding interaction effects with sex worker characteristics (H2.2). In all regressions, heteroscedasticity- and autocorrelation-consistent standard errors are used.

## **Results**

### **Descriptive results**

Figure 1 explores the year-to-year trend (April 2019–2020) of reviews and comments (counts), and prices and duration of transactions (averages).



**Figure 1.** Evolution of transactions – numbers (primary axis), averages price and duration (secondary axis).

Transactions, as an indication of market activity, show a clear decline after the lockdown (*H1.1*). Encounters approximately halved from 2468 in February to 1346 in March, and activity completely halted after 7th April. A focused look at March shows that the reduction in activity mainly takes place in the second half of the month (after the formal closing of sex work). This indicates only limited self-interested precautionary behaviour, and that the main reduction in activity was triggered by the imposed lockdowns.

As overall activity slowed down due to the outbreak and lockdowns, the inflation-adjusted average price<sup>3</sup> and the average duration increased.<sup>4</sup> The average price increased by around 10% between just before and after the lockdown. Subsequently, the average price continued to increase by another 46% from late March to early April, although only few transactions were reported. This does not necessarily imply higher rewards. The regressions following will show a selection effect, with higher-range prostitution surviving.

There is also an increase in the duration of the encounter during the lockdown<sup>4</sup> (*H1.3*), possibly due to a risk reducing strategy. Of course, this also affects prices given that the correlation between duration and prices is 70.2%. Alternatively, it might be that high-range sex workers, who also happen to provide longer services, are the ones who predominantly kept on working. The regressions will take that into account.

<sup>3</sup>Welch's *t*-test = -3.4917; *p* < 0.0003.

<sup>4</sup>Welch's *t*-test = -3.0574; *p* < 0.0012.



**Table 1.** Transactions before and during the lockdown.

|                              | Before (%) | During (%) | Change ( <i>p.p.</i> ) |
|------------------------------|------------|------------|------------------------|
| <b>Age</b>                   |            |            |                        |
| 18–20                        | 3.08       | 5.60       | 2.52                   |
| 20–25                        | 23.96      | 31.20      | 7.24                   |
| 25–30                        | 32.07      | 28.80      | –3.27                  |
| 30–40                        | 30.41      | 26.00      | –4.41                  |
| 40 plus                      | 10.47      | 8.40       | –2.07                  |
| <i>N</i>                     | 25,709     | 250        |                        |
| Chi <sup>2</sup>             |            |            | 13.8602***             |
| <b>Country</b>               |            |            |                        |
| Belgium                      | 32.46      | 40.98      | 8.62                   |
| Netherlands                  | 67.64      | 59.02      | –8.62                  |
| <i>N</i>                     | 28,006     | 266        |                        |
| Chi <sup>2</sup>             |            |            | 8.9260***              |
| <b>Ethnicity</b>             |            |            |                        |
| African                      | 2.66       | 2.07       | –0.59                  |
| Asian                        | 8.81       | 7.88       | –0.93                  |
| East European                | 34.91      | 31.12      | –3.79                  |
| South American               | 16.65      | 10.37      | –6.28                  |
| South European               | 5.26       | 9.54       | 4.29                   |
| West European                | 31.70      | 39.00      | 7.31                   |
| <i>N</i>                     | 24,102     | 241        |                        |
| Chi <sup>2</sup>             |            |            | 19.4858***             |
| <b>Segment</b>               |            |            |                        |
| Brothels, sex clubs & saunas | 19.75      | 12.03      | –7.72                  |
| Escort & private reception   | 30.01      | 56.77      | 26.76                  |
| Massage salons               | 8.47       | 6.77       | –1.71                  |
| Specialty                    | 14.41      | 12.78      | –1.63                  |
| Windows                      | 27.35      | 11.65      | –15.70                 |
| <i>N</i>                     | 28,006     | 266        |                        |
| Chi <sup>2</sup>             |            |            | 95.5794***             |

\*\*\*  $p < 0.01$ .**Exit: who remained active?**

Table 1 documents the frequency of occurrence in the sample before and after the lockdown, for the various segments, the country and features of the sex workers. As expected, the market share increases in independent and less publicly visible segments, such as escort or private reception (*H1.5*). These two segments have in common that sex workers are usually physically separated from other sex workers, unlike prostitution in window, brothels or massage segments, who lose market share. The straightforward explanation is the enforced closure of these establishments, and the intense policing of street sex work. This may be an indication of a strengthening of typical vulnerabilities, as sex workers are evidently inviting clients to private locations or visiting clients independently.

Furthermore, the biggest decline in terms of ethnicity is for those of South-American and Eastern-European descent (–6.28 and –3.79 pp,

respectively). We cannot directly test what these differences result from. The proportion of Western- and Southern-European active sex workers concurrently increased during the lockdown, and African and Asian sex workers, generally faced with a price penalty, do not appear to have had a significant change in market share (rejecting H2.1).

The greatest reduction in groups in this period was of those in the 30–50 age range. It is pretty clear that risks of complications and case fatality rates of Covid-19 increase strongly with age (Onder *et al.* 2020). It may thus be that sex workers who were more at risk, more often and intentionally stopped working. This result is in line with earlier prostitution research related to the sex worker's decision to have unprotected sex. For two prostitution markets there was evidence that a sex worker's willingness to accept risky sex decreased if the STD infection rate was higher in a certain location, indicating that sex workers' decisions are sensitive to the risk they run (Arunachalam and Shah 2013; Shah 2013).

Finally, there is a clear difference between the two countries in compliance to the lockdown. In Belgium, more market activity survives. This result is in line with hypothesis 1.6 and indicates some role of national differences in compliance with Covid-19 policies.

### *Price effects of the lockdown*

The results from the fixed effects hedonic pricing regressions in Table 2 document price effects of the Covid-19 lockdown. The baseline regression only controls for the constant effects of sex worker covariates, number of services and the duration of the interaction. The second regression introduces the effect of the lockdown. The first regression indicates an overall stability in the price of transactions during the lockdown, contradicting hypothesis 1.2.

The second regression indicates a slightly growing positive impact of longer durations of encounters on prices during the lockdown (H1.4), although the effect is borderline significant, and not very strong. That means that sex workers benefited more than before the lockdown from spending more time with their client. The first results already showed that they on average saw clients for longer (H1.3). Thus it appears that the extra time spent with clients partially offset the income penalty from the lockdown. As proposed earlier, such behaviour can be expected given the high risk associated with providing contact sexual services during a pandemic.

Finally, it appears that the general price penalties and premiums faced by different groups of sex workers remain intact during the lockdown,

**Table 2.** Fixed effects regression on the logarithm of prices.

|  | (1) Baseline model |         | (2) Interaction model |         |
|--|--------------------|---------|-----------------------|---------|
| Number of services                     | 0.011***           | (0.001) | 0.011***              | (0.001) |
| Duration (log)                         | 0.707***           | (0.015) | 0.709***              | (0.015) |
| Lockdown                               | 0.005              | (0.016) | -0.364**              | (0.168) |
| Lockdown × duration (log)              |                    |         | 0.068*                | (0.035) |
| <b>Lockdown × segment</b>              |                    |         |                       |         |
| Brothels, sex clubs & saunas           |                    |         | 0.112***              | (0.036) |
| Escort & private reception+            |                    |         |                       |         |
| Massage parlours                       |                    |         | 0.008                 | (0.082) |
| Windows                                |                    |         | 0.062                 | (0.056) |
| <b>Lockdown × age</b>                  |                    |         |                       |         |
| 18–20                                  |                    |         | -0.032                | (0.055) |
| 20–25+                                 |                    |         |                       |         |
| 25–30                                  |                    |         | 0.086**               | (0.044) |
| 30–40                                  |                    |         | 0.061                 | (0.048) |
| 40 plus                                |                    |         | 0.089                 | (0.059) |
| <b>Lockdown × ethnicity</b>            |                    |         |                       |         |
| Asian                                  |                    |         | 0.034                 | (0.110) |
| East European                          |                    |         | 0.007                 | (0.041) |
| South American                         |                    |         | 0.046                 | (0.040) |
| South European                         |                    |         | -0.019                | (0.041) |
| West European+                         |                    |         |                       |         |
| <b>Lockdown × country</b>              |                    |         |                       |         |
| Belgium                                |                    |         | -0.027                | (0.029) |
| Netherlands+                           |                    |         |                       |         |
| Sex worker fixed effects               | Yes                |         | Yes                   |         |
| Appearance main effect                 | Yes                |         | Yes                   |         |
| Hygiene main effect                    | Yes                |         | Yes                   |         |
| Lockdown × appearance                  | No                 |         | Yes                   |         |
| Number of sex workers                  | 5561               |         | 5561                  |         |
| Number of transactions                 | 23,791             |         | 23,791                |         |
| $R^2$                                  | 0.58               |         | 0.58                  |         |
| $F$ statistic                          | 282.99***          |         | 95.14***              |         |
| $F$ statistic (interaction terms only) |                    |         | 1.64**                |         |

+ Reference categories.

Cluster robust standard errors in parentheses: \* $p < 0.10$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ .

but do not increase, thus rejecting the countercyclical vulnerability hypothesis ( $H2.2$ ).

Overall, there appear to be two factors at play indicating that risks may be magnified: the shift of market share towards independent sex work, and the relative stability in the proportion of vulnerable ethnic groups alongside the survival of more local sex workers from Western (and to a smaller extent Southern) Europe.

## Conclusion and discussion

This contribution builds on unique observations of commercial sexual transactions in the prostitution markets of the Netherlands and Belgium, after a lockdown was enacted due to the Covid-19 pandemic.

We develop hypotheses on how the market reacts, building on knowledge from earlier crises, the functioning of prostitution markets before the Covid-19 crisis and the emerging Covid-19 literature.

The market responds as expected by reduced transactions with a considerable push toward less visible forms of sex work. This might entail a perverse effect of the lockdown, pushing the sector toward less visible and potentially riskier commercial sex. Also, the difference in turnover reduction between the Netherlands and Belgium, seems to mirror the differences in their citizens' general tendency to comply with regulations and trust the government. More importantly, it might indicate that having a regulated prostitution scene, which exists in the Netherlands, can possibly increase the control by the polity over such a sector.

In general, the effects on different groups within the population of sex workers are less marked. Existing inherent vulnerabilities persist, but are not strengthened, after the lockdown went into effect. We expected stronger effect on vulnerable groups, but this did not occur. For instance, we hypothesized that weaker ethnic and age groups, who already suffer from a wage penalty, would be hit harder by means of a decrease in income opportunities relative to the stronger groups. Ethnic minorities, very young and older sex workers, keep on suffering from wage penalties, but they were not exacerbated by the crisis. In short, existing inherent vulnerabilities are reproduced, but not strengthened, after the lockdown went into effect. One potential explanation may be that the flexibility and mobility of many sex workers allowed them to choose the most rewarding activity, be it remaining in the same place, move to another segment or country, or even by switching to other (sex) work, for instance online work. Another explanation could be that we only study the earliest phase of the economic crisis, indicating a possible time lag for the strengthening of countercyclical vulnerabilities. Although we do not see the strengthening of vulnerabilities yet, we document an increase in some risk factors. In combination with the expected exacerbation of precariousness for sex workers, subsequent research may identify the lag between the onset of the Covid-19-pandemic and ensuing effects on prostitution markets.

Future research should address what happens to sex workers that stop selling physical sex. Did they easily find alternative income generating opportunities, against a general economic downturn? Anecdotal evidence seems to indicate some substitution toward online sexual services. The size and success in terms of income and client contact of this movement, and the core agents nevertheless remain unclear.

Finally, caution is warranted in terms of the data source. One should critically assess online data sources, in terms of which segments of sex work they actually represent, and which types of bias they risk being subject to. That being said, online sources have become a promising avenue of data collection about sex work, as long as one is mindful of potential bias: there is no reason not to seize that opportunity.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Notes on contributors

*Anahita Azam* recently received a Master of Economics from KU Leuven. Her research focus is in applying quantitative methods to study the dynamics of prostitution markets in Belgium and the Netherlands. Prior to that, she received a Bachelor of Commerce from the University of Toronto's Rotman School of Management, and has professional experiences in commercial banking, public ministry, and private alternative funds, allowing her to develop expertise about the Canadian financial sector.

*Stef Adriaenssens* is a sociologist teaching courses in Economic Sociology and in Policy at the Faculty of Economics and Business (Brussels campus of KU Leuven). His core research interests involve underground, informal, and poorly protected economic activities and groups. More specifically, he published about topics as diverse as tax evasion, black market work, and activities and groups that are often hardly recognized as work(ers), such as begging and prostitution.

*Jef Hendrickx* is Mathematician and Statistician. His teaching includes Statistics, Econometrics, Quantitative Methods and Research Methodology. His main research interests include the fields of informal and underground economies, and hard to reach populations and behaviour. Methodologically his core interests are in mixed and multilevel method modelling, and those (big) data and techniques that allow for the analysis of sensitive, informal and underground activities.

### ORCID

*Stef Adriaenssens*  <http://orcid.org/0000-0001-9357-6575>

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## Appendix

**Table A1.** Descriptive statistics of the discrete variables.

|                    | N      | Mean   | St. dev. | Min. | Max. |
|--------------------|--------|--------|----------|------|------|
| Price              | 23,791 | 107.55 | 81.09    | 20   | 2543 |
| Duration (minutes) | 23,791 | 44.59  | 27.12    | 15   | 150  |
| Number of services | 9016   | 5.74   | 3.15     | 1    | 28   |

**Table A2.** Descriptive statistics of the categorical variables.

|                          | Fixed effect |           | Lockdown interaction |           |
|--------------------------|--------------|-----------|----------------------|-----------|
|                          | Freq.        | Prop. (%) | Freq.                | Prop. (%) |
| <b>Appearance rating</b> |              |           |                      |           |
| Above expectations       | 4820         | 17.05     | 44                   | 16.54     |
| As expected +            | 5329         | 18.85     | 59                   | 22.18     |
| Disappointing            | 1480         | 5.23      | 23                   | 8.65      |
| Missing                  | 16,643       | 59        | 140                  | 52.63     |
| <b>Age</b>               |              |           |                      |           |
| 18–20                    | 807          | 2.85      | 14                   | 5.26      |
| 20–25                    | 6239         | 22.07     | 78                   | 29.32     |
| 25–30                    | 8317         | 29.42     | 72                   | 27.07     |
| 30–40                    | 7884         | 27.89     | 65                   | 24.44     |
| 40 plus                  | 2712         | 9.59      | 21                   | 8.00      |
| Missing                  | 2313         | 8.15      | 16                   | 6.00      |
| <b>Country</b>           |              |           |                      |           |
| Belgium                  | 9172         | 32.44     | 109                  | 40.98     |
| Netherlands              | 19,100       | 67.56     | 157                  | 59.02     |
| <b>Ethnicity</b>         |              |           |                      |           |
| Asian                    | 2143         | 7.58      | 19                   | 7.14      |
| East European            | 8490         | 30.03     | 75                   | 28.20     |
| South American           | 4039         | 14.29     | 25                   | 9.40      |
| South European           | 1290         | 4.56      | 23                   | 8.65      |
| West European+           | 7734         | 27.36     | 94                   | 35.34     |
| Other                    | 4576         | 16.19     | 30                   | 11.00     |
| <b>Hygiene rating</b>    |              |           |                      |           |
| Excellent                | 10,241       | 36.22     | 99                   | 37.22     |
| Nice and fresh+          | 6960         | 24.62     | 44                   | 16.54     |
| Could be better          | 2345         | 8.29      | 49                   | 18.42     |
| Missing                  | 8726         | 30.86     | 74                   | 27.82     |

(Continued)



**Table A2.** Continued.

|                              | Fixed effect |           | Lockdown interaction |           |
|------------------------------|--------------|-----------|----------------------|-----------|
|                              | Freq.        | Prop. (%) | Freq.                | Prop. (%) |
| <b>Segment</b>               |              |           |                      |           |
| Brothels, sex clubs & saunas | 5564         | 19.68     | 32                   | 12.03     |
| Escort & private reception   | 8556         | 30.26     | 151                  | 56.77     |
| Massage salons               | 2391         | 8.46      | 18                   | 6.77      |
| Windows                      | 7692         | 27.21     | 31                   | 11.65     |
| Others                       | 4069         | 14.39     | 34                   | 12.78     |

+ Reference categories.

**Table A3.** Comparison of sex worker demographics from hookers.nl and kinky.nl.

|                            | Prop. (%) |       |
|----------------------------|-----------|-------|
|                            | Hookers*  | Kinky |
| <b>Age</b>                 |           |       |
| Under 25                   | 26.43     | 24.88 |
| 25–30                      | 31.31     | 31.98 |
| 30–40                      | 29.73     | 28.75 |
| 40 plus                    | 12.54     | 14.40 |
| <i>N</i>                   | 4619      | 4084  |
| <b>Ethnicity</b>           |           |       |
| African                    | 2.84      | 2.88  |
| Asian                      | 8.92      | 3.99  |
| European                   |           | 22.39 |
| East European              | 35.92     | 5.76  |
| Netherlands                |           | 36.47 |
| South American             | 19.89     | 25.42 |
| South European             | 6.31      | 3.08  |
| West European+             | 26.12     |       |
| <i>N</i>                   | 4360      | 3957  |
| <b>Segment</b>             |           |       |
| Escort & private reception | 43.64     | 93.41 |
| Massage                    | 12.58     | 4.46  |
| Specialty                  | 12.77     | 2.06  |
| Windows                    | 31.01     | 0.07  |
| <i>N</i>                   | 4824      | 4084  |

\* Segments of brothels, sex clubs, and saunas were omitted.

\* Older than 40.