Part IV: Problem Set 2

Yongseok Kim

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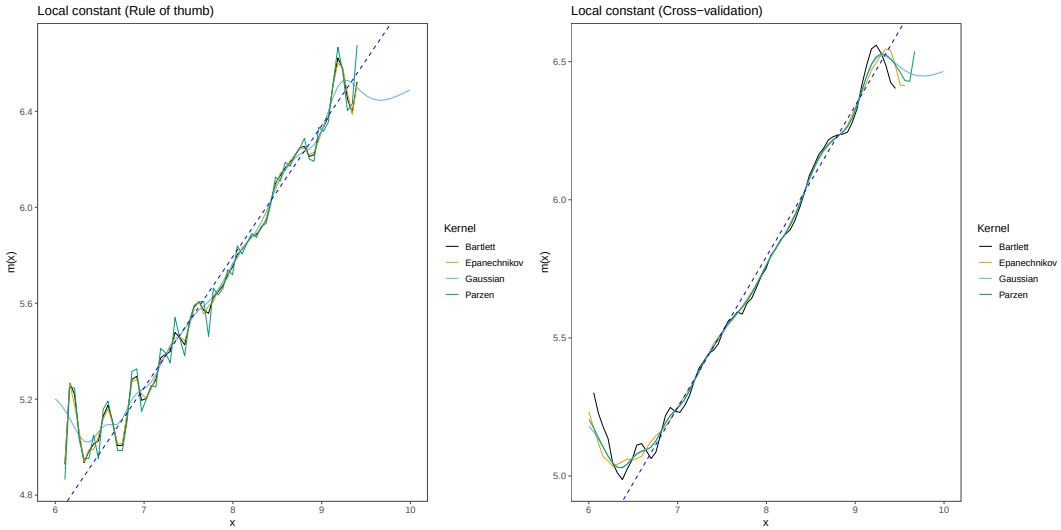
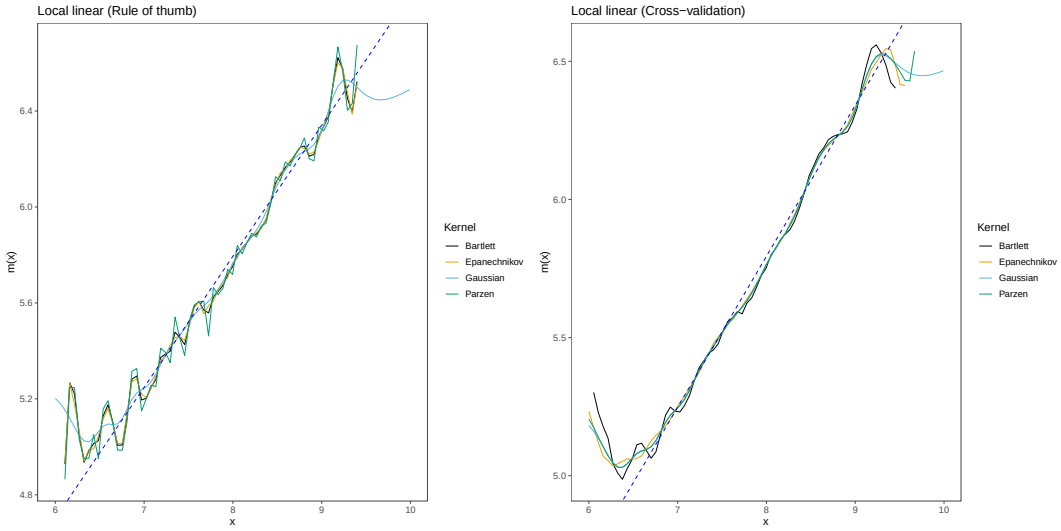
1. (a) See Figure 1. The results obtained from $\hat{m}(x)$ and $\tilde{m}(x)$ are very similar.
   (b) See Figure 1. The results obtained from the nonparametric regression function estimates and from the linear model are very similar.
   (c) Unlike the effect of age, the effect of income on happinesss is linear.

2. For this question, calculating the bandwith set by cross validation is computationally too burdening. Hence, I only calculate estimators using the bandwidth set by the rule of thumb.
   (a) See Figure 2. While $\hat{\alpha}(z)$ shows U-shaped graph, $\hat{\beta}(z)$ shows inverse U-shaped graph with respect to age. In other words, on average, people are happiest when they are 20s; gradually becomes unhappier as they get older; and a level of happiness rebounds after their 50s.
   (b) See Figure 3. Compared to the results from part (a), it is relatively hart to interpret the results in part (b).

3. From the above questions, we can verify that the local constant estimator and the local linear estimator yield almost identical results. Hence, for this question, I only calculate the local constant estimator using the bandwidth set by the rule of thumb to highlight a comparison between two subsets .
   (a) Male vs. Female: For the results, see Figure 4, 5, and 6. Overall, no distinct patterns are detected in subsamples.
   (b) Employed vs. Unemployed: For the results, see Figure 7, 8, and 9. Overall, no distinct patterns are detected in subsamples.
   (c) With vs. Without college education: For the results, see Figure 10, 11, and 12. Overall, no distinct patterns are detected in subsamples except with college education subsample around 60s.

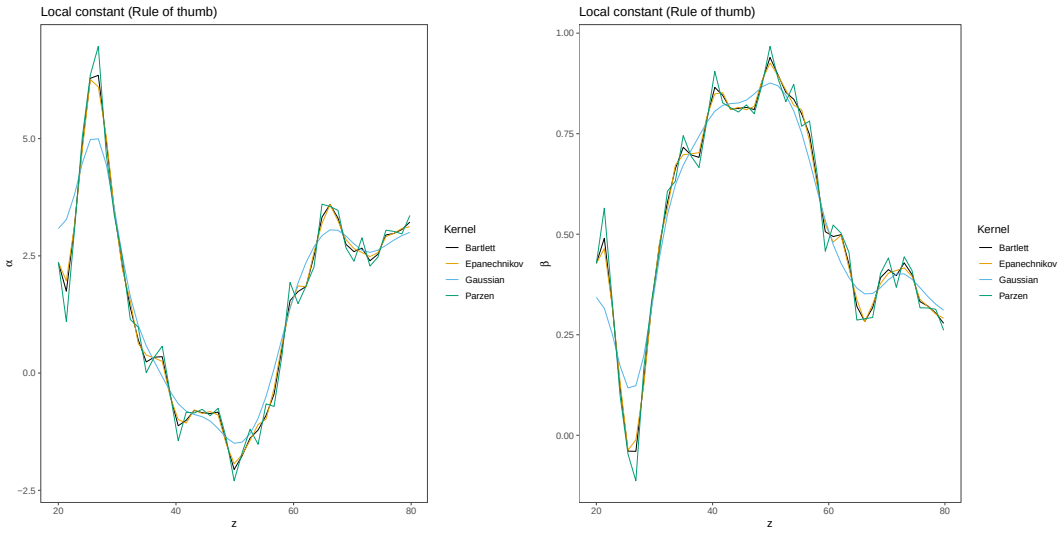


(a) Local constant

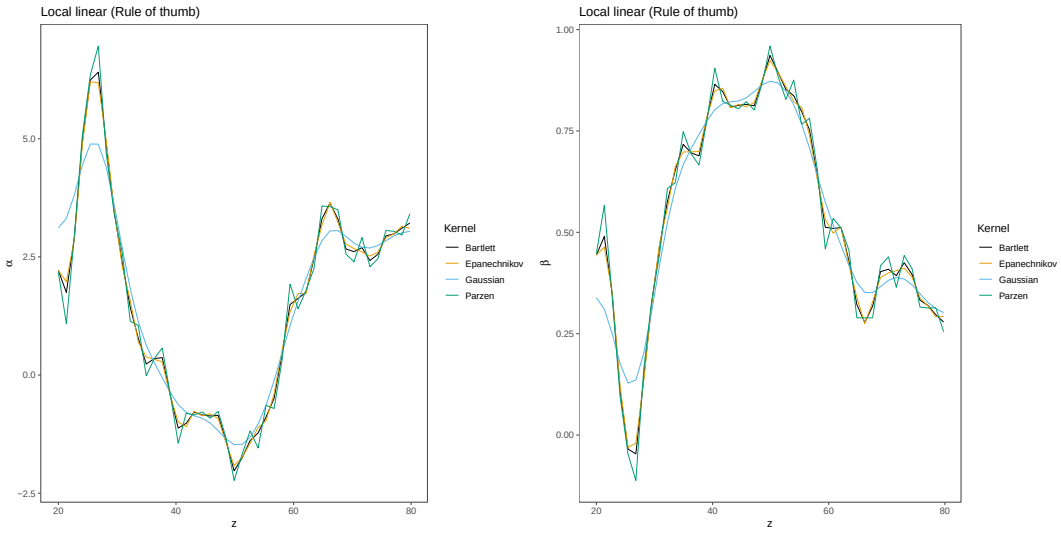


(b) Local linear

Figure 1: $\hat{m}(x)$ and $\tilde{m}(x)$ by the local constant and linear estimation
This figure shows $\hat{m}(x)$ and $\tilde{m}(x)$ from various local constant and linear estimators. Blue linear dashed line represents the linear regression model $y = \hat{\alpha} + \hat{\beta}x$.

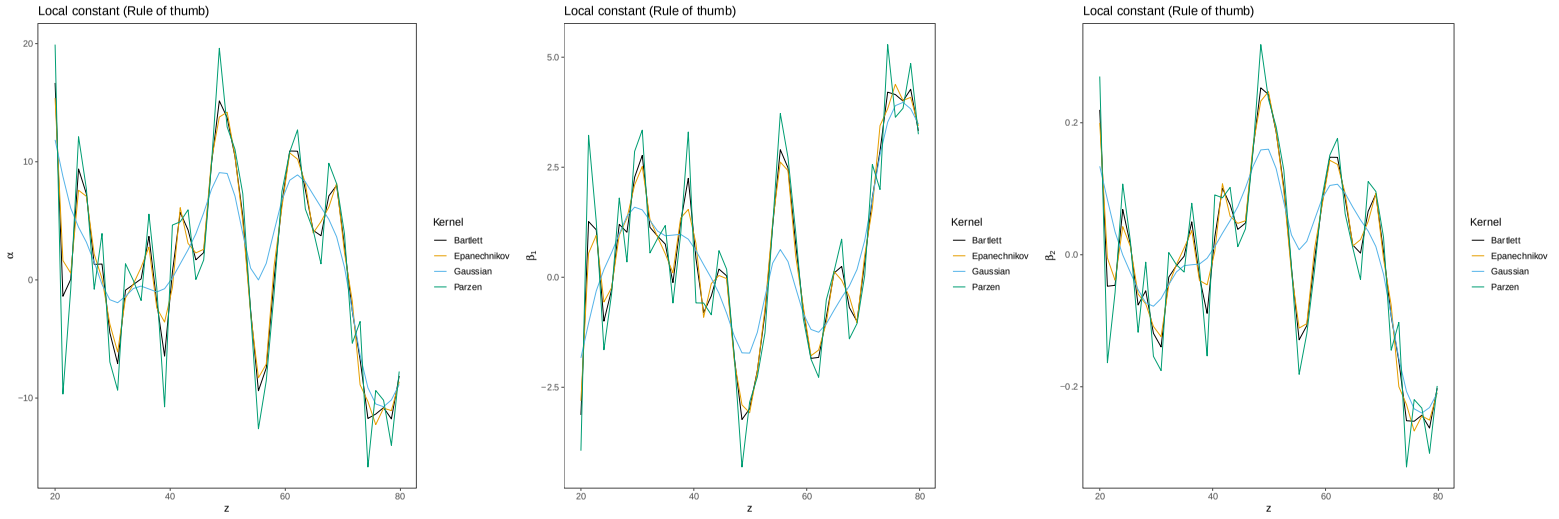


(a) Local constant

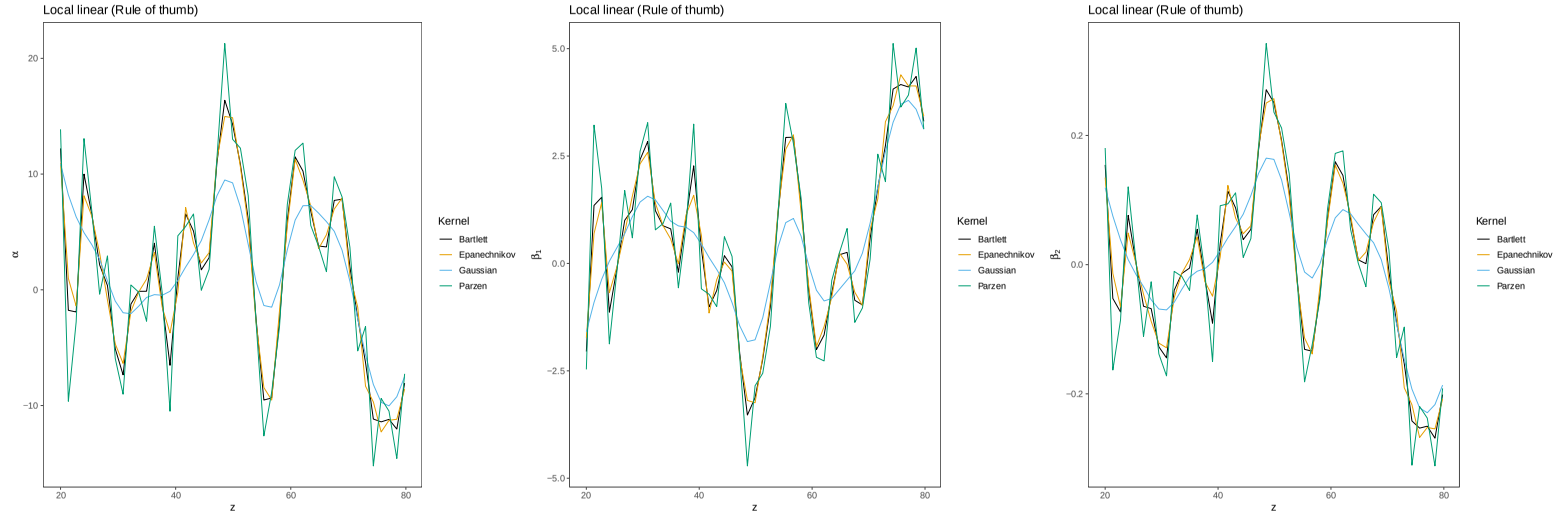


(b) Local linear

Figure 2: $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ by the local constant and linear estimation
This figure shows $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ from various local constant and linear estimators.



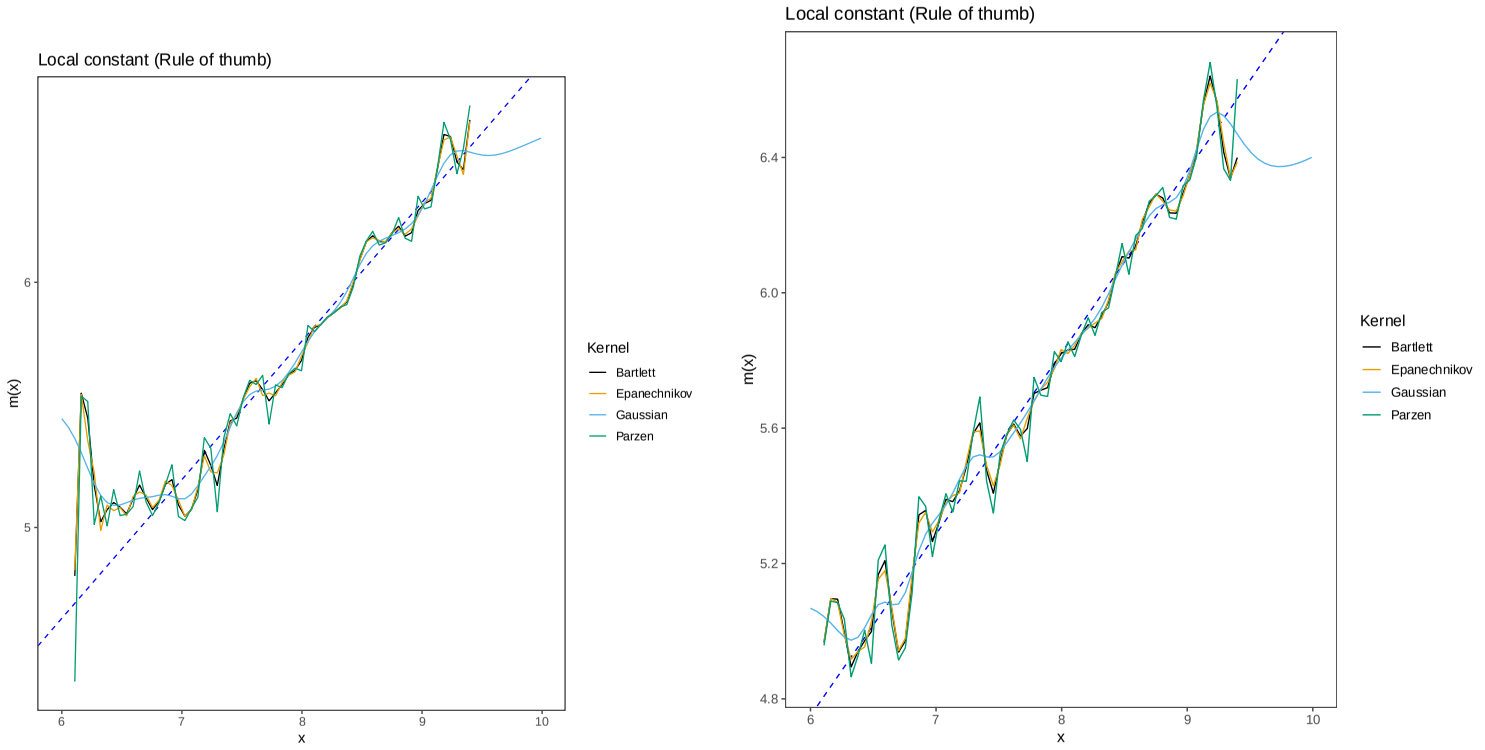
(a) Local constant



(b) Local linear

Figure 3: $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ by the local constant and linear estimation

This figure shows $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ from various local constant and linear estimators.

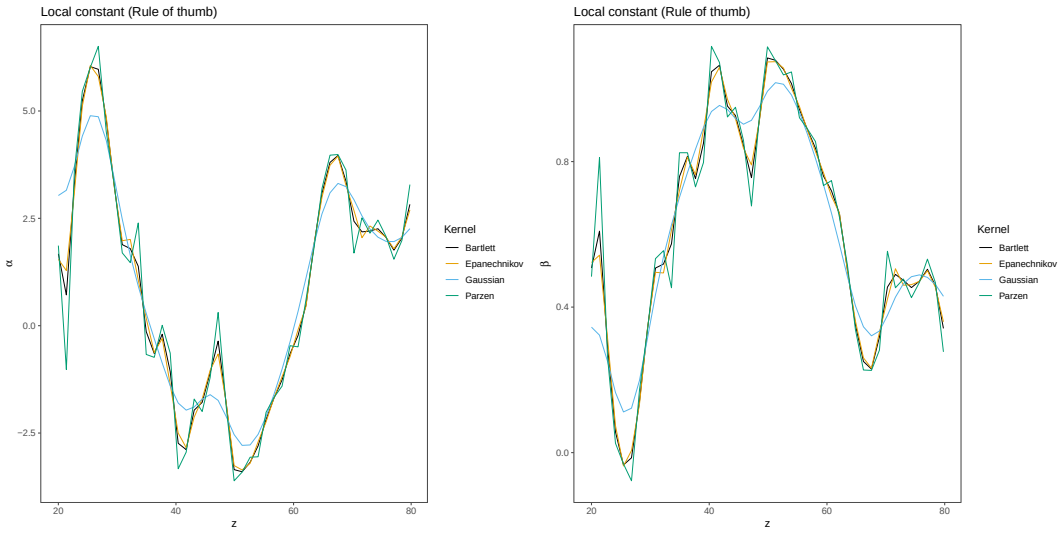


(a) Male

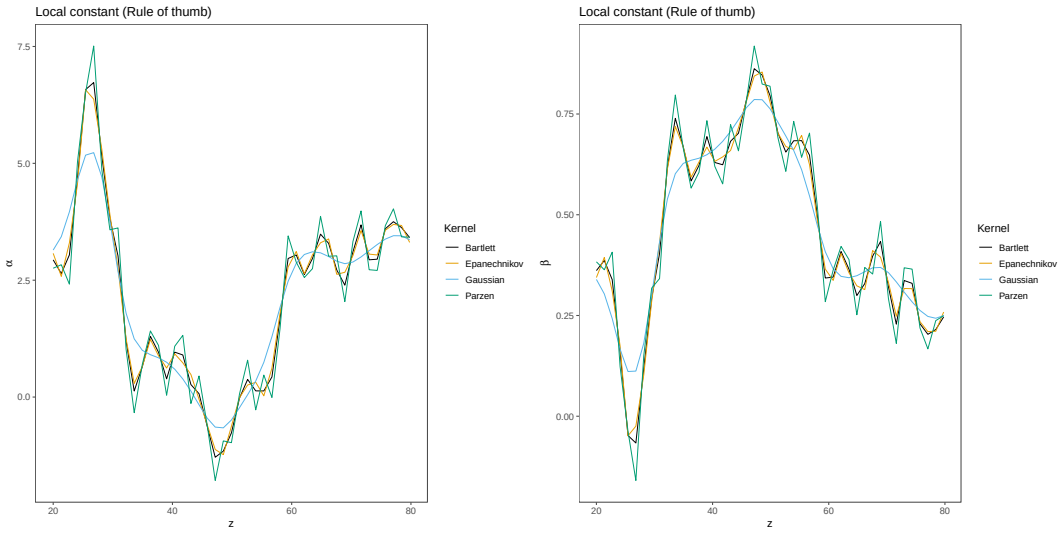
(b) Female

Figure 4: $\hat{m}(x)$ by the local constant estimation

This figure shows $\hat{m}(x)$ from various local constant estimators. Blue linear dashed line represents the linear regression model $y = \hat{\alpha} + \hat{\beta}x$.

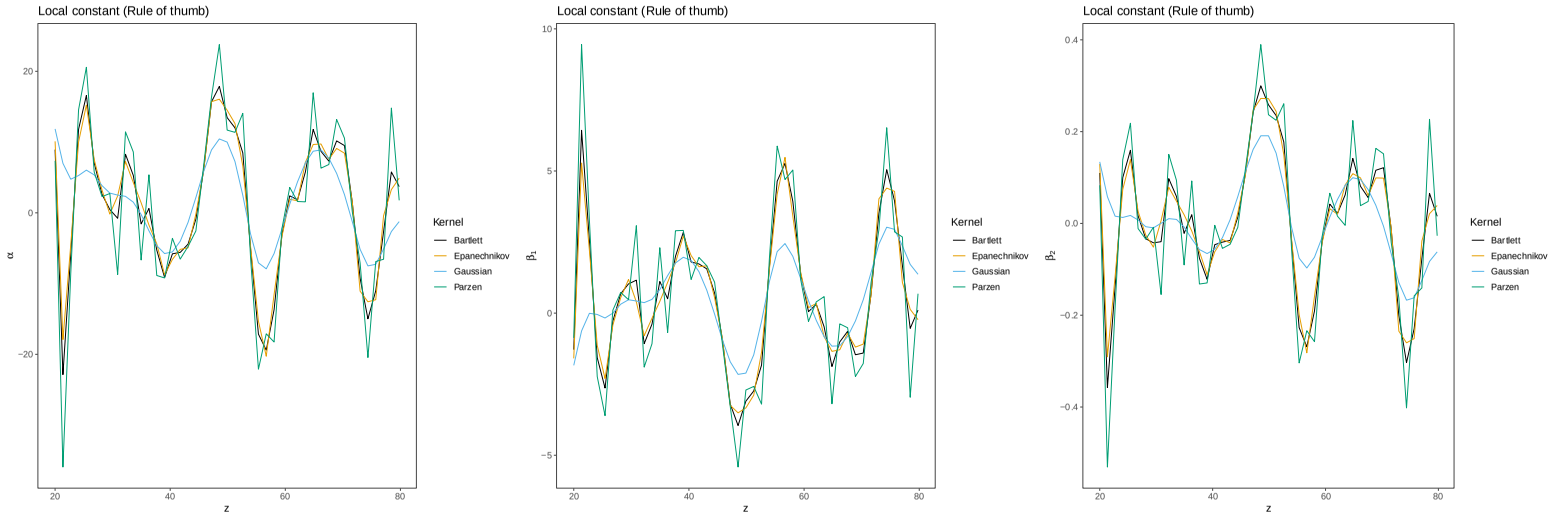


(a) Male

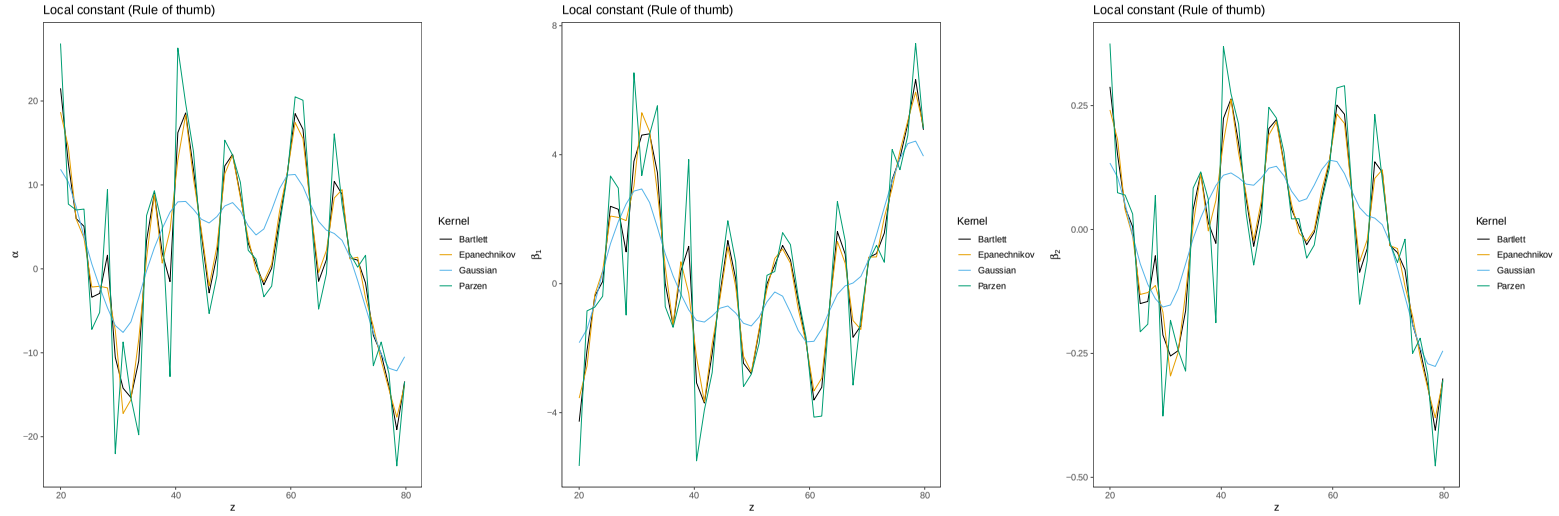


(b) Female

Figure 5: $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ by the local constant estimation
This figure shows $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ from various local constant estimators.



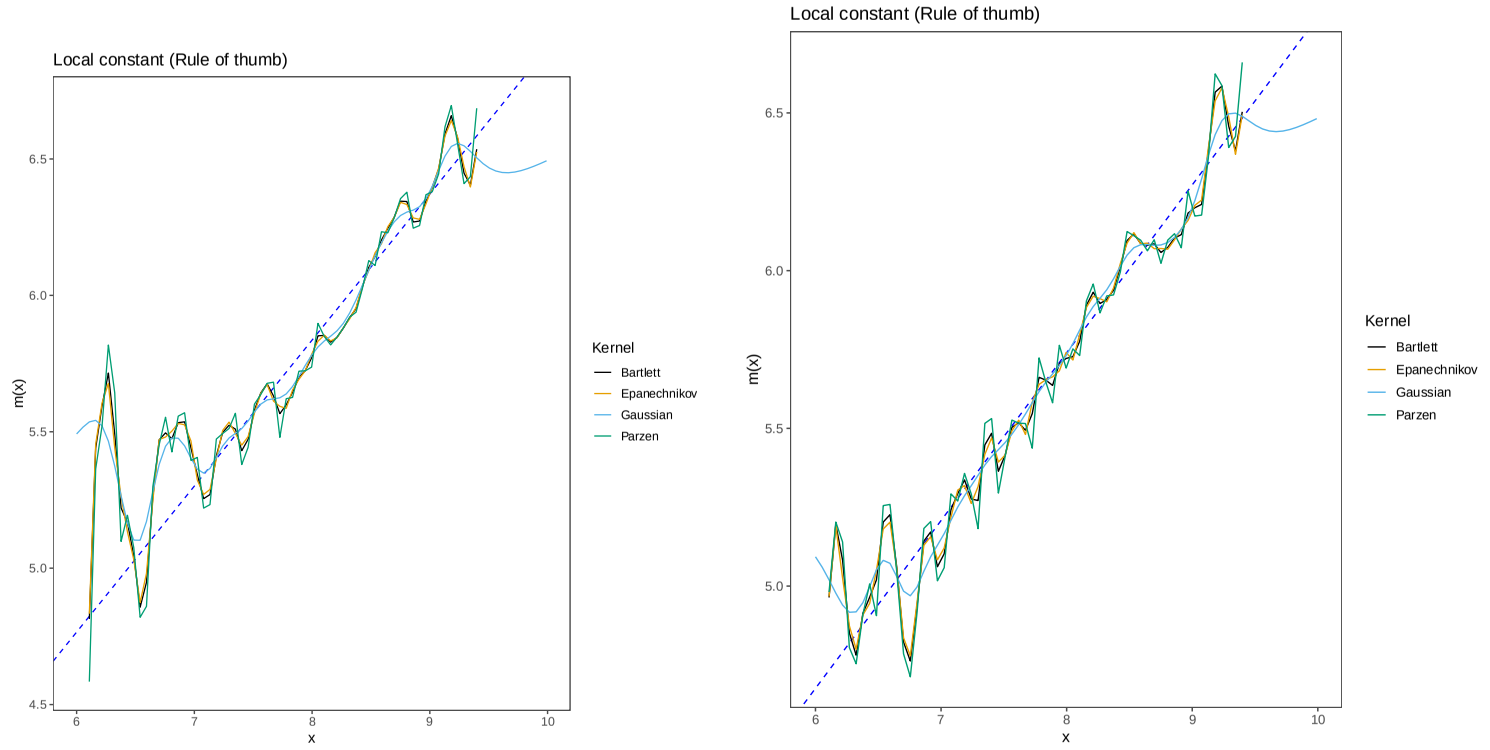
(a) Male



(b) Female

Figure 6: $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ by the local constant estimation

This figure shows $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ from various local constant estimators.

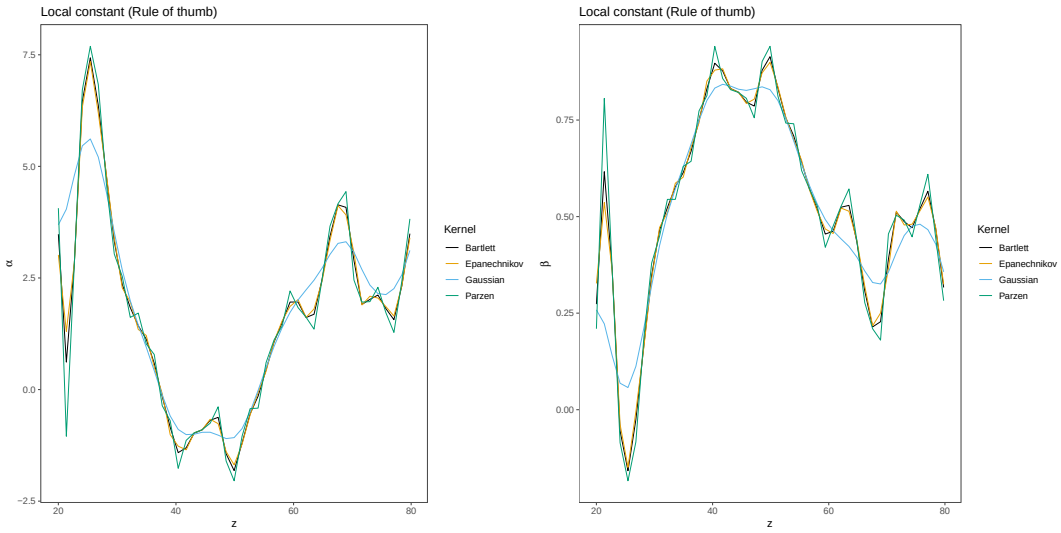


(a) Employed

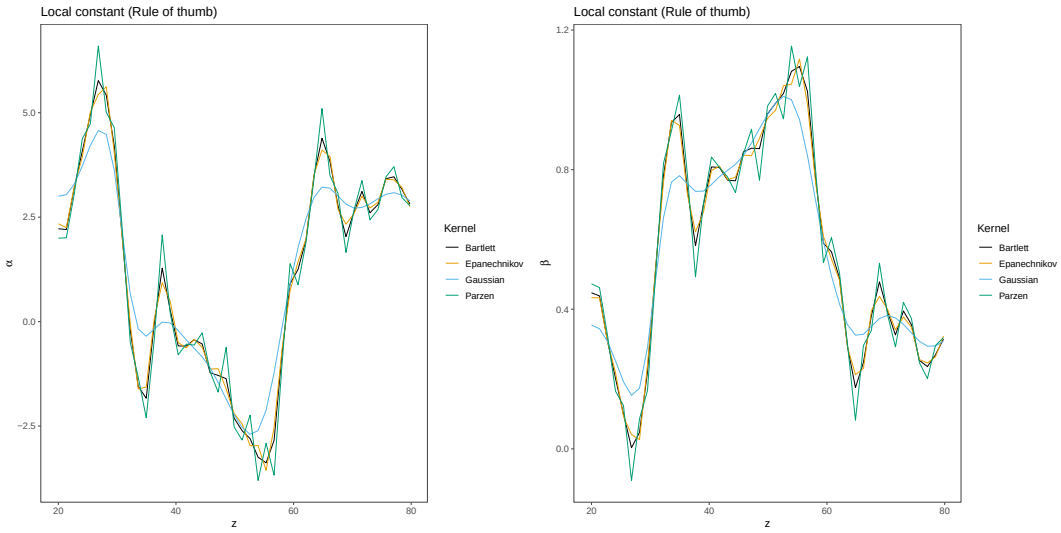
(b) Unemployed

Figure 7: $\hat{m}(x)$ by the local constant estimation

This figure shows $\hat{m}(x)$ from various local constant estimators. Blue linear dashed line represents the linear regression model $y = \hat{\alpha} + \hat{\beta}x$.



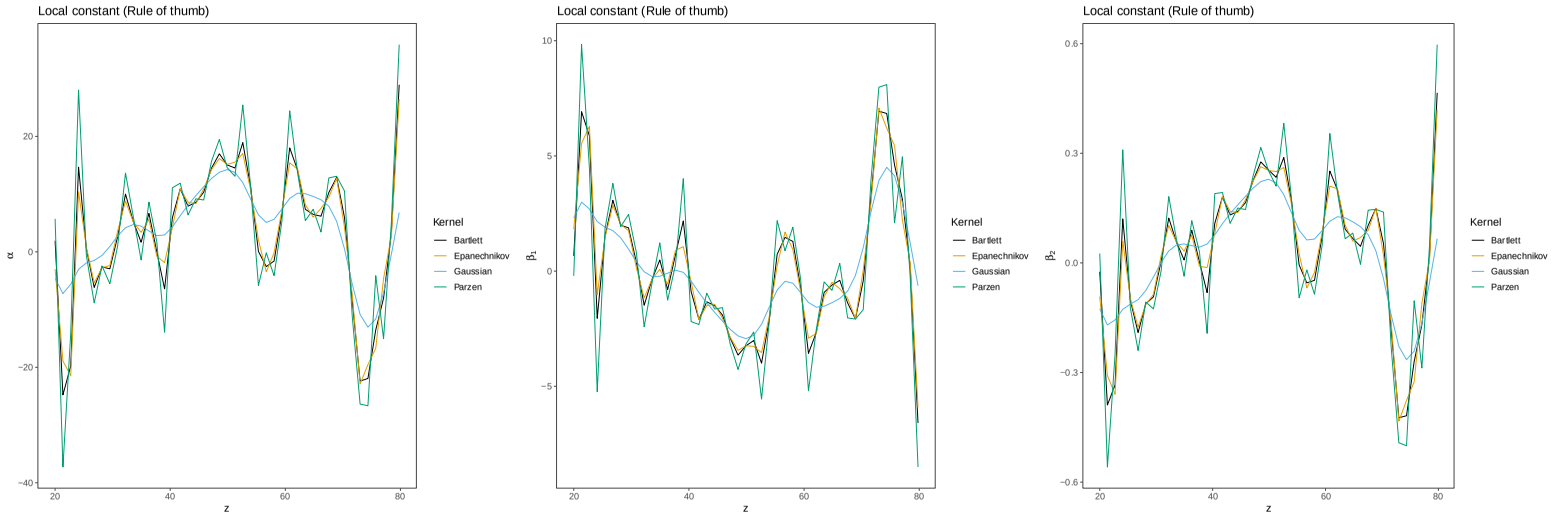
(a) Employed



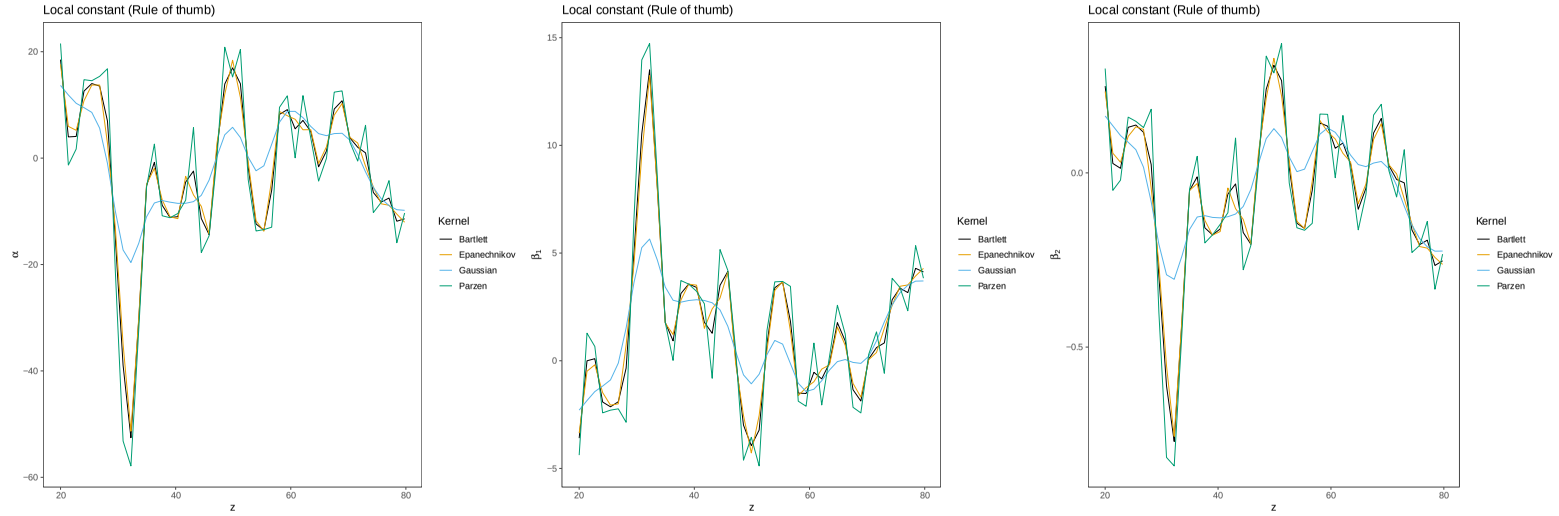
(b) Unemployed

Figure 8: $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ by the local constant estimation

This figure shows $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ from various local constant estimators.



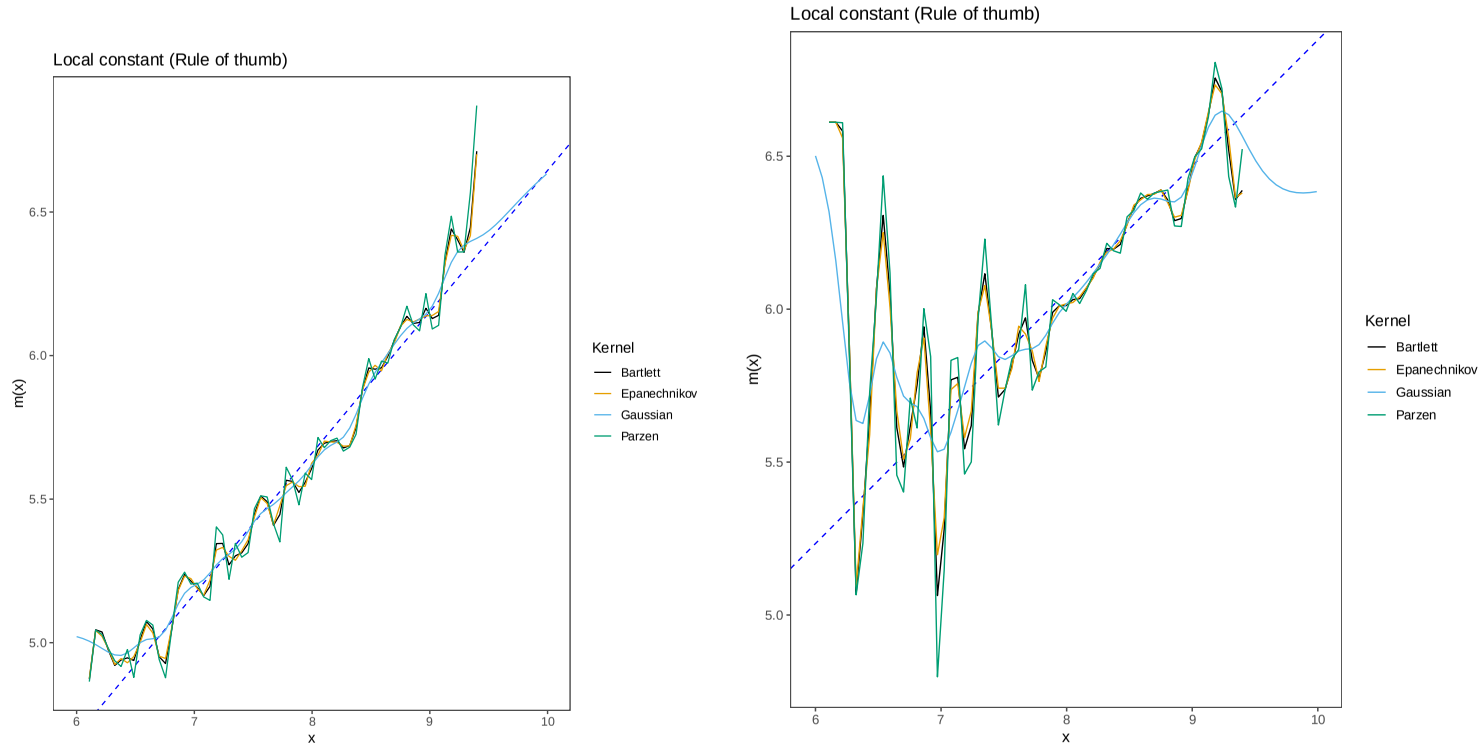
(a) Employed



(b) Unemployed

Figure 9: $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ by the local constant estimation

This figure shows $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ from various local constant estimators.

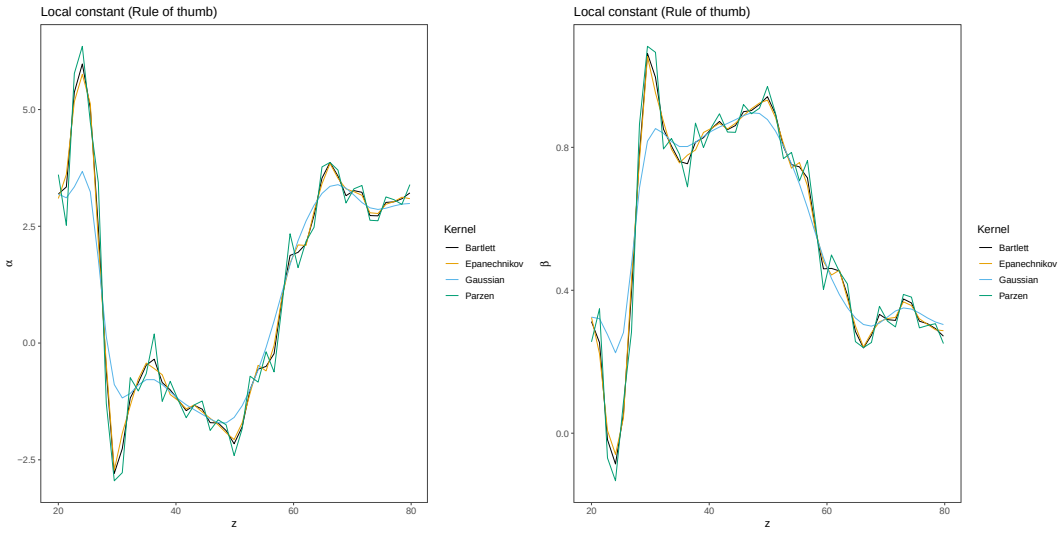


(a) Uneducated

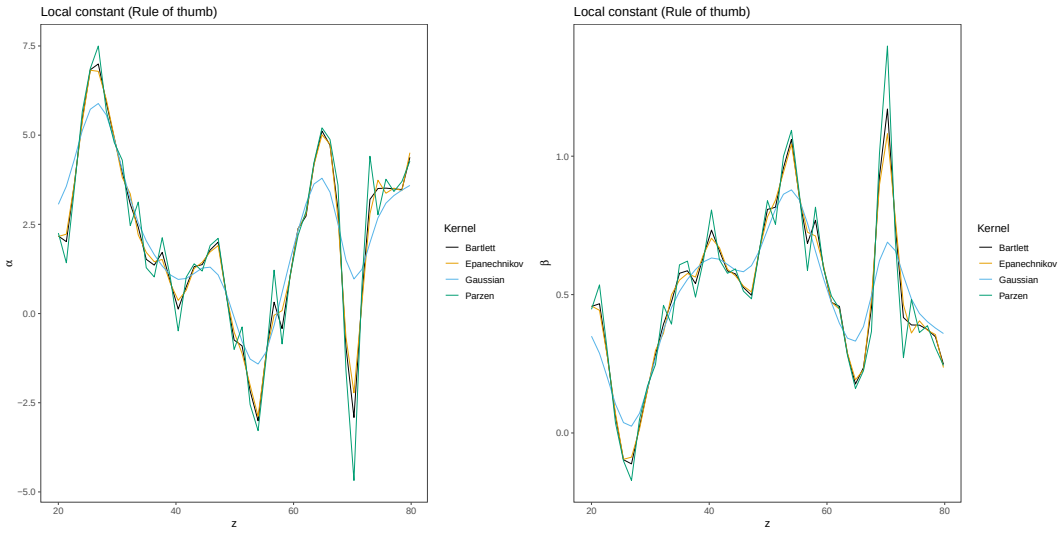
(b) Educated

Figure 10: $\hat{m}(x)$ by the local constant estimation

This figure shows $\hat{m}(x)$ from various local constant estimators. Blue linear dashed line represents the linear regression model $y = \hat{\alpha} + \hat{\beta}x$.



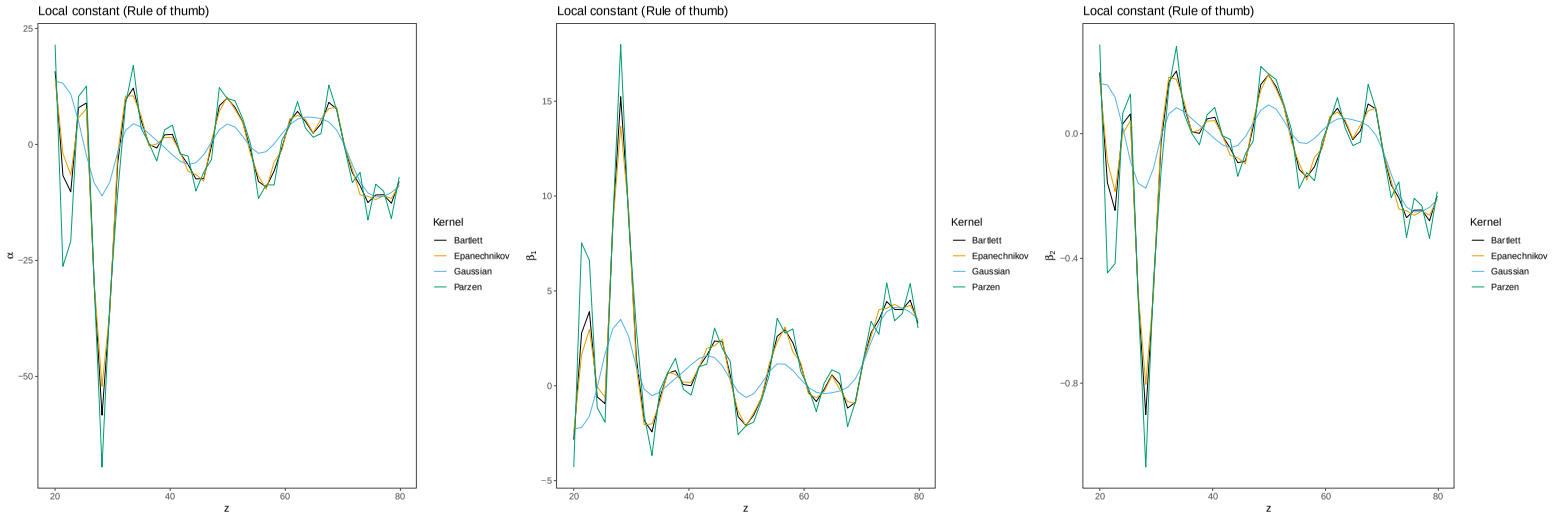
(a) Uneducated



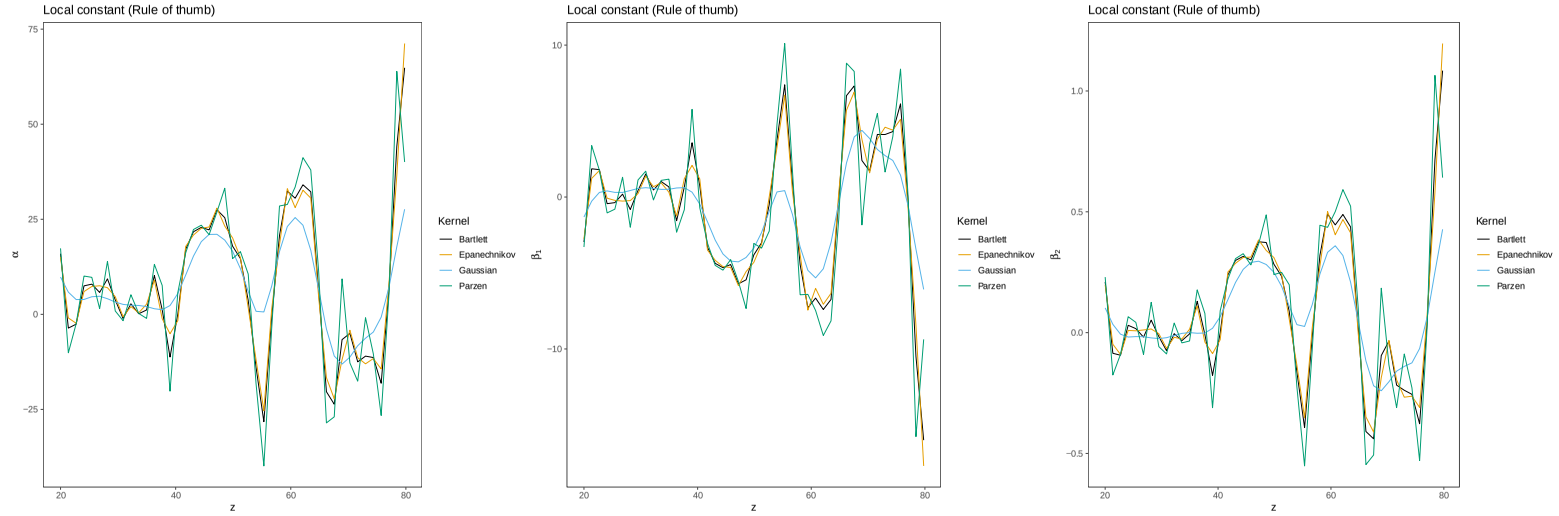
(b) Educated

Figure 11: $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ by the local constant estimation

This figure shows $\hat{\alpha}(z)$ and $\hat{\beta}(z)$ from various local constant estimators.



(a) Uneducated



(b) Educated

Figure 12: $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ by the local constant estimation

This figure shows $\hat{\alpha}(z)$, $\hat{\beta}_1(z)$, and $\hat{\beta}_2(z)$ from various local constant estimators.

A Appendix

For R codes to get the above results, see `https://github.com/ysugk/Course-ECON572/tree/master/code`