

## ADDITIONAL EXPERIMENTAL RESULTS

### A EVALUATION METRICS

- **MRR.** MRR measures on average how well a RS captures user preference, specifically by measuring whether the first preferred item is ranked top, defined as:

$$MRR = \frac{1}{|\mathcal{U}|} \sum_{u \in \mathcal{U}} \frac{1}{rank_u^*} \quad (1)$$

where  $rank_u^*$  means the rank of the first preferred item of user  $u$  in his recommendation list.

- **Hit@10.** Hit ratio is a way of calculating how often you recommend at least 1 preferred item to users. If the recommendation list contains at least 1 item in the test set, we call it a hit.

$$Hit@K = \frac{1}{|\mathcal{U}|} \sum_{u \in \mathcal{U}} \delta(\hat{R}(u) \cap R(u) \neq \emptyset) \quad (2)$$

where  $\delta$  is an indicator function.  $\delta(x) = 1$  if  $x$  is true and 0 otherwise.  $\hat{R}(u)$  is the recommendation list and  $R(u)$  is the positive items in the test set for user  $u$ .

- **NDCG@10.** NDCG (Normalized Discounted Cumulative Gain) is a measure of ranking quality. It give higher scores to the hits at top ranks.

$$NDCG@K = \frac{1}{|\mathcal{U}|} \sum_{u \in \mathcal{U}} \left( \frac{\frac{1}{\sum_{i=1}^K \min(|R(u)|, K)} \sum_{i=1}^K \delta(\hat{R}_i(u) \in R(u)) \frac{1}{\log_2(i+1)}}{\frac{1}{\log_2(i+1)}} \right) \quad (3)$$

where  $\hat{R}_i(u)$  is the  $i$ -th item recommended to user  $u$ .

- **Precision@10.** Precision is the fraction of correctly recommended items out of all the recommended items for users.

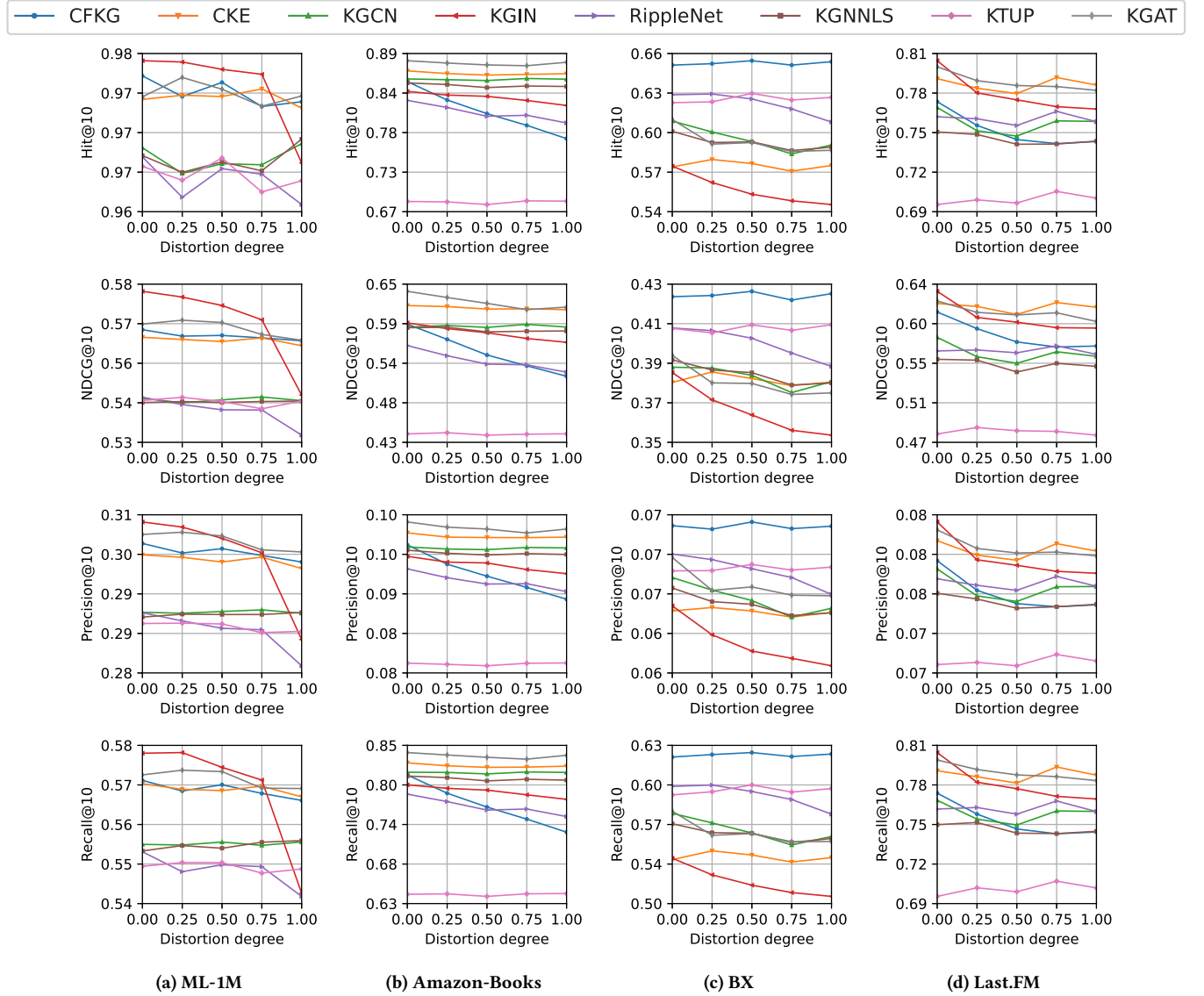
$$Precision@K = \frac{1}{|\mathcal{U}|} \sum_{u \in \mathcal{U}} \frac{|\hat{R}(u) \cap R(u)|}{|\hat{R}(u)|} \quad (4)$$

- **Recall@10.** Recall is the fraction of correctly recommended item out of all the preferred items for users.

$$Recall@K = \frac{1}{|\mathcal{U}|} \sum_{u \in \mathcal{U}} \frac{|\hat{R}(u) \cap R(u)|}{|R(u)|} \quad (5)$$

## B ADDITIONAL RESULTS OF FALSE KNOWLEDGE EXPERIMENT

Additional results of false knowledge experiments are presented in Figure B1. When using Hit, NDCG, Precision and Recall as metrics, the results are similar to those when using MRR as metric. The results also indicate that with more knowledge distorted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease, which is the same as the conclusion in Section 4.3.



**Figure B1: Additional results of randomly distorted KG. The horizontal axis represents the distortion degree. The results are similar to those when using MRR as metric, i.e., with more knowledge distorted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease.**

## C ADDITIONAL RESULTS OF DECREASING KNOWLEDGE EXPERIMENT

Additional results of decreasing knowledge experiments are presented in Figure C2-C4. When using Hit, NDCG, Precision and Recall as metrics, the results are similar to those when using MRR as metric. Decreasing entities and relations generally have similar effects as decreasing facts. The results indicate that with more knowledge deleted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease, which is the same as the conclusion in Section 4.4.

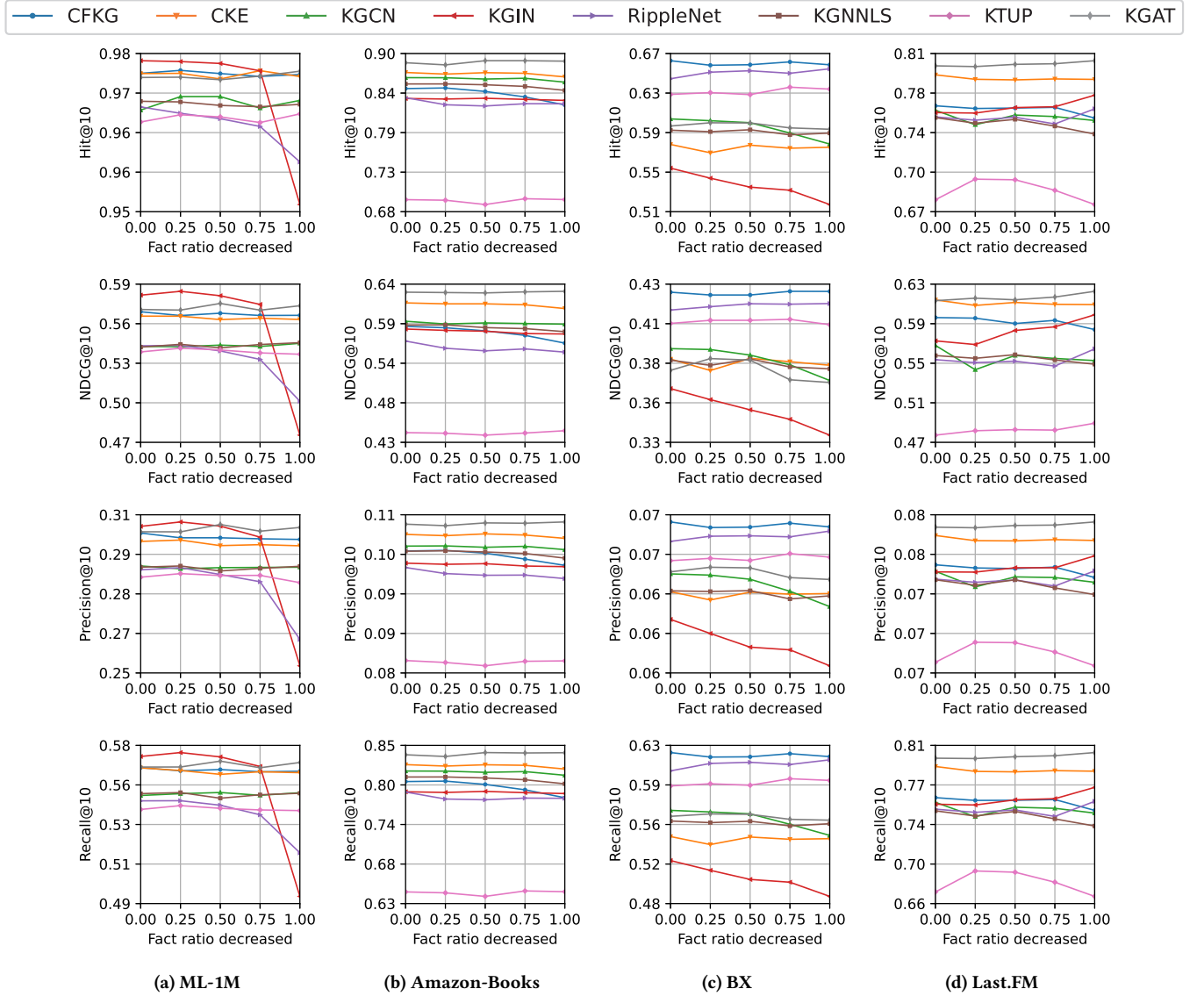
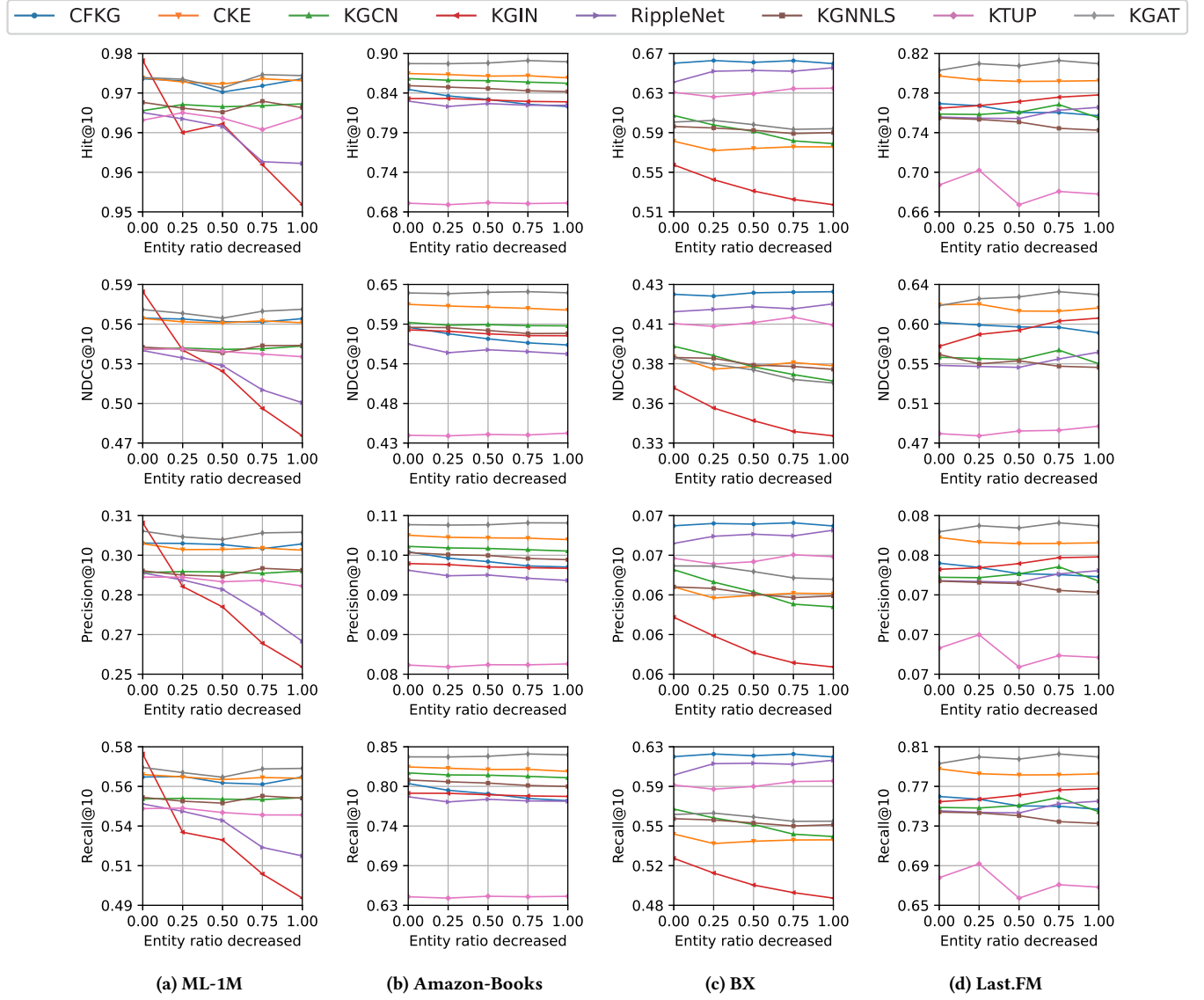
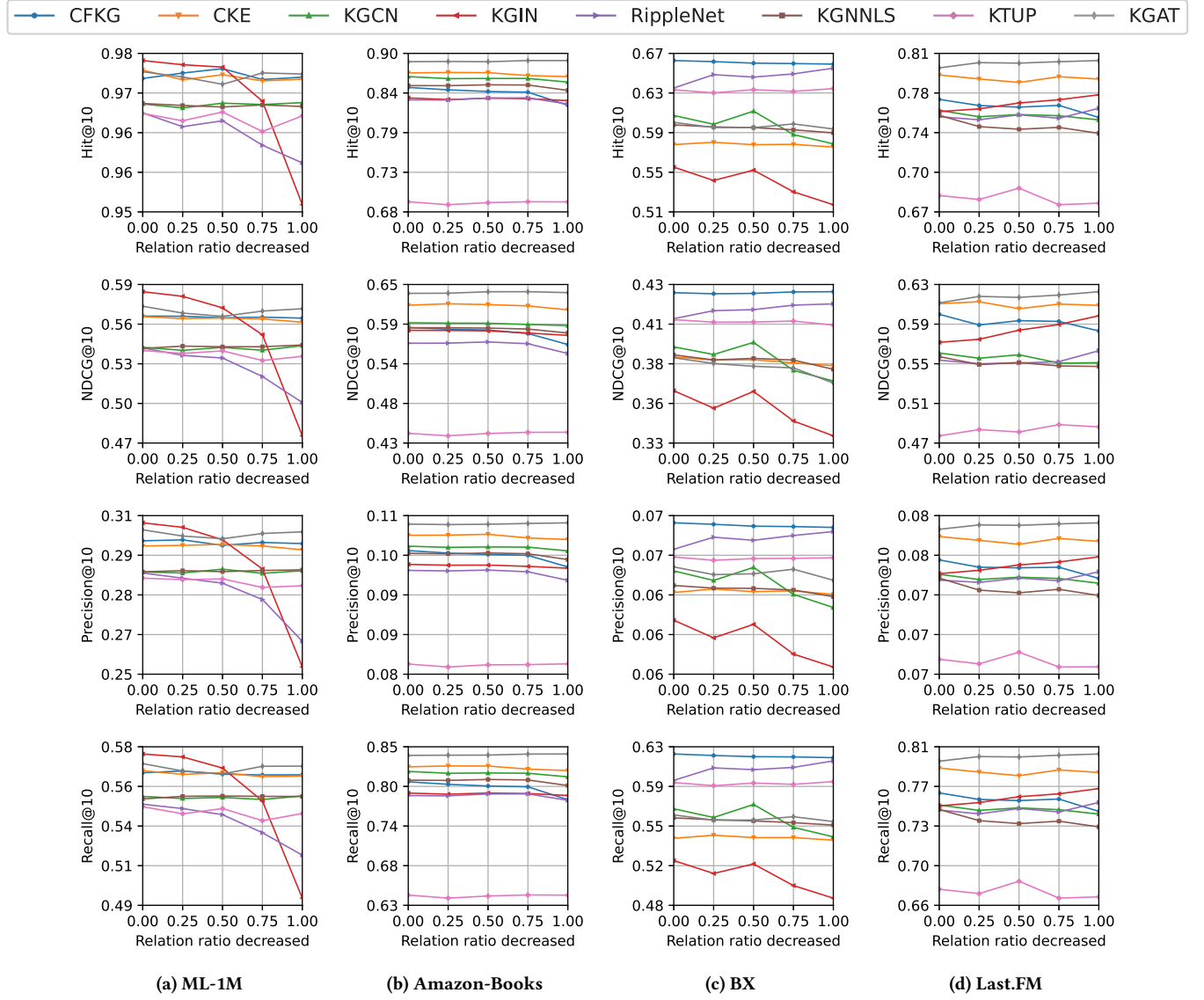


Figure C2: Additional results of decreasing the facts. The horizontal axis denotes the ratio that decreases. The results are similar to those when using MRR as metric, i.e., with more facts deleted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease.



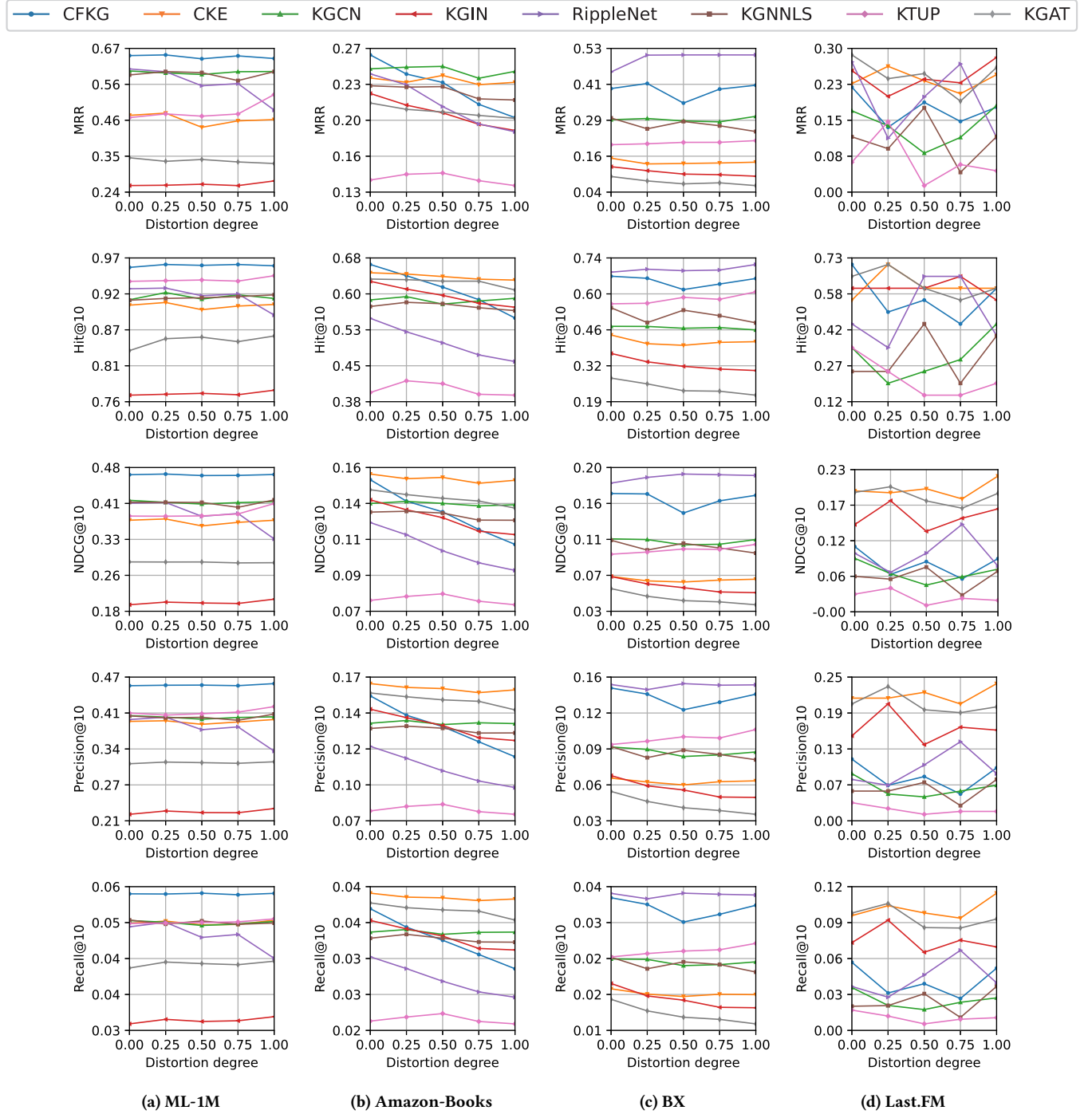
**Figure C3: Additional results of decreasing the entities (nodes). The horizontal axis denotes the ratio that decreases. The results are similar to those when decreasing facts, i.e., with more entities deleted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease.**



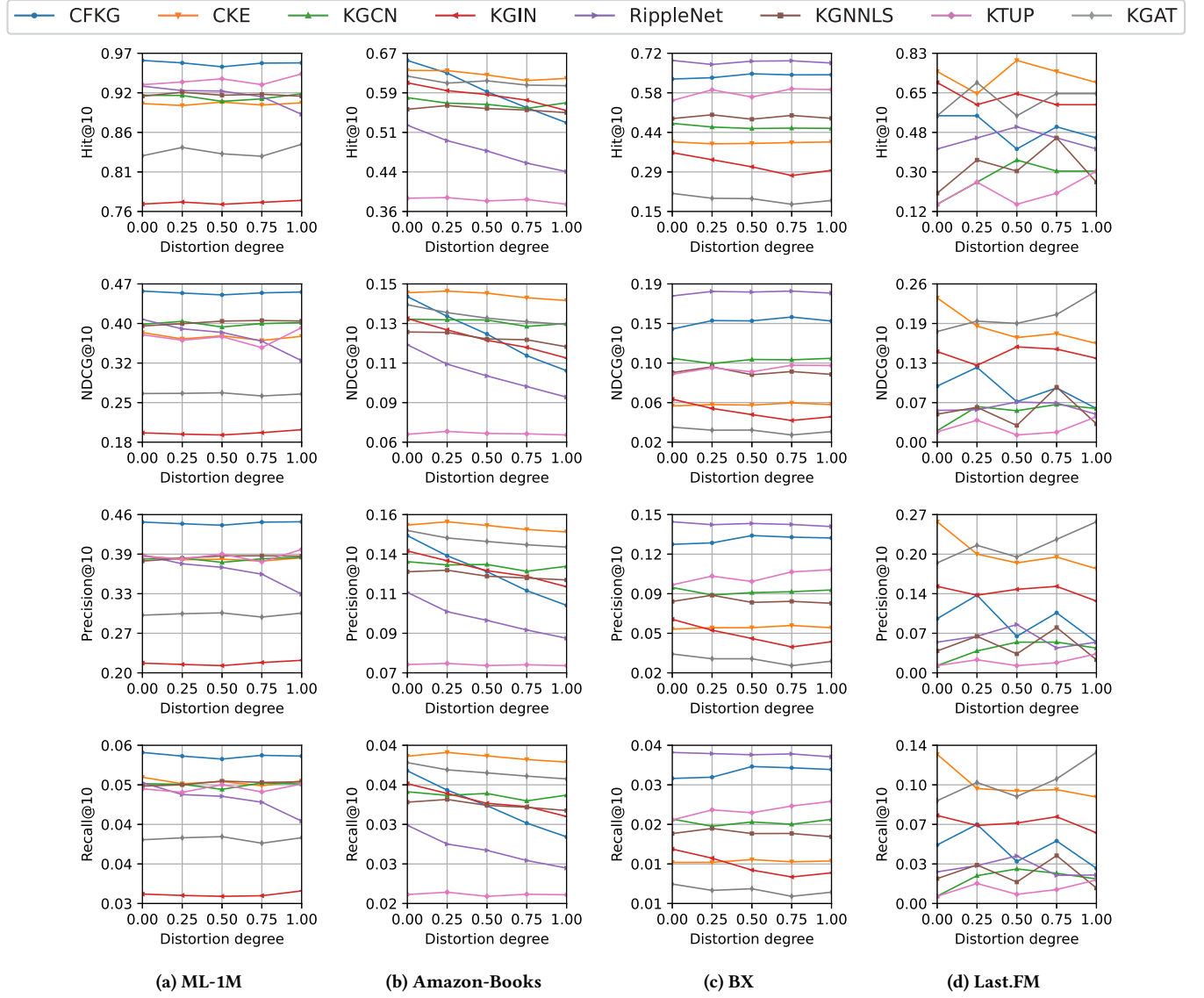
**Figure C4: Additional results of decreasing the relations. The horizontal axis denotes the ratio that decreases. The results are similar to those when decreasing facts, i.e., with more relations deleted in a KG, the recommendation accuracy of a KG-based RS does not necessarily decrease. And the change degree is generally smaller than that when decreasing facts.**

## **D ADDITIONAL RESULTS OF COLD-START EXPERIMENT**

Additional results of cold-start experiments are presented in Figure D5-D10. When using different metrics and  $T$ , the results are generally similar to those when using MRR as metric and  $T=3$ . Decreasing entities and relations generally have similar effects as decreasing facts. The results indicate that with more knowledge randomly distorted or deleted, recommendation accuracy for cold-start users does not necessarily decrease, and how it gets influenced depends on both the model and the dataset being used., which is the same as the conclusion in Section 4.5.

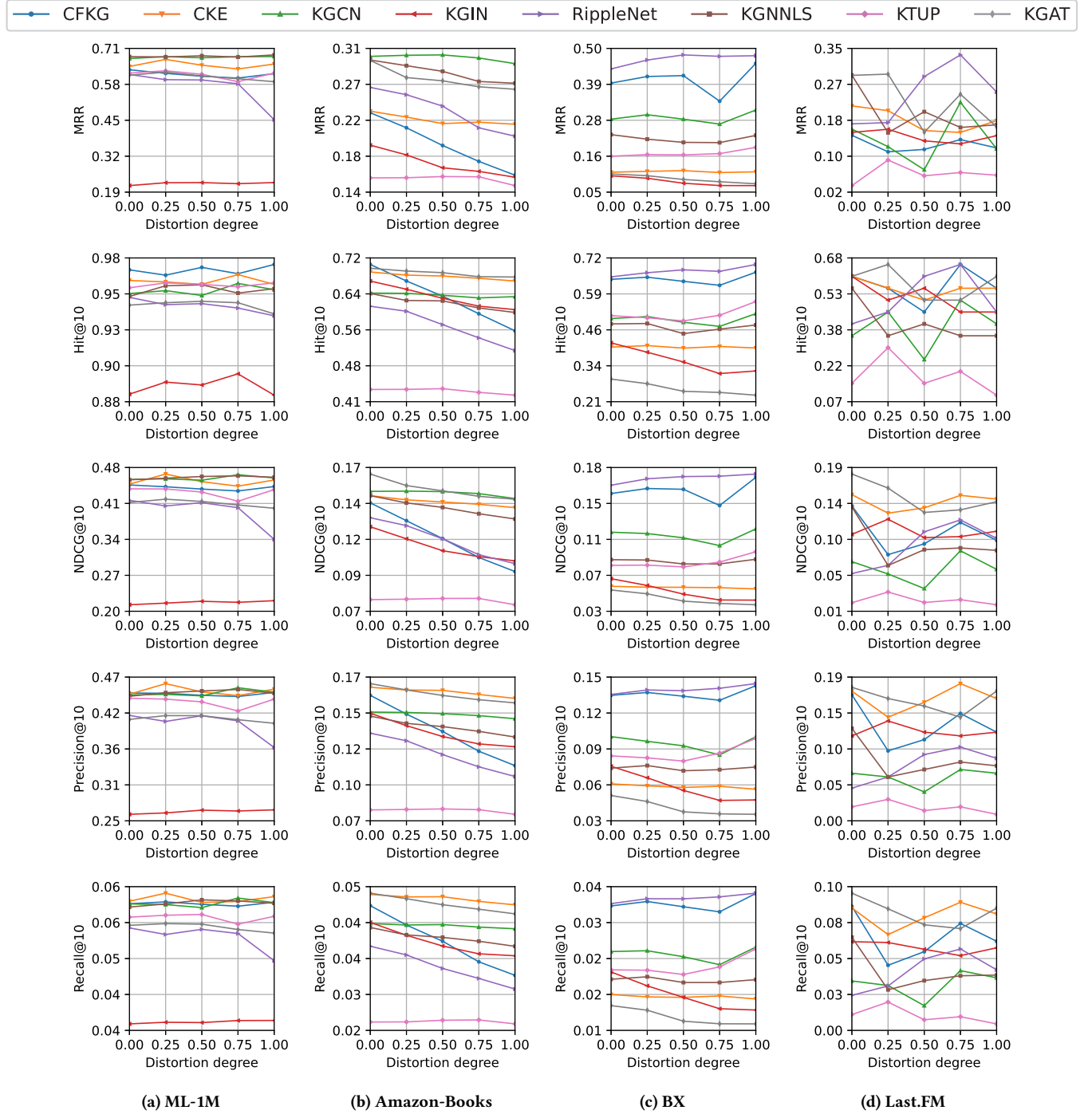


**Figure D5: Additional result of cold-start experiment with false knowledge,  $T=1$ . Horizontal axis denotes distortion degree. The results are similar to those when  $T=3$ , i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**

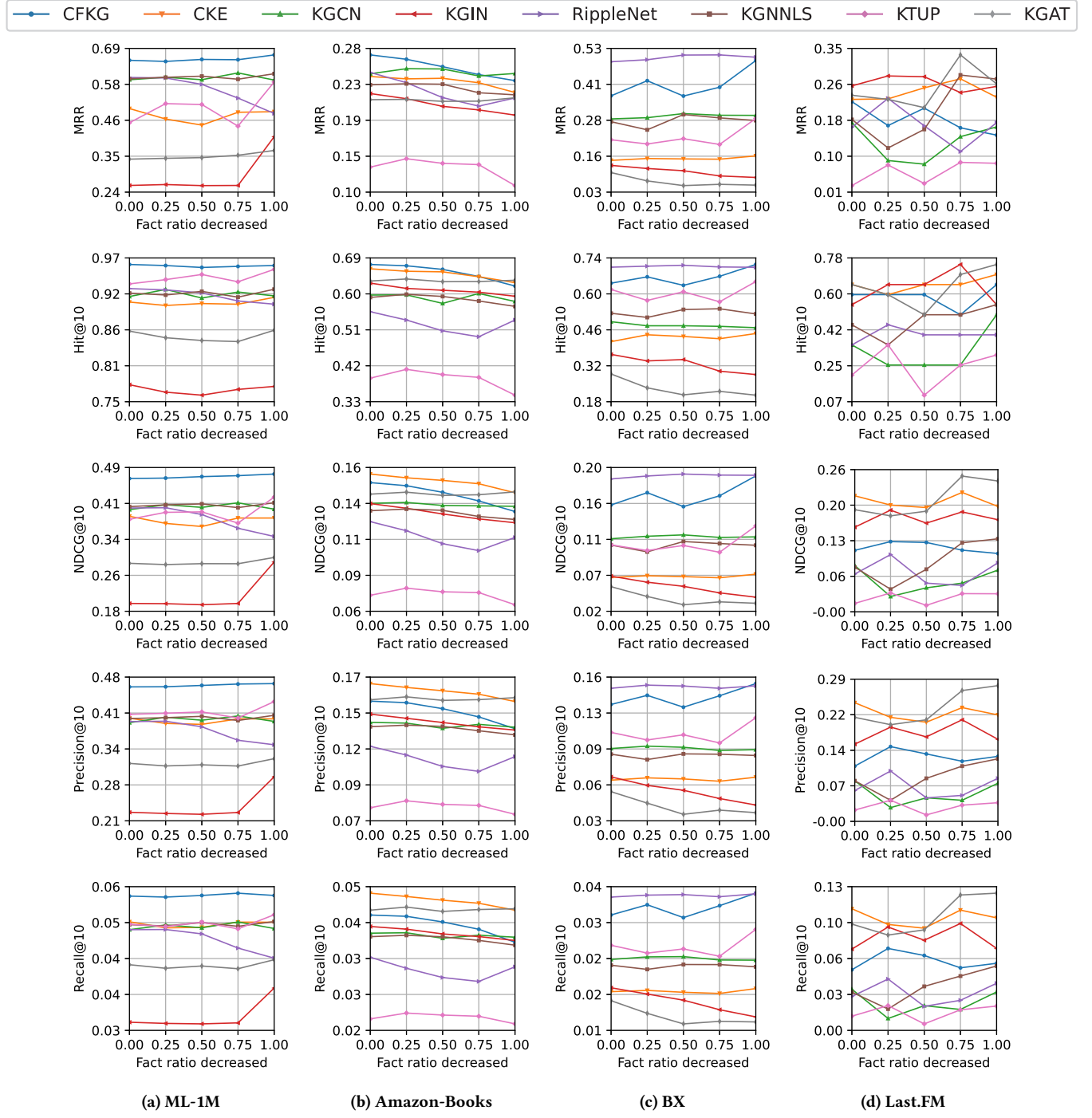


**Figure D6: Additional result of cold-start experiment with false knowledge,  $T=3$ . Horizontal axis denotes distortion degree. The results are similar to those using MRR as metric, i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**

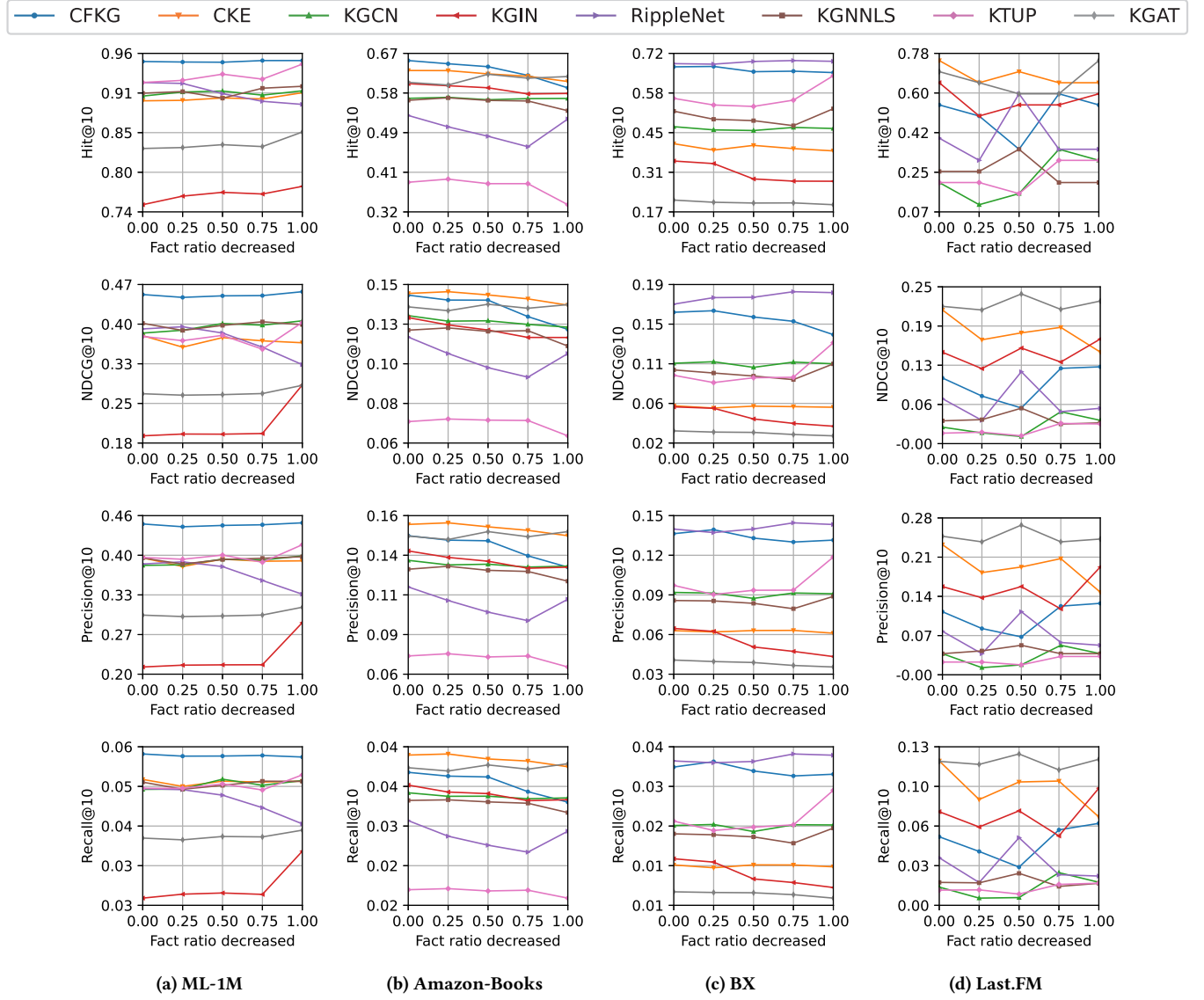




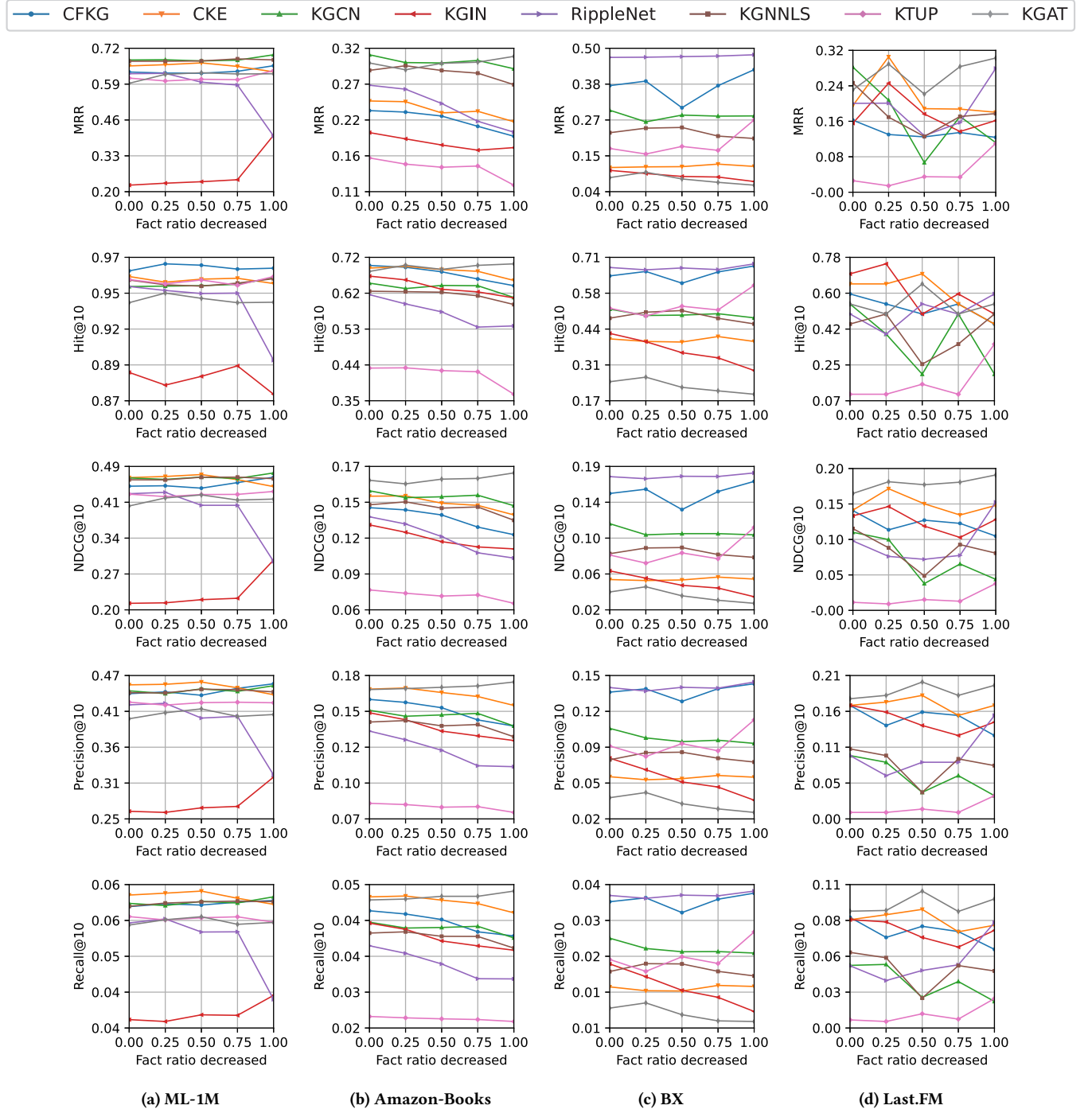
**Figure D7: Additional result of cold-start experiment with false knowledge,  $T=5$ . Horizontal axis denotes distortion degree. The results are similar to those when  $T=3$ , i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**



**Figure D8: Additional result of cold-start experiment with decreased facts,  $T=1$ . Horizontal axis denotes distortion degree. The results are similar to those when  $T=3$ , i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**



**Figure D9: Additional result of cold-start experiment with decreased facts,  $T=3$ . Horizontal axis denotes distortion degree. The results are similar to those when using MRR as metric, i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**



**Figure D10: Additional result of cold-start experiment with decreased facts,  $T=5$ . Horizontal axis denotes distortion degree. The results are similar to those when  $T=3$ , i.e., how cold-start performance of RSs is influenced depends on both the model and the dataset being used.**

## E ADDITIONAL RESULTS OF KGER

Additional experimental results of KGER are presented in Table E1-E14.

**Table E1: Under the normal settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.25.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | -0.002 | 0.007  | 0.149        | 0.021  | -0.007 | 0.009  | 0.136   | 0.002  |
| CKE       | 0.001  | -0.002 | 0.005        | 0.005  | -0.055 | 0.089  | 0.027   | 0.044  |
| KGCN      | 0.014  | 0.004  | -0.020       | 0.038  | -0.028 | 0.003  | 0.175   | 0.227  |
| KGIN      | 0.021  | -0.010 | 0.068        | 0.016  | 0.181  | 0.081  | 0.209   | 0.037  |
| RippleNet | 0.000  | 0.000  | 0.122        | 0.077  | 0.025  | -0.004 | 0.004   | 0.028  |
| KGNNLS    | -0.001 | -0.017 | -0.010       | -0.001 | 0.065  | 0.045  | 0.021   | 0.024  |
| KTUP      | 0.003  | -0.015 | -0.012       | 0.003  | 0.049  | -0.019 | -0.059  | 0.004  |
| KGAT      | -0.011 | 0.005  | 0.074        | -0.001 | 0.157  | -0.115 | 0.104   | -0.024 |

**Table E2: Under the normal settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.75.**

|           | ML-1M  |        | Amazon-Books |       | BX    |        | Last.FM |        |
|-----------|--------|--------|--------------|-------|-------|--------|---------|--------|
|           | F      | D      | F            | D     | F     | D      | F       | D      |
| CFKG      | 0.002  | 0.001  | 0.140        | 0.031 | 0.006 | -0.004 | 0.093   | 0.008  |
| CKE       | -0.003 | 0.004  | 0.009        | 0.007 | 0.009 | 0.006  | 0.002   | 0.012  |
| KGCN      | -0.001 | -0.002 | -0.013       | 0.010 | 0.038 | 0.036  | 0.045   | 0.042  |
| KGIN      | 0.018  | 0.010  | 0.060        | 0.021 | 0.126 | 0.082  | 0.094   | -0.045 |
| RippleNet | 0.007  | 0.021  | 0.077        | 0.030 | 0.055 | -0.010 | -0.010  | 0.019  |
| KGNNLS    | 0.004  | -0.005 | 0.012        | 0.012 | 0.051 | 0.015  | 0.011   | 0.013  |
| KTUP      | 0.011  | 0.005  | 0.004        | 0.003 | 0.011 | -0.004 | 0.002   | -0.012 |
| KGAT      | 0.004  | -0.001 | 0.071        | 0.001 | 0.078 | 0.034  | 0.031   | -0.010 |

**Table E3: Under the normal settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 1.0.**

|           | ML-1M |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|-------|--------|--------------|--------|--------|--------|---------|--------|
|           | F     | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.002 | 0.000  | 0.130        | 0.042  | -0.005 | -0.005 | 0.068   | 0.023  |
| CKE       | 0.002 | 0.004  | 0.011        | 0.014  | 0.002  | 0.014  | 0.009   | 0.009  |
| KGCN      | 0.001 | -0.006 | -0.000       | 0.006  | 0.010  | 0.057  | 0.045   | 0.035  |
| KGIN      | 0.033 | 0.129  | 0.054        | 0.017  | 0.102  | 0.088  | 0.070   | -0.060 |
| RippleNet | 0.016 | 0.063  | 0.077        | 0.034  | 0.056  | -0.005 | 0.010   | -0.026 |
| KGNNLS    | 0.001 | -0.006 | 0.007        | 0.016  | 0.038  | 0.019  | 0.017   | 0.016  |
| KTUP      | 0.002 | -0.000 | 0.001        | -0.009 | -0.002 | 0.009  | 0.010   | -0.042 |
| KGAT      | 0.009 | -0.001 | 0.048        | -0.001 | 0.054  | 0.030  | 0.043   | -0.020 |

**Table E4: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.25, T=1.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | -0.013 | 0.021  | 0.282        | 0.079  | -0.174 | -0.568 | 1.503   | 0.995  |
| CKE       | -0.057 | 0.262  | 0.069        | 0.047  | 0.486  | -0.178 | -0.629  | -0.022 |
| KGCN      | 0.040  | -0.052 | -0.025       | -0.100 | -0.058 | -0.058 | 0.715   | 2.016  |
| KGIN      | -0.015 | -0.043 | 0.200        | 0.112  | 0.414  | 0.338  | 0.834   | -0.355 |
| RippleNet | 0.055  | 0.010  | 0.174        | 0.201  | -0.505 | -0.057 | 2.308   | -1.637 |
| KGNNLS    | -0.068 | -0.031 | 0.022        | -0.023 | 0.495  | 0.402  | 0.828   | 1.454  |
| KTUP      | -0.097 | -0.525 | -0.157       | -0.305 | -0.061 | 0.269  | -5.074  | -6.717 |
| KGAT      | 0.125  | -0.031 | 0.113        | -0.008 | 0.617  | 1.123  | 0.682   | 0.161  |

**Table E5: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.5, T=1.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.030  | -0.009 | 0.203        | 0.106  | 0.249  | 0.004  | 0.286   | 0.136  |
| CKE       | 0.153  | 0.208  | -0.021       | 0.018  | 0.224  | -0.069 | -0.054  | -0.235 |
| KGCN      | 0.035  | -0.000 | -0.019       | -0.047 | 0.028  | -0.127 | 1.014   | 1.105  |
| KGIN      | -0.031 | 0.004  | 0.166        | 0.140  | 0.383  | 0.289  | 0.139   | -0.163 |
| RippleNet | 0.166  | 0.072  | 0.259        | 0.247  | -0.256 | -0.095 | 0.529   | -0.041 |
| KGNLNS    | -0.024 | -0.028 | 0.007        | -0.007 | 0.080  | -0.179 | -1.012  | 0.253  |
| KTUP      | -0.019 | -0.251 | -0.095       | -0.069 | -0.077 | -0.035 | 1.465   | -0.348 |
| KGAT      | 0.030  | -0.028 | 0.080        | 0.018  | 0.514  | 0.879  | 0.268   | 0.241  |

**Table E6: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.75, T=1.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.002  | -0.004 | 0.243        | 0.118  | 0.006  | -0.108 | 0.428   | 0.363  |
| CKE       | 0.047  | 0.031  | 0.036        | 0.042  | 0.135  | -0.037 | 0.121   | -0.278 |
| KGCN      | 0.005  | -0.048 | 0.049        | 0.014  | 0.033  | -0.058 | 0.425   | 0.249  |
| KGIN      | 0.001  | 0.000  | 0.176        | 0.119  | 0.278  | 0.382  | 0.132   | 0.079  |
| RippleNet | 0.097  | 0.144  | 0.265        | 0.220  | -0.171 | -0.065 | 0.020   | 0.459  |
| KGNLNS    | 0.038  | 0.003  | 0.072        | 0.055  | 0.119  | -0.064 | 0.827   | -0.756 |
| KTUP      | -0.031 | 0.031  | 0.006        | -0.030 | -0.052 | 0.099  | 0.098   | -2.526 |
| KGAT      | 0.049  | -0.048 | 0.074        | 0.011  | 0.294  | 0.529  | 0.443   | -0.524 |

**Table E7: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 1.0, T=1.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.013  | -0.026 | 0.231        | 0.116  | -0.028 | -0.332 | 0.188   | 0.348  |
| CKE       | 0.027  | 0.020  | 0.017        | 0.080  | 0.084  | -0.107 | -0.082  | -0.022 |
| KGCN      | 0.003  | 0.001  | 0.010        | -0.001 | -0.040 | -0.042 | -0.064  | 0.057  |
| KGIN      | -0.054 | -0.589 | 0.159        | 0.118  | 0.247  | 0.328  | -0.107  | 0.005  |
| RippleNet | 0.203  | 0.189  | 0.229        | 0.125  | -0.128 | -0.032 | 0.572   | -0.066 |
| KGNLNS    | -0.017 | -0.027 | 0.059        | 0.052  | 0.155  | -0.015 | -0.004  | -0.515 |
| KTUP      | -0.150 | -0.280 | 0.038        | 0.169  | -0.067 | -0.341 | 0.269   | -1.820 |
| KGAT      | 0.050  | -0.080 | 0.068        | -0.011 | 0.317  | 0.423  | 0.090   | -0.111 |

**Table E8: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.25, T=3.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.040  | 0.034  | 0.159        | 0.053  | -0.527 | 0.047  | 0.062   | 0.472  |
| CKE       | 0.232  | 0.371  | 0.040        | -0.032 | -0.083 | 0.312  | 0.568   | 0.890  |
| KGCN      | -0.106 | -0.173 | -0.055       | 0.074  | 0.063  | -0.086 | -7.153  | -4.312 |
| KGIN      | 0.037  | -0.087 | 0.231        | 0.105  | 0.646  | -0.012 | 1.340   | 1.647  |
| RippleNet | 0.171  | -0.054 | 0.222        | 0.312  | -0.315 | -0.463 | 0.961   | 0.905  |
| KGNLNS    | 0.005  | 0.139  | 0.080        | -0.010 | -0.185 | 0.321  | 0.353   | 0.016  |
| KTUP      | 0.251  | 0.191  | -0.178       | -0.089 | -0.300 | 0.333  | -5.927  | -0.882 |
| KGAT      | 0.058  | 0.025  | 0.096        | 0.069  | 0.314  | 0.245  | 0.425   | -0.337 |

**Table E9: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.75, T=3.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.036  | 0.002  | 0.262        | 0.098  | -0.172 | 0.084  | 0.404   | -0.333 |
| CKE       | 0.085  | 0.061  | 0.035        | 0.024  | -0.054 | 0.086  | 0.254   | 0.277  |
| KGCN      | -0.009 | -0.088 | 0.008        | 0.052  | -0.024 | -0.035 | -1.553  | -3.671 |
| KGIN      | 0.006  | -0.044 | 0.157        | 0.121  | 0.436  | 0.347  | -0.007  | -0.349 |
| RippleNet | 0.141  | 0.122  | 0.225        | 0.268  | -0.102 | -0.163 | -1.377  | 0.465  |
| KGNLNS    | -0.029 | -0.039 | 0.037        | -0.030 | -0.038 | 0.191  | -1.463  | 0.557  |
| KTUP      | 0.197  | 0.208  | -0.013       | -0.034 | -0.107 | -0.005 | 0.402   | -2.325 |
| KGAT      | 0.048  | -0.017 | 0.086        | 0.010  | 0.274  | 0.131  | 0.150   | 0.132  |

**Table E10: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 1.0, T=3.**

|           | ML-1M  |        | Amazon-Books |       | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|-------|--------|--------|---------|--------|
|           | F      | D      | F            | D     | F      | D      | F       | D      |
| CFKG      | 0.022  | -0.021 | 0.246        | 0.133 | -0.078 | 0.273  | 0.310   | -0.156 |
| CKE       | 0.045  | 0.076  | 0.034        | 0.056 | -0.040 | 0.032  | 0.219   | 0.055  |
| KGCN      | -0.003 | -0.086 | 0.019        | 0.082 | -0.022 | 0.003  | -1.497  | -1.872 |
| KGIN      | -0.053 | -0.693 | 0.161        | 0.101 | 0.278  | 0.249  | 0.058   | 0.214  |
| RippleNet | 0.186  | 0.200  | 0.224        | 0.072 | -0.073 | -0.122 | 0.285   | -0.037 |
| KGNLNS    | -0.011 | 0.027  | 0.098        | 0.099 | 0.018  | -0.082 | 0.081   | 0.305  |
| KTUP      | -0.033 | -0.103 | 0.007        | 0.199 | -0.039 | -0.504 | -1.470  | -1.633 |
| KGAT      | 0.041  | -0.099 | 0.075        | 0.011 | 0.095  | 0.166  | -0.085  | -0.128 |

**Table E11: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.25, T=5.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.082  | 0.024  | 0.315        | 0.038  | -0.209 | -0.151 | 1.037   | 0.802  |
| CKE       | -0.158 | -0.028 | 0.123        | 0.017  | -0.092 | -0.072 | 0.205   | -2.265 |
| KGCN      | -0.040 | -0.005 | -0.018       | 0.148  | -0.195 | 0.497  | 1.008   | 1.063  |
| KGIN      | -0.188 | -0.130 | 0.246        | 0.189  | 0.289  | 0.376  | -0.187  | -2.336 |
| RippleNet | 0.121  | -0.008 | 0.135        | 0.088  | -0.252 | -0.005 | -0.066  | -0.007 |
| KGNLNS    | 0.007  | -0.000 | 0.093        | -0.095 | 0.240  | -0.257 | 1.859   | 1.260  |
| KTUP      | -0.054 | 0.068  | -0.005       | 0.231  | -0.122 | 0.403  | -7.636  | 1.866  |
| KGAT      | -0.072 | -0.221 | 0.283        | 0.135  | 0.197  | -0.826 | -0.039  | -1.011 |

**Table E12: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.5, T=5.**

|           | ML-1M  |        | Amazon-Books |       | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|-------|--------|--------|---------|--------|
|           | F      | D      | F            | D     | F      | D      | F       | D      |
| CFKG      | 0.074  | 0.014  | 0.344        | 0.070 | -0.118 | 0.375  | 0.443   | 0.467  |
| CKE       | -0.014 | -0.034 | 0.129        | 0.145 | -0.082 | -0.048 | 0.531   | 0.073  |
| KGCN      | -0.008 | 0.010  | -0.012       | 0.078 | -0.000 | 0.104  | 1.163   | 1.534  |
| KGIN      | -0.098 | -0.115 | 0.286        | 0.187 | 0.437  | 0.363  | 0.254   | -0.268 |
| RippleNet | 0.064  | 0.099  | 0.173        | 0.203 | -0.199 | -0.011 | -1.257  | 0.734  |
| KGNLNS    | -0.009 | -0.003 | 0.093        | 0.001 | 0.206  | -0.148 | 0.589   | 0.986  |
| KTUP      | 0.014  | 0.014  | -0.021       | 0.173 | -0.050 | -0.073 | -1.467  | -0.733 |
| KGAT      | 0.008  | -0.130 | 0.168        | 0.003 | 0.308  | 0.103  | 0.921   | 0.084  |

**Table E13: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 0.75, T=5.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.063  | -0.005 | 0.340        | 0.135  | 0.190  | 0.000  | 0.090   | 0.230  |
| CKE       | 0.018  | 0.004  | 0.077        | 0.084  | 0.012  | -0.126 | 0.380   | 0.055  |
| KGCN      | -0.013 | 0.001  | 0.009        | 0.036  | 0.072  | 0.084  | -0.511  | 0.529  |
| KGIN      | -0.042 | -0.120 | 0.221        | 0.177  | 0.382  | 0.266  | 0.230   | 0.162  |
| RippleNet | 0.072  | 0.088  | 0.249        | 0.267  | -0.119 | -0.012 | -1.224  | 0.290  |
| KGNNLS    | 0.003  | -0.017 | 0.118        | 0.019  | 0.141  | 0.063  | 0.563   | 0.412  |
| KTUP      | 0.065  | 0.013  | -0.011       | 0.101  | -0.064 | 0.046  | -1.304  | -0.444 |
| KGAT      | 0.027  | -0.077 | 0.145        | -0.005 | 0.289  | 0.241  | 0.204   | -0.304 |

**Table E14: Under the cold-start settings, comparison of KGER under false knowledge and decreased knowledge, distortion (F) / decreased (D) ratio is 1.0, T=5.**

|           | ML-1M  |        | Amazon-Books |        | BX     |        | Last.FM |        |
|-----------|--------|--------|--------------|--------|--------|--------|---------|--------|
|           | F      | D      | F            | D      | F      | D      | F       | D      |
| CFKG      | 0.022  | -0.036 | 0.327        | 0.166  | -0.156 | -0.135 | 0.198   | 0.241  |
| CKE       | -0.013 | 0.033  | 0.068        | 0.126  | -0.009 | -0.031 | 0.159   | 0.078  |
| KGCN      | -0.011 | -0.028 | 0.029        | 0.066  | -0.101 | 0.061  | 0.283   | 0.607  |
| KGIN      | -0.050 | -0.830 | 0.203        | 0.113  | 0.288  | 0.334  | 0.049   | -0.038 |
| RippleNet | 0.263  | 0.363  | 0.226        | 0.261  | -0.094 | -0.018 | -0.424  | -0.396 |
| KGNNLS    | -0.009 | -0.008 | 0.096        | 0.073  | 0.010  | 0.081  | 0.401   | 0.283  |
| KTUP      | 0.000  | -0.045 | 0.062        | 0.254  | -0.165 | -0.515 | -0.778  | -3.435 |
| KGAT      | 0.038  | -0.059 | 0.119        | -0.033 | 0.273  | 0.289  | 0.417   | -0.312 |