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Corrigendum: Imitation Perfection—A Simple Rule to Prevent Discrimination in Procurement†

By Helene Mass, Nicolas Fugger, Vitali Gretscho, and Achim Wambach*

We have been made aware that our 2020 paper published in the *American Economic Journal: Microeconomics* 12 (3): 189–245 is missing a technical assumption. In light of this discovery, we carefully checked all of the results, and in this corrigendum we correct any remaining inconsistencies.

Page 197: Assumption 2 needs to include that the payment function is right-continuous at zero, i.e., for every bidder i, for every vector of bids $\mathbf{b}_{-i}$, and for every $\epsilon > 0$ there exists a $\delta > 0$, such that for all b_i with $0 < b_i < \delta$ it holds that

$$\left| p_i(0, \mathbf{b}_{-i}) - p_i(b_i, \mathbf{b}_{-i}) \right| < \epsilon.$$

Explanation of Impact.—Lemma 3 states that the payment of a bidder who is not a bidder with a tie is right-continuous in her bid. The Proof of Lemma 3 on page 210 does not work if a bidder places a bid of zero, since the proof relies on the possibility of imitating a higher bid. Since zero can never be a higher bid, we need this additional assumption.[1]

Page 222: Lemma 10 should state

$$\Pr\left(b_k = \max_{i \neq j,k} \beta_i(v_i)\right)\left(v_j - p^{win}(b_k)\right) > 0$$

instead of

$$P := \Pr\left(b_k > \beta_i(v_i) \text{ for all } i \neq j,k\right)\left(v_j - p^{win}(b_k)\right) > 0.$$

Explanation of Impact.—We need the stronger version of Lemma 10 when we apply it on pages 227 and 236. Thus, bidder j can deviate from $b_k = \beta_j(v_j)$ to b' such that $p^{win}(b') - p^{win}(b_k)$, $p^{lose}(b') - p^{lose}(b_k) < \epsilon$, and $p^{win} - b' > 0$. Let $\alpha > 0$ be defined by

$$\left(F_k(\underline{\hat{v}}_k) + \left[F_k(\hat{\bar{v}}_k) - F_k(\underline{\hat{v}}_k)\right]\right)(P + \alpha) = X_j^{\beta_{-j}}(b').$$

*Mass: Institute for Microeconomics, University of Bonn (email: hmass@uni-bonn.de); Fugger: University of Cologne (email: fugger@wiso.uni-koeln.de); Gretschko: ZEW Mannheim (email: vitali.gretschko@zew.de); Wambach: ZEW Mannheim (email: achim.wambach@zew.de).
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[1] We thank Dmitriy Knyazev and Hayrullah Dindar for pointing this out.

Then the increase in expected payoff is given by at least

$$\Big(F_k(\hat{\underline{v}}_k) + \big[F_k(\hat{\bar{v}}_k) - F_k(\hat{\underline{v}}_k)\big]\Big)(P+\alpha)\Big(v_j - p^{win}(b_k) - \frac{\epsilon}{2}\Big)$$
$$- \Big(F_k(\hat{\underline{v}}_k) + \frac{1}{2}\big[F_k(\hat{\bar{v}}_k) - F(\hat{\underline{v}}_k)\big]\Big)P\big(v_j - p^{win}(b_k)\big) - \frac{\epsilon}{2}$$
$$\geq \frac{1}{2}\big[F_k(\hat{\bar{v}}_k) - F(v_k)\big]P - \epsilon > 0.$$

Page 226: Instead of "Thus, it holds that $\bar{v}_j(b) \leq \bar{v}_i(b)$, and it follows from part (ii) of Lemma 9 that $X_i^{\beta}(b) = X_j^{\beta}(b)$. If $\beta_j(\underline{z}) > \beta_i(\underline{z})$, then it follows from part (ii) of Lemma 9 that $X_j^{\beta}(b) > X_i^{\beta}(b)$." it should say "Thus, it holds that $\bar{v}_j(b) \leq \bar{v}_i(b)$, and it follows Lemma 9 that $X_i^{\beta}(b) \leq X_j^{\beta}(b)$. If $\beta_j(\underline{z}) > \beta_i(\underline{z})$, then it follows from part (i) of Lemma 9 that $X_j^{\beta}(\underline{z}) > X_i^{\beta}(\underline{z})$."

Explanation of Impact.—Fixes a typo, all arguments remain intact.

Page 230: In Proposition 4 we need to restrict the strategies of bidders such that no bidder i with valuation v_i can bid strictly higher than $(p^{win})^{-1}(v_i)$, i.e., no bidder places a bid potentially inducing a negative payoff. Additionally, it must hold that $\bar{b} > (p^{win})^{-1}(\bar{v})$ and that the bidders' value distribution has positive density over $[0, \bar{v}]$.

Explanation of Impact.—In the Proof of Proposition 4 on page 230, we consider the possibility of ties. In this case, there is a bidder who is losing with positive probability over some interval of valuations. We argue that this bidder can strictly increase her winning probability by placing a slightly higher bid. If bidders tie at $\bar{b}$, this is not possible. The imposed conditions prevent ties at $\bar{b}$, and the positive density on $[0, \bar{v}]$ ensures that the bidder can strictly increase her winning probability. Such additional conditions are also required in Reny (1999).

Page 241: In case 3 in the Proof of Proposition 5, we need a different argument. This argument is provided by reformulating statements (i) and (ii) in Lemma 14:

(i) If $\beta_i(\bar{z}) \geq \beta_j(\bar{z})$ or if there exists a valuation $\hat{v} < \bar{z}$ such that $\beta_i(z) = \beta_j(z)$ for all $z \in (\hat{v}, \bar{z})$, then it holds that

$$U_i^{\beta}(\bar{z}) + \Delta_{i,j}\bar{z} \geq U_j^{\beta}(\bar{z}).$$

(ii) If there exists a valuation $\hat{v} > \bar{z}$ such that $\beta_i(z) \geq \beta_j(z)$ for all $z \in (\bar{z}, \hat{v})$, then it holds that

$$U_i^{\beta}(\bar{z}) + \Delta_{i,j}\bar{z} \geq U_j^{\beta}(\bar{z}).$$

Explanation of Impact.—In case 3, i.e., the case where there exists an interval (v', v) such that $\beta_i(z) = \beta_j(z)$ for all $z \in (v', v)$, the reasoning is as follows: if there exists an interval (v, v'') such that $\beta_i(z) \geq \beta_j(z)$ for all $z \in (v, v'')$, the statement to show follows from (i). If there exists an interval (v, v'') such that $\beta_i(z) < \beta_j(z)$ for all $z \in (v, v'')$, one can define $\bar{z}$ as in case 1 and the same reasoning applies.

Page 242: In Proposition 6 we need to assume that bidding strategies are continuously differentiable with respect to Δ.

Explanation of Impact.—In the Proof of Proposition 6 on page 242, we use Lemma 1 in Fibich et al. (2004). As Fibich et al. (2004) assume that bidding strategies are continuously differentiable with respect to Δ, Proposition 6 needs to impose this condition as well.

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Reny, **Philip J.** 1999. "On the Existence of Pure and Mixed Strategy Nash Equilibria in Discontinuous Games." *Econometrica* 67 (5), 1029–56.