Metrics of Wickedness: On the connection between murdering human beings and slaughtering animals

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ABSTRACT

Building on a thought that had been discussed for many centuries but theoretically framed only in the 20th century, this paper suggests that the extent and development of wickedness towards animals (animal production as described by Ovid) may correlate with wickedness towards human beings (homicide rates). This paper tests this hypothesis quantitatively, using high-quality data from 78 countries and covering the period between 1990 and 2021. The analysis shows that the murder rate in a country can be explained not only by GDP per capita and time but also (a) for male victims – by the development of livestock and (b) for female victims – by both livestock production development and the extent of aquaculture. Given the well-established connection between domestic violence and animal cruelty, the new correlations found in this paper provide evidence that – ethically and socioeconomically – killing humans and non-human animals have much more in common than previously expected.

Keywords: killing, human behavior, intentional homicides, animal production, GDP

INTRODUCTION

Veganism and the protest against killing farmed animals arguably is one of the most significant movements of our age (Bertuzzi, 2017; Linzey and Linzey, 2018; Gheiman, 2021). While there are health-related (Dinu et al., 2017; Radnitz et al., 2020; Marrone et al., 2021) and environmental (Chai et al., 2019; Rabes et al., 2020; Choreziak and Rzymski, 2025) arguments for veganism, ethicists make compelling cases against the legitimacy of killing sentient beings such as chicken, pigs and cows. Particularly rights-based scholars like Cochrane (2012), Baranzke (2016) and de Oliveira et al. (2025) often depart from the human right to life and demonstrate coercive reasons to extend this right to other sentient beings. This claim has not permeated mainstream society. There is no single country in the world in which the killing of farmed animals is outlawed, and at the same time there is no single country where the killing of humans by individuals is allowed except in cases of self-defense or wartime actions by military personnel. This fundamental difference in the legal judgement stems from deeply rooted perceptions about the difference whether humans or other animals are killed. This distinction even extends to language, where killing humans is typically referred to as "murder," whereas killing non-human animals is commonly called "slaughter." As a result, the entire literature on homicides is totally decoupled from the literature of the so-called value chain for animals. Accepted factors for predicting the rate of homicides in a society are inequality and poverty (Norris, 2025), but also variables like financial inclusion (Gazilas, 2024), divorce rates (Tcherni, 2011), educational attainment (Croci and Gomez, 2024) and government effectiveness (Chainey et al., 2021).

Nevertheless, over modern history several writers have prepared that the act of slaughtering animals for human consumption and the act of murdering fellow humans do have some relationship. In 1973, Singer began his seminal book “Animal Liberation” by the remark that “’animal liberation’ may sound more like a parody of other liberation movements than a serious objective”. Today, the claim that the number of farmed animals killed may contribute to explain the level of violence against humans in a country may also sound like a parody on the vegan movement. But what if there is an underlying variable that reflects how we respect the lives of others? Is it so absurd to think that societies whose citizens kill animals with modesty and care are also more cautious about killing other people? And that countries in which the consumption of a steak is unburdened by ethical considerations may also be more willing to "solve" conflicts through murder? This paper approaches these questions both theoretically and empirically.

In the history of treating the killing of sentient beings as a single phenomenon, regardless of whether the animals killed were human or not, it has been an important first step to use the language of legal disputes. Ovid's Metamorphoses, written around 0 CE and one of the most popular books over many medieval centuries in Europe, is an impressive example for that. Towards its end, it lends the Greek mathematician and philosopher Pythagoras its voice and let him promote a vegetarian diet. The text takes an evolutionary perspective, claiming that humans started with a plant-based diet, but that they then discovered the edibility of the wild beasts they had killed, calling not the killing itself, but the consumption of the meat, *sceleri*, a crime. This may well have been the first use in human history of a legal term to describe the killing of a non-human animal. From there, "the wickedness spread further" (Ovid, 6, ch.15, 106), having the pig as the first animal raised for meat production after violent death. Sissa (2023) emphasizes in her analysis of this part of the text that Ovid takes an animistic perspective, comparing the different species by an umbrella view.

Turning to the medieval era, Hughes (1996) calls an innovation to extend the proclamation of the gospel from human to non-human animals, as practiced by Francis of Assisi. The teachings of Assisi contain points that may be among the first non-speciecist texts: "Obedience subjects a man/ to everyone on earth./ And not only to men,/ but to all the beasts as well/ and to the wild animals,/ So that they can do what they like with him,/ as far as God allows them" (Francis of Assisi, 1226/ 1999). Crane (2021) claims that Francis's choice not to eat animals offered as food was known and accepted among his early followers, but more importantly, she also recalls him speaking of his "brother lamb", weakening borders between species.

Tolstoy (1884/ 1999) finally made an important step to contextualize the act of killing sentient beings and characterizing it as unnatural: " Who would dispute that, not to mention torturing or killing a human being, but even torturing a dog, killing a chicken, or a calf is repugnant and painful to human nature?". Tolstoy then goes on to describe how human institutions would enable us to enter the process of killing. This quote is certainly speciecist, as it draws a clear hierarchy from humans to dogs to chickens, but it may be the first to clarify the phenomenological parallels between killing human and non-human animals. Interestingly, the social movements of the 20th century shortened and biased this claim to a false Tolstoy quote – "as long as there are slaughterhouses, there will be battlefields" – that is filling the internet to date.

In today's environment, the concept of the interrelatedness between killing humans and killing other animals has become sufficiently credible to test it. Redgate (2025) is showing how fiction is paving the way to this insight, for examples by turning around the relationship so than non-human animals kill humans by an industrial organization. Blume (2024) compares the legal conditions between the execution of convicts and the slaughtering of farmed animals. And partly the evidence has become empirical already: Jacques (2015) has shown that in communities with a slaughterhouse, total arrest rate, arrests for rape, and arrests for offenses against the family were higher than in other locations. All this paves the way for an empirical investigation about the correlations between slaughtering and murdering.

MATERIALS AND METHODS

To test our hypothesis, livestock production and intentional homicides in all available countries were analysed using the most widely known publicly available socioeconomic data source: the World Bank (2025). The range of indicators used for our calculations is presented in Table 1.

While it would have been easy to aggregate the rate of male and female homicides to an overall murder rate, most scholars agree that the murder by gender follow markedly different patterns (Fridel and Fox, 2019; Karakasi et al., 2022; Ventura et al., 2022). Therefore, it is crucial to check whether both categories of murder respond equally to changes in animal production.

Regarding the independent variables, two different realms of animal production were used. Regarding the x_{land} variable that depicts the World Bank's Livestock Production Index, a relative measure was opted for, suggesting that the development of animal production in society might correlate with the rate of homicides. However, this index only describes the level of animal production on the land, and this why denoted as x_{land}. The level of animal production in the water, through aquaculture, is equally associated with violence (Lam, 2016; Elder, 2018; Cooper et al., 2023). Given the rapid development of aquaculture over recent years (Naylor et al., 2023; Xiong et al., 2023), an absolute index for aquaculture was included in this analysis and denoted as x_{water}.

Finally, two essential control variables were used. As noted earlier, poverty is an important predictor for homicides, and GDP per capita is often found to be a suitable indicator (Ouimet, 2012; Gazilas, 2024; Rasvanis, 2024). To account for time trends, which have also been found to be significant by Baumer & Wolff (2014) and Trägardh et al. (2016), the number of years was included as a variable in all equations.

Table 1. Variable description

Symbol	Indicator [WorldBank ID, id]	WorldBank Glossary
y_{male}	Intentional homicides, male (per 100,000 male) [VC.IHR.PSRC.MA.P5]	Intentional homicides, male are estimates of unlawful male homicides purposely inflicted as a result of domestic disputes, interpersonal violence, violent conflicts over land resources, intergang violence over turf or control, and predatory violence and killing by armed groups. Intentional homicide does not include all intentional killing; the difference is usually in the organisation of the killing. Individuals or small groups usually commit homicide, whereas killing in armed conflict is usually committed by fairly cohesive groups of up to several hundred members and is thus usually excluded.
y_{female}	Intentional homicides, female (per 100,000 female) [VC.IHR.PSRC.FE.P5]	Intentional homicides, female are estimates of unlawful female homicides purposely inflicted as a result of domestic disputes, interpersonal violence, violent conflicts over land resources, intergang violence over turf or control, and predatory violence and killing by armed groups. Intentional homicide does not include all intentional killing; the difference is usually in the organisation of the killing. Individuals or small groups usually commit homicide, whereas killing in armed conflict is usually committed by fairly cohesive groups of up to several hundred members and is thus usually excluded.
x_{land}	Livestock production index (2014-2016 = 100) [AG.PRD.LVSK.XD]	Livestock production index includes meat and milk from all sources, dairy products such as cheese, and eggs, honey, raw silk, wool, and hides and skins.
x_{water}	Aquaculture production (metric tons) [ER.FSH.AQUA.MT]	Aquaculture is understood to mean the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Aquaculture production specifically refers to output from aquaculture activities, which are designated for final harvest for consumption.
x_{GDP}	GDP per capita (constant 2015 US$) [NY.GDP.PCAP.KD]	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2015 U.S. dollars.
S	GDP, current LCU [NY.GDP.MKTP.SACN]	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in the current local currency.
t	Year	Year
i	Country	Country

Note. GDP stands for Gross Domestic Product. LCU stands for Local Currency Unit - national currency of a specific country. US$ stands for United States Dollar.

For the indicators (id) listed in Table 1, two linear transformations were performed: a 1 to each value was added to prevent the loss of zero observations and to ensure a smooth transition from values in levels to values under logarithm (see Loginova & Mann, 2022). Formally, for each value ($\acute{c}$) of an indicator of interest id in levels for each country (i) at year $t \in (1990 \dots 2021)$, logarithms (c) were calculated as follows:

$$c_{i,id,t} = ln(\acute{c}_{i,id,t} + 1) \quad (1)$$

To ensure reliable observations and sufficient variation for correlation analysis, all combinations of country (i) and year (t) with at least one missing value in any of the variables in Table 1 were excluded. These data preparations ensured the quality of the data for correlation analysis and resulted in a dataset with 1496 observations

across 78 countries from 1990 onward. It is important to note that GDP in current LCU did not participate in further calculations and has not been available online at the World Bank since 2021. However, this indicator was included in the bulk data downloaded using the "wbstats" package [R Core Team, 2025; wbstats (2025)] and served as a strong filter for getting high-quality observations. This indicator was a turning point in this paper's calculations: without filtering out missing values for this indicator, many significant results cannot be obtained. Thus, the results are only relevant for the countries and years for which this indicator was available.

Figure 1, displaying the countries' homicide rates and livestock development for 2021, does not show a clear pattern. A comparison between Bosnia and Herzegovina and Nicaragua might confirm the hypothesis, whereas a comparison between Singapore and Ecuador would suggest the opposite. After the data had been selected, a preregistration was carried out at the Open Science Framework on June 23rd, 2025 (available at: https://osf.io/m7dz5/overview).

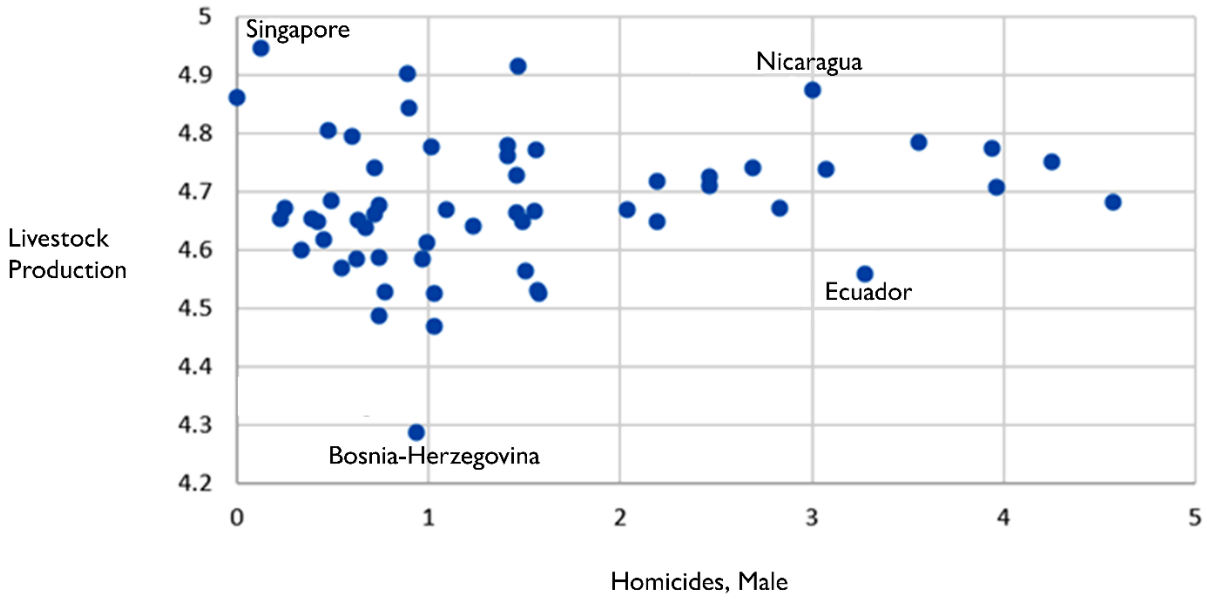


Figure 1. The connection between homicides on male persons and livestock production in 2021

Table 2, which displays correlation coefficients over the entire period, provides a clearer picture. It is foreseeable that homicides among men and women correlate strongly. However, correlations between three other phenomena are less predictable. First, the development of livestock production is rather independent of the extent of aquaculture in a country. While the business models of the two sectors are similar, their development is not. Second, there is a weak positive correlation between aquaculture and homicides. Third, there is a strong negative correlation between livestock production and homicides.

Table 2. Correlation table between the variables of homicides and animal production

	y_{male}	y_{female}	x_{land}	x_{water}
y_{male}	1			
y_{female}	0.90	1		
x_{land}	-0.23	-0.19	1	
x_{water}	0.09	0.05	-0.03	1

This finding should at least raise skepticism regarding the part of our hypothesis related to animal production on land. On the other hand, one should remain open to the possibility that the background variable of material welfare has an overwhelming influence: once societies become wealthier, homicides tend to decrease, but animal production (due to the growing demand for meat) increases. However, this does not appear to apply to aquaculture.

The regressions that allow testing the hypothesis were the following:

$$ln(y_{male,i,t}) = \alpha_{0,i} + \alpha_1 t + \\ + \alpha_2 ln(y_{female,i,t}) + \alpha_3 ln(x_{land,i,t}) + \alpha_4 ln(x_{water,i,t}) + \alpha_5 ln(x_{GDP,i,t}) + \varepsilon_{i,t} \quad (2)$$

$$ln(y_{female,i,t}) = \beta_{0,i} + \beta_1 t + \\ + \beta_2 ln(y_{female,i,t}) + \beta_3 ln(x_{land,i,t}) + \beta_4 ln(x_{water,i,t}) + \beta_5 ln(x_{GDP,i,t}) + \xi_{i,t} \quad (3)$$

where $\alpha_{0,i}$ and $\beta_{0,i}$ are constants for each country (i), i.e. analogs of country fixed effects, and other α_j, β_j j ∈ (1…4) are the coefficients quantifying the associations between the studied indicators. $\varepsilon_{i,t}$ and $\xi_{i,t}$ are the error terms. This means that our final equations are multiplications of the associated factors with our estimations as corresponding degrees.

RESULTS AND DISCUSSION

Table 3 presents the five equations explaining the two dependent variables. The development of livestock production is consistently a significant predictor for homicides. The situation is more complex for aquaculture. The amount of aquaculture fish production in a country contributes to explain femicides, but not male murders, sometimes labelled as masculicides (Rollat-Farnier, 2014). This leads to another (first) equation in which the amount of aquaculture in the explanation of masculicides is omitted. The control variables contribute strongly to the equations. It is obvious that the rate of femicides ($\boldsymbol{y_{female}}$) contributes strongly to explaining the rate of homicide ($\boldsymbol{y_{male}}$) and vice versa. It is also very understandable that per-capita GDP contributes strongly to explaining homicide rates. Finally, the most optimistic result of our regression is that the number of homicides, for both genders, has been decreasing over time.

Table 3. Results of the tested models

Dependent	**Explanatories**						**Adj. R-Squared**
	$\boldsymbol{y_{male}}$	$\boldsymbol{y_{female}}$	$\boldsymbol{x_{land}}$	$\boldsymbol{x_{water}}$	$\boldsymbol{x_{GDP}}$	$\boldsymbol{T}$	
$\boldsymbol{y_{male}}$			0.216 (0.046) ***		-0.583 (0.054) ***	-0.011 (0.001) ***	0.9556
$\boldsymbol{y_{male}}$			0.2121 (0.048) ***	0.004 0.012	-0.590 (0.057) ***	-0.011 (0.001) ***	0.9556
$\boldsymbol{y_{male}}$		0.726 (0.031) ***	0.107 (0.041) **	-0.013 (0.01)	-0.222 (0.051) ***	-0.007 (0.001) ***	0.9677
$\boldsymbol{y_{female}}$			0.143 (0.034) ***	0.023 (0.008) **	-0.506 (0.041) ***	-0.005 (0.001) ***	0.9078
$\boldsymbol{y_{female}}$	0.375 (0.016) ***		0.064 (0.029) *	0.022 (0.007) **	-0.284 (0.036) ***	-0.001 (0.001)	0.933

Note. Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1. All models account for country fixed effects. All models pass tests on model significance.

It is necessary to acknowledge that these results can be interpreted in different ways. There is a potential claim that, to quote a proverb by Ronald Coase, the data was tortured until it confesses. Under such a view, the narrative would emerge that for an arbitrary sample of countries, a dynamic variable (development of livestock) and a stationary variable (amount of aquaculture) show, after being transformed accordingly, some spurious, probably random significance for femicides and, partly, masculicides. Kunce et al. (1975) were among the first to show how

random variables could show highly significant correlations. Couldn't this also be the case for any imagined connection between animal production and homicide?

A more optimistic reading of the results is also possible. This does not only require readers to accept the availability of variable S (see Table 1) as a national indicator for statistics of high quality. It also necessitates recognizing that the authors are not the first who contextualise violence against humans and violence against other animals. Bègue et al. (2025), for example, raise the question about determinants of intentional harm against animals. They find that a climate of violence in a subject's family is among the main influencing factors. This is only the latest publication in a series of studies showing the strong connection between domestic violence and cruelties to animals (Bentovim, 2002; DeGue and DiLillo, 2008; Genc et al. 2017; Arkow, 2019). Other scholars found high correlations between child abuse and animal abuse (Ascione and Arkow, 1999) or graduations from animal cruelty to serial murder (Wright and Hensley, 2003).

It is, of course, much more intuitive that boys being beaten by their fathers are likely to beat dogs and cats, than to think that eating a Frankfurter sausage increases the probability of killing one's neighbour. This is precisely why research about the first connection has been carried out, but not about the second. Therefore, it is worthwhile to identify some core differences and parallels between our research question and the transfer from domestic violence to animal mistreatment. The main difference is, of course, that the meat industry and retailers work hard to conceal the violent background of animal product consumption. Even staff in slaughterhouses sometimes manage to suppress the violent aspect of their work (Ben-Yonatan, 2021; Pastrana-Camacho et al., 2023). However, consumers of animal products are usually aware that their consumption involves the killing of a sentient being. The obvious parallel between the two transfers—from domestic violence to animal cruelty, and from livestock production to homicide—is the general acceptance that violence may be a legitimate or at least necessary way of interaction.

The tolerance of violence in societies may be the core background variable behind the two phenomena of animal production and homicides. If one decides to take the empirical results seriously, one will have to conclude that there may well be synergies in reducing the rate of homicides and reducing our reliance on animal production. Consequential work for a non-violent society could benefit both.

After developing the hypothesis that the extent of the so-called production of animals may contribute to explaining the homicide rate in a country, it was shown, after certain transformations, that the development of livestock production is a significant predictor of masculicides, while both livestock production and aquaculture are significant predictors of femicides. While this finding holds for a subsample of countries with particularly high-quality data, it has the potential to lead to significant theoretical and empirical follow-up work. Empirically, both national and international levels offer ample opportunities to explore in more depth the connection between land-based and aquatic animal production on one hand, and homicides on the other. Theoretically, it may be time to reconsider our approach toward farmed animals, as this could have synergies in combating human murder.

DECLARATION OF INTEREST STATEMENT

I declare that I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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