The dates used to define the key periods were 2012-09-24 and 2013-11-05. To use these dates in a statistical form we constructed three time windows which were basically dummies representing the phenomena after the first date (before 2012-09-24), between the first and second event (from 2012-09-24 to 2013-11-05) and after the last event (after 2013-11-05). This was done because the number of observations in each key event date were not enough to proceed with the statistical models considered and also because we expect our outcome can change based on these three windows. The aggregated dataset summarized by author and the three windows presented 46,530 observations using this aggregated data we calculated the descriptive statistics and correlations appear in Table 2. Our primary independent variable, out, is not highly correlated with our other variables. The high correlation between comments\_count, collection\_count, downloads\_count, thing\_like\_count, made\_count and views\_count ( see Table 2) is an exception, and it is important to note that these variables were not used in either models evaluated by us during the analysis, furthermore the low correlation between the independent variables increase the robustness of our model since the chance of a multicollinearity or a redundant information account is low.

Table 2 also present the Mean and Standard Deviation for each variable considered in our analysis, from the aggregated dataset and we can note that since the mean and standard deviation of the out variable are very distant each other we should not considered the Zero-Inflated Poisson Regression Models that is the reason for our choice of the Zero-Inflated Negative Binomial Regression to test our hypothesis about the phenomena of interest.

The standard deviation of the variables considered in the Zero-Inflated Negative Binomial Regression were all not high which is an indicate that the outliers issues were not possible a problem since a leverage effect in the regression’s coefficient is very low.

Table 3 reports the estimated coefficients of five Zero-Inflated Negative Binomial Regression. Model 1 includes the mean null effect on the count data generating process and the zero inflated part by entering made and filescount. It is important to note that for the possibility of comparison between models, the zero inflated part should be the same for all models then we kept the same variables in the the zero inflated part.

The first model presents all variables statistically significant and the odds ratio for the Zero-inflation model coefficients for the made and filescount variables were, respectively, and and then we can interpretate these results in the follow way: each unit increase in the made variable presents in our model 85% less likely the non-occurrence of the outcome. For the filescount the interpretation is similar, we expect that for each unit increase in the filescount the odds of the non-occurrence in our dependent variable (out) will be 13% less likely.

Also, for all models the coefficients in the count part can be interpreted in the follow way: for a one unit change in the predictor variable, the difference in the logs of expected counts of the response variable is expected to change by the respective regression coefficient, given the other predictor variables in the model are held constant. Since this interpretation is not very useful we intend to use the incidence rate ratios as a more suitable measure to understand how the variables explain our outcome. To calculate the incidence rate ratios in a negative binomial regression model we just apply the exponential, for example for Model 2 we have , so we can say that when the observations were considered between the first and second key dates given the other variables are held constant in the model the observations inside this window compared to the other two time periods, while holding the other variable constant in the model, are expected to have a rate 3.72 times greater for out. A similar interpretation is given for the other factor variables such as design.strategy, for example for Model 3 free-riding compared to the others design strategies, while holding the other variable constant in the model, are expected to have a rate times lower for out. When the variable is discrete or continuous such as copyleft in Model 4 we can say that If an author were to increase his copyleft by one point, his rate for out would be expected to increase by a factor , while holding all other variables in the model constant.

With respect to our hypothesis we have:

1. h1: private-collective increases follow-on derivatives (in contrast to private, and free riding)
2. h2: The use of collective-rivalry license will increase follow-on derivatives (other license use will be included just to show collective-rivalry will result in significant follow-on derivatives)
3. h3: Collective-rivalry will positively moderate the relationship between private-collective and follow-on derivatives.

With respect to the first hypothesis we can see by Model 3 that the coefficient of private-collective is positive. Since hybrid strategy was codified by one if the observation was private-collective and zero otherwise (in contrast to private, and free riding) we can say that this hybrid strategy increases follow-on derivatives and it is statistically significant. In terms of our interpretation, every time an author defines the license as private-collective we have that the difference in the logs of expected counts of the follow-on derivatives is expected to change by 1.10, given the other predictor variables in the model are held constant. In terms of the incidence rate we say that when every time an author defines the license as private-collective, given the other variables are held constant in the model the follow-on derivatives are expected to have a rate 3.02 () times greater for out.

The second hypothesis is evaluated by Model 2 and we have strong evidence that this hypothesis can also be true, since the coefficient of the collective-rivalry license factor is positive. In other words we can say compared to the others licenses types, while holding the other variable constant in the model, are expected to have a rate times greater for out.

Finally, we have the same results for the hypothesis 3 because the iteration between Collective-rivalry and private-collective is positive and statistically significant.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** |
| **comments\_count** | 2.889 | 15.59 | 1 | 0.9 | 0.8 | 0.6 | 0.9 | 0.8 | 0.3 | 0.21 | 0.9 | 0.3 | 0.5 | 0.4 | 0.5 | 0.1 | 0.3 | 0.06 | 0.1 | 0.3 | 0.2 | 0.3 | 0 | 0.3 | 0.31 | 0.04 | 0.3 | 0.1 | 0.3 |
| **collection\_count** | 43.91 | 234.8 | 0.9 | 1 | 0.8 | 0.5 | 1 | 0.8 | 0.4 | 0.19 | 0.9 | 0.4 | 0.4 | 0.3 | 0.5 | 0.1 | 0.3 | 0.03 | 0.1 | 0.3 | 0.1 | 0.4 | 0 | 0.3 | 0.3 | 0.05 | 0.2 | 0.1 | 0.2 |
| **downloads\_count** | 855.4 | 4542 | 0.8 | 0.8 | 1 | 0.6 | 0.8 | 0.8 | 0.3 | 0.22 | 0.9 | 0.3 | 0.5 | 0.4 | 0.5 | 0.1 | 0.3 | 0.06 | 0.1 | 0.3 | 0.1 | 0.4 | 0 | 0.2 | 0.31 | 0.05 | 0.3 | 0.1 | 0.3 |
| **files\_count** | 6.836 | 21.05 | 0.6 | 0.5 | 0.6 | 1 | 0.5 | 0.4 | 0.2 | 0.52 | 0.6 | 0.2 | 0.8 | 0.3 | 0.5 | 0.1 | 0.51 | 0.04 | 0.1 | 0.3 | 0.1 | 0.4 | 0 | 0.3 | 0.51 | 0.08 | 0.2 | 0.1 | 0.2 |
| **thing\_like\_count** | 35.68 | 194.1 | 0.9 | 1 | 0.8 | 0.5 | 1 | 0.8 | 0.4 | 0.19 | 0.9 | 0.4 | 0.4 | 0.3 | 0.5 | 0.1 | 0.3 | 0.03 | 0.1 | 0.3 | 0.1 | 0.3 | 0 | 0.3 | 0.3 | 0.05 | 0.2 | 0.1 | 0.2 |
| **made\_count** | 1.386 | 11.48 | 0.8 | 0.8 | 0.8 | 0.4 | 0.8 | 1 | 0.3 | 0.16 | 0.8 | 0.3 | 0.4 | 0.3 | 0.4 | 0.1 | 0.23 | 0.02 | 0.1 | 0.2 | 0.1 | 0.3 | 0 | 0.3 | 0.23 | 0.03 | 0.2 | 0.1 | 0.2 |
| **remix\_count** | 1.962 | 70.77 | 0.3 | 0.4 | 0.3 | 0.2 | 0.4 | 0.3 | 1 | 0.08 | 0.4 | 1 | 0.1 | 0 | 0.1 | 0 | 0.06 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0.06 | 0.01 | 0 | 0 | 0 |
| **remixed\_froms\_count** | 1.889 | 5.197 | 0.2 | 0.2 | 0.2 | 0.5 | 0.2 | 0.2 | 0.1 | 1 | 0.2 | 0.1 | 0.3 | 0.1 | 0.5 | 0 | 0.42 | -0 | 0 | 0.2 | 0 | 0.4 | 0 | 0.2 | 0.42 | 0.05 | 0.1 | 0.1 | 0.1 |
| **views\_count** | 4334 | 21164 | 0.9 | 0.9 | 0.9 | 0.6 | 0.9 | 0.8 | 0.4 | 0.22 | 1 | 0.4 | 0.5 | 0.3 | 0.5 | 0.1 | 0.3 | 0.05 | 0.1 | 0.3 | 0.1 | 0.4 | 0 | 0.2 | 0.31 | 0.05 | 0.3 | 0.1 | 0.2 |
| **out** | **1.888** | **68.46** | **0.3** | **0.4** | **0.3** | **0.2** | **0.4** | **0.3** | **1** | **0.08** | **0.4** | **1** | **0.1** | **0** | **0.1** | **0** | **0.06** | **0** | **0** | **0** | **0** | **0.1** | **0** | **0** | **0.06** | **0.01** | **0** | **0** | **0** |
| **tags\_count** | 6.781 | 33.35 | 0.5 | 0.4 | 0.5 | 0.8 | 0.4 | 0.4 | 0.1 | 0.32 | 0.5 | 0.1 | 1 | 0.3 | 0.4 | 0.1 | 0.33 | 0.07 | 0.1 | 0.3 | 0 | 0.3 | 0 | 0.2 | 0.33 | 0.04 | 0.2 | 0.1 | 0.2 |
| **copyleft** | 0.1338 | 0.9787 | 0.4 | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0 | 0.1 | 0.3 | 0 | 0.3 | 1 | 0.1 | 0 | 0.06 | 0.05 | 0 | 0.1 | 0.3 | 0.1 | 0 | 0 | 0.06 | 0.3 | 0.8 | 0.2 | 0.5 |
| **anticompetition** | 1.159 | 2.63 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.1 | 0.45 | 0.5 | 0.1 | 0.4 | 0.1 | 1 | 0.1 | 0.14 | 0.01 | 0.1 | 0.5 | 0 | 0.8 | 0 | 0.6 | 0.14 | 0.04 | 0.1 | 0 | 0.1 |
| **anti\_social\_rivarly** | 0.02547 | 0.3535 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.01 | 0.1 | 0 | 0.1 | 0 | 0.1 | 1 | 0 | 0 | 1 | 0.2 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 |
| **collective\_rivalry** | 1.19 | 2.215 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 | 0.2 | 0.1 | 0.42 | 0.3 | 0.1 | 0.3 | 0.1 | 0.1 | 0 | 1 | -0.1 | 0 | 0.1 | 0 | 0.1 | 0 | 0.1 | 1 | 0.02 | 0 | 0 | 0.1 |
| **All.Rights.Reserved** | 0.01618 | 0.2072 | 0.1 | 0 | 0.1 | 0 | 0 | 0 | 0 | -0 | 0.1 | 0 | 0.1 | 0.1 | 0 | 0 | -0.1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | -0 | -0 | 0 | 0 | 0.1 |
| **Attribution…Non.Commercial…No.Derivatives** | 0.02162 | 0.3406 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.01 | 0.1 | 0 | 0.1 | 0 | 0.1 | 1 | 0 | 0 | 1 | 0.2 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Attribution…Non.Commercial…Share.Alike** | 0.1574 | 0.9471 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0 | 0.23 | 0.3 | 0 | 0.3 | 0.1 | 0.5 | 0.2 | 0.07 | 0.01 | 0.2 | 1 | 0 | 0.1 | 0 | 0.1 | 0.07 | 0.02 | 0.1 | 0 | 0 |
| **BSD.License** | 0.00916 | 0.2419 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.02 | 0.1 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0.01 | 0 | 0 | 1 | 0.1 | 0 | 0 | 0.01 | 0.01 | 0 | 0 | 0 |
| **Creative.Commons…Attribution** | 0.7291 | 1.783 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.1 | 0.39 | 0.4 | 0.1 | 0.3 | 0.1 | 0.8 | 0 | 0.12 | 0.01 | 0 | 0.1 | 0.1 | 1 | 0 | 0.1 | 0.12 | 0.03 | 0.1 | 0 | 0.1 |
| **Creative.Commons…Attribution…No.Derivatives** | 0.00385 | 0.0745 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0.1 | 0 | 0 | 0 | 1 | 0 | 0 | 0.01 | 0 | 0 | 0 |
| **Creative.Commons…Attribution…Non.Commercial** | 0.2724 | 1.406 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0 | 0.19 | 0.2 | 0 | 0.2 | 0 | 0.6 | 0 | 0.06 | 0 | 0 | 0.1 | 0 | 0.1 | 0 | 1 | 0.06 | 0.03 | 0 | 0 | 0 |
| **Creative.Commons…Attribution…Share.Alike** | 1.206 | 2.2 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 | 0.2 | 0.1 | 0.42 | 0.3 | 0.1 | 0.3 | 0.1 | 0.1 | 0 | 1 | -0 | 0 | 0.1 | 0 | 0.1 | 0 | 0.1 | 1 | 0.02 | 0 | 0 | 0.1 |
| **Creative.Commons…Public.Domain.Dedication** | 0.02663 | 0.2542 | 0 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.05 | 0.1 | 0 | 0 | 0.3 | 0 | 0 | 0.02 | -0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 1 | 0 | 0 | 0 |
| **GNU…GPL** | 0.06432 | 0.7146 | 0.3 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0 | 0.07 | 0.3 | 0 | 0.2 | 0.8 | 0.1 | 0 | 0.04 | 0.03 | 0 | 0.1 | 0 | 0.1 | 0 | 0 | 0.04 | 0.03 | 1 | 0.1 | 0.1 |
| **GNU…LGPL** | 0.00718 | 0.152 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.05 | 0.1 | 0 | 0.1 | 0.2 | 0 | 0 | 0.01 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 | 0.01 | 0.1 | 1 | 0 |
| **Public.Domain** | 0.0265 | 0.4251 | 0.3 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0 | 0.05 | 0.2 | 0 | 0.2 | 0.5 | 0.1 | 0 | 0.05 | 0.06 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0.05 | 0.03 | 0.1 | 0 | 1 |

Table 2: Descriptive Statistics and Correlations of Variables Used in Regression Analysis. n=46,530

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Model 1** | | **Model 2** | | **Model 3** | | **Model 4** | | **Model 5** | |
| **(null)** | | **(control)** | | **(H1)** | | **(H2)** | | **(H3)** | |
| **Count model coefficients (negbin with log link)** | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  | Estimate |  |
| (Intercept) | 2.1401 | \*\*\* | 1.43274 | \*\*\* | 0.35481 | \*\*\* | 0.063725 |  | 0.12362 | \* |
|  | (0.02757) |  | (0.04893) |  | (0.04956) |  | (0.050791) |  | (0.05973) |  |
| copyleft |  |  |  |  |  |  | 0.101360 | \*\*\* | 0.24216 | \*\*\* |
|  |  |  |  |  |  |  | (0.016138) |  | (0.04349) |  |
| anticompetition |  |  |  |  |  |  | 0.089471 | \*\*\* | 0.07908 | \*\*\* |
|  |  |  |  |  |  |  | (0.005080) |  | (0.01503) |  |
| anti\_social\_rivarly |  |  |  |  |  |  | -0.229350 | \*\*\* | -0.38806 | \*\*\* |
|  |  |  |  |  |  |  | (0.033801) |  | (0.08451) |  |
| collective\_rivalry |  |  |  |  |  |  | 0.083172 | \*\*\* | 0.03042 | \* |
|  |  |  |  |  |  |  | (0.007035) |  | (0.01186) |  |
| Hybrid strategy |  |  |  |  | 1.96996 | \*\*\* | 1.105729 | \*\*\* | 0.95610 | \*\*\* |
|  |  |  |  |  | (0.04905) |  | (0.053367) |  | (0.07299) |  |
| key.event2 |  |  | 1.31391 | \*\*\* | 0.87373 | \*\*\* | 0.866506 | \*\*\* | 0.85120 | \*\*\* |
|  |  |  | (0.0619) |  | (0.05969) |  | (0.057936) |  | (0.05803) |  |
| key.event3 |  |  | -0.24835 | \*\*\* | -0.14993 | \* | -0.077882 |  | -0.06508 |  |
|  |  |  | (0.0651) |  | (0.06165) |  | (0.060231) |  | (0.06019) |  |
| anticompetition:hybrid |  |  |  |  |  |  |  |  | 0.01348 |  |
|  |  |  |  |  |  |  |  |  | (0.01604) |  |
| anti\_social\_rivarly:hybrid |  |  |  |  |  |  |  |  | 0.19510 | \* |
|  |  |  |  |  |  |  |  |  | (0.09574) |  |
| collective\_rivalry:hybrid |  |  |  |  |  |  |  |  | 0.07623 | \*\*\* |
|  |  |  |  |  |  |  |  |  | (0.01482) |  |
| copyleft:hybrid |  |  |  |  |  |  |  |  | -0.16675 | \*\*\* |
|  |  |  |  |  |  |  |  |  | (0.04576) |  |
| Log(theta) | -1.8436 | \*\*\* | -1.75155 | \*\*\* | -1.62897 | \*\*\* | -1.526102 | \*\*\* | -1.52090 | \*\*\* |
|  | (0.04249) |  | (0.02146) |  | (0.02167) |  | (0.022145) |  | (0.02215) |  |
| **Zero-inflation model coefficients (binomial with logit link):** | | | | | | | | | | |
| (Intercept) | 3.05588 | \*\*\* | 3.056658 | \*\*\* | 2.836071 | \*\*\* | 2.789485 | \*\*\* | 2.812942 | \*\*\* |
|  | (0.043053) |  | (0.043053) |  | (0.045147) |  | (0.045121) |  | (0.046590) |  |
| made\_count | -1.90015 | \*\*\* | -1.881191 | \*\*\* | -1.946211 | \*\*\* | -2.019902 | \*\*\* | -2.023624 | \*\*\* |
|  | (0.06726) |  | (0.067646) |  | (0.074802) |  | (0.076791) |  | (0.077056) |  |
| files\_count | -0.14157 | \*\*\* | -0.14855 | \*\*\* | -0.140789 | \*\*\* | -0.127732 | \*\*\* | -0.131945 | \*\*\* |
|  | (0.00656) |  | (0.006878) |  | (0.007203) |  | (0.007007) |  | (0.007333) |  |

Table 3: Estimated Coefficients from Zero-Inflated Poisson Regression Models of Innovation on Selected Independent Variables.