Sequence IVB Operational Analysis

By: Industry Stats Team

02-14-18

Operational Analysis with Partial Least Squares

- All operational data was analyzed using Partial Least Squares (PLS)
  - Method is appropriate for multicollinear data and/or where the number of independent variables exceeds the number of observations
  - Some operational, surface finish, and camshaft related variable measurement data in analysis seems suspect (data entry error?), which will affect analysis results
- Factors identified in partial least squares does not imply root cause
  - It identifies factors that may be of interest for additional investigation
- PLS Model Related info:
  - Dependent variable analyzed: Sqrt(AVLI)
  - Number of observations = 28
  - Number of independent variables = 90
  - For the analysis, missing values were imputed using mean value substitution

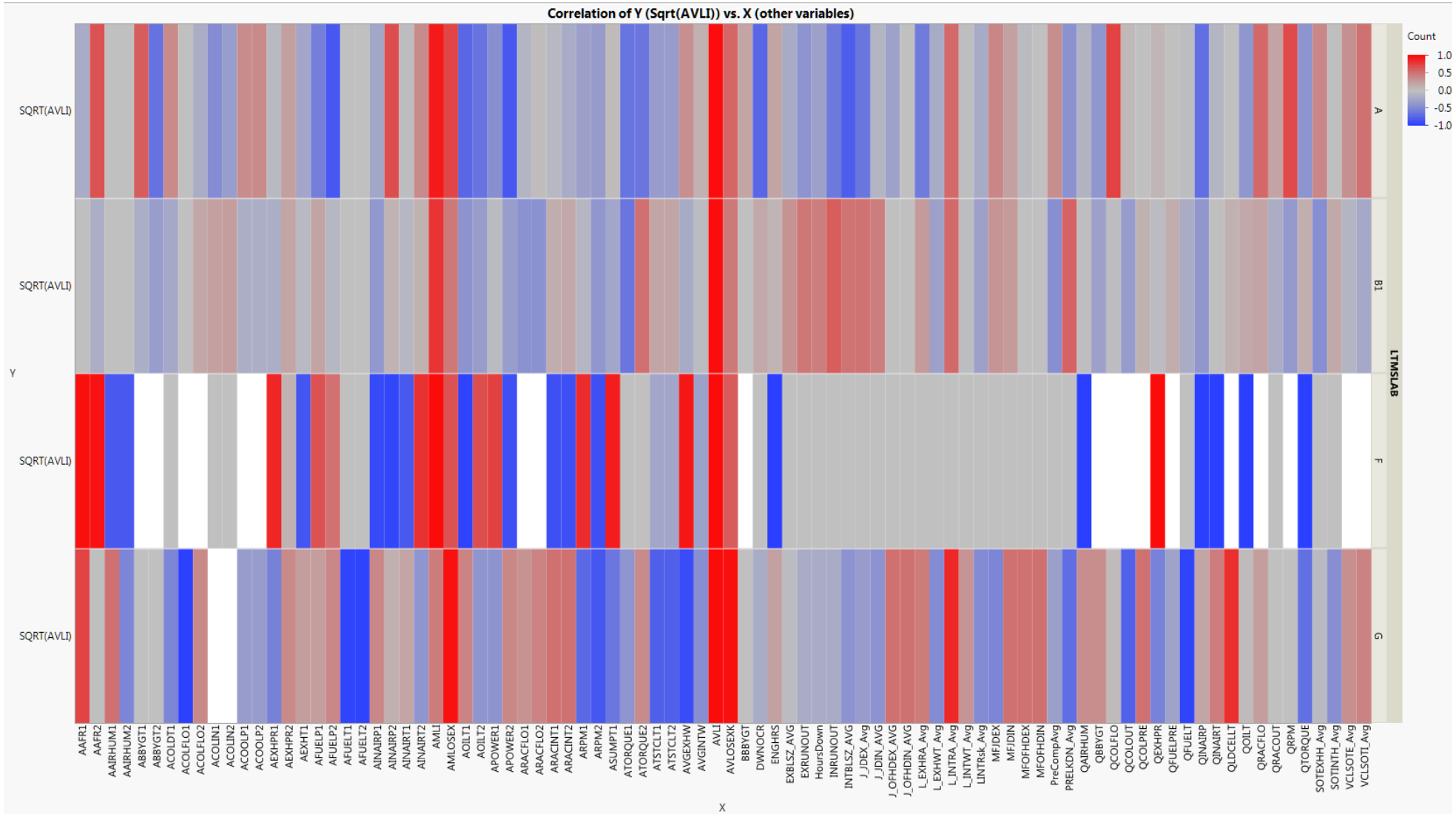
Operational Analysis with Partial Least Squares

- Excluding lab-Stand & oil factors, the top 20 variables identified in the PLS analysis of the Sqrt(AVLI) are summarized below:

	Top 20 Factors	Variable Description
1	INRUNOUT	Intake Camshasft Runout
2	L_INTRA_Avg	Lobe Intake Surface Finish Average Ra
3	EXRUNOUT	Exhaust Camshaft Runout
4	DWNOCR	Number of Downtime Occurrences
5	ARPM2	Average RPM - Phase 2
6	AAFR2	Avg Air/Fuel Ratio Phase 2
7	J_JDIN_AVG	Journal to Journal Dia Intake Avg
8	QOILT	EOT QI Oil Gallery Temp
9	PreCompAvg	Average Cyl Compression PreTest
10	EXBLSZ_AVG	Exhaust Lifter Bucket Size Average
11	J_JDEX_Avg	Journal to Journal Dia Exhaust Avg
12	ATORQUE1	Average Torque Phase 1
13	ACOOLP2	Average Engine Coolant Pressure Stage 2
14	ACOOLP1	Average Engine Coolant Pressure Stage 1
15	AFUELP2	Average Fuel Pressure Phase 2
16	SOTINTH_Avg	Start of Test Heel to Toe Intake Avg
17	MFJDEX	Main Feed Oil Hole Dia, Exhaust Cam
18	AINAIRT2	Avg Intake Air Temp Phase 2
19	QAIRHUM	EOT QI Intake Air Humidity
20	INTBLSZ_AVG	Avg Intake Bucket Lifter Size

Operational Analysis with Partial Least Squares

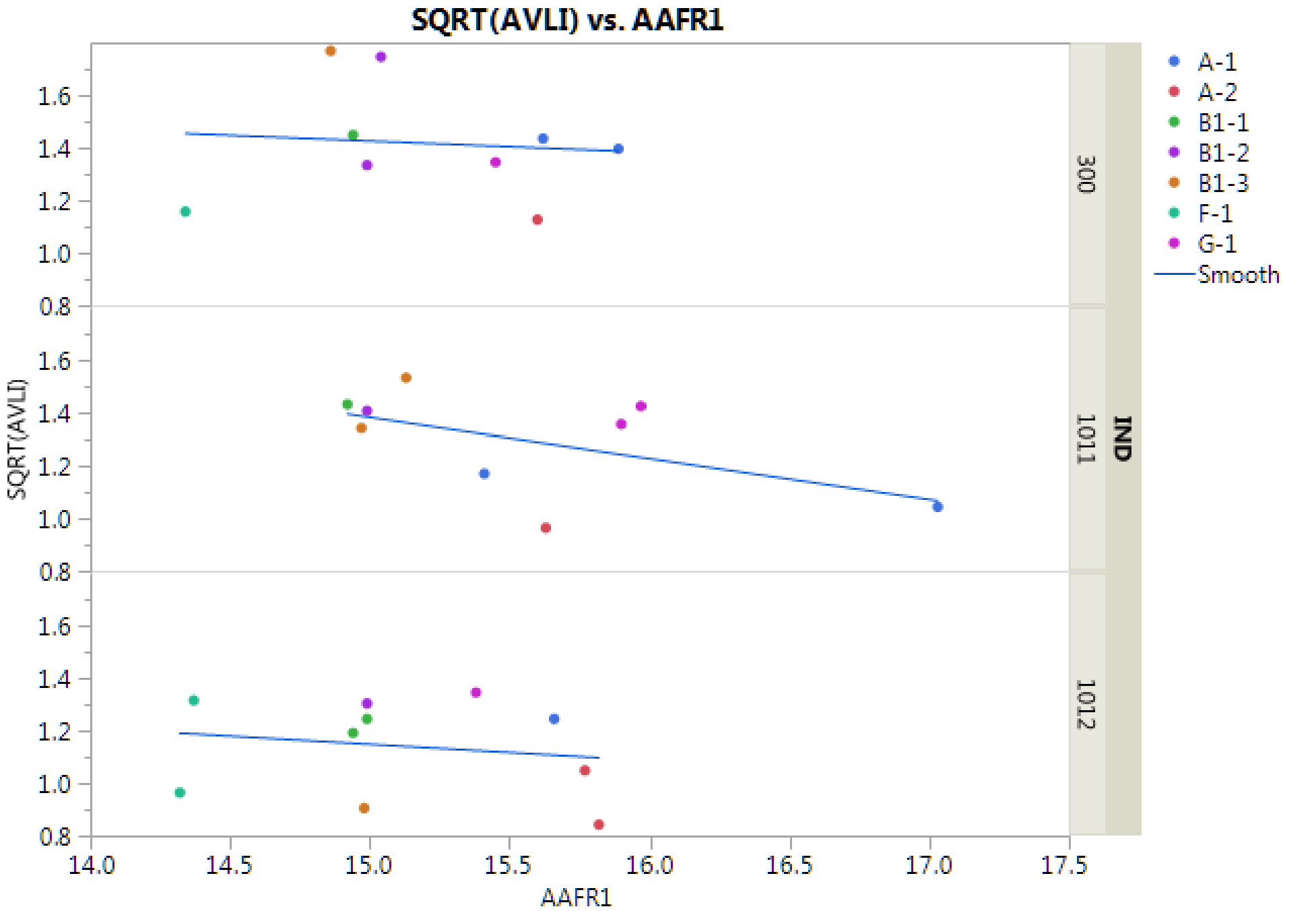
- A color heat map of the correlations between the Sqrt(AVLI) and the other remaining variables are summarized below - by test lab:



Operational Analysis with Partial Least Squares

- Plots of all variables included in the analysis are provided in the following slides.

Graph Builder



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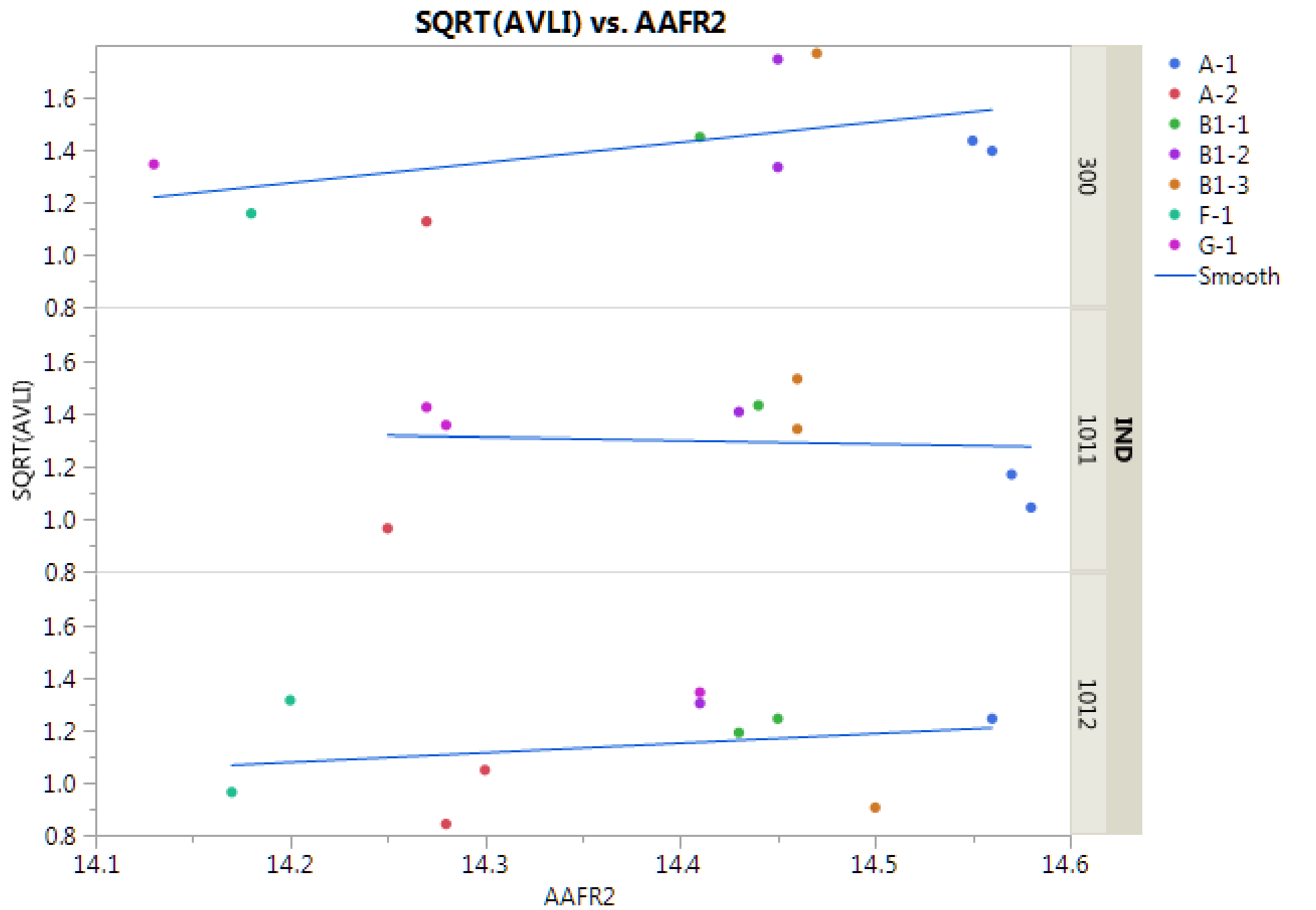

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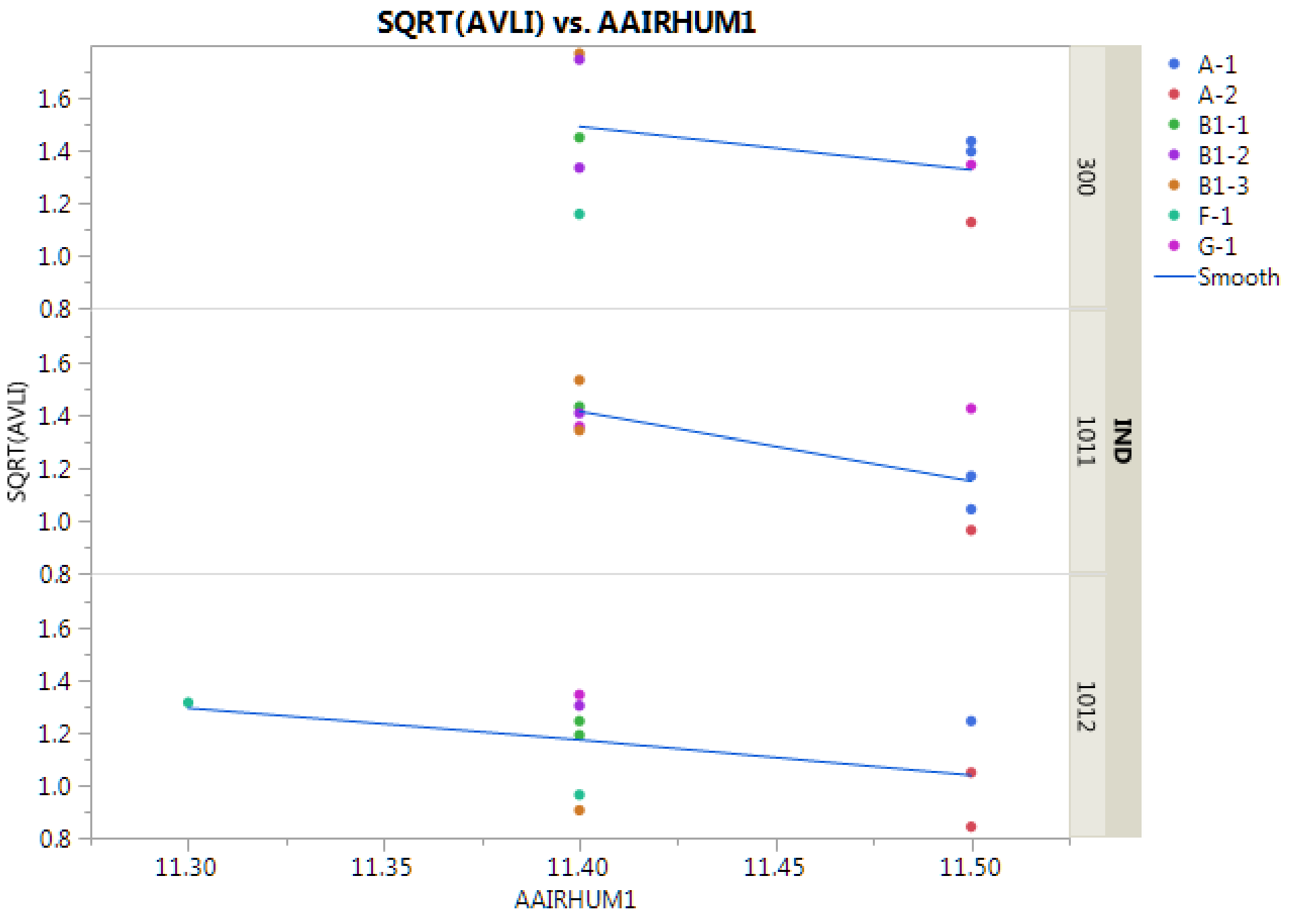

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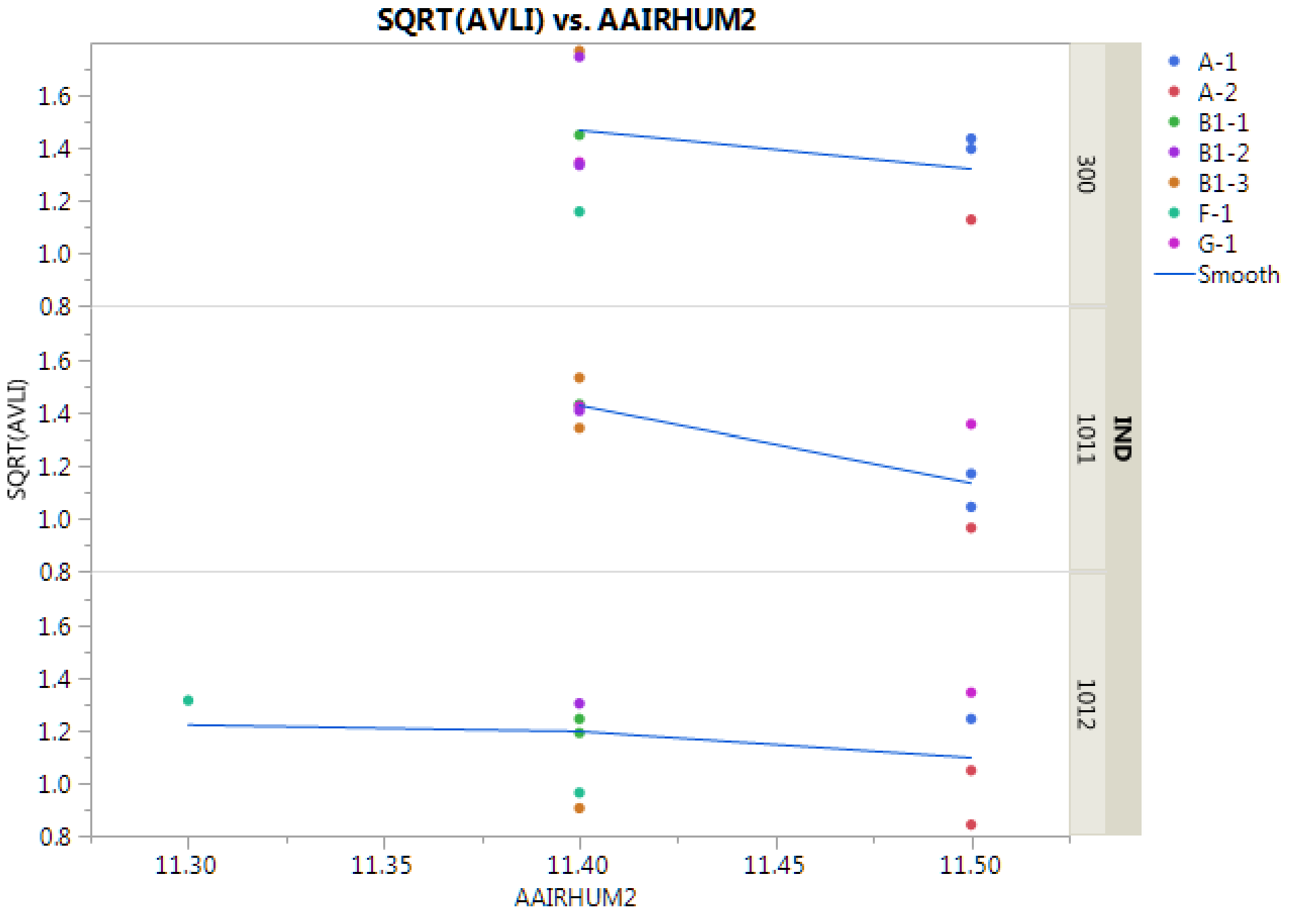

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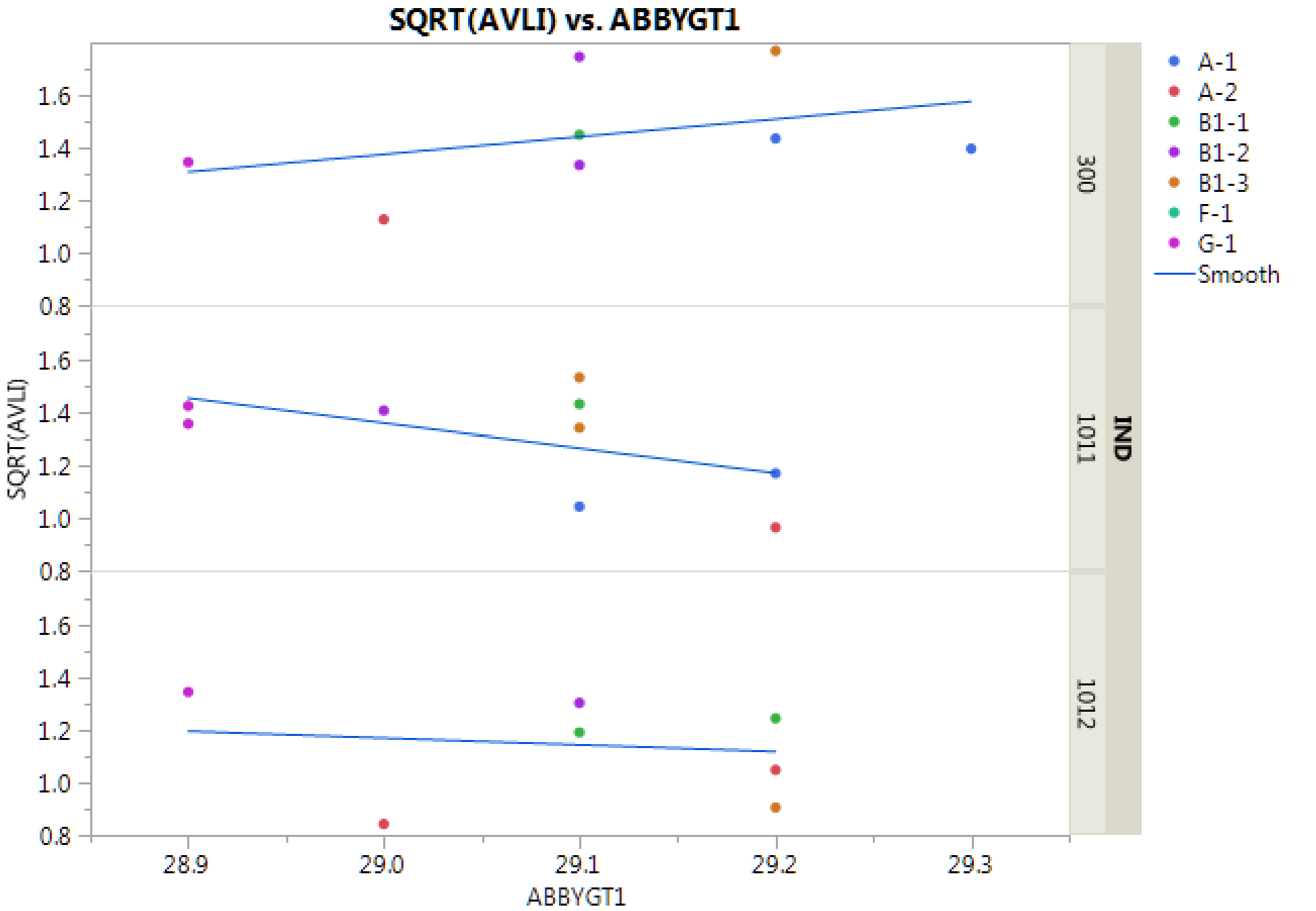

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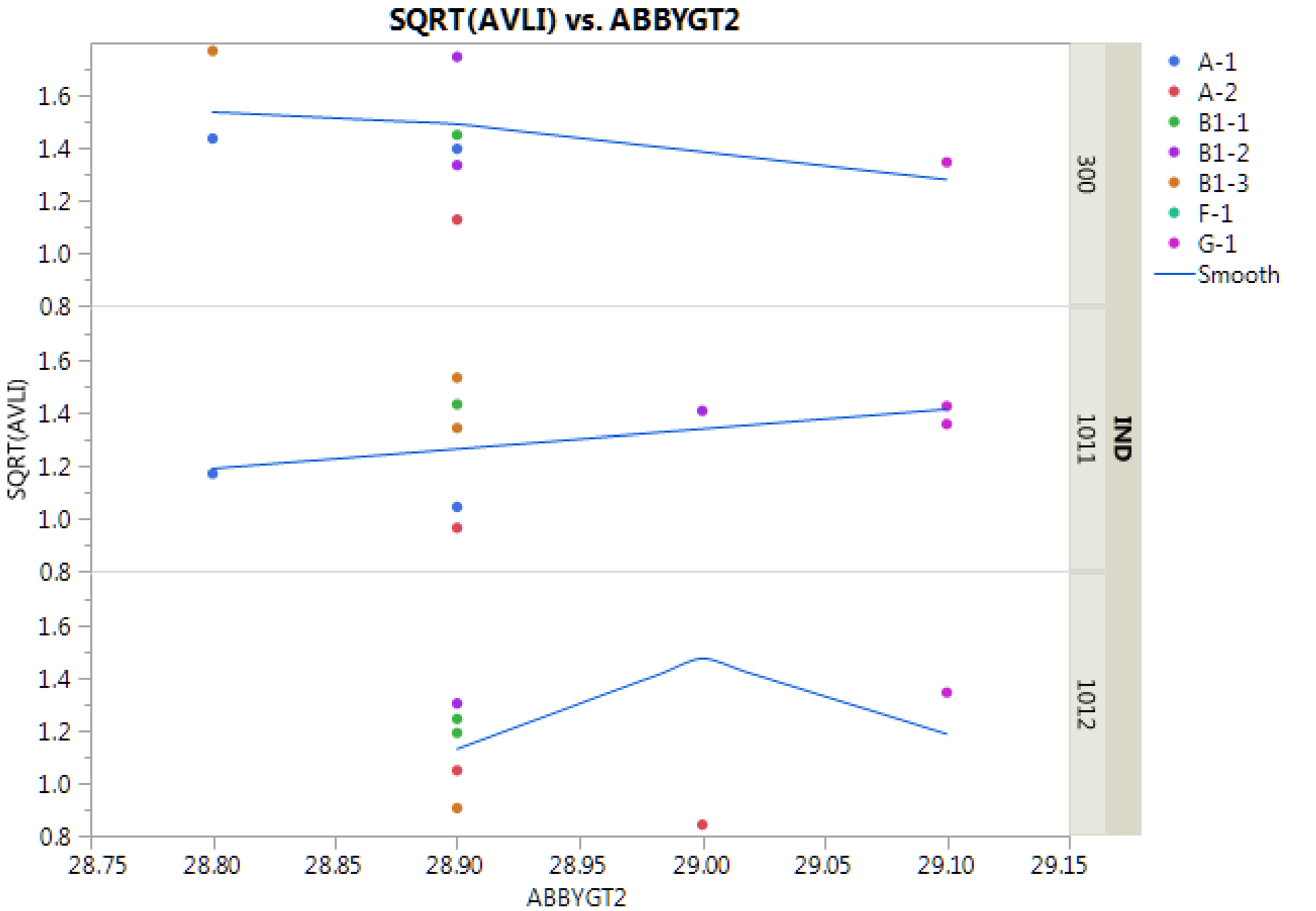

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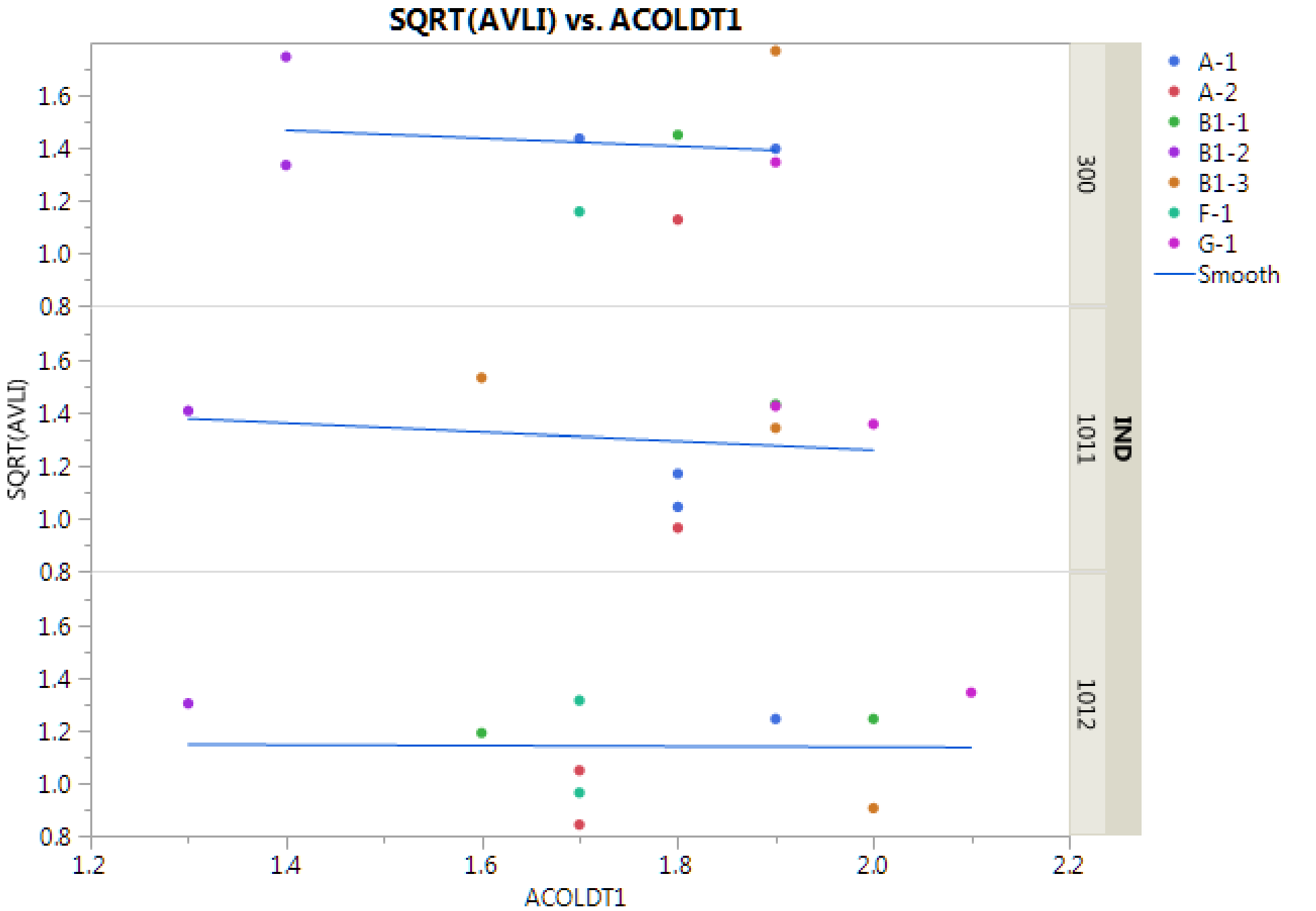

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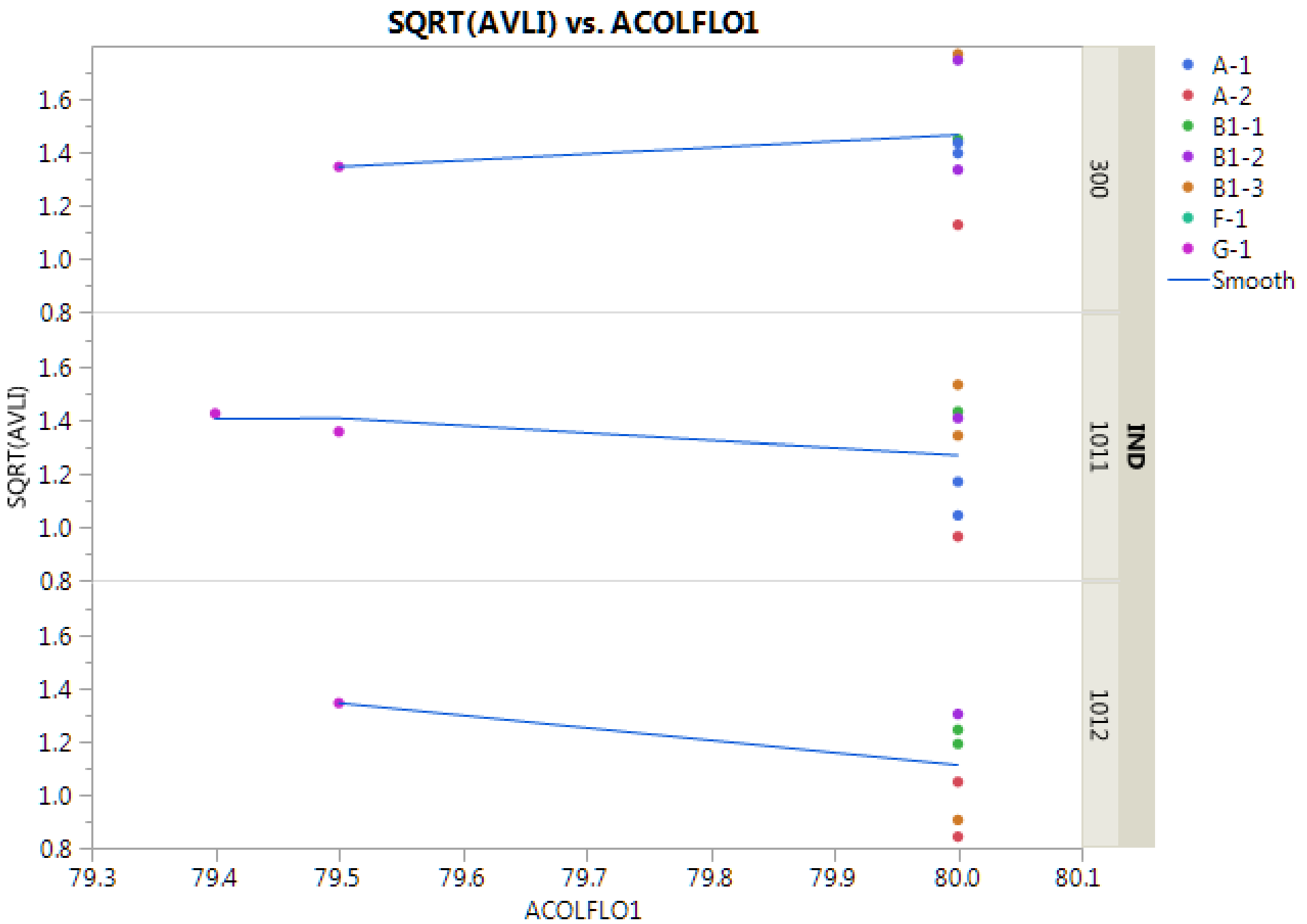

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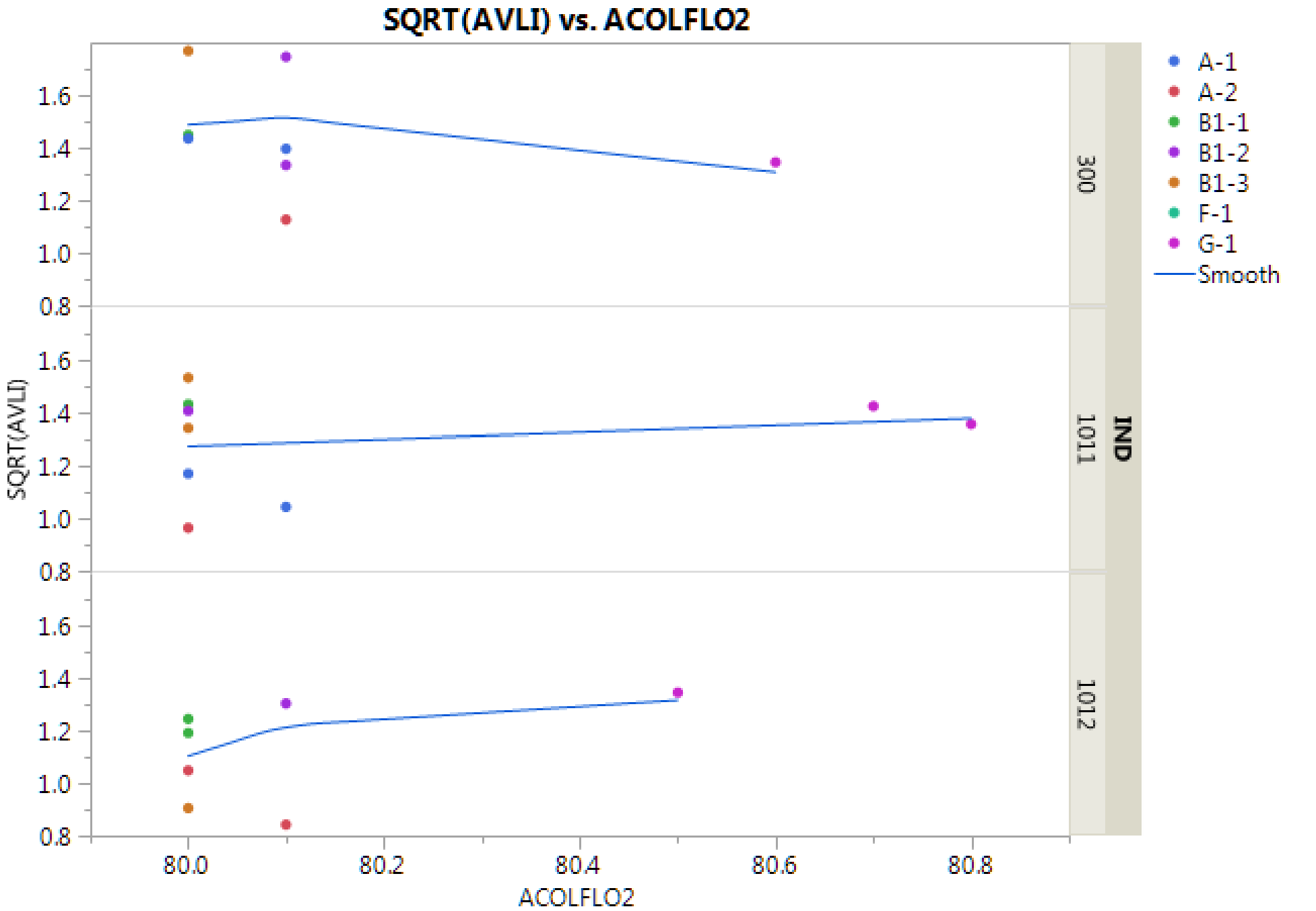

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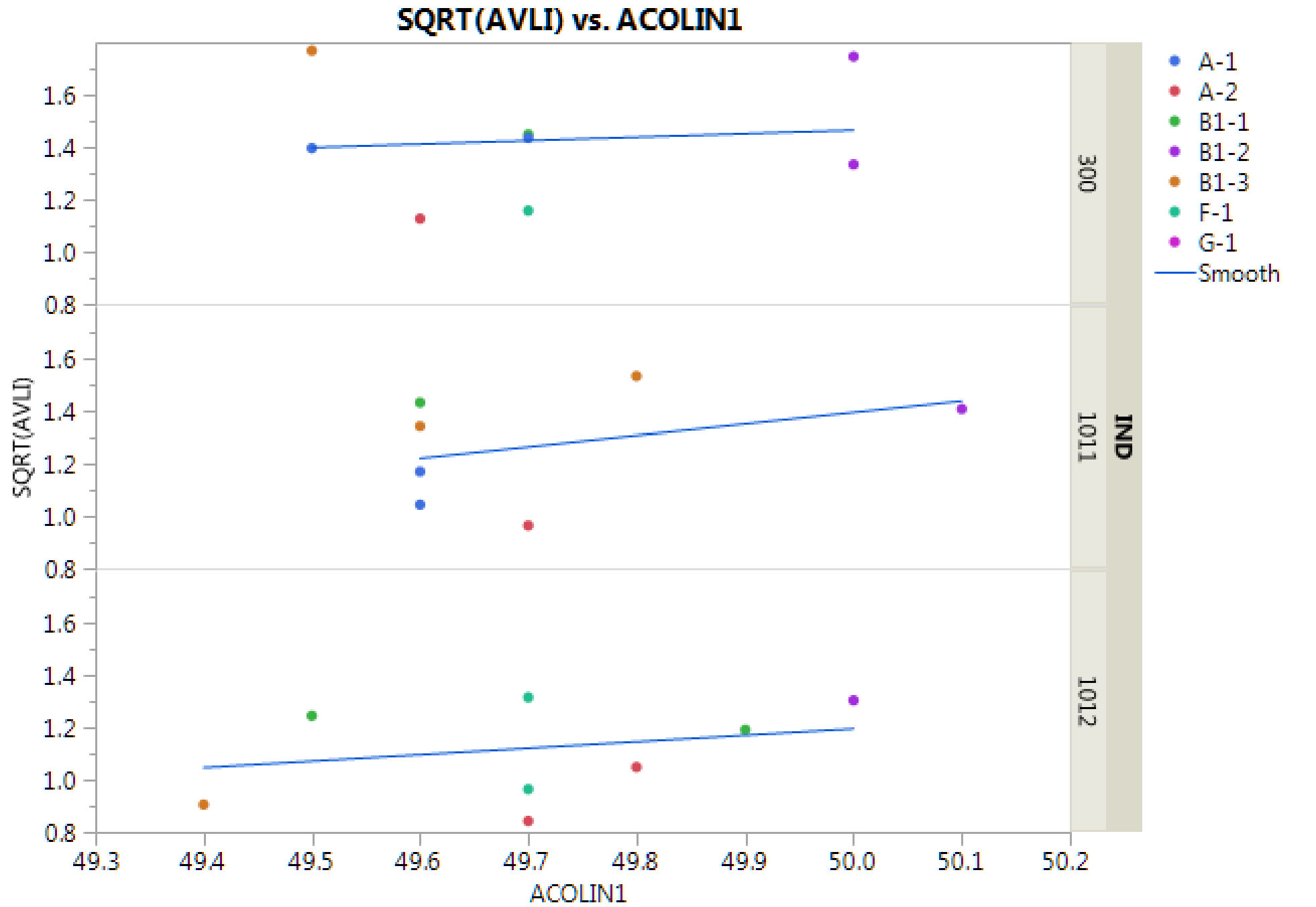

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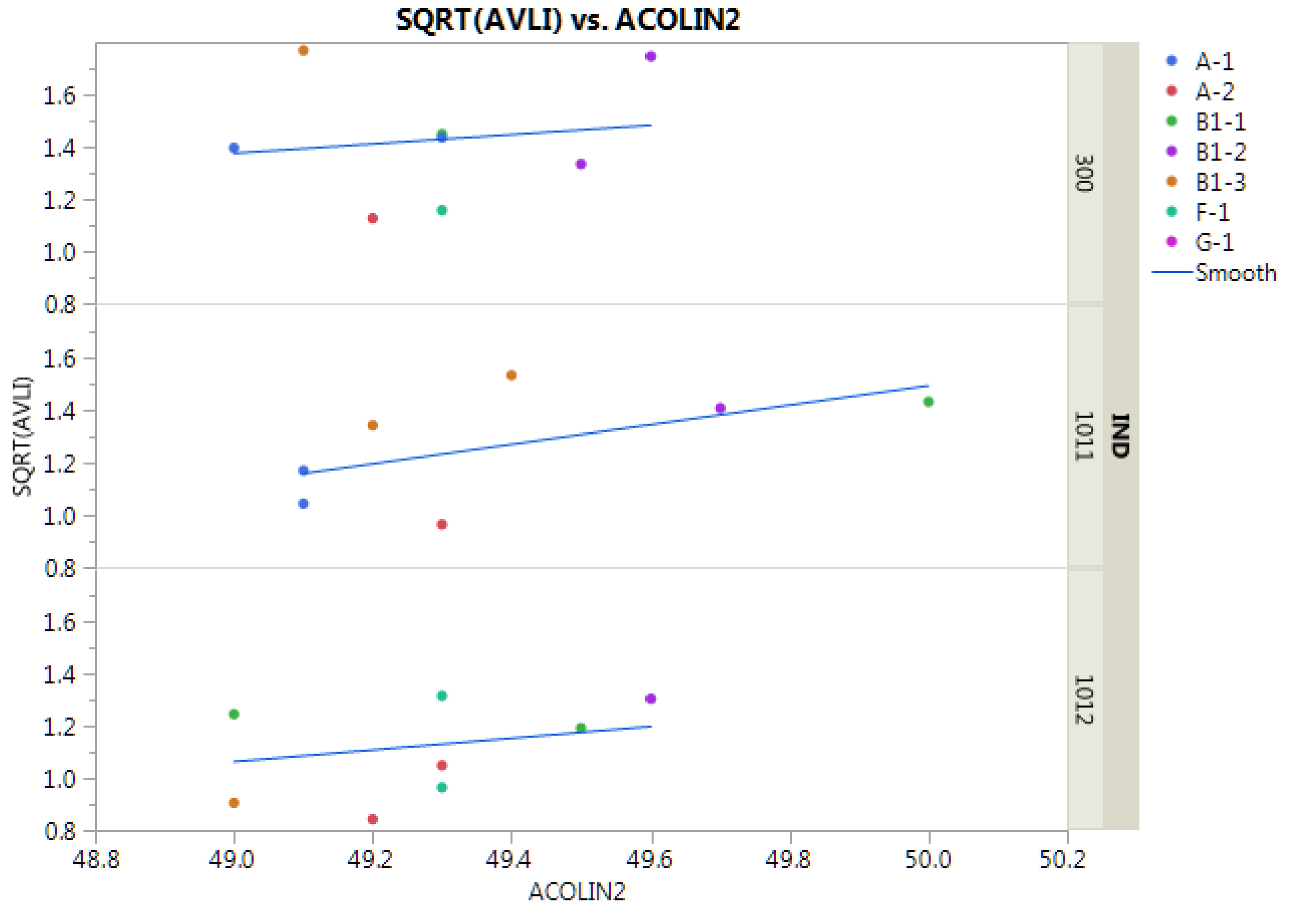

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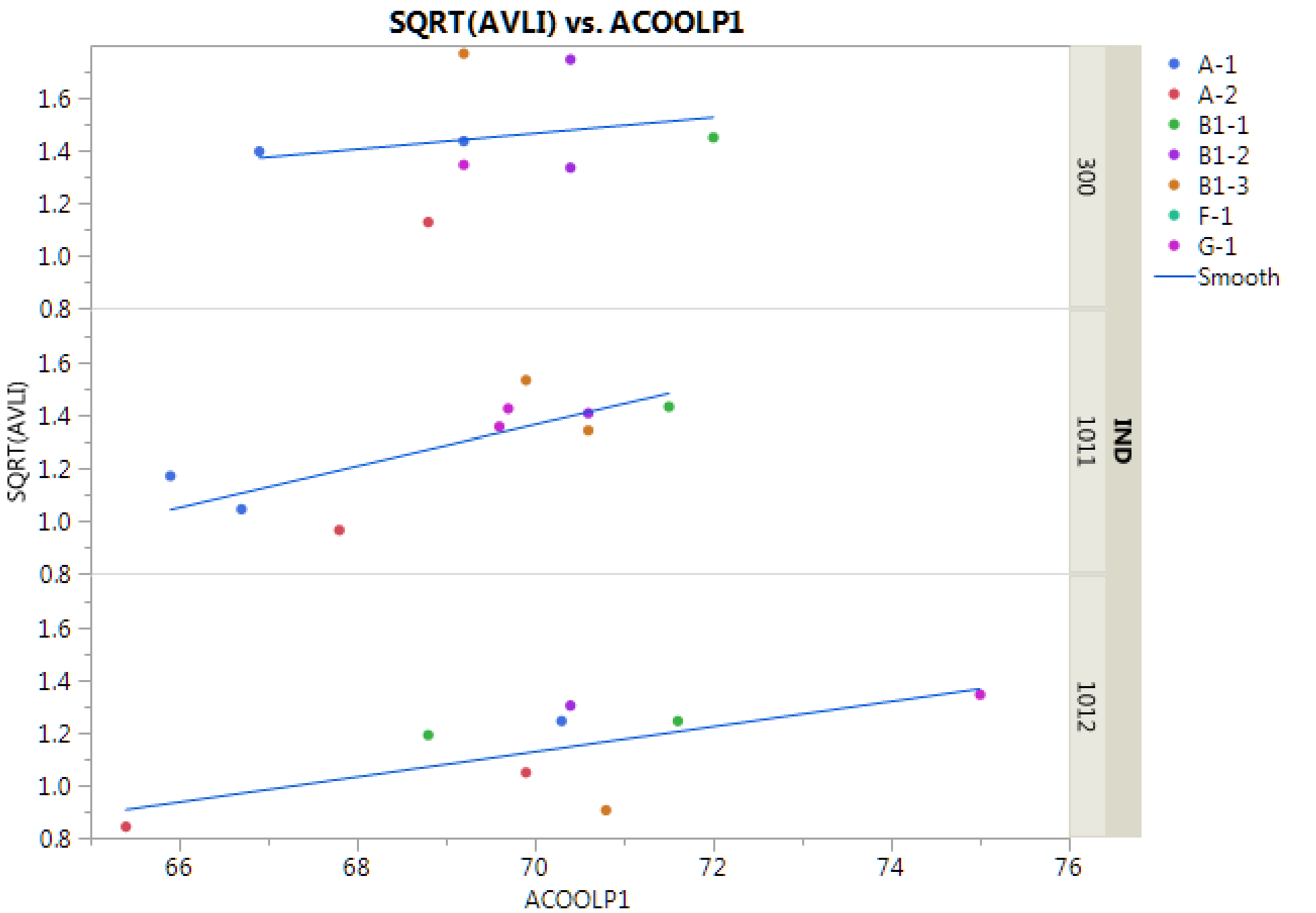

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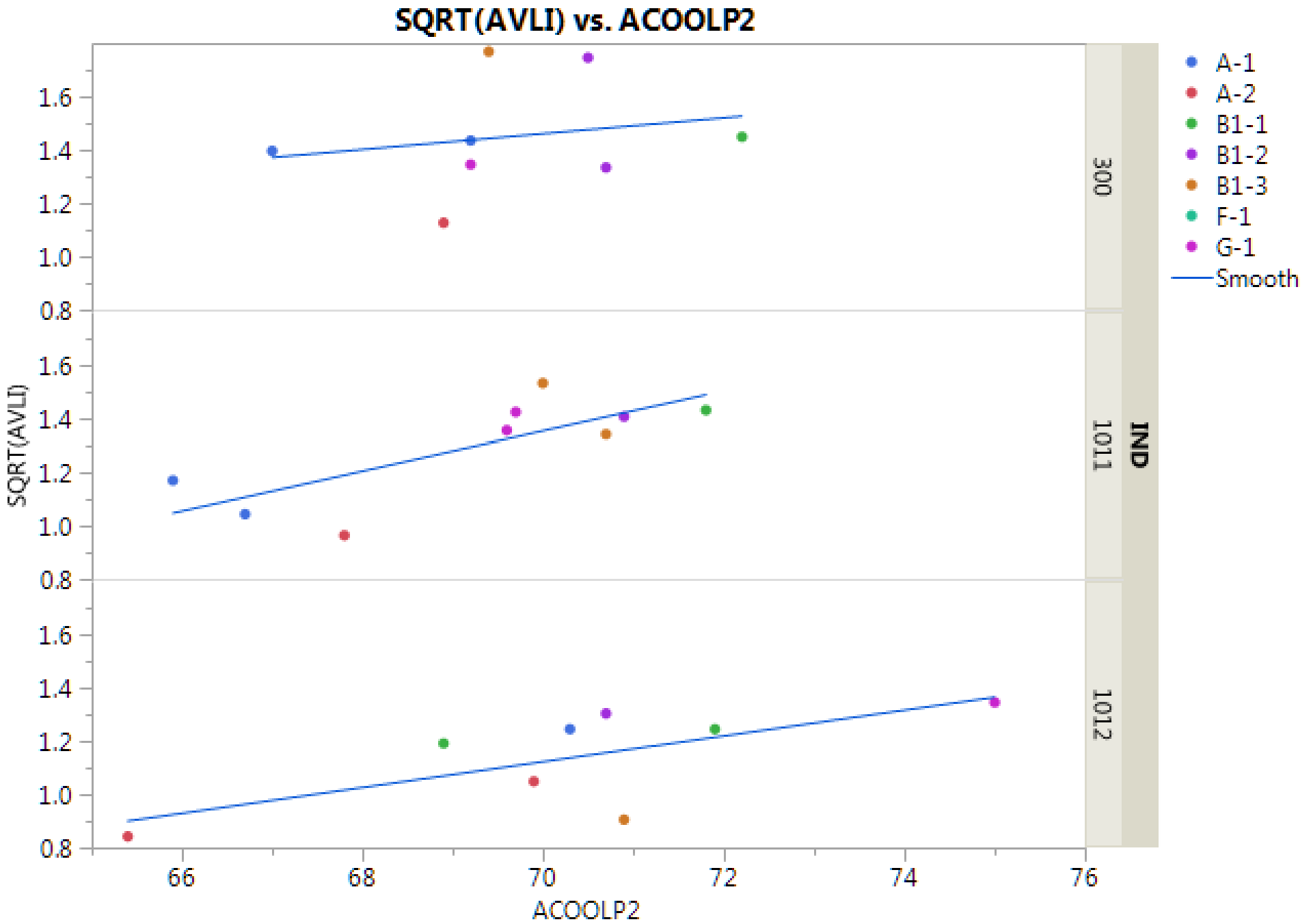

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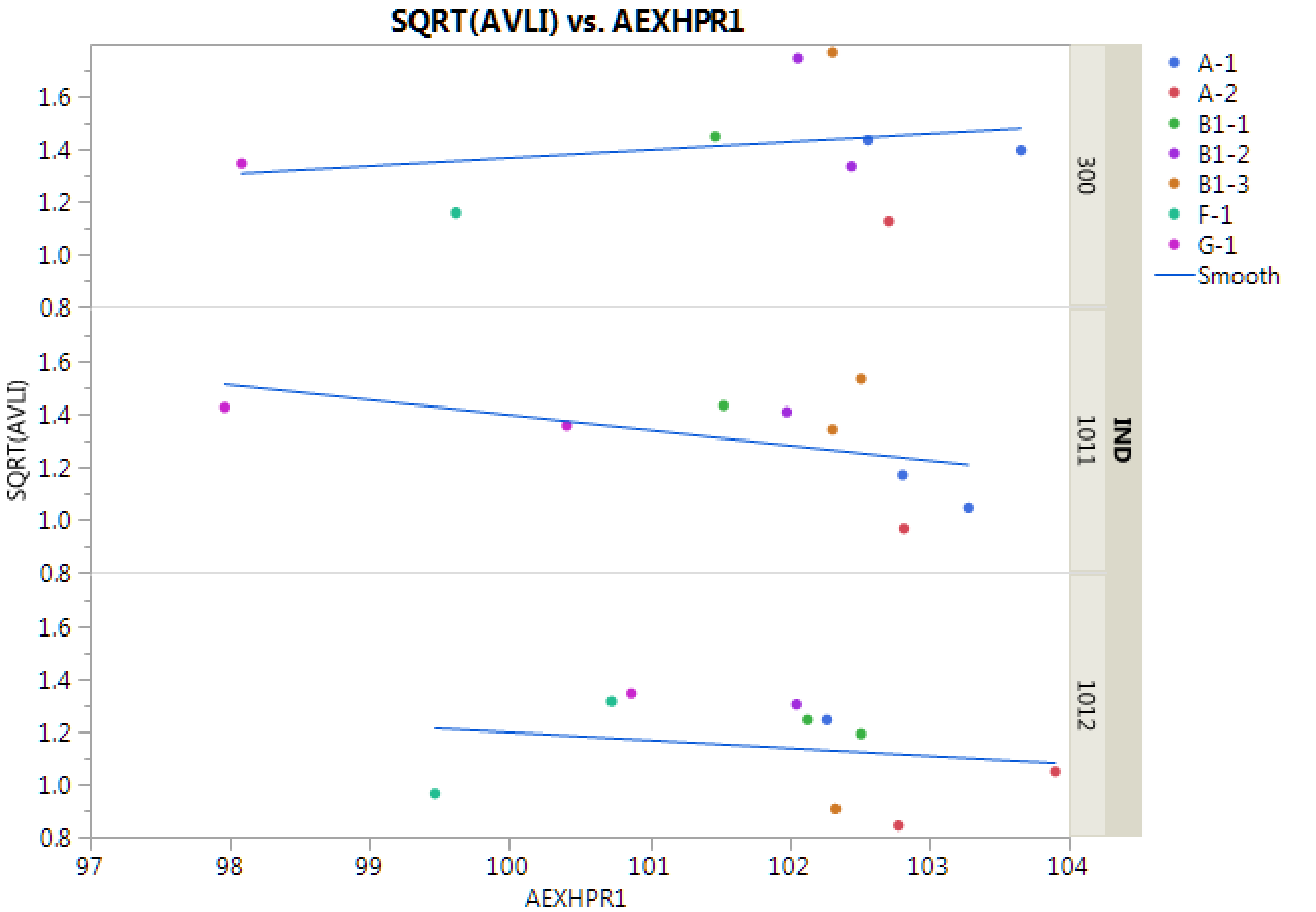

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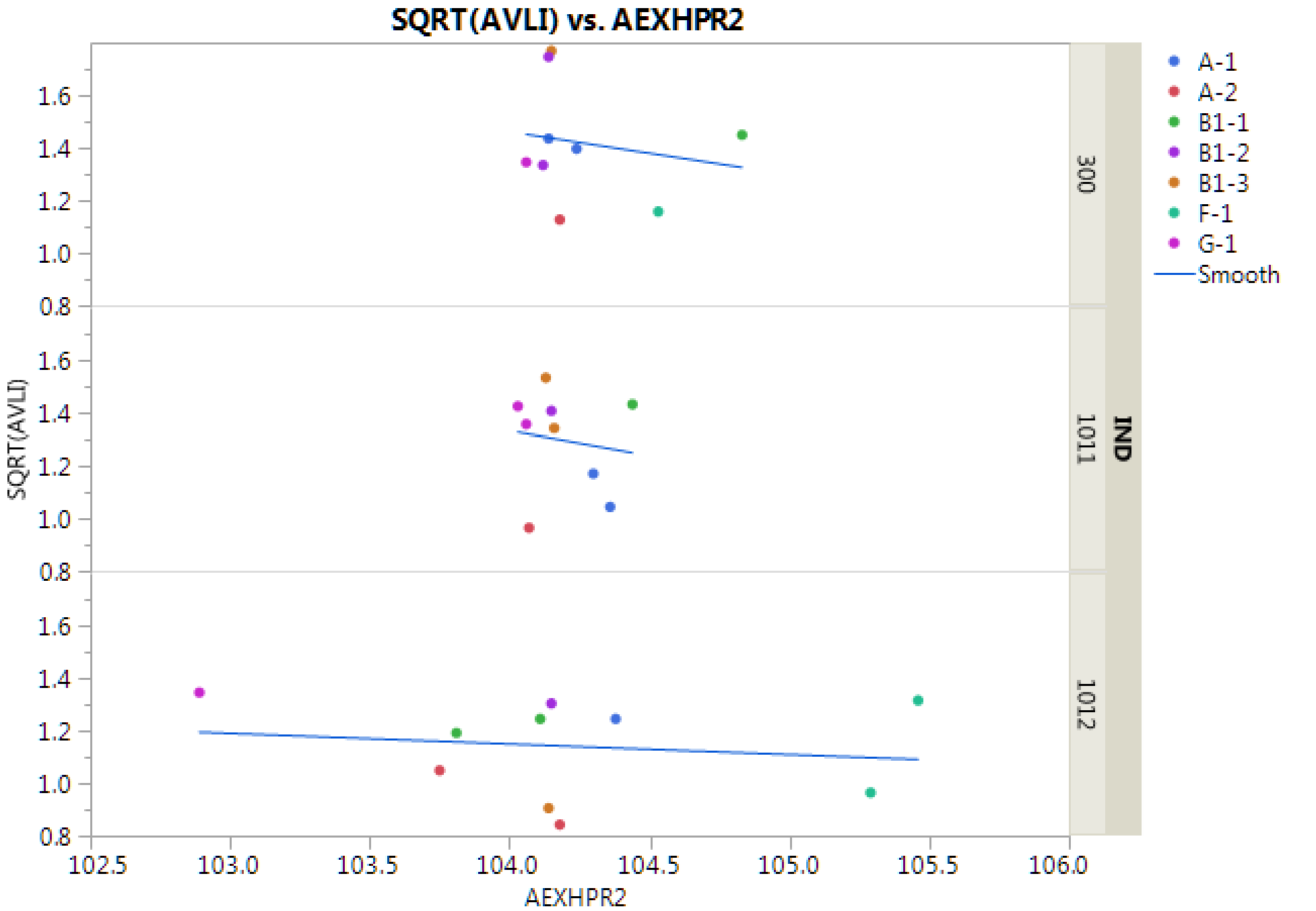

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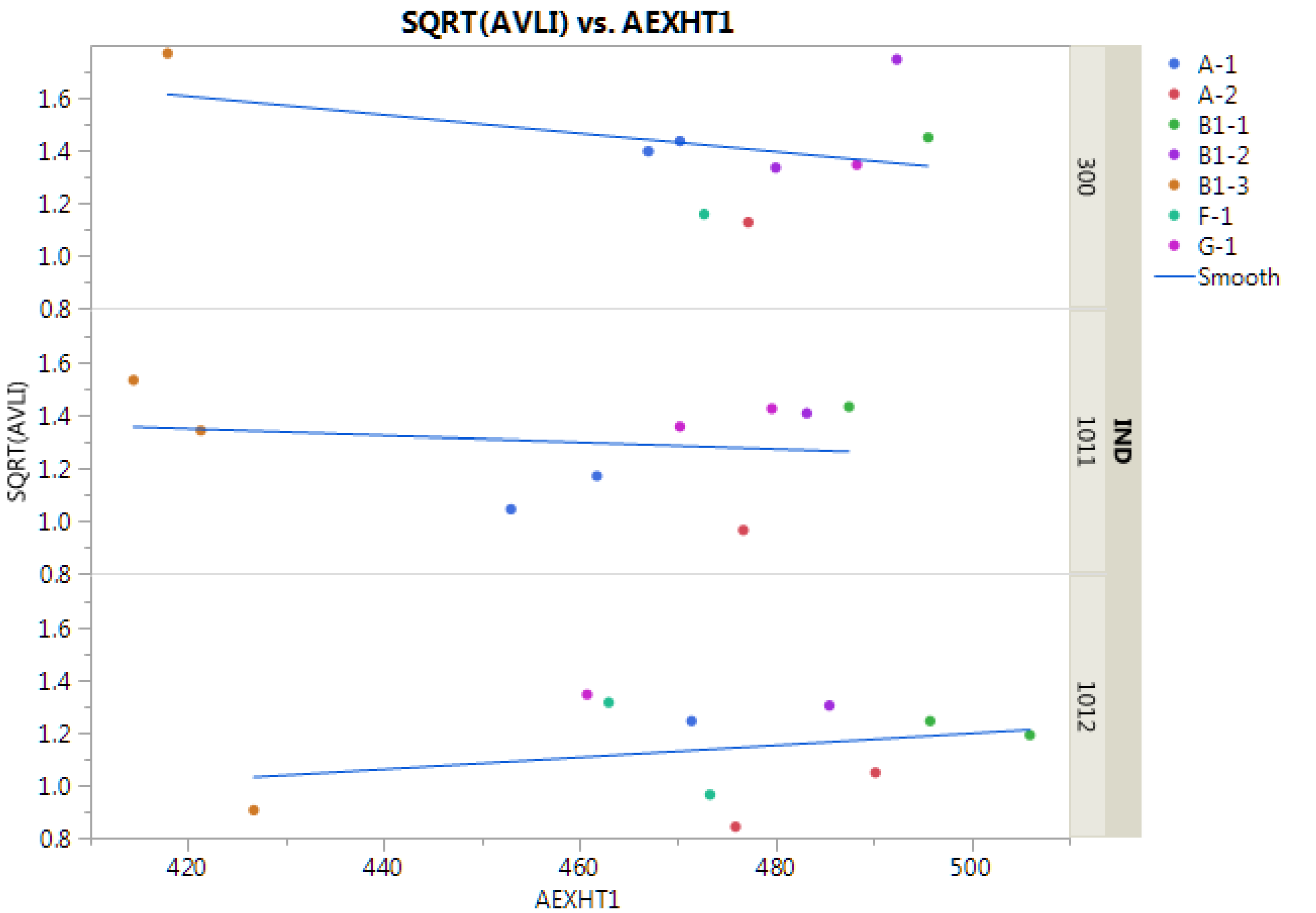

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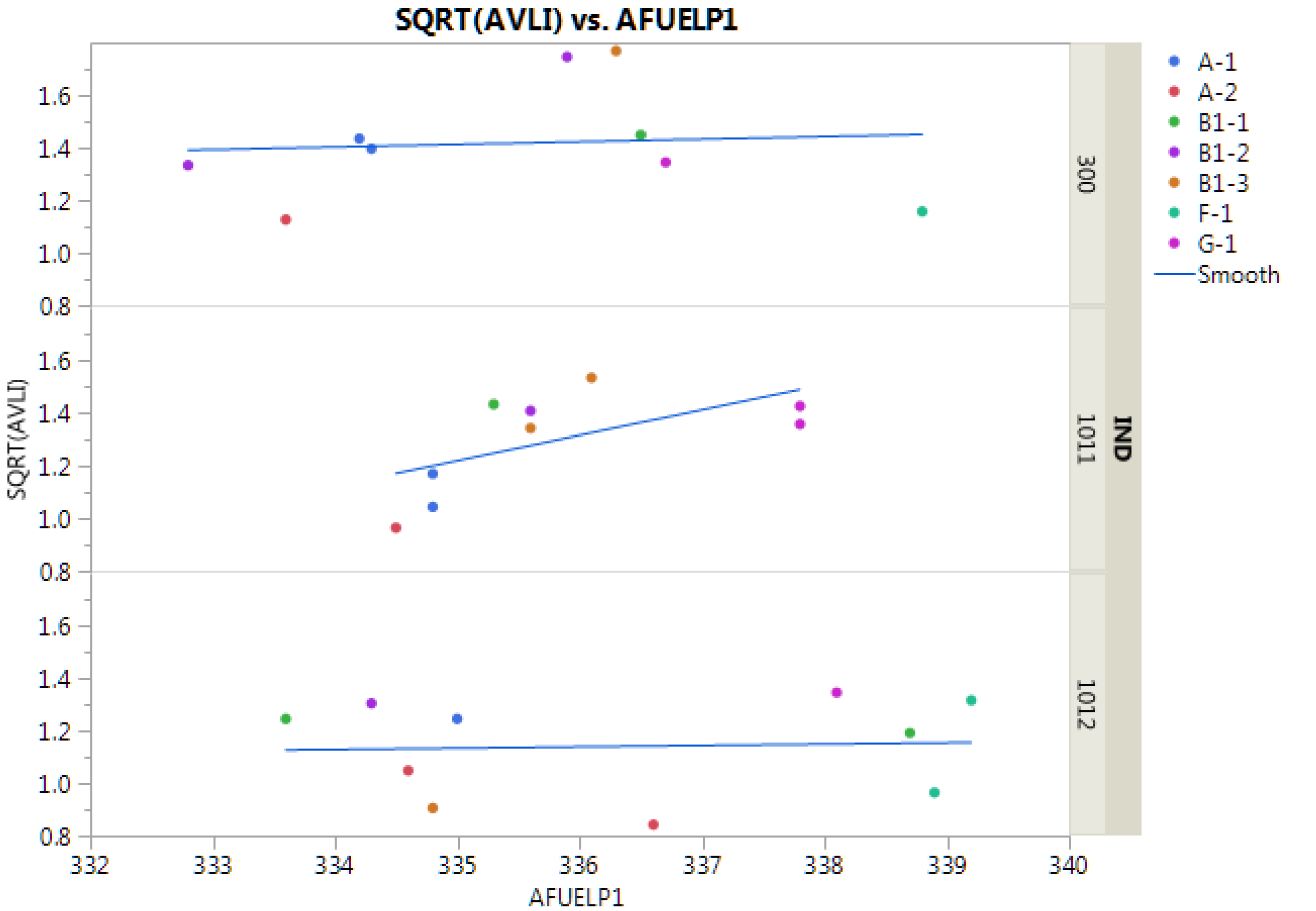

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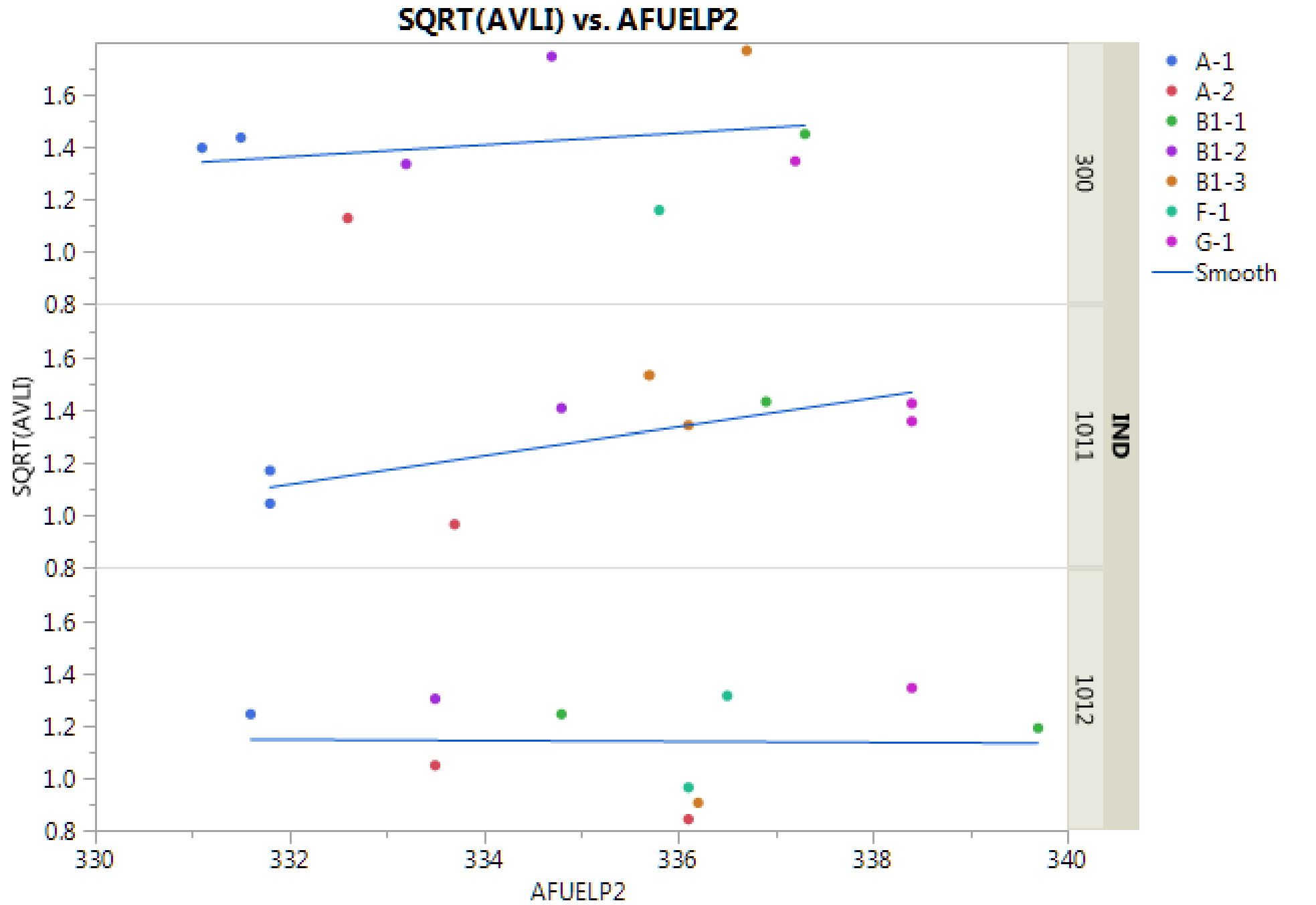

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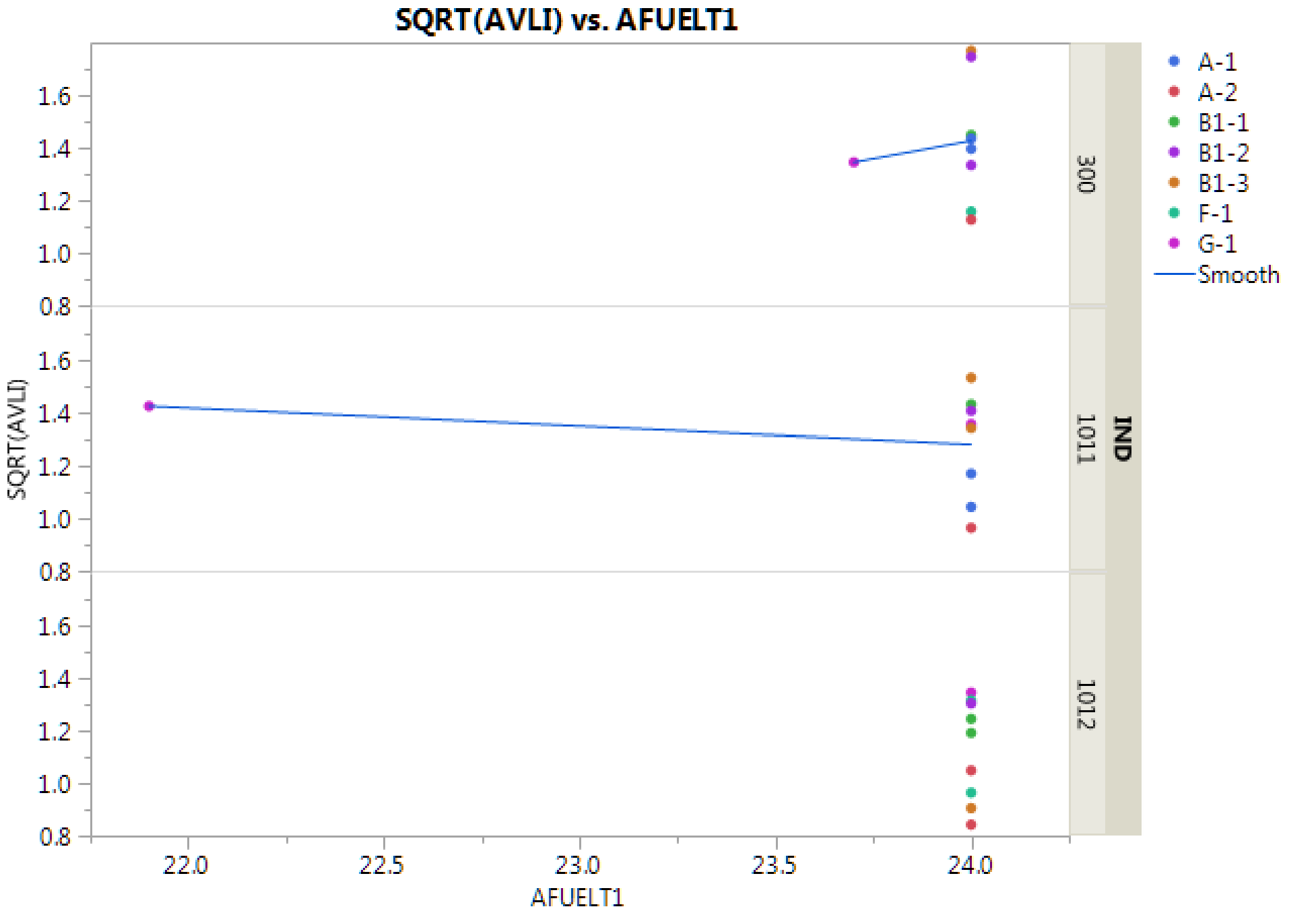

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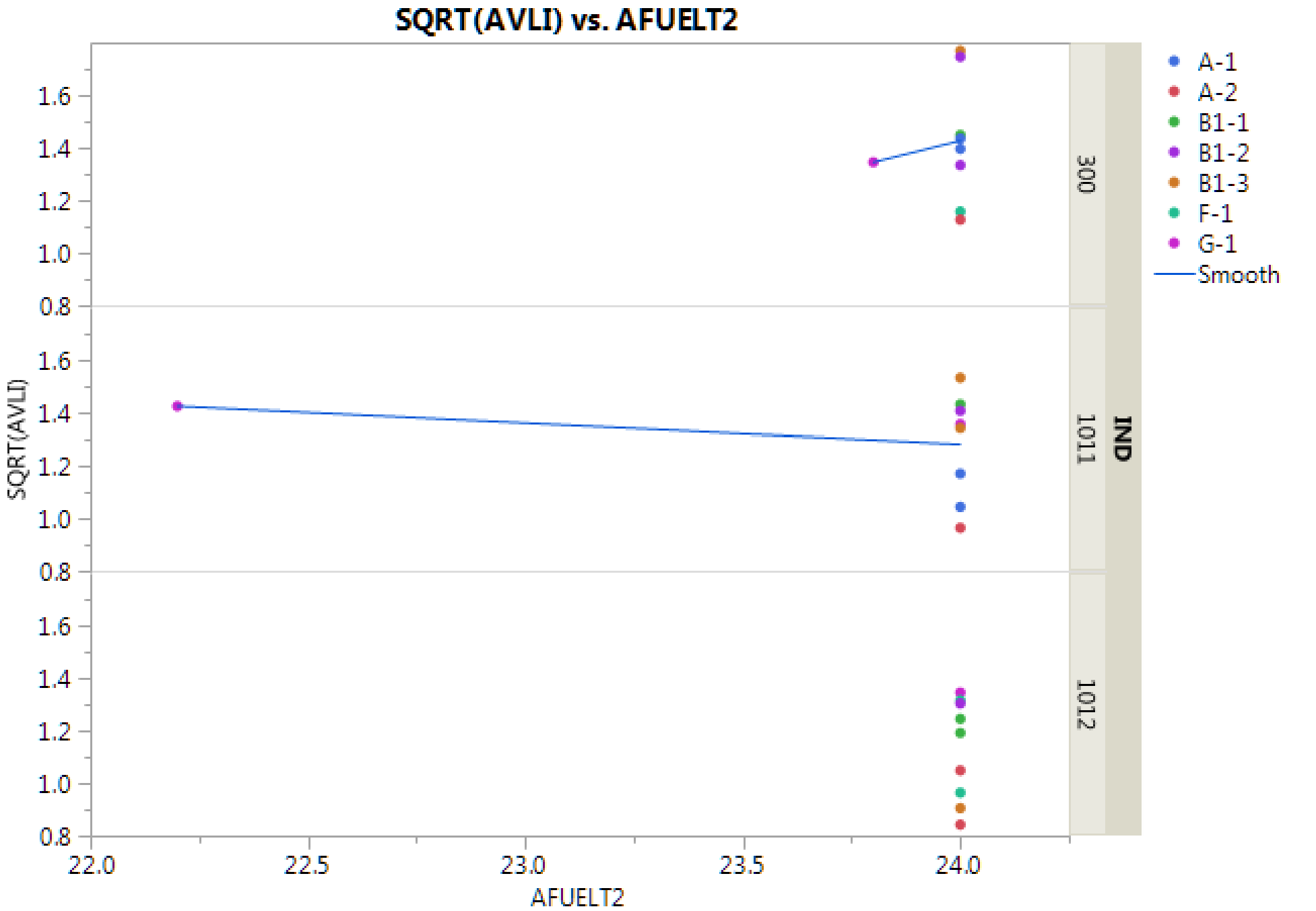

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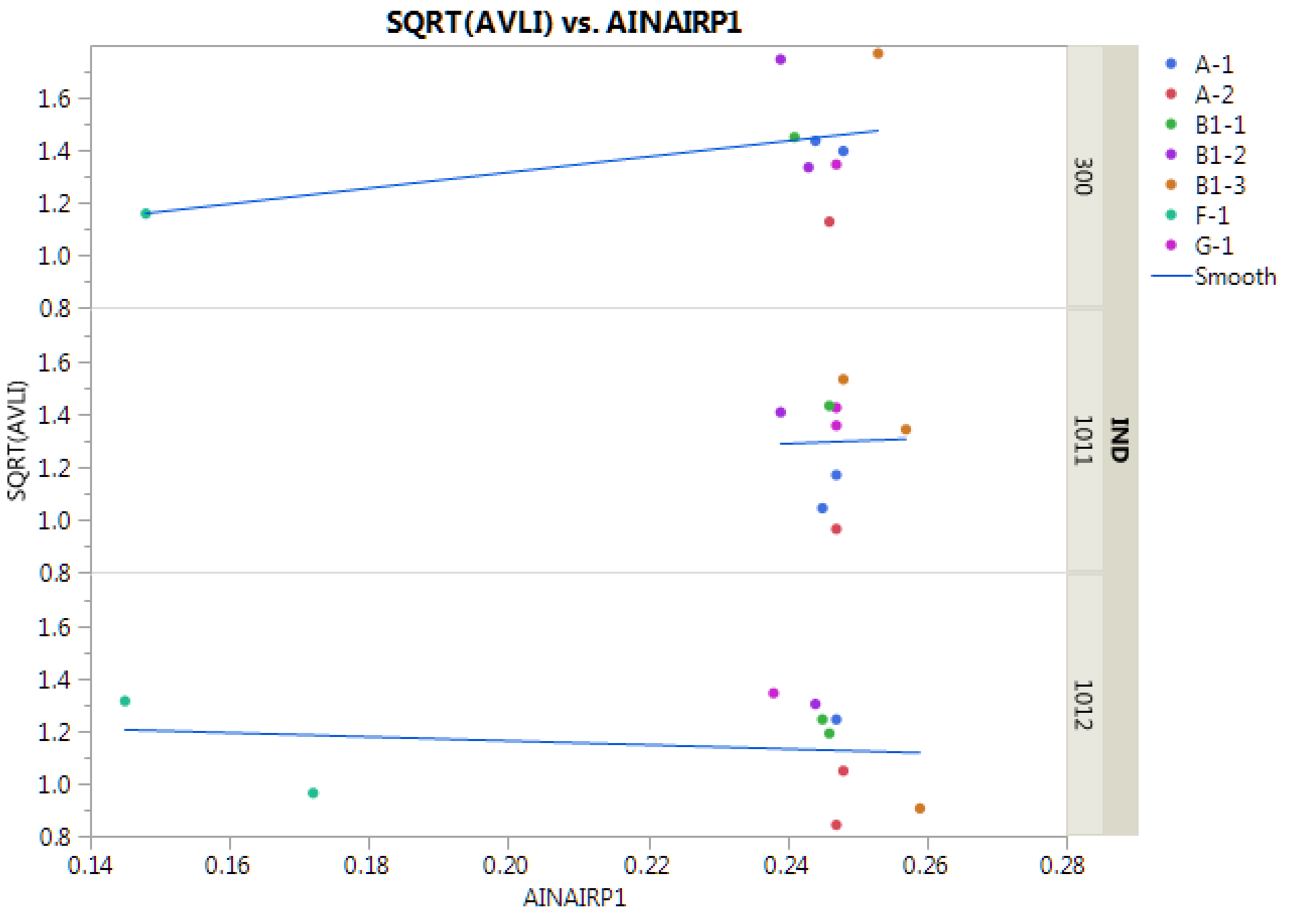

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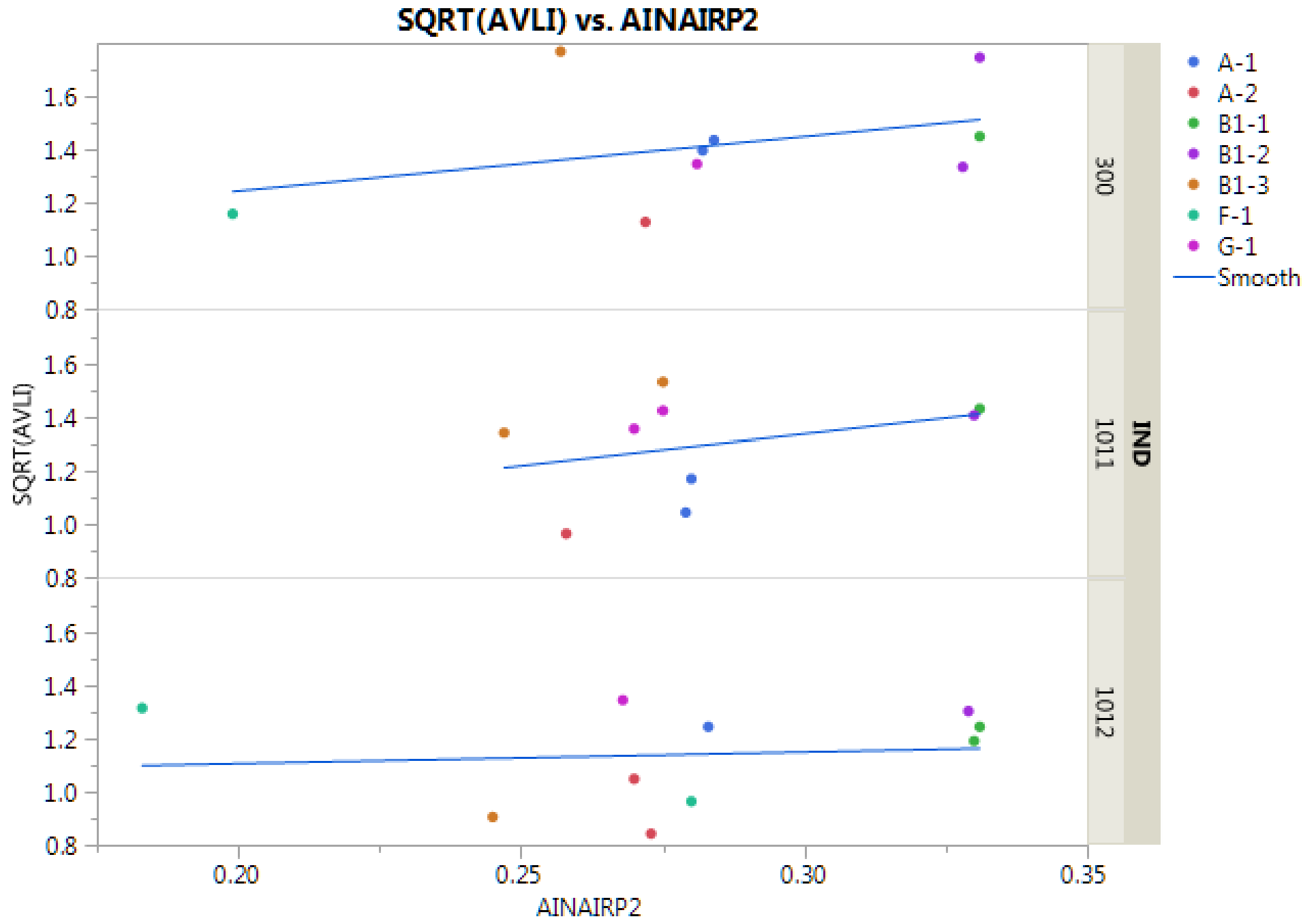

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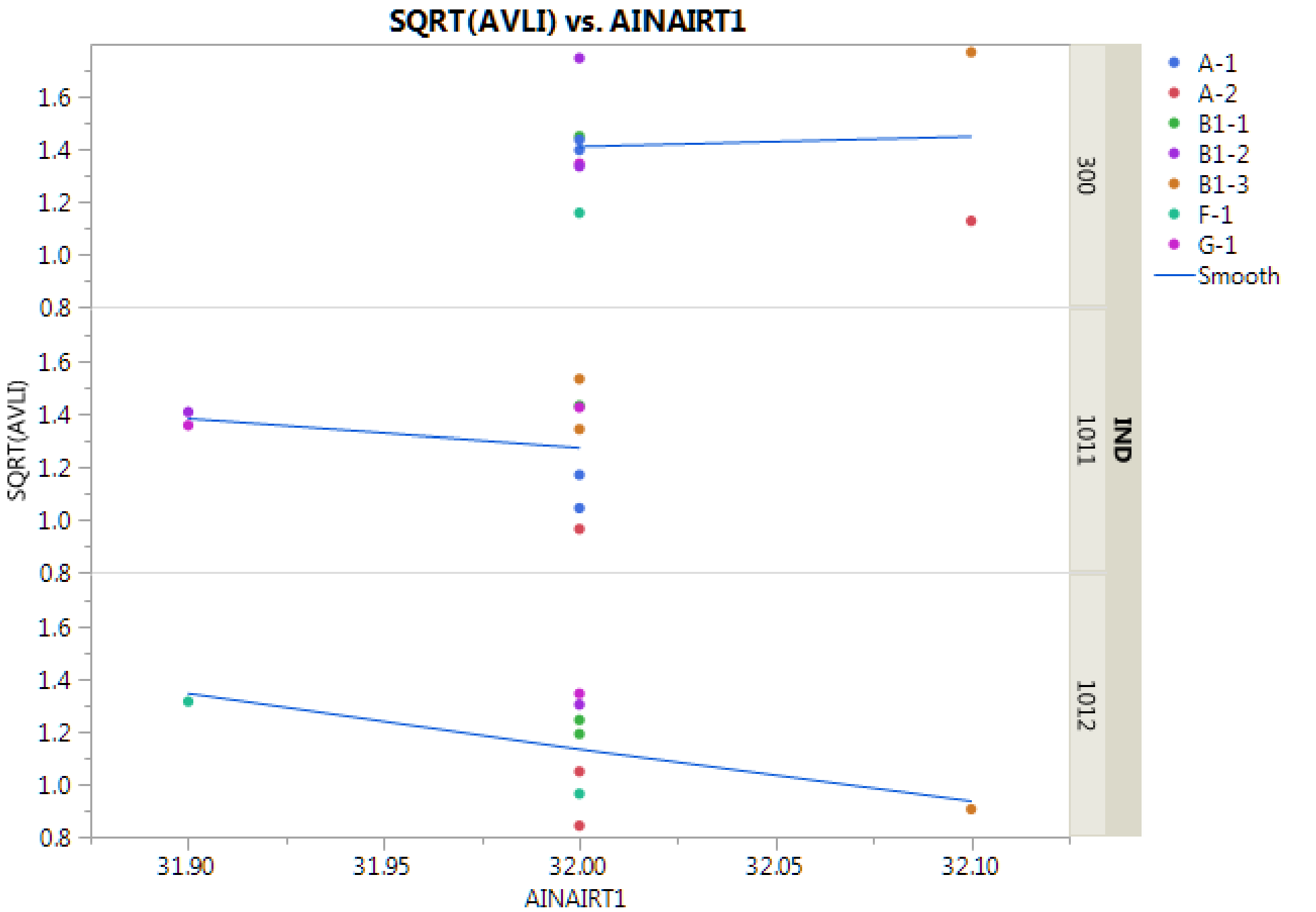

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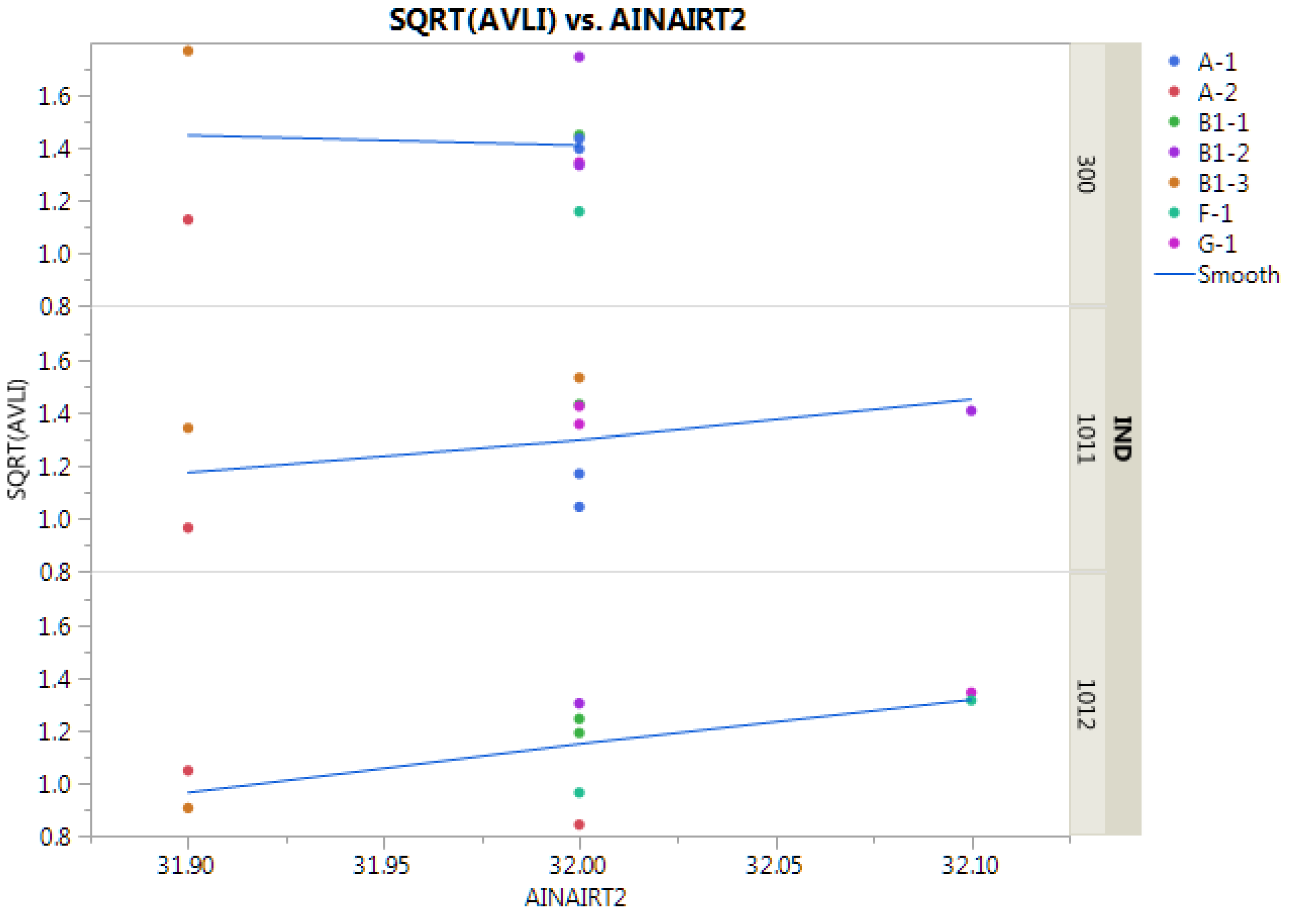

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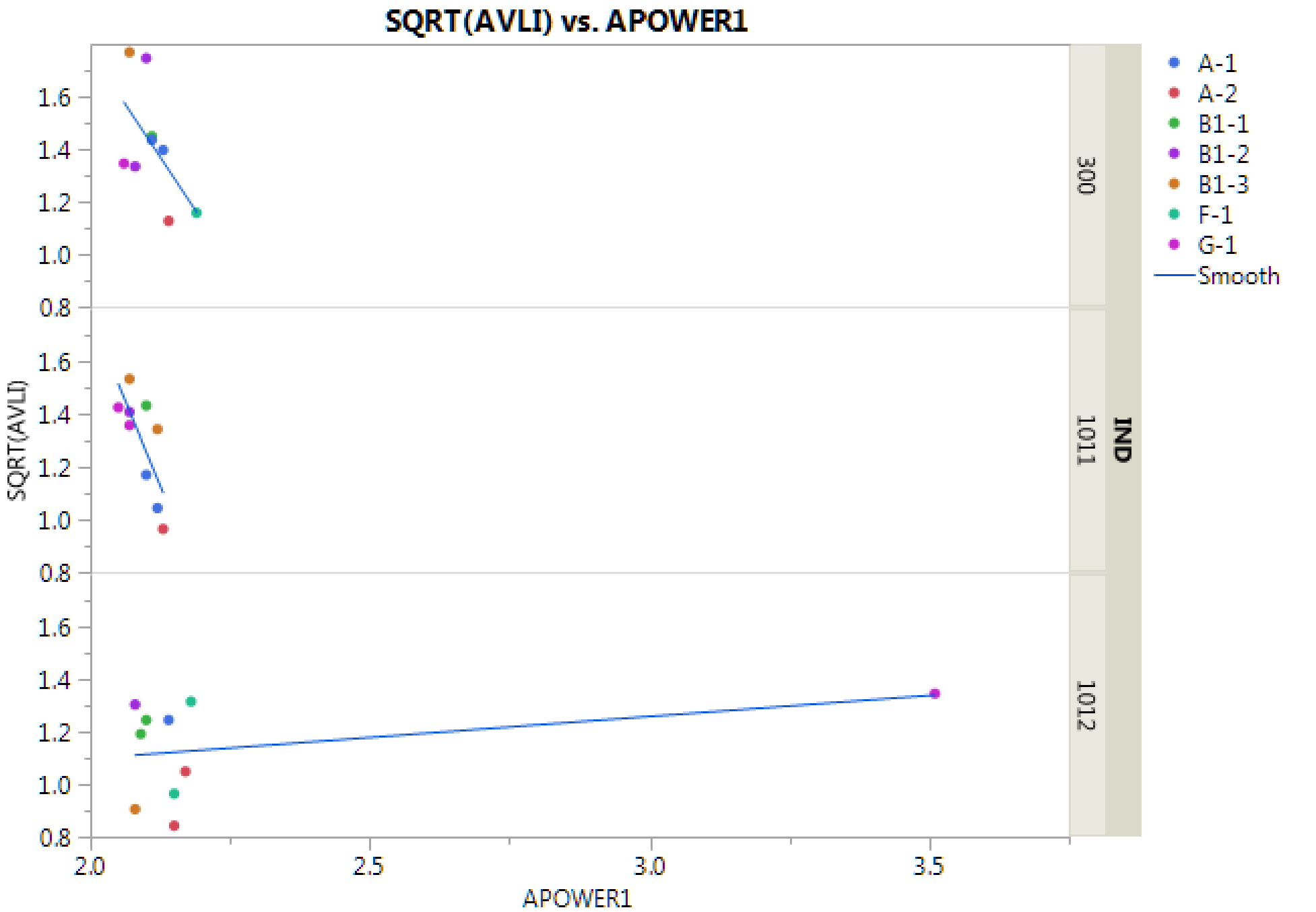

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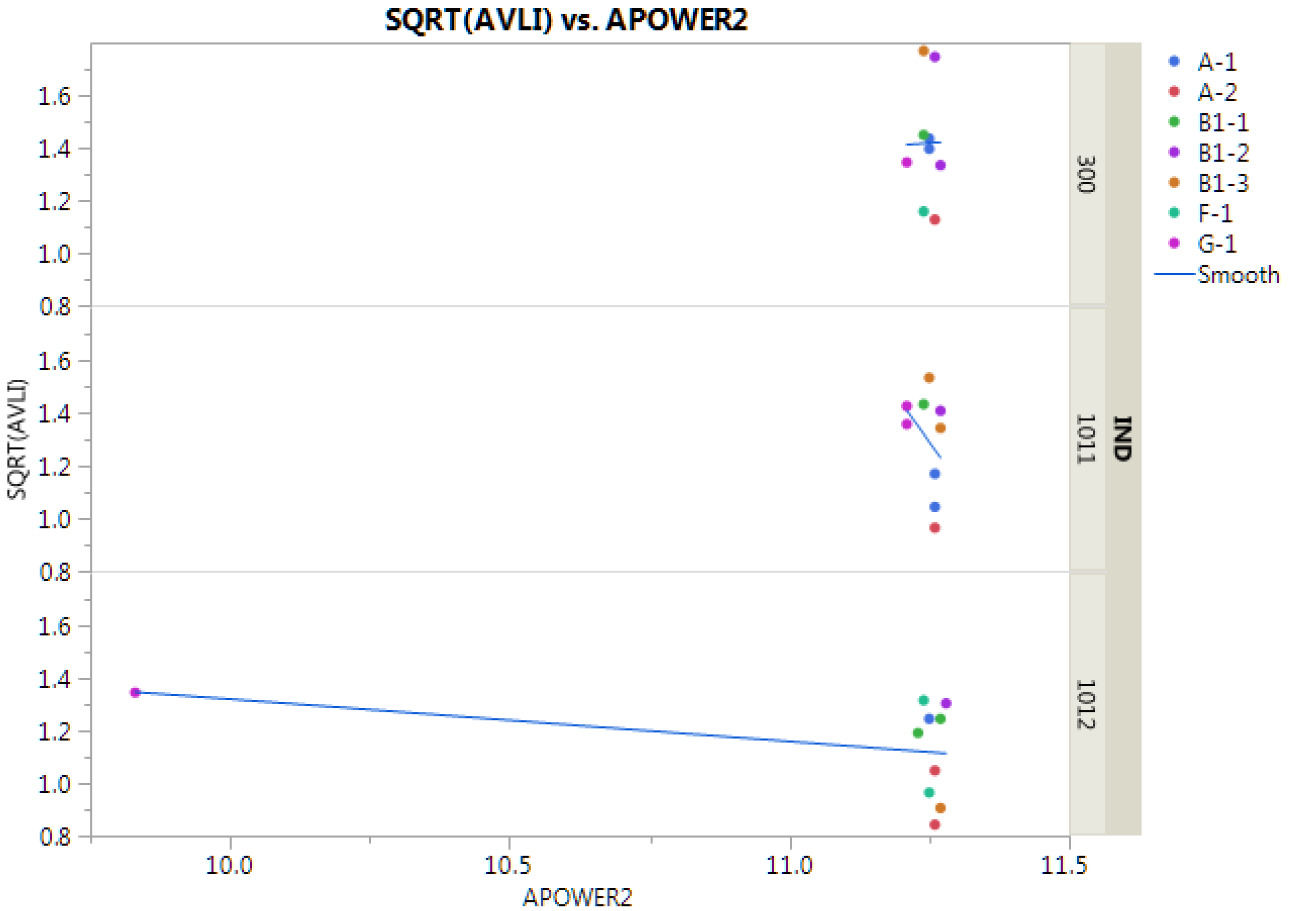

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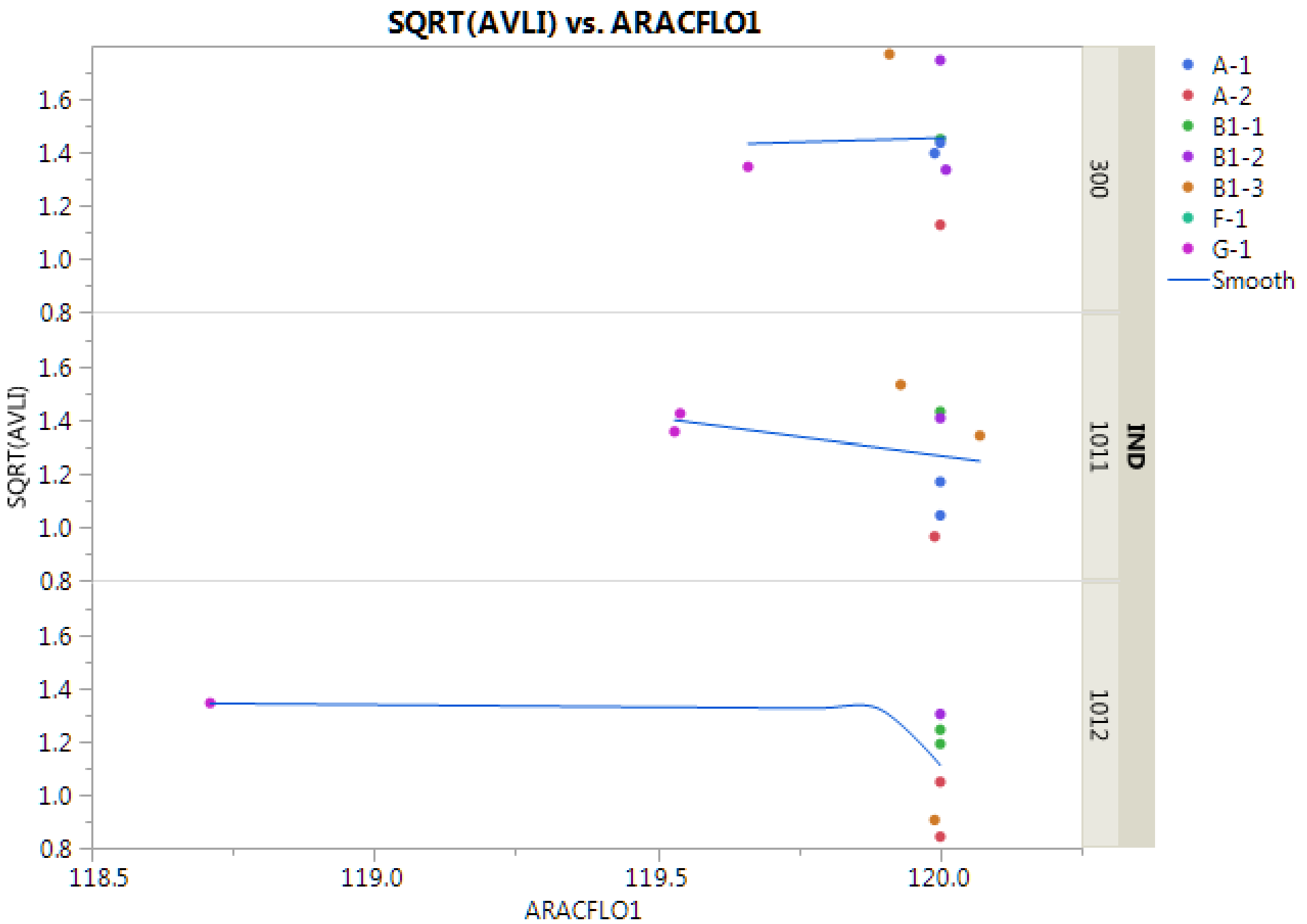

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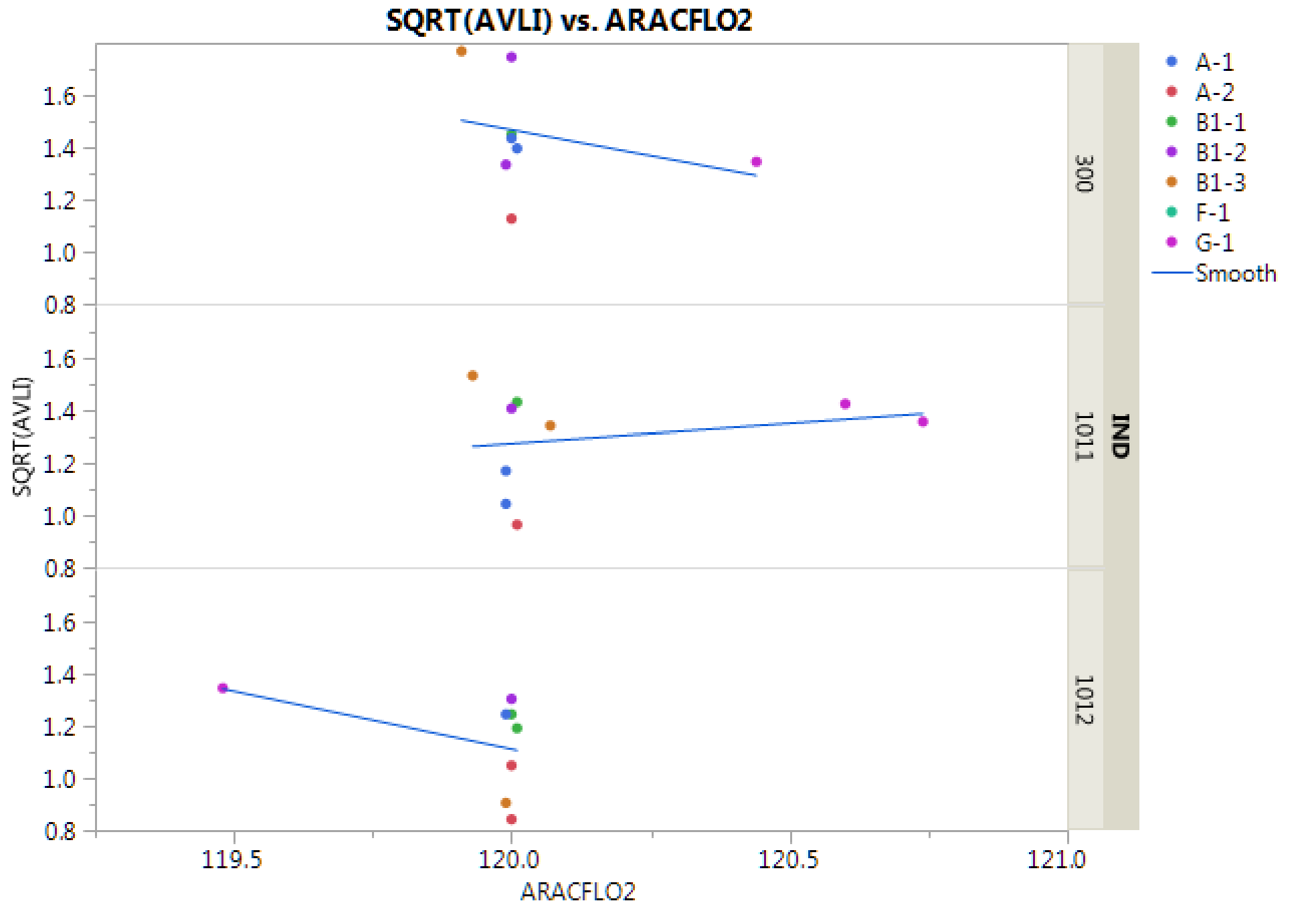

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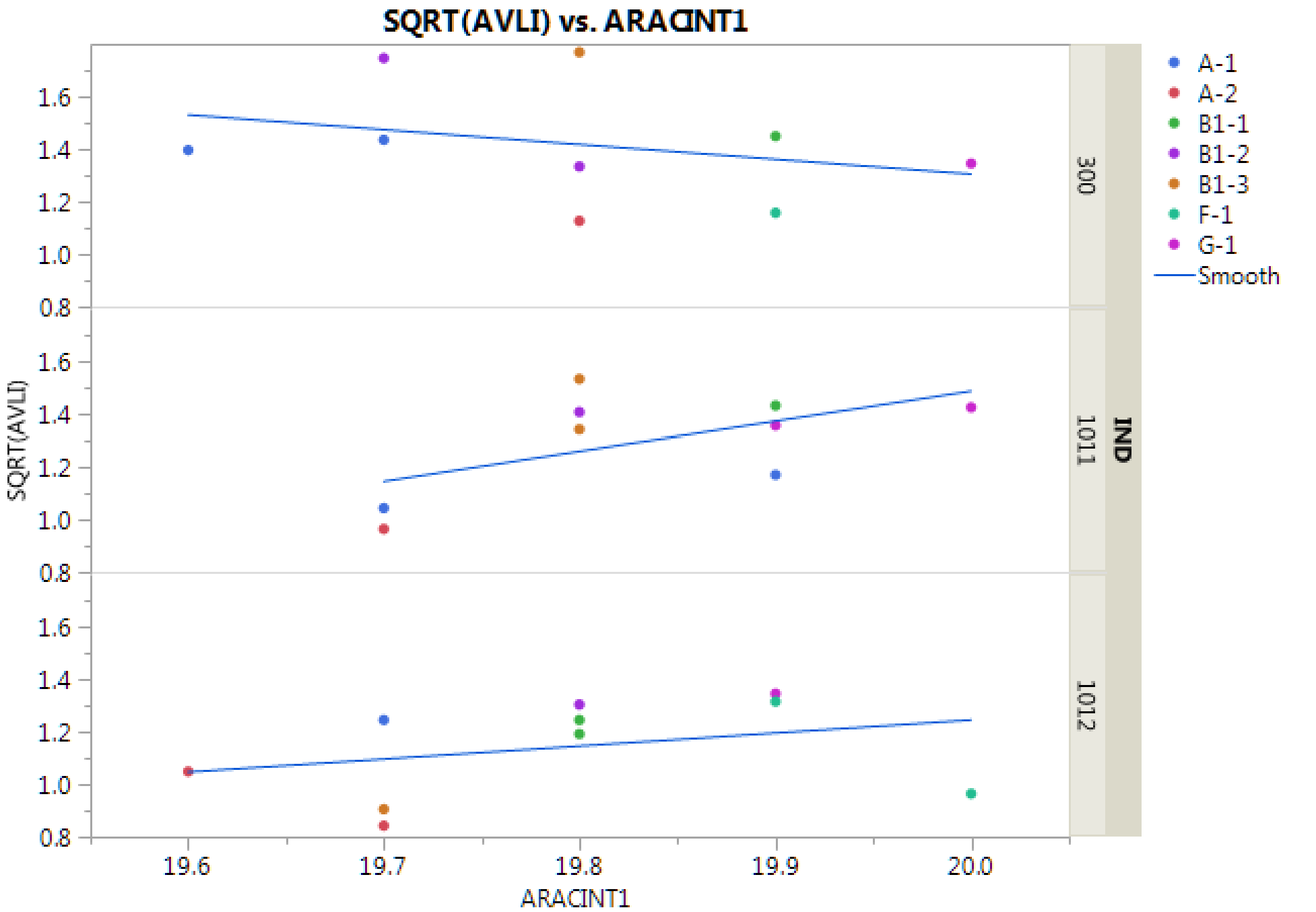

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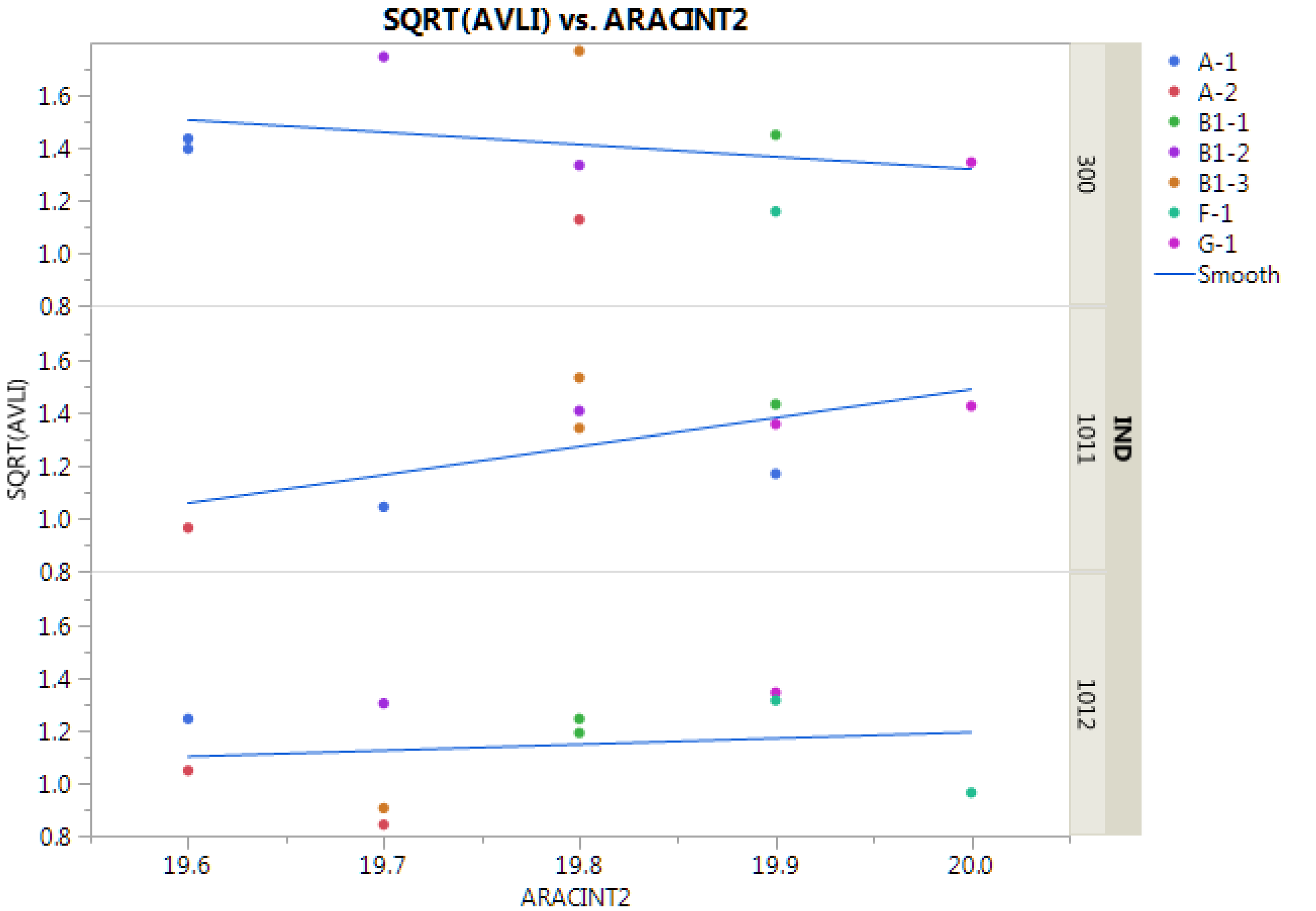

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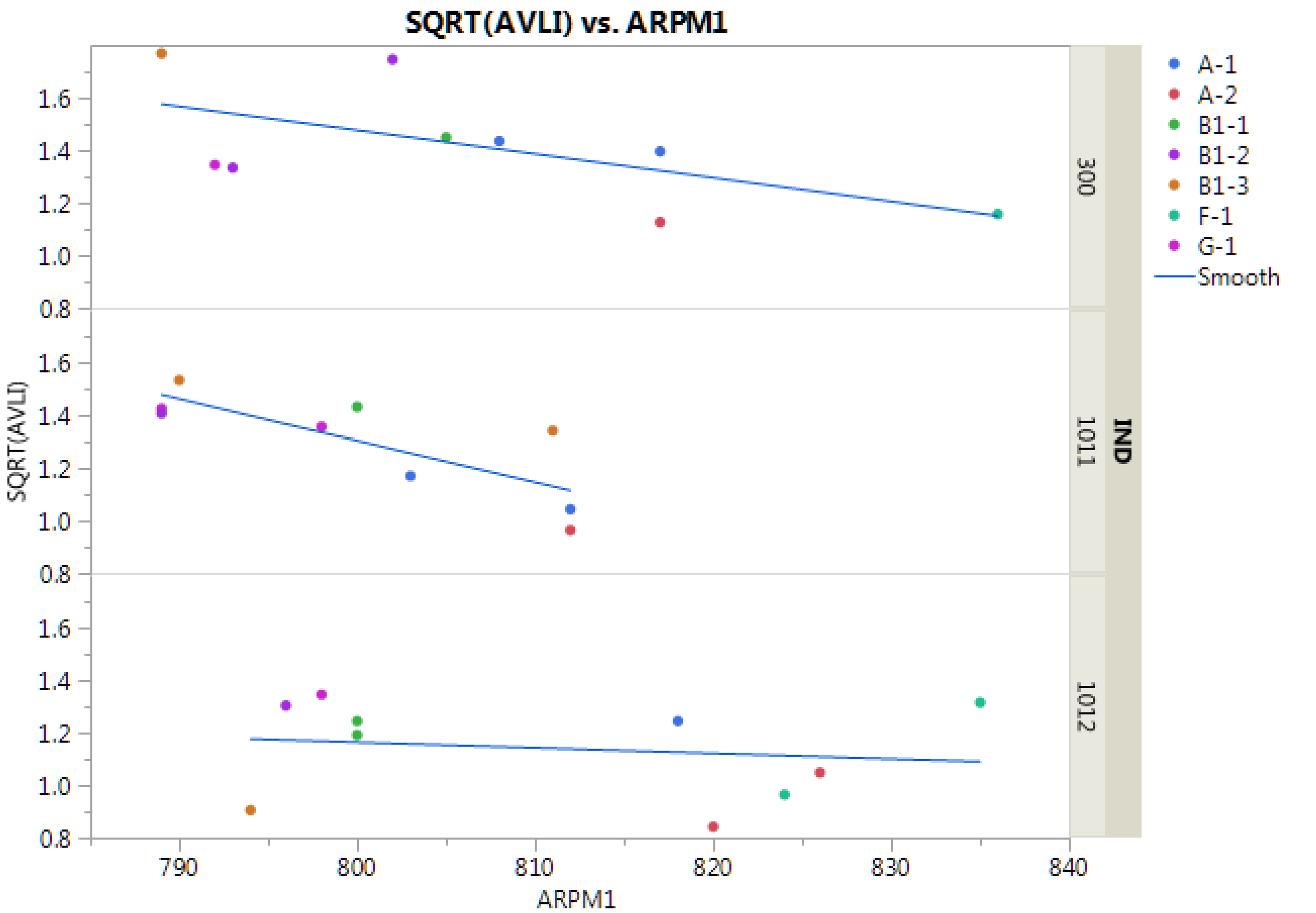

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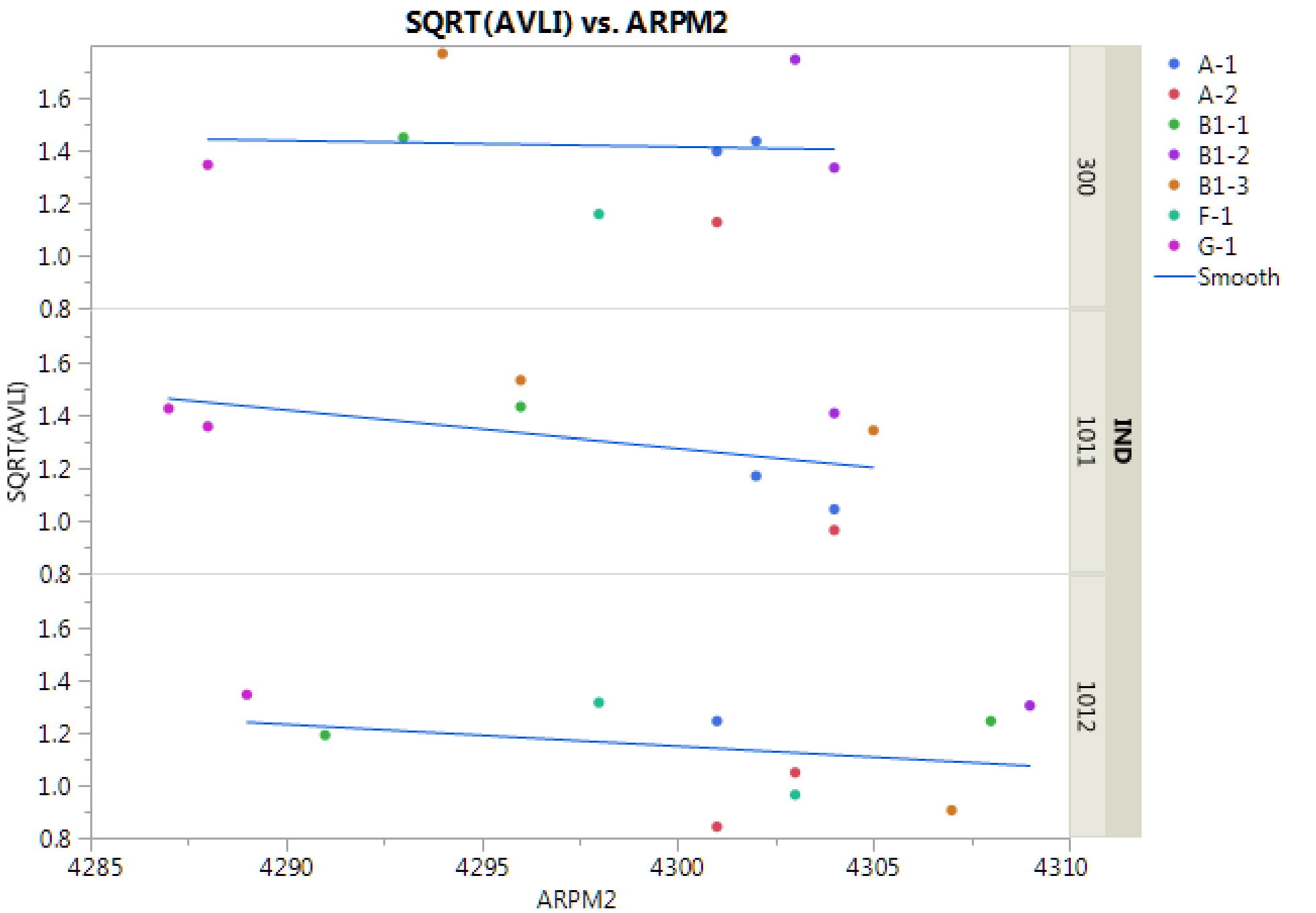

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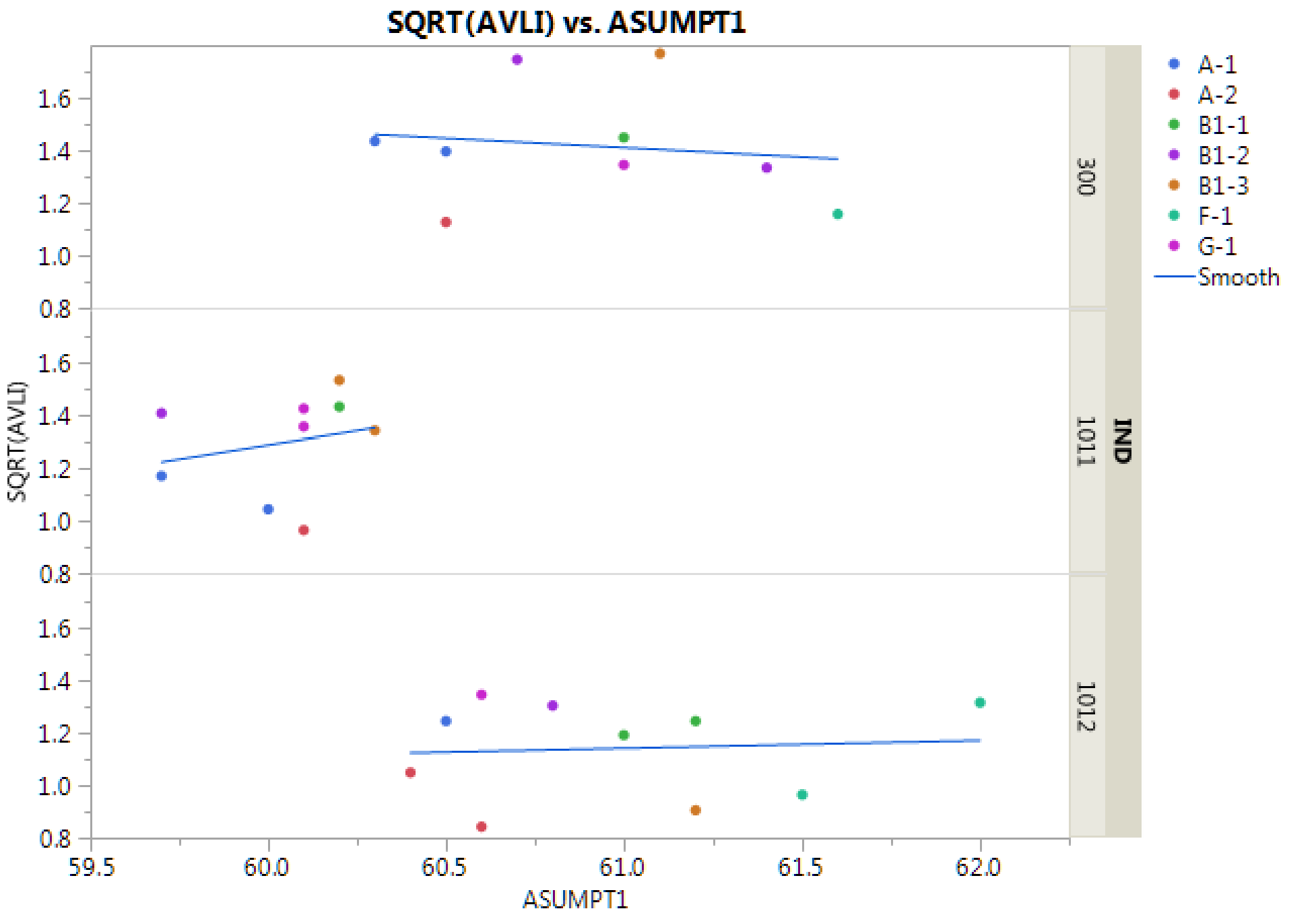

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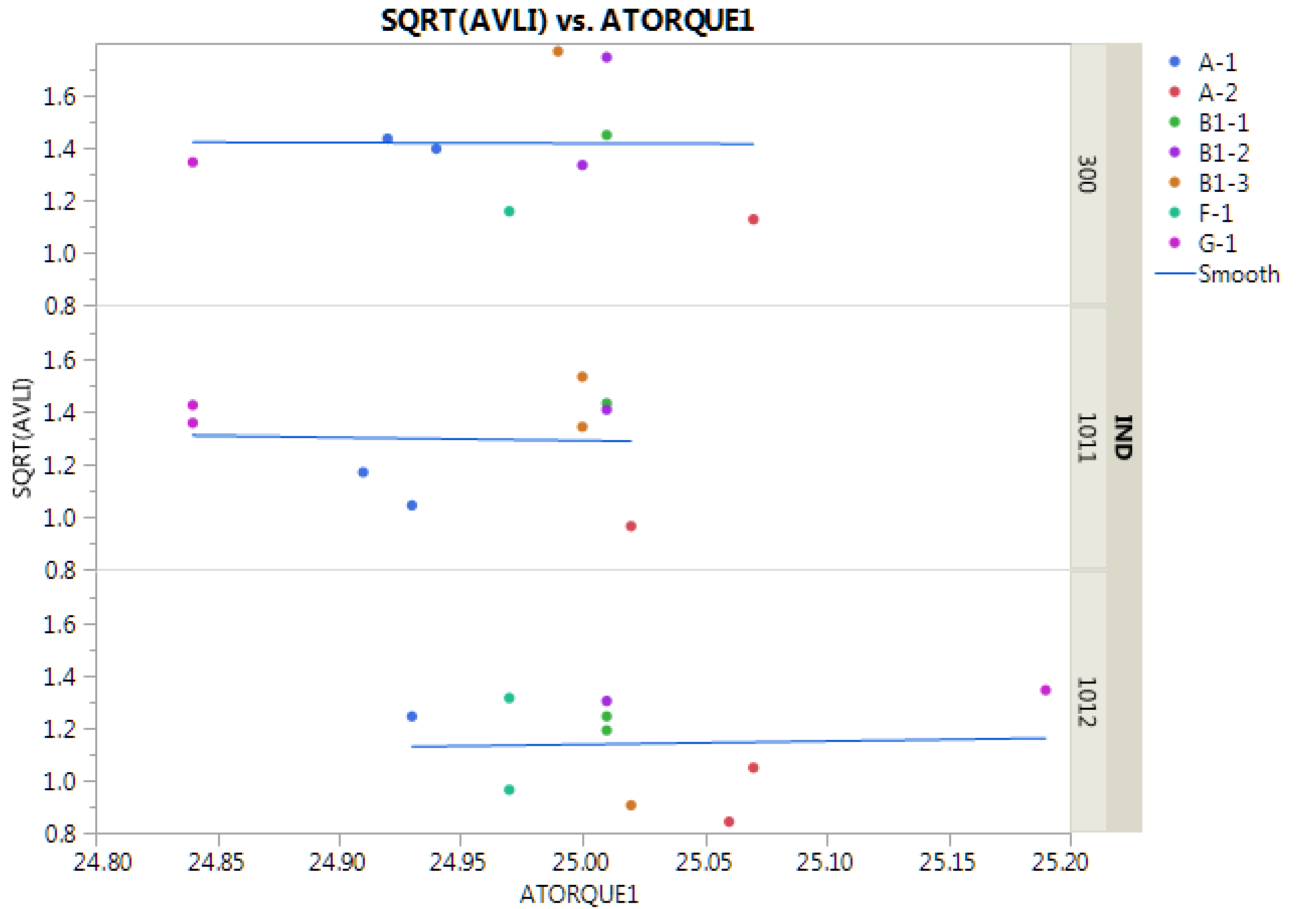

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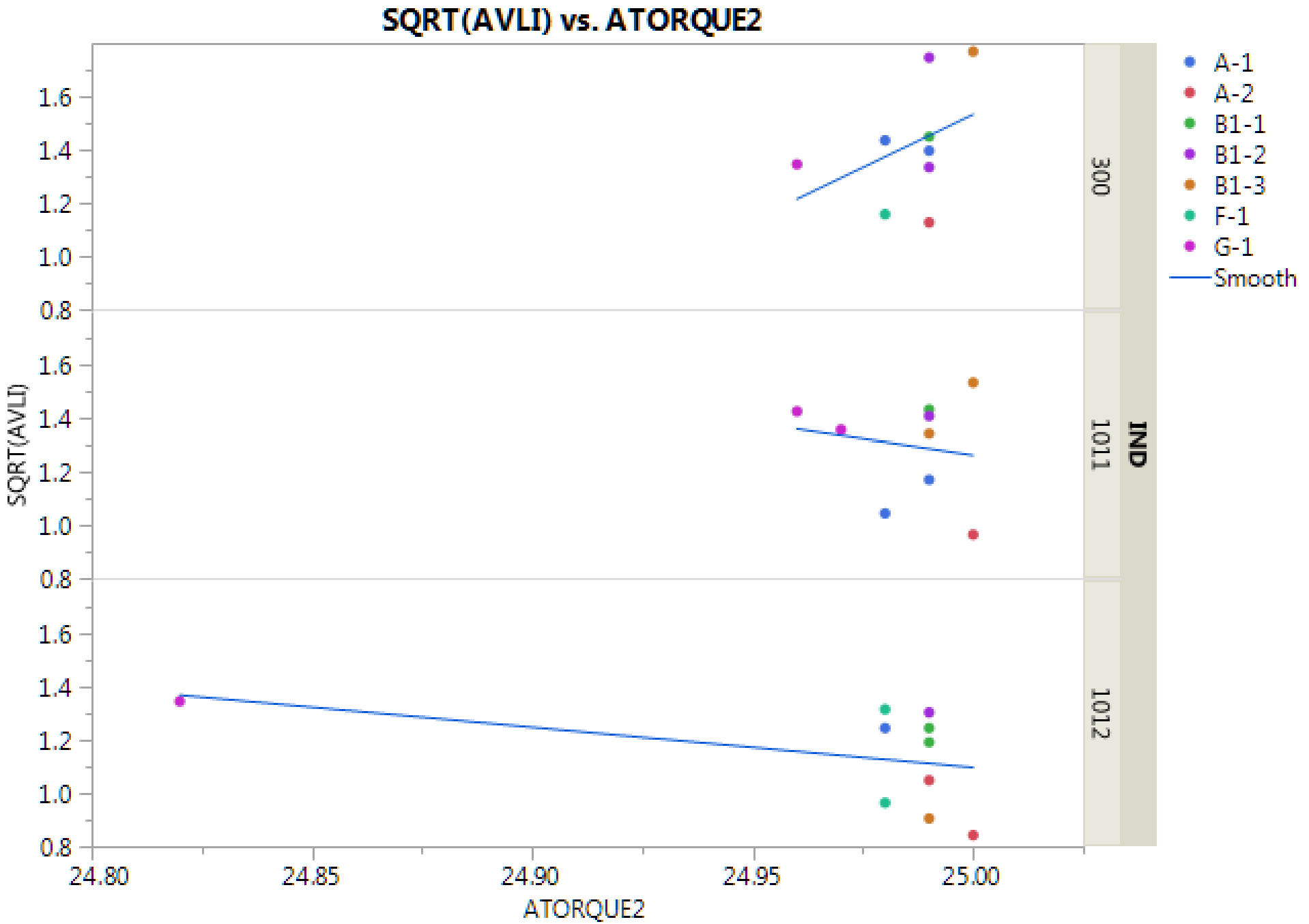

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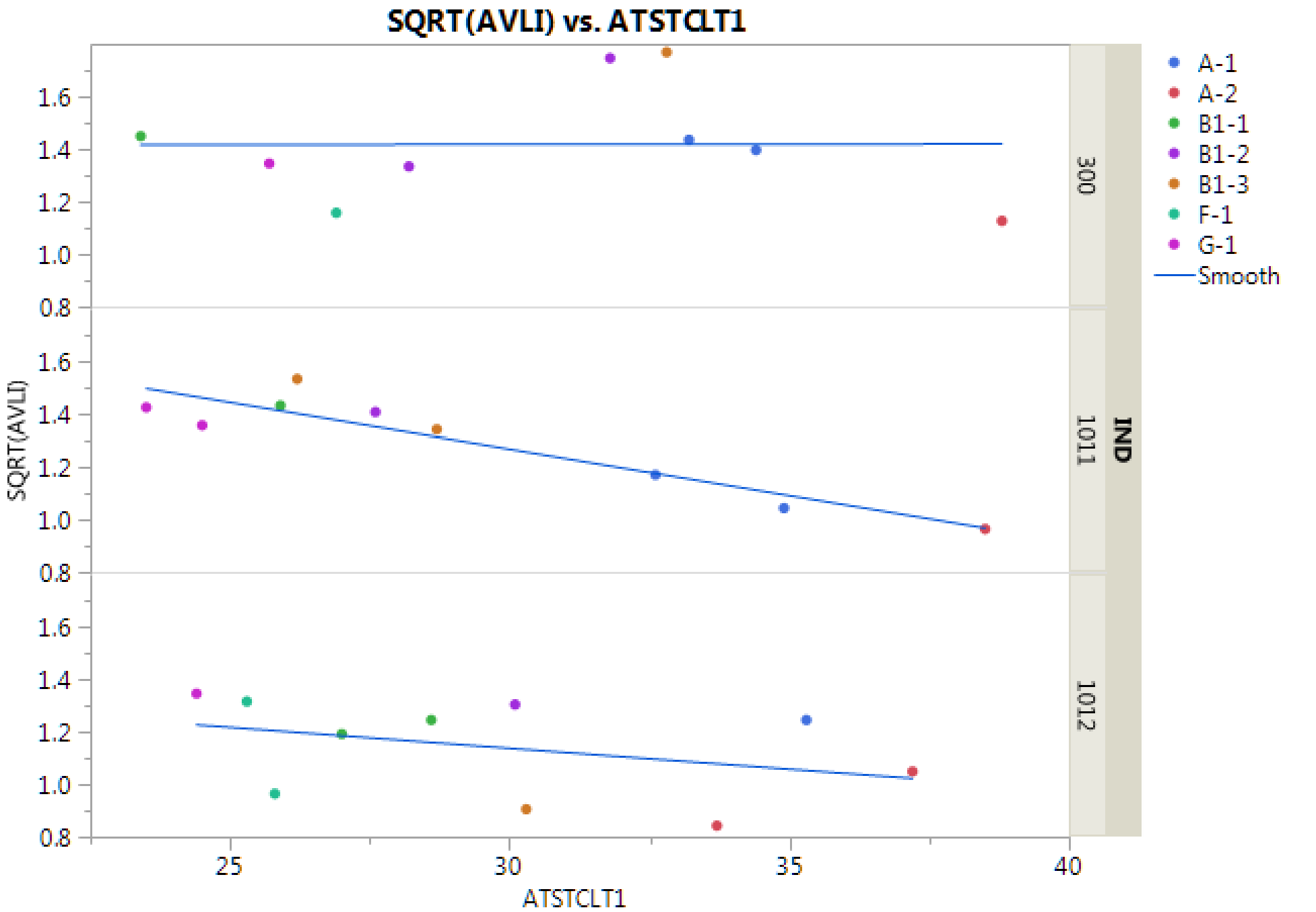

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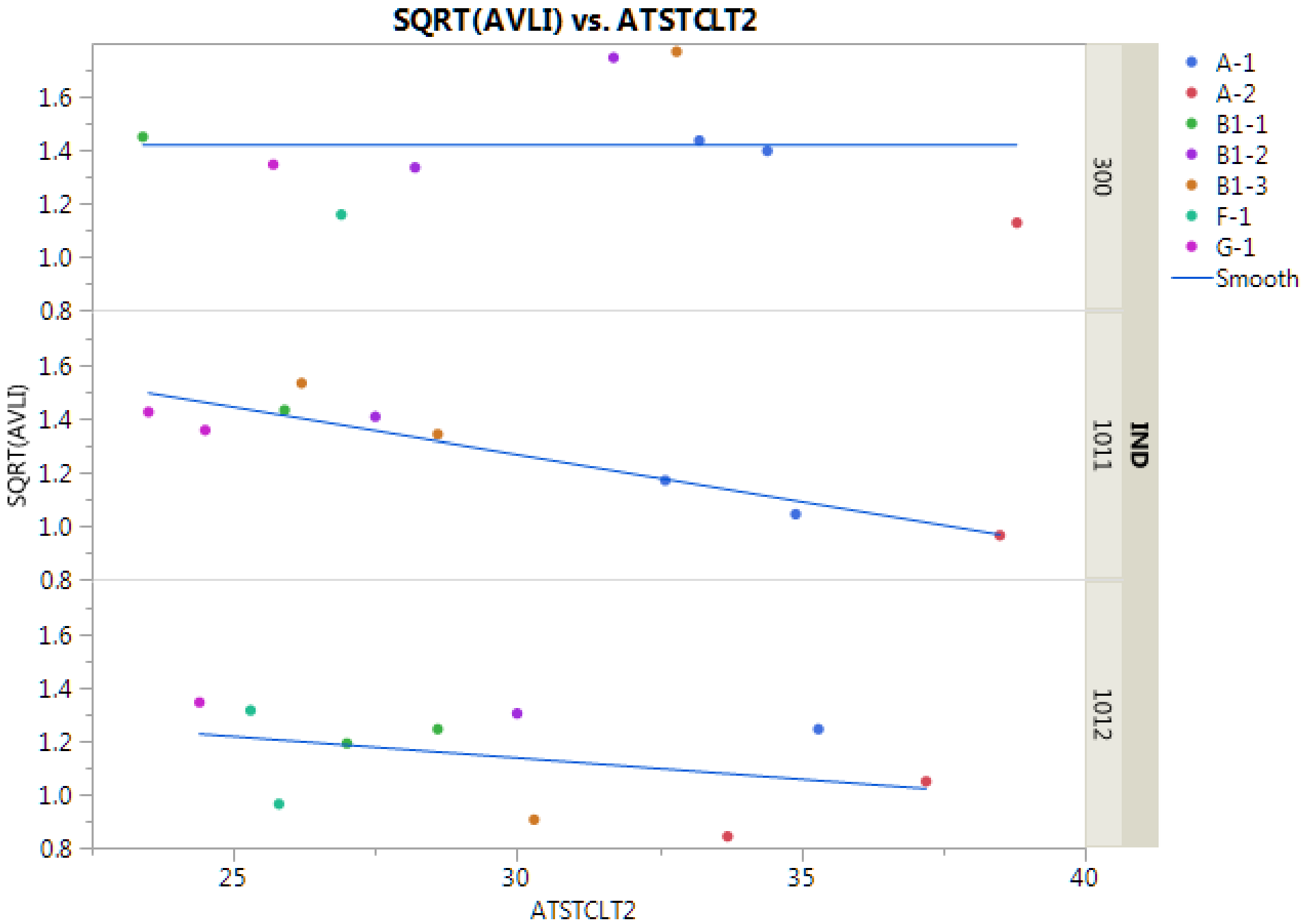

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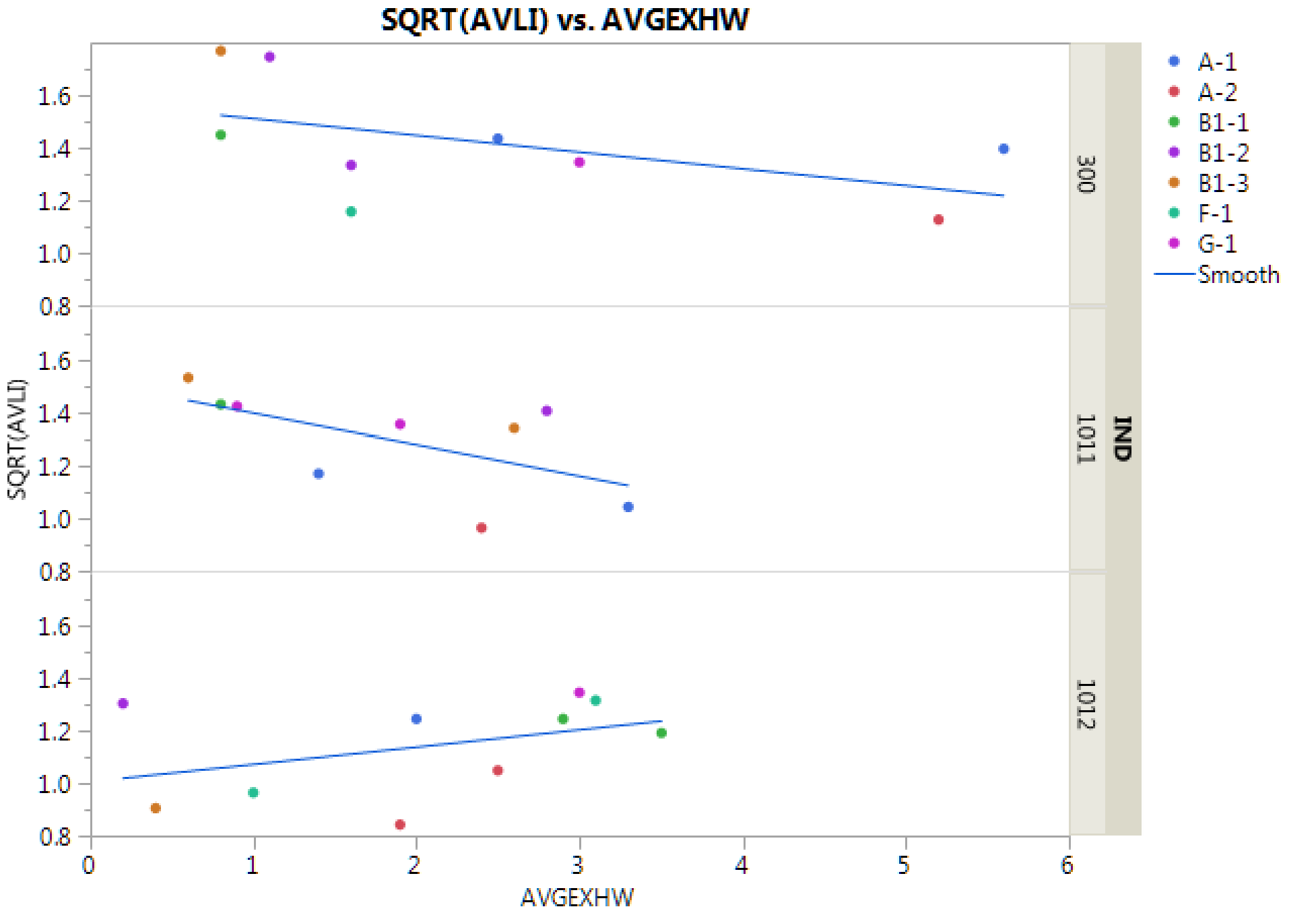

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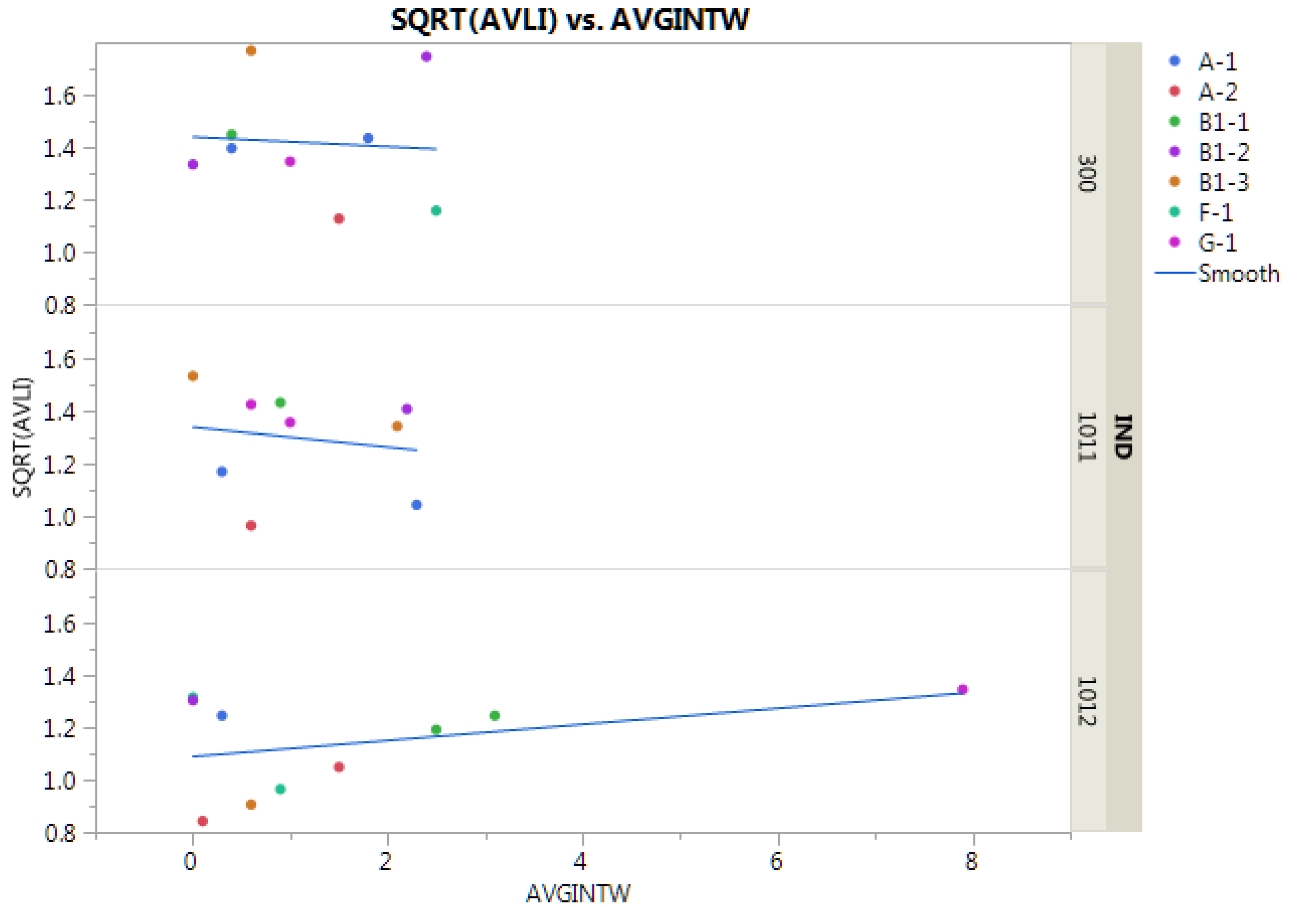

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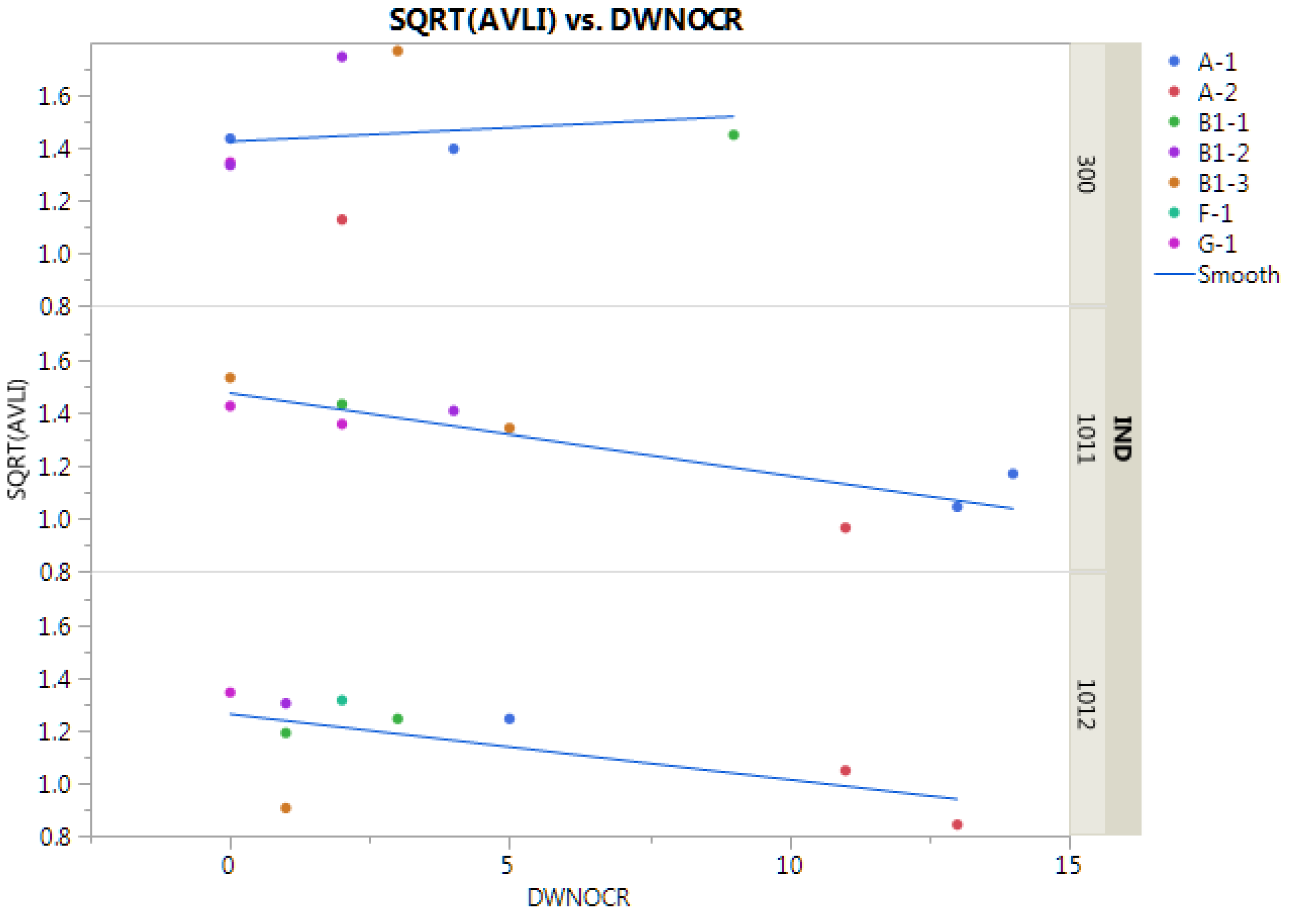

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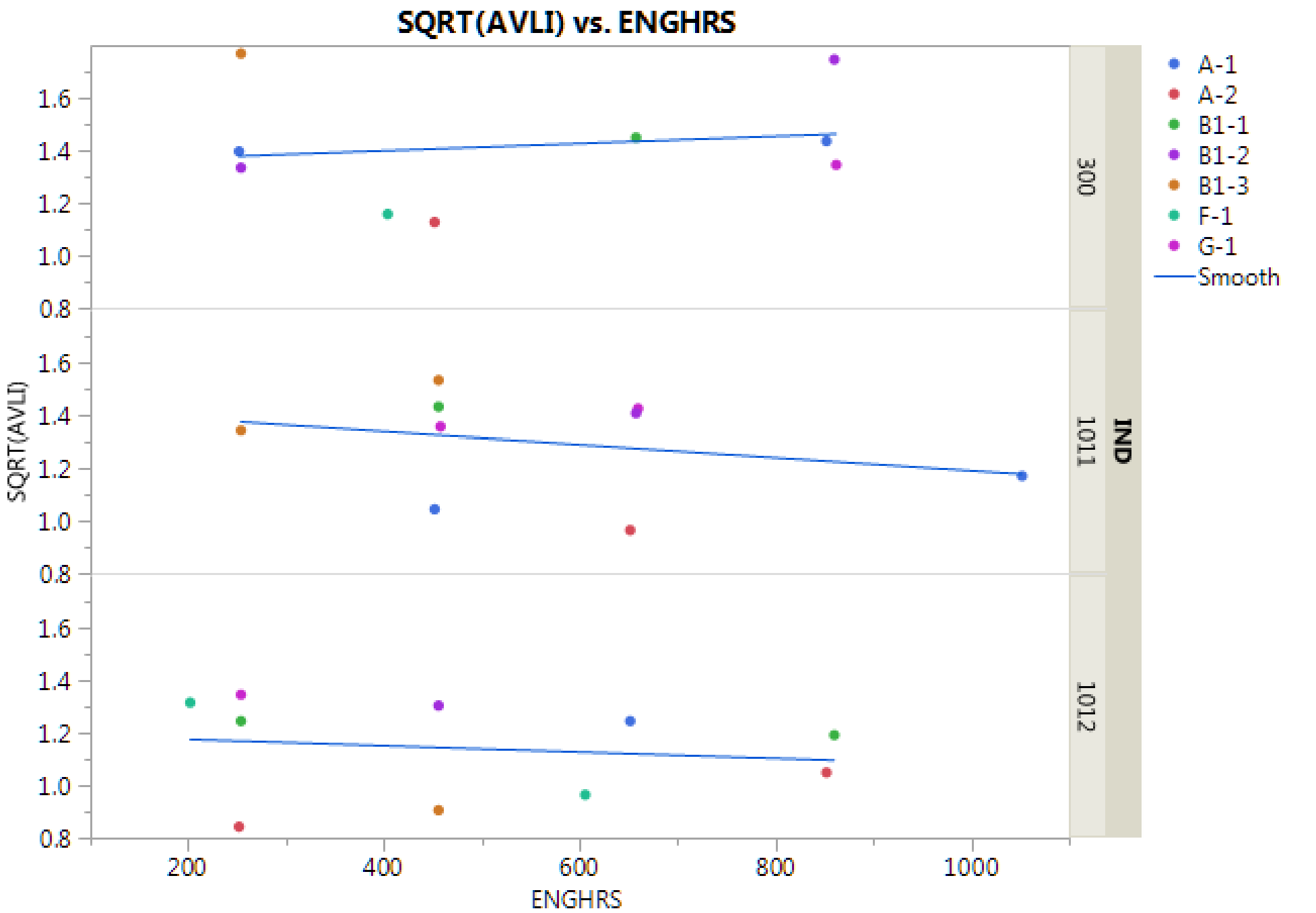

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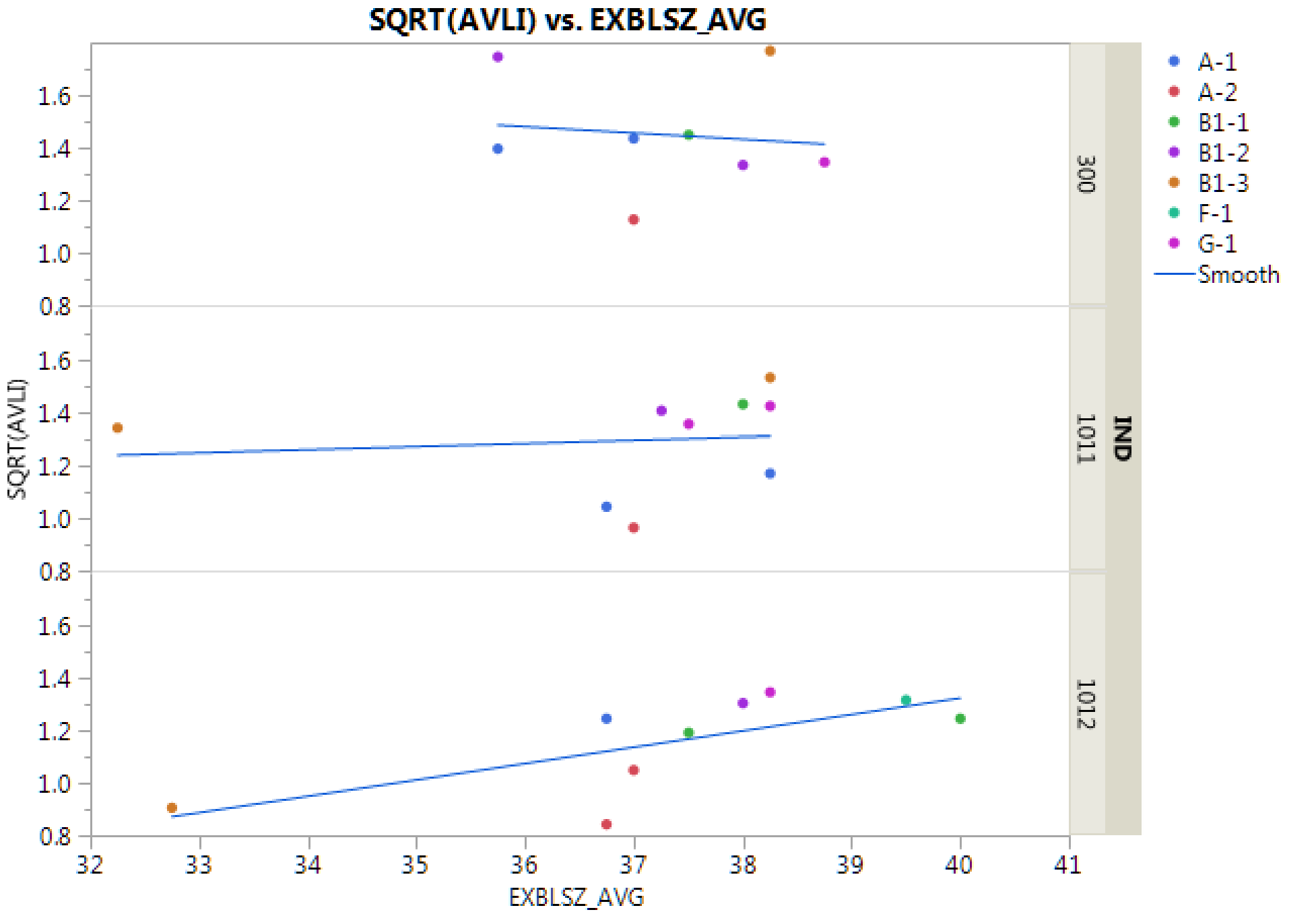

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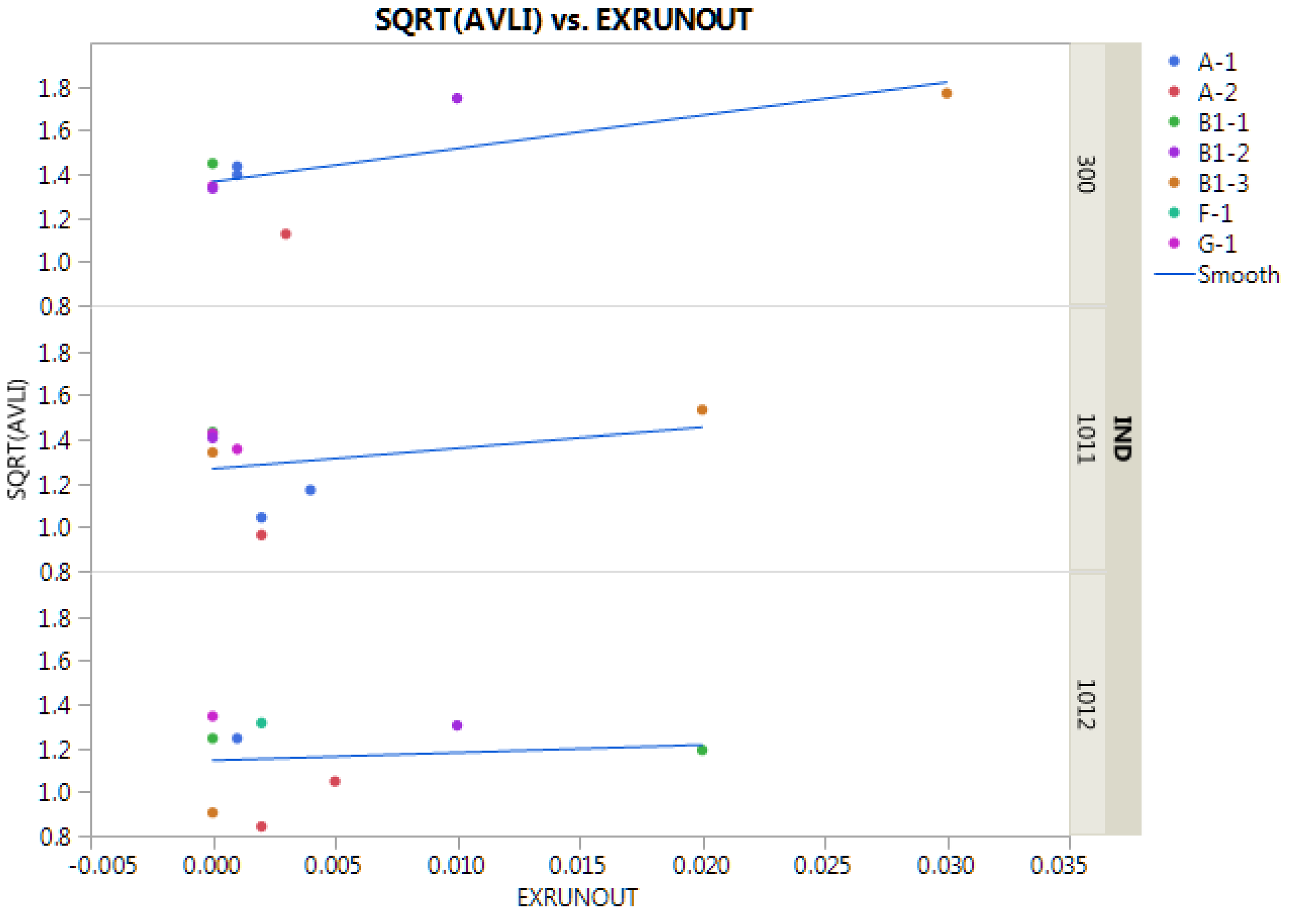

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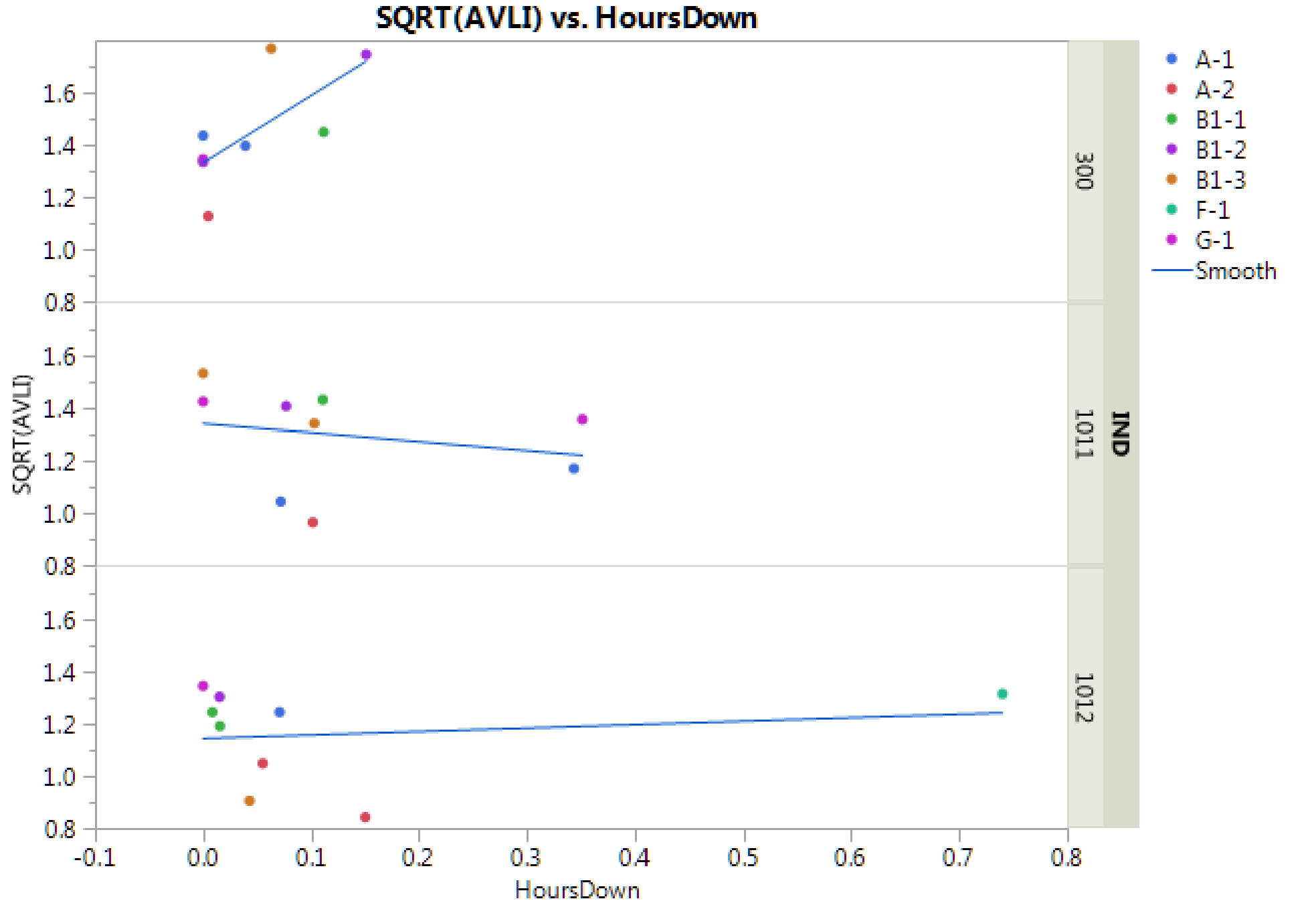

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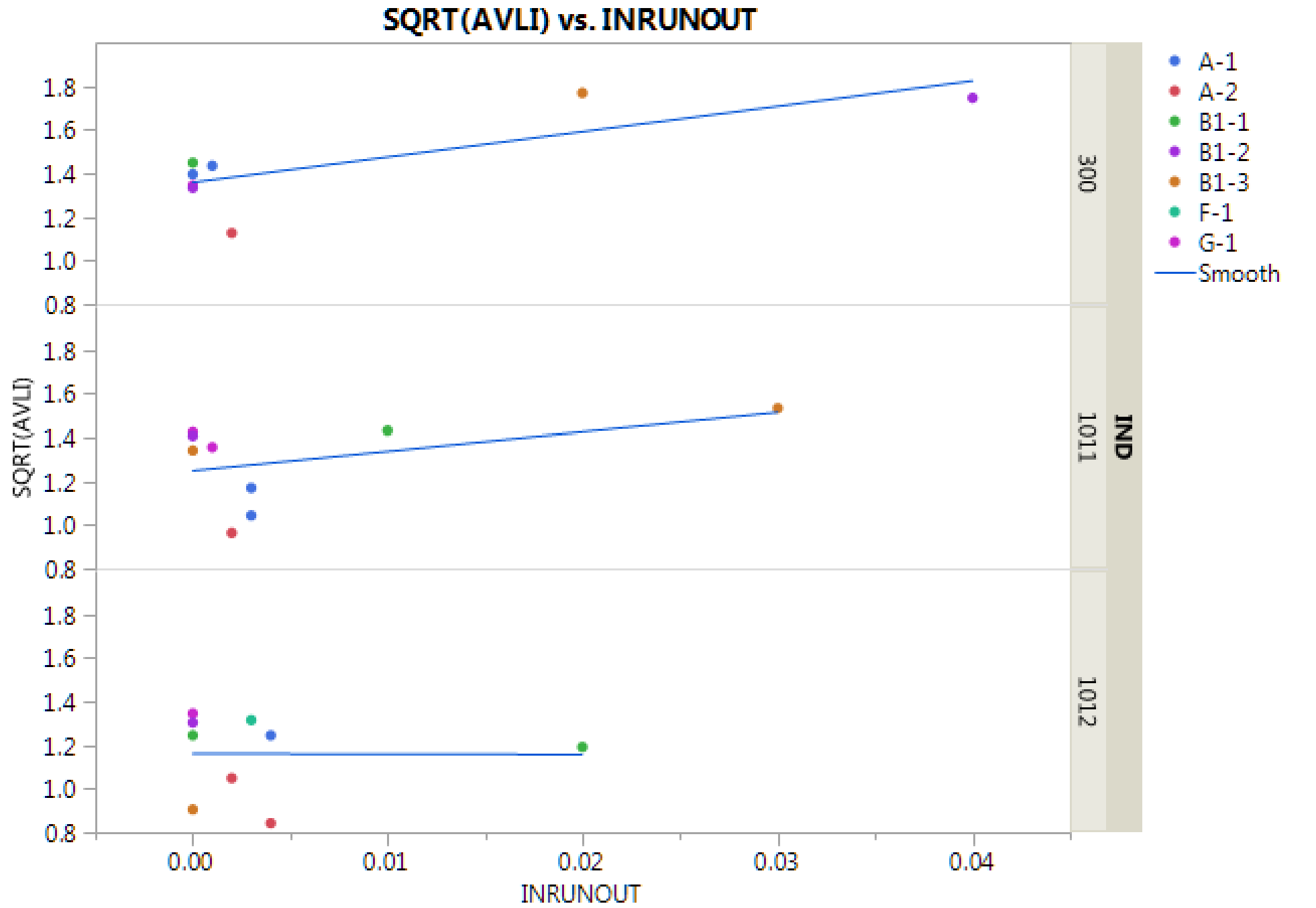

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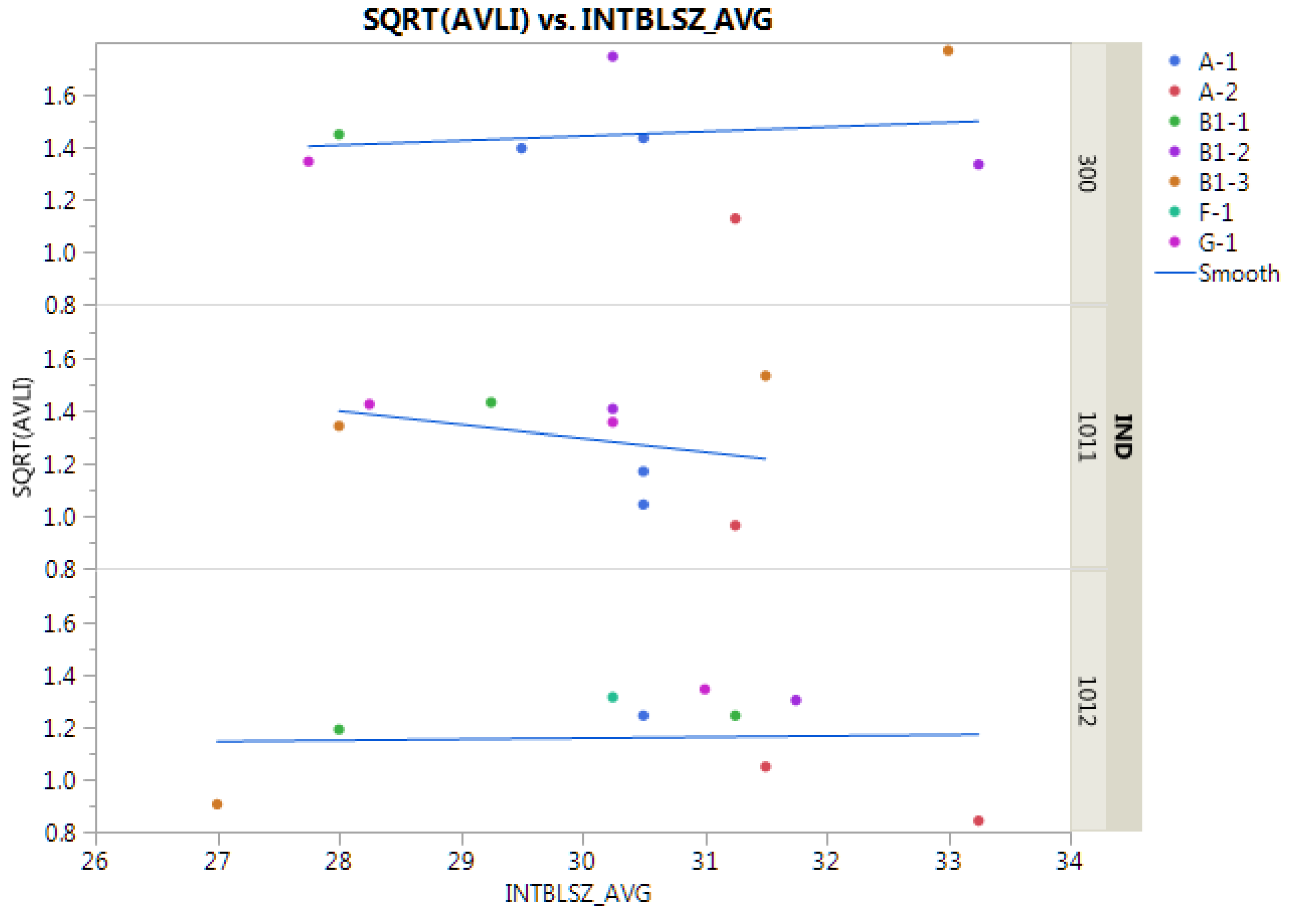

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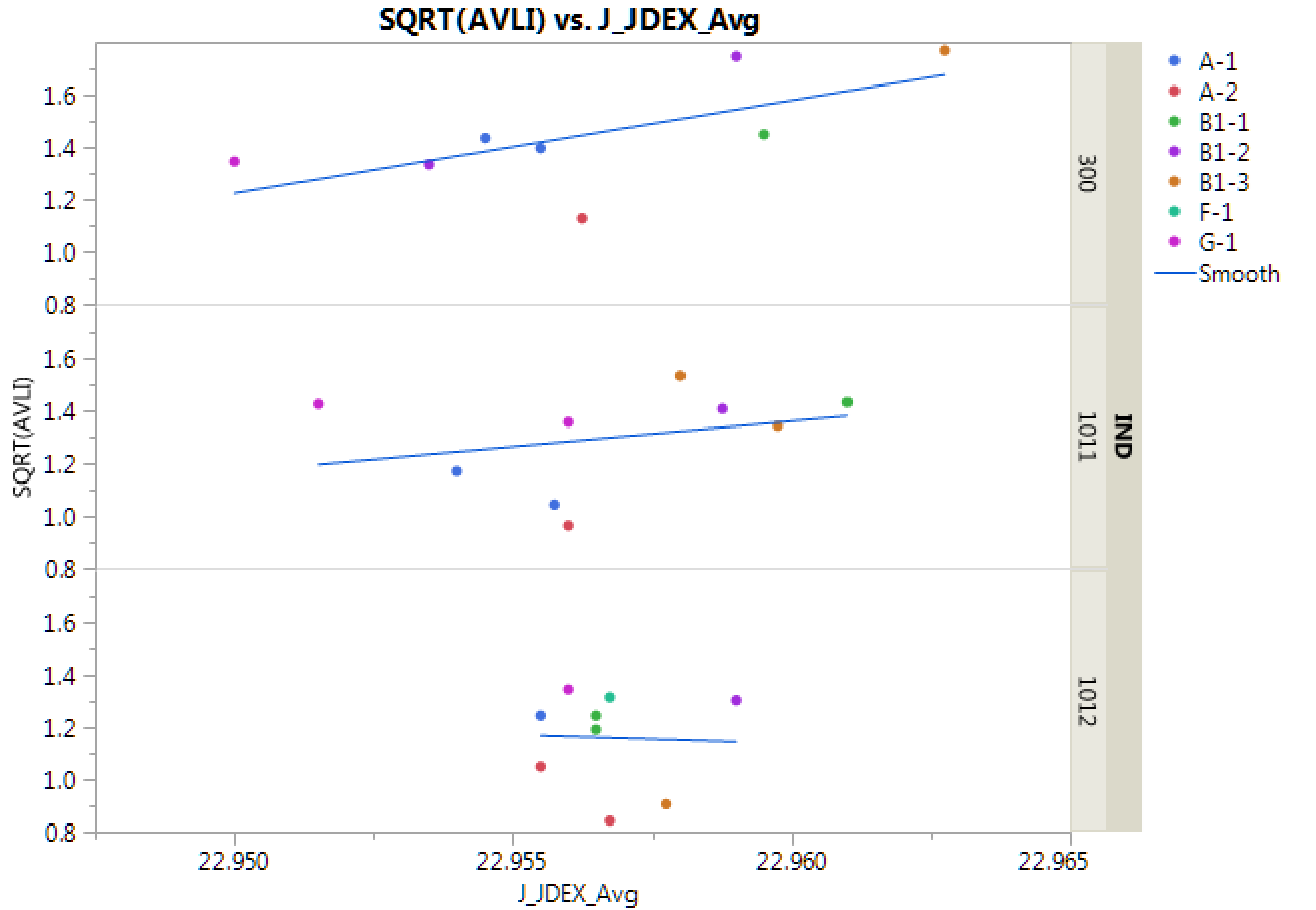

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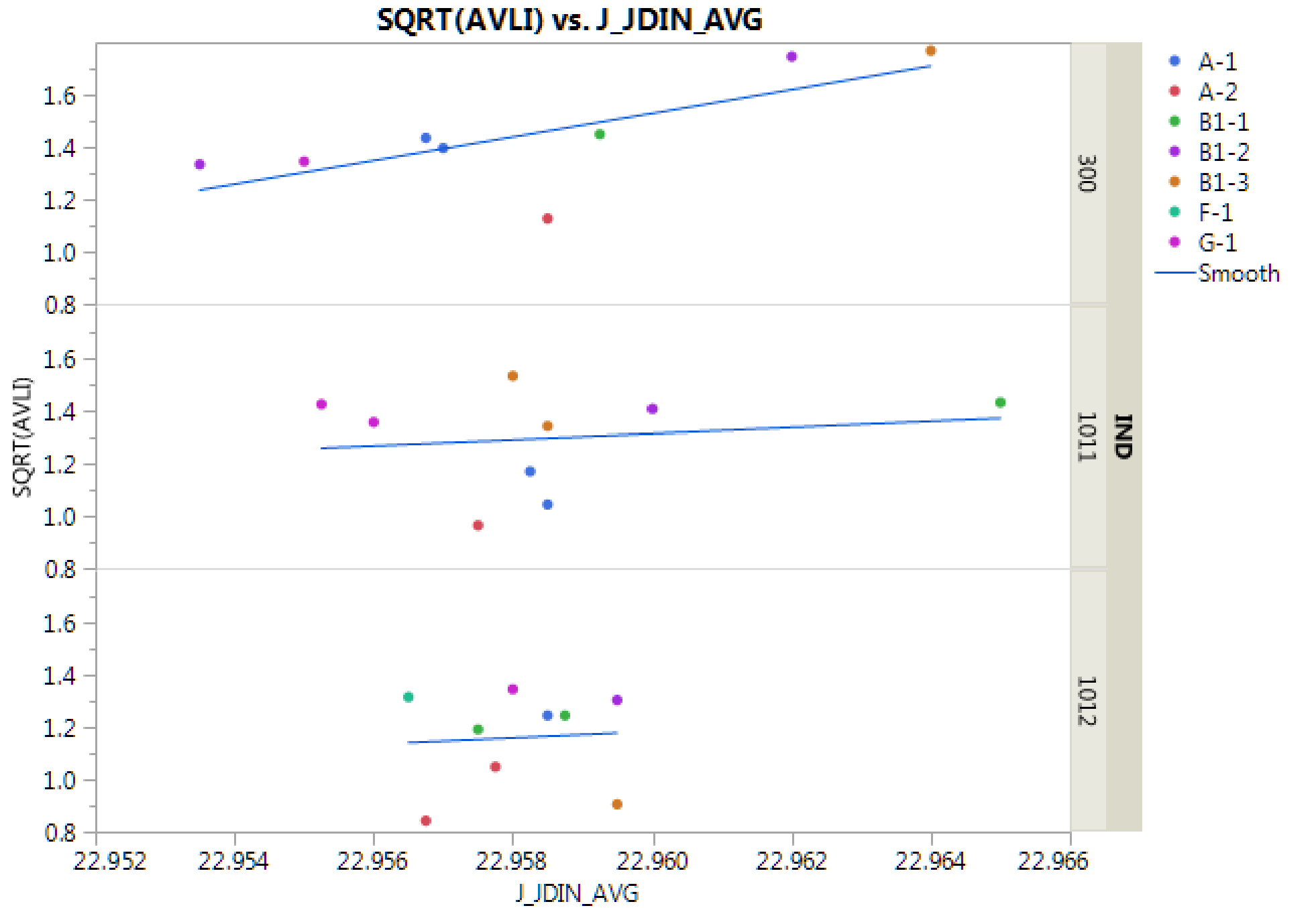

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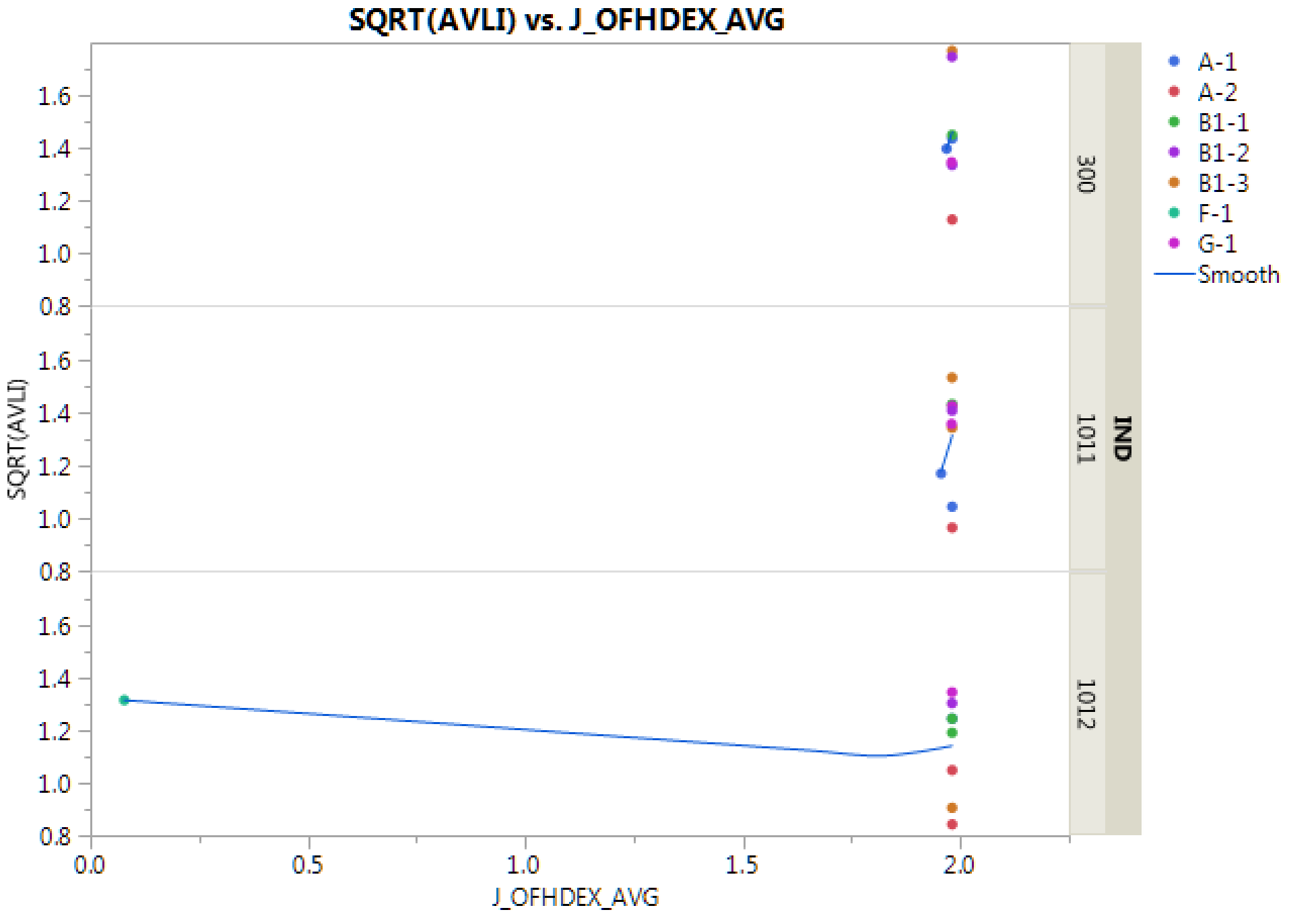

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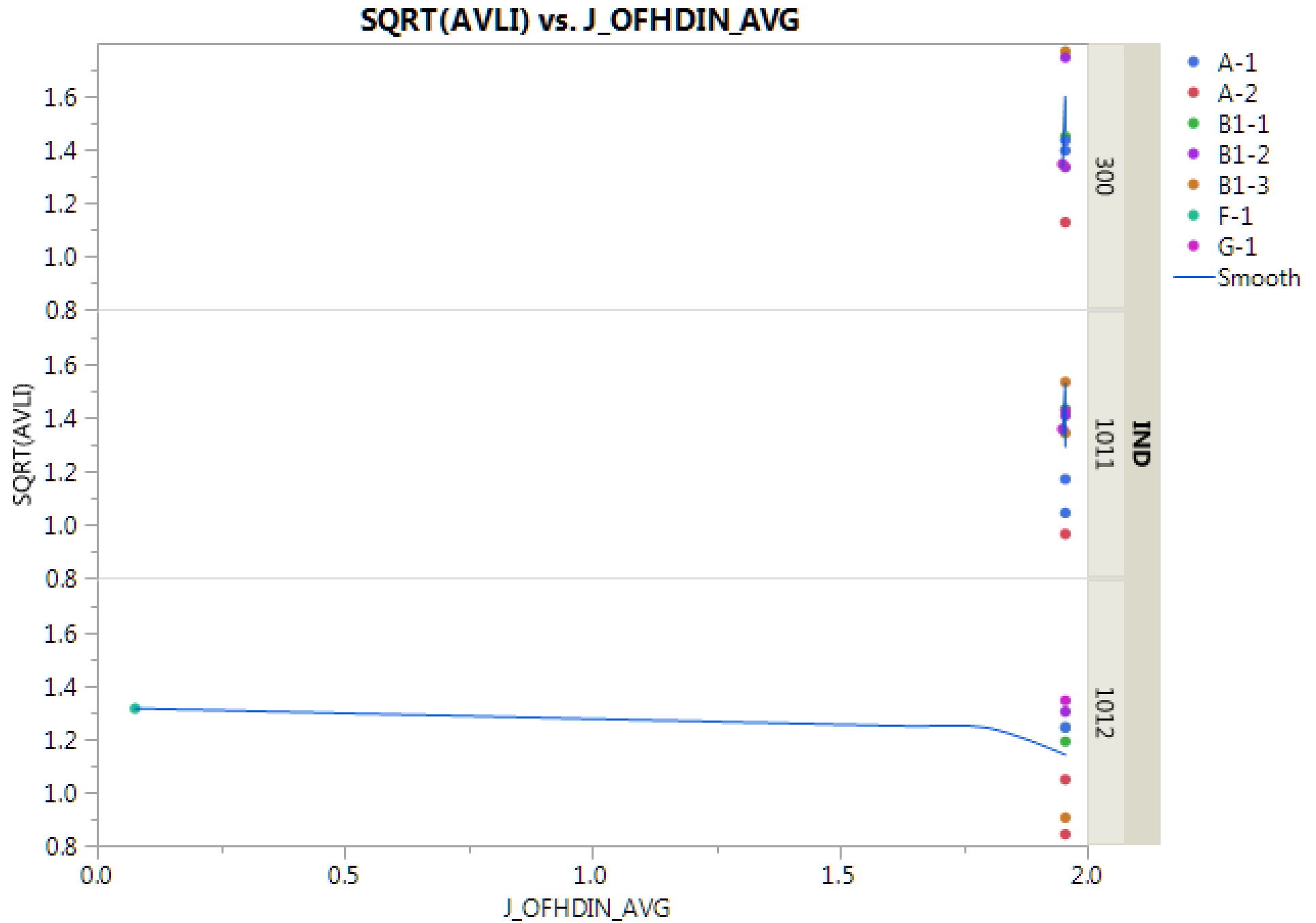

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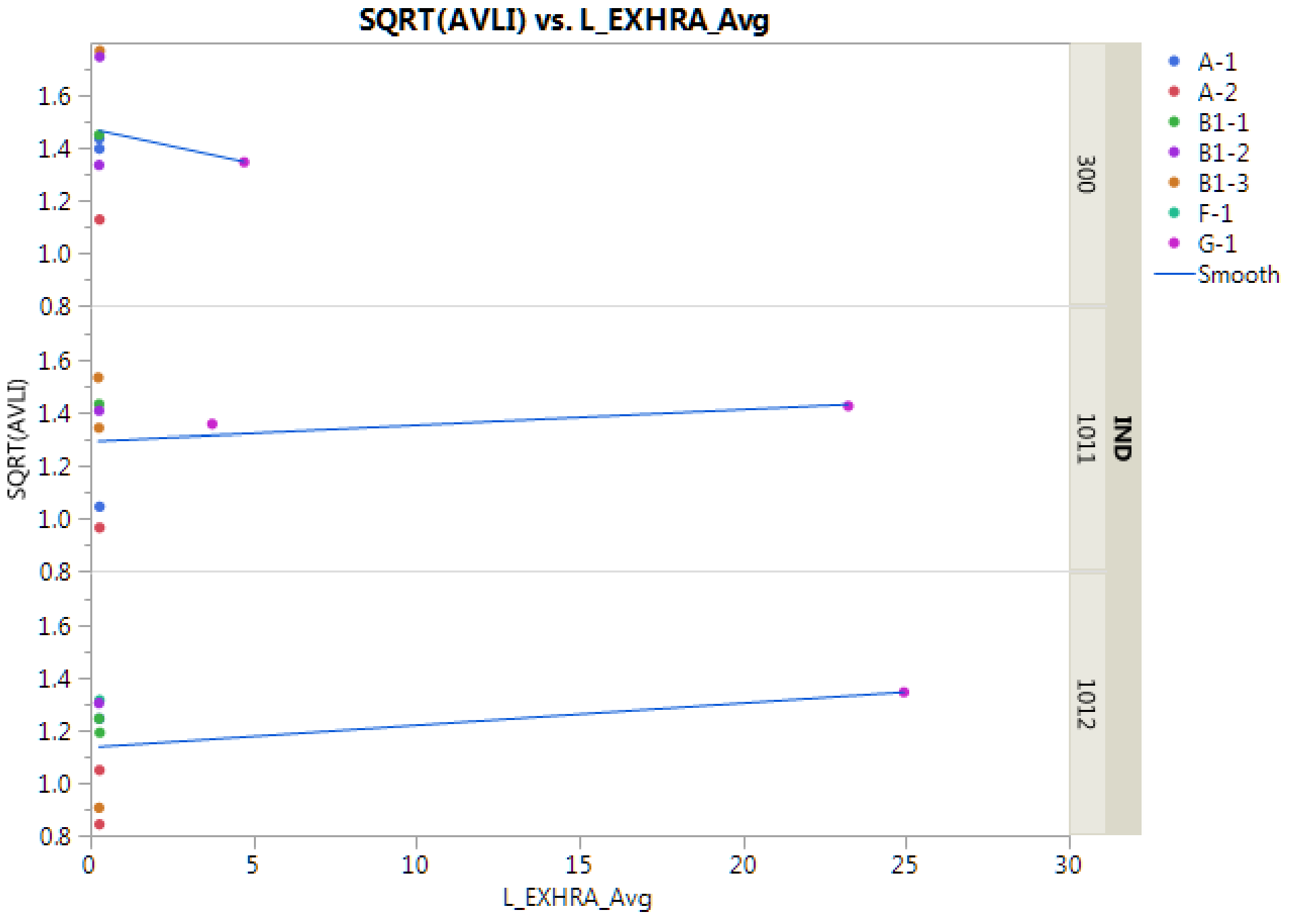

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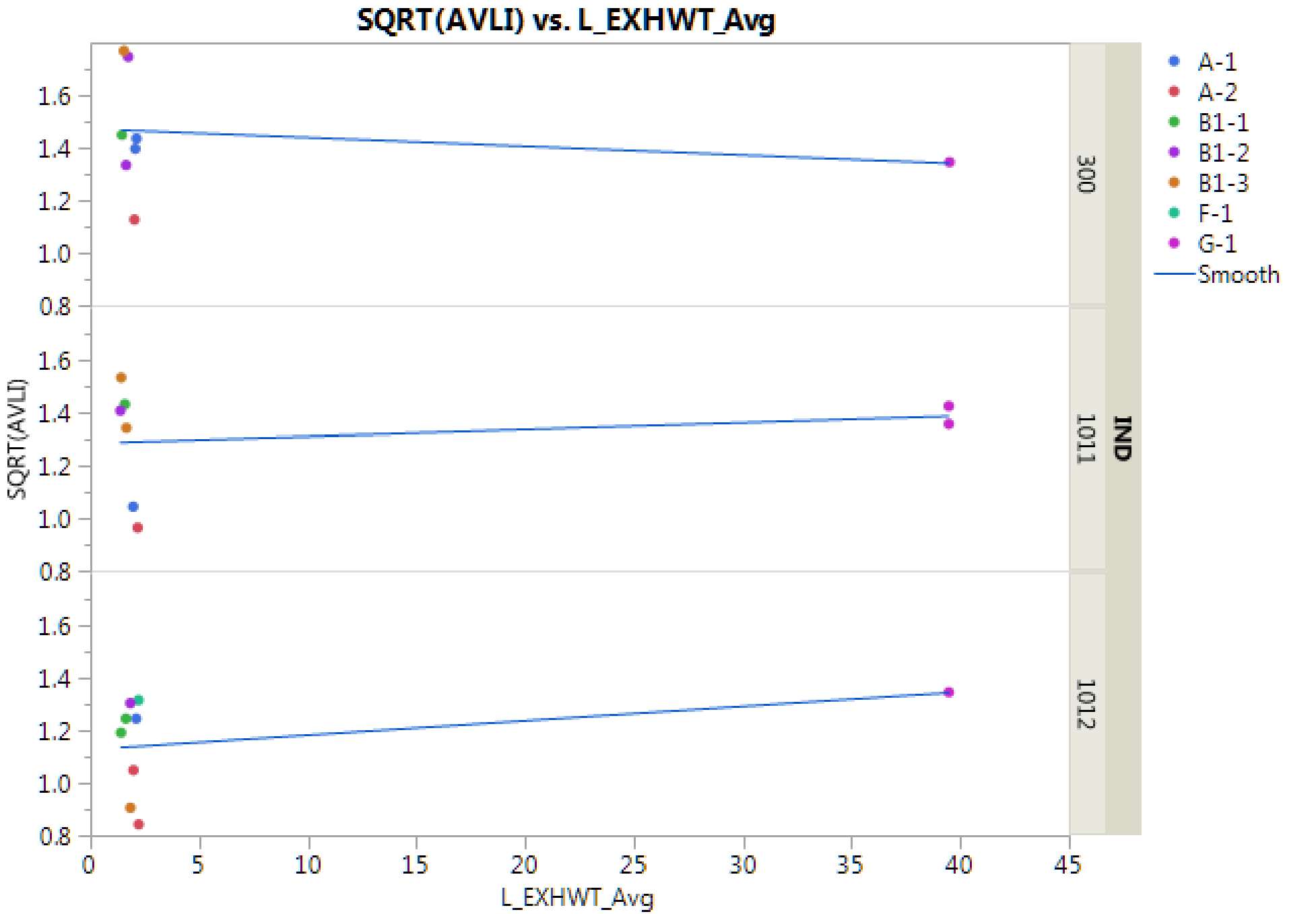

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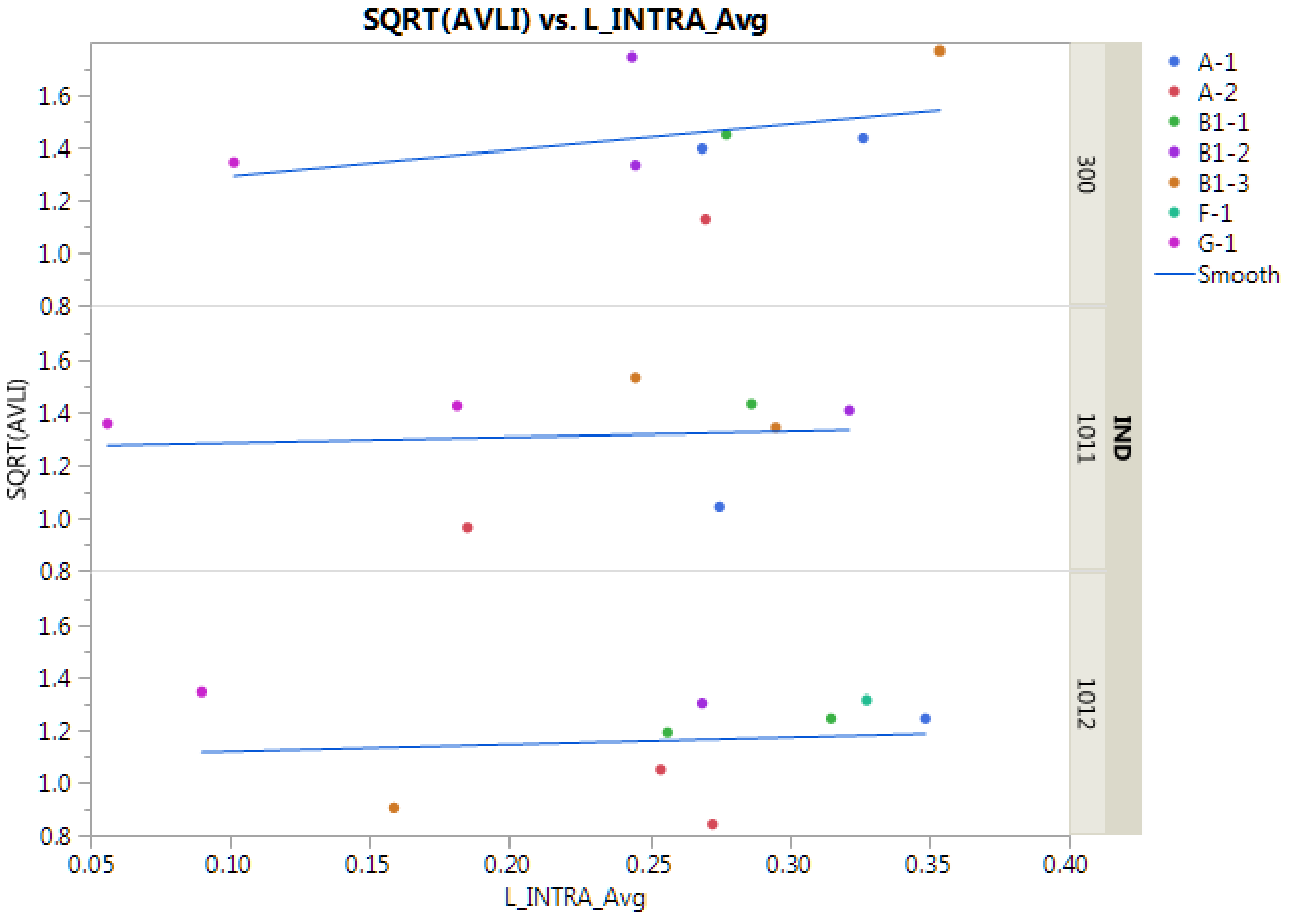

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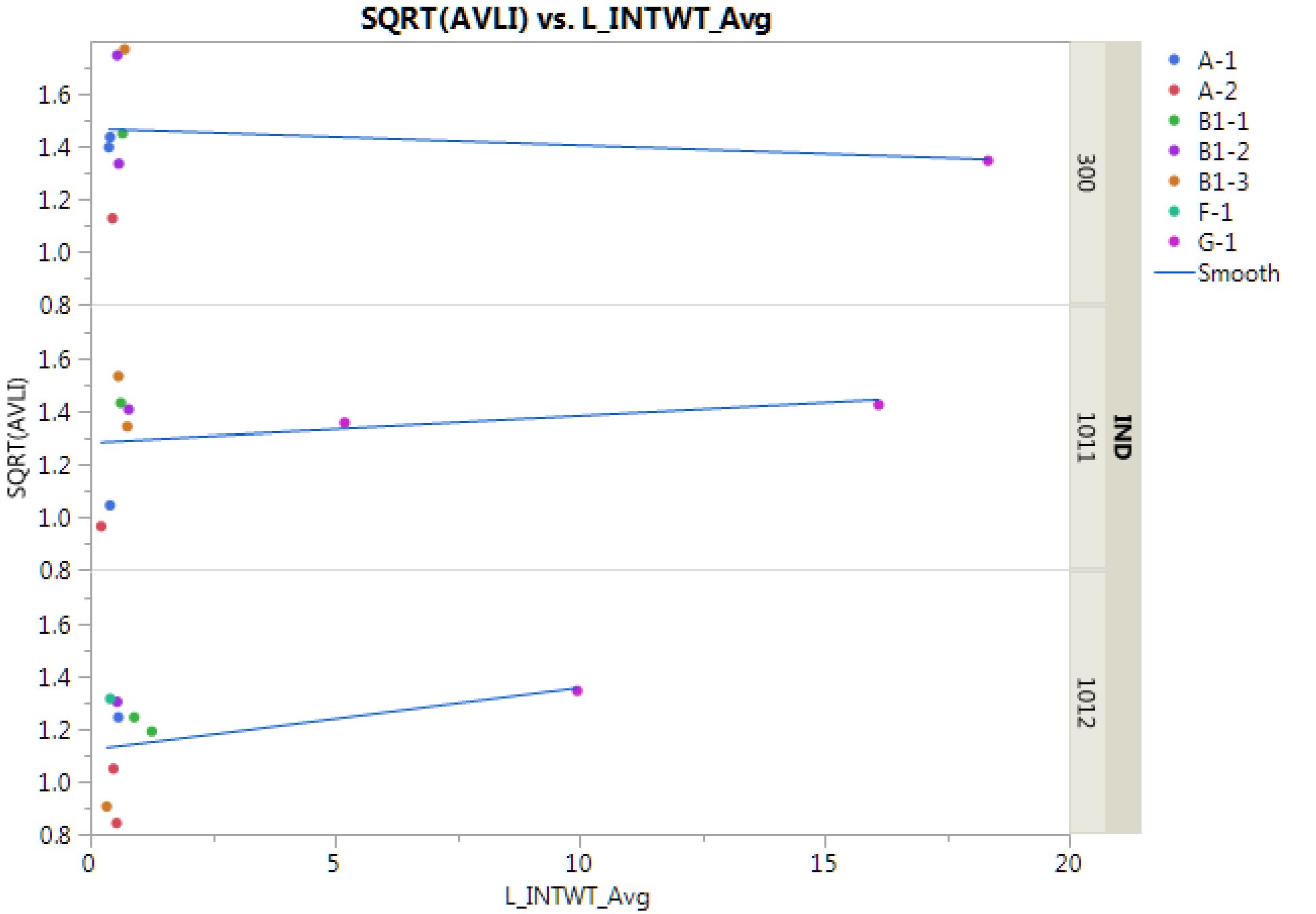

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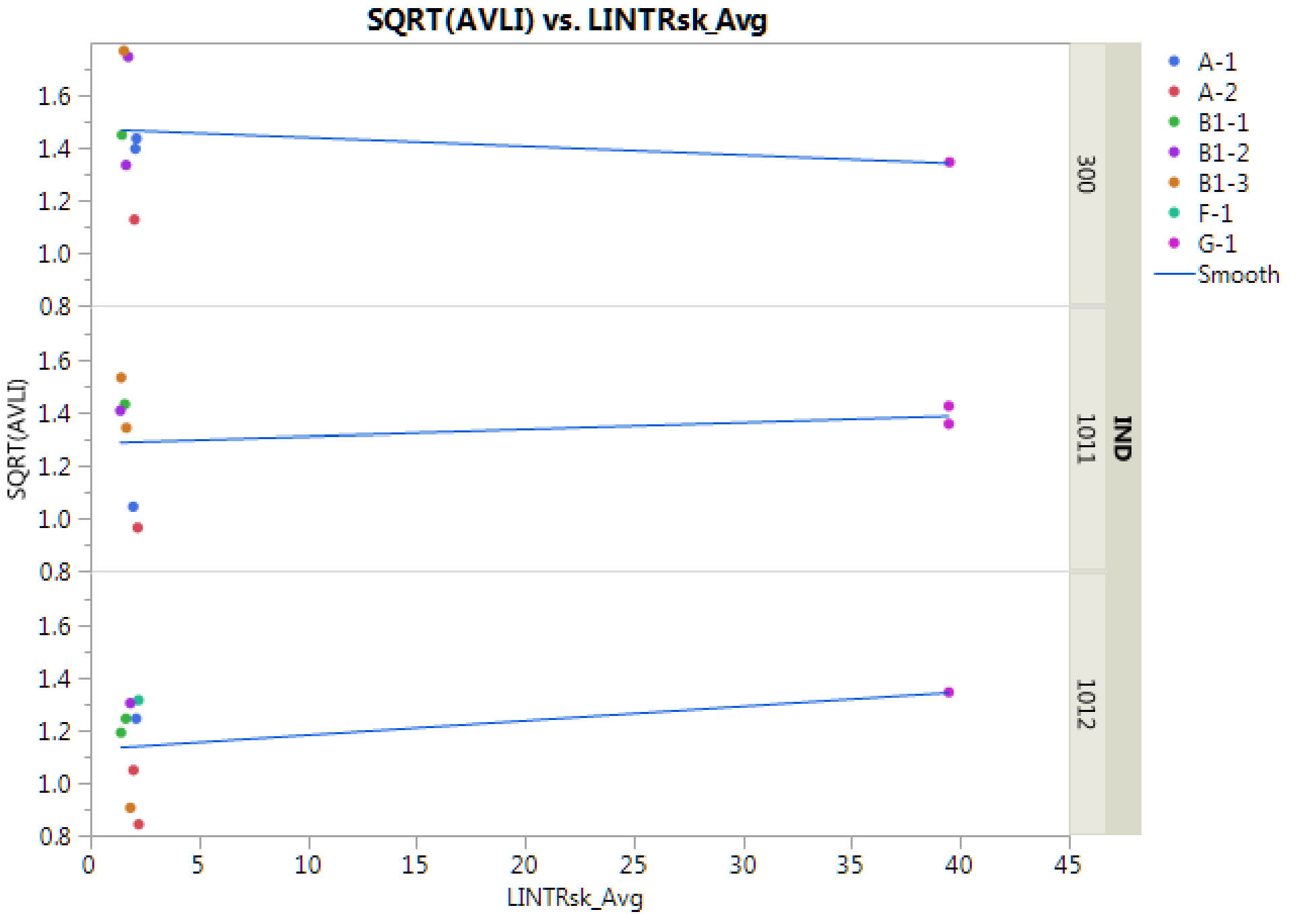

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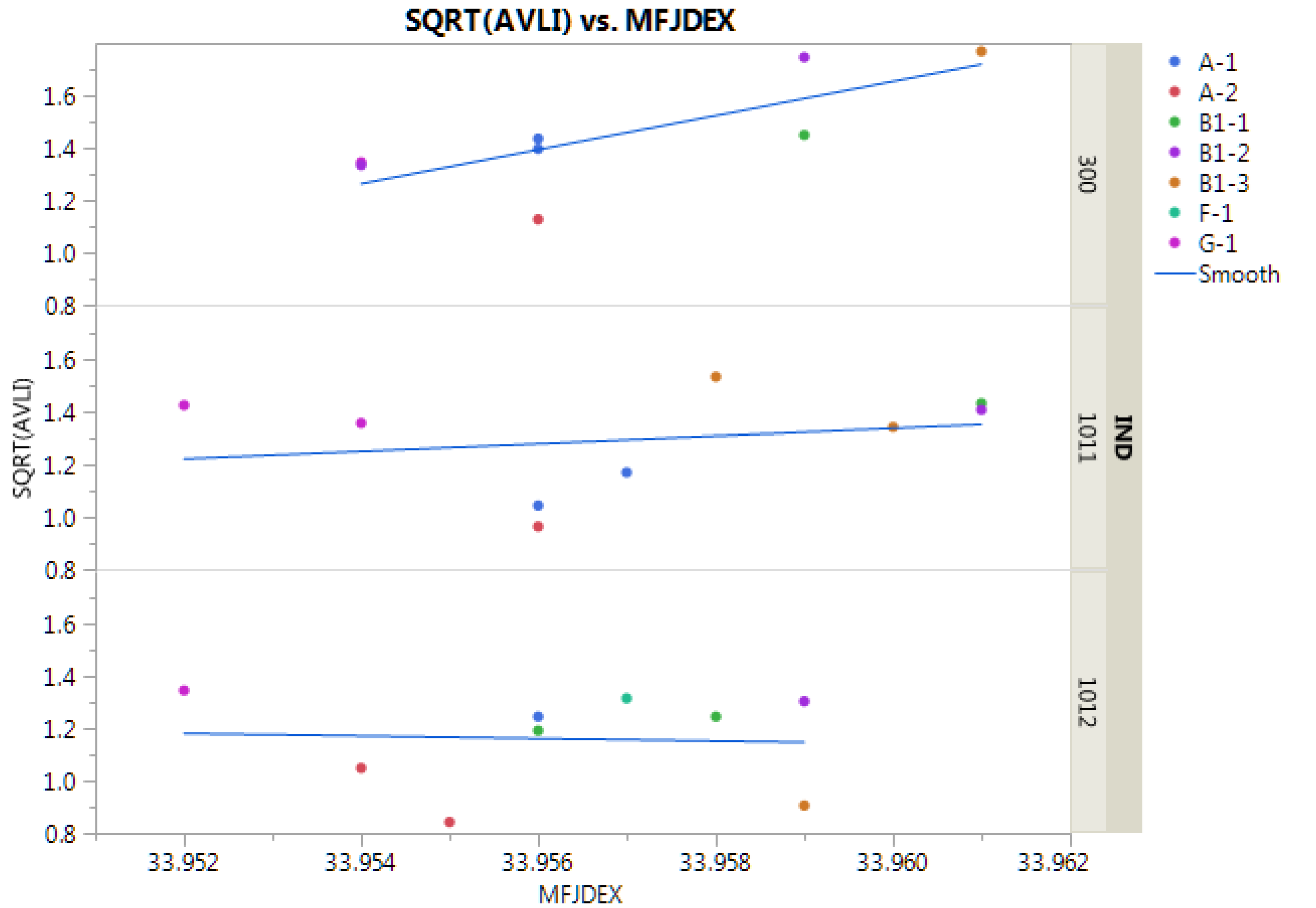
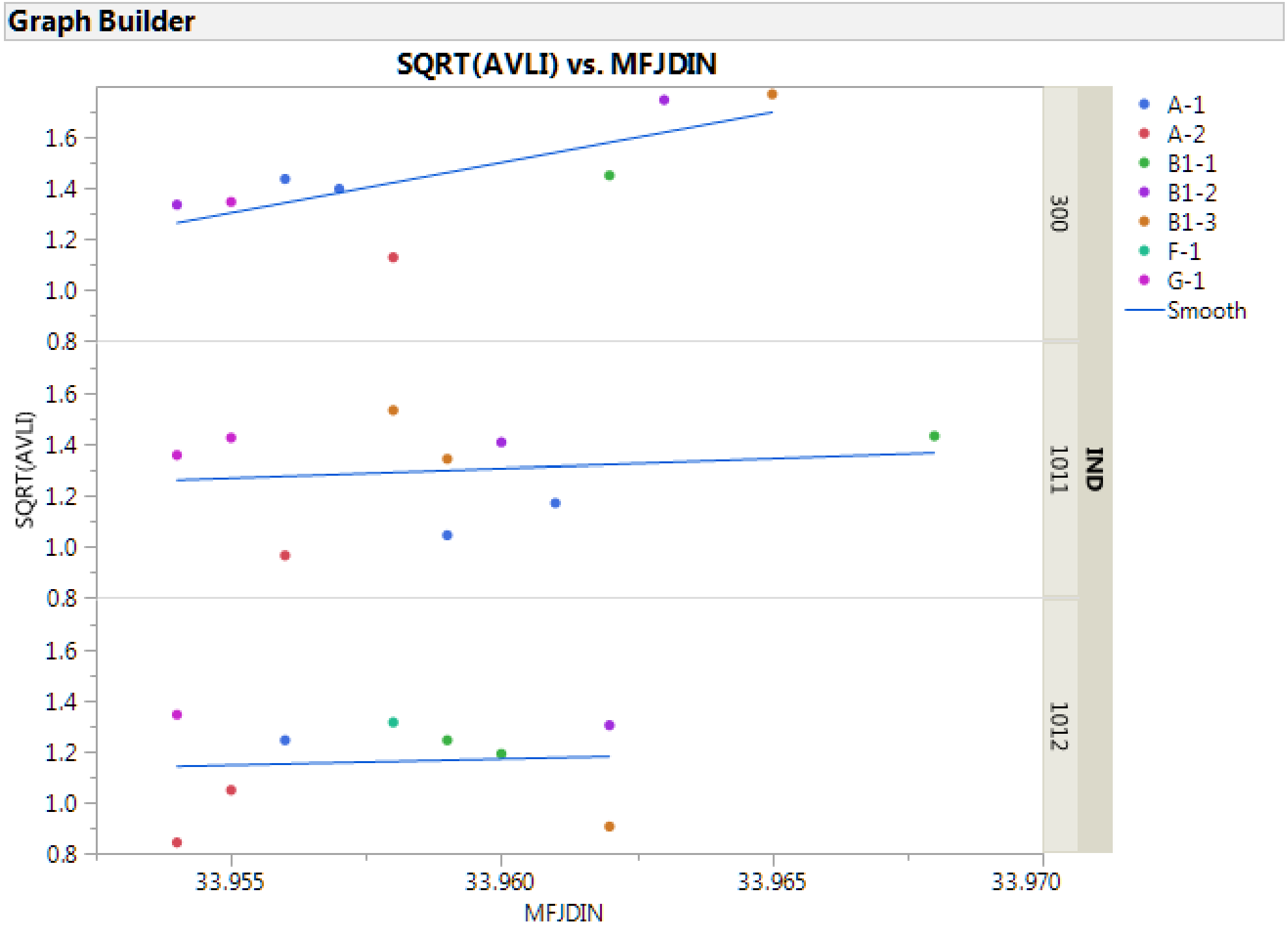
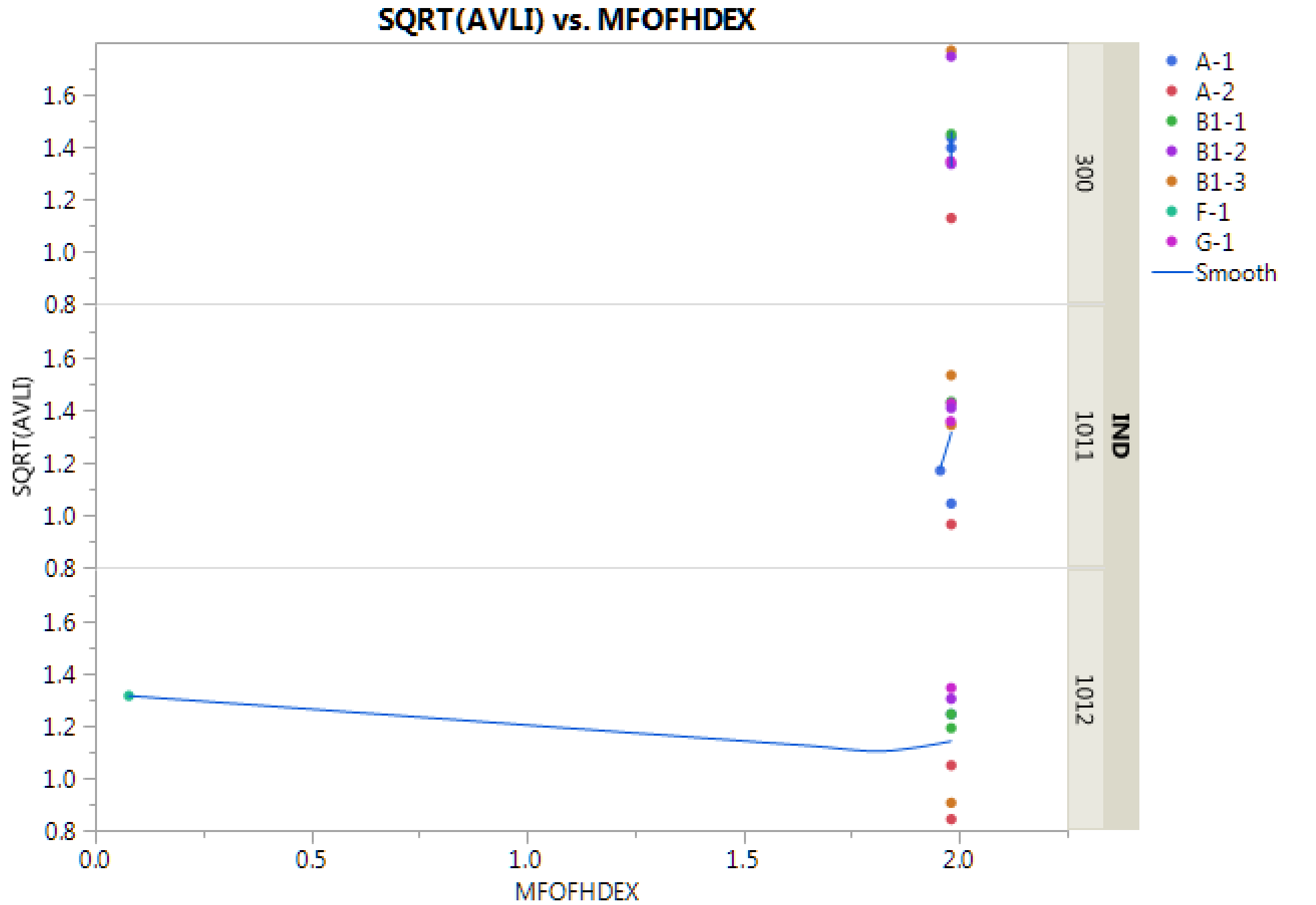



Graph Builder
SQRT(AVLI) vs. MFJDIN
SQRT(AVLI)
1.6
1.4
1.2
1.0
0.8
33.955
33.960
33.965
33.970
MFJDIN
300
1011
1012
IND
A-1
A-2
B1-1
B1-2
B1-3
F-1
G-1
Smooth

Graph Builder



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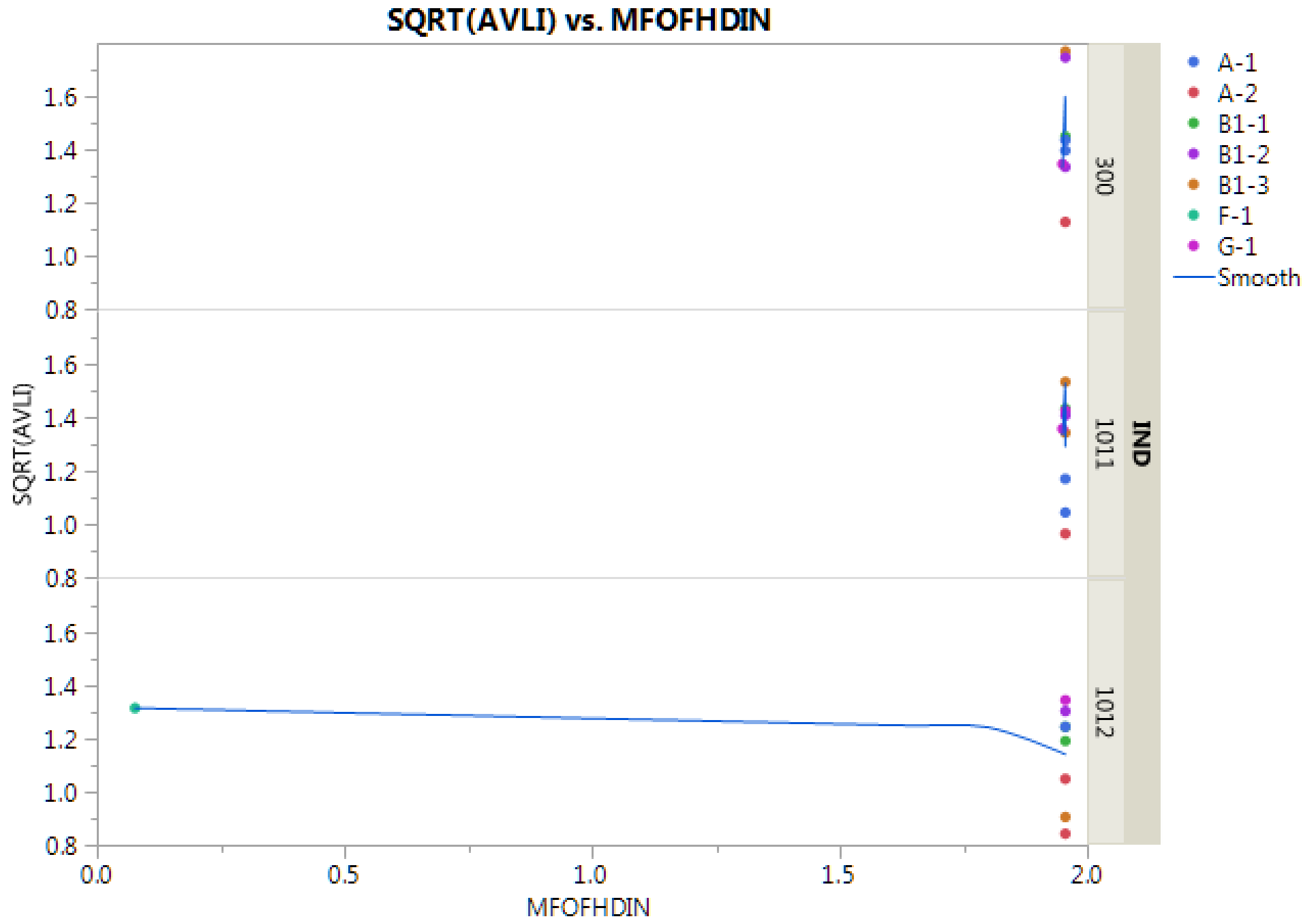

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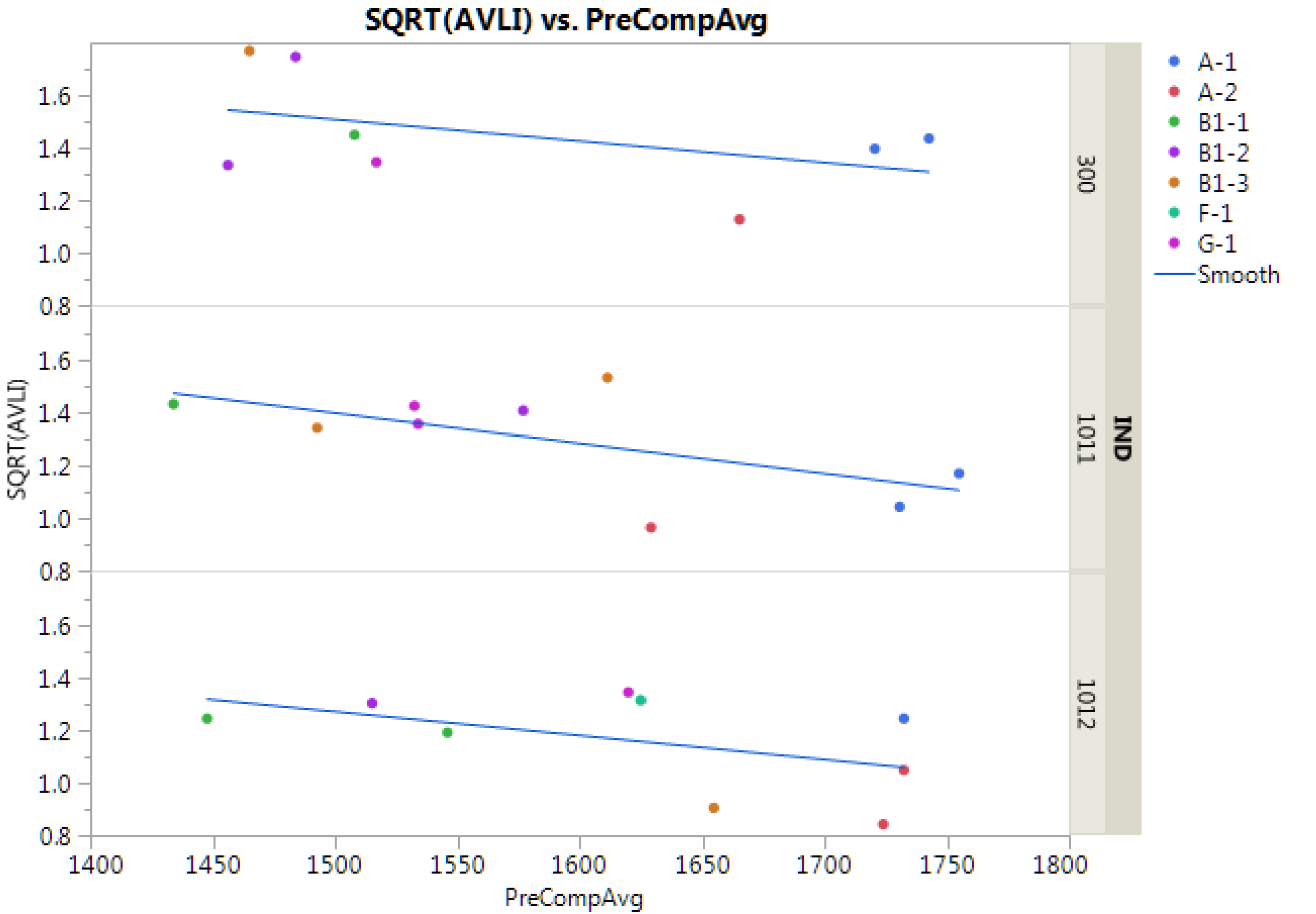

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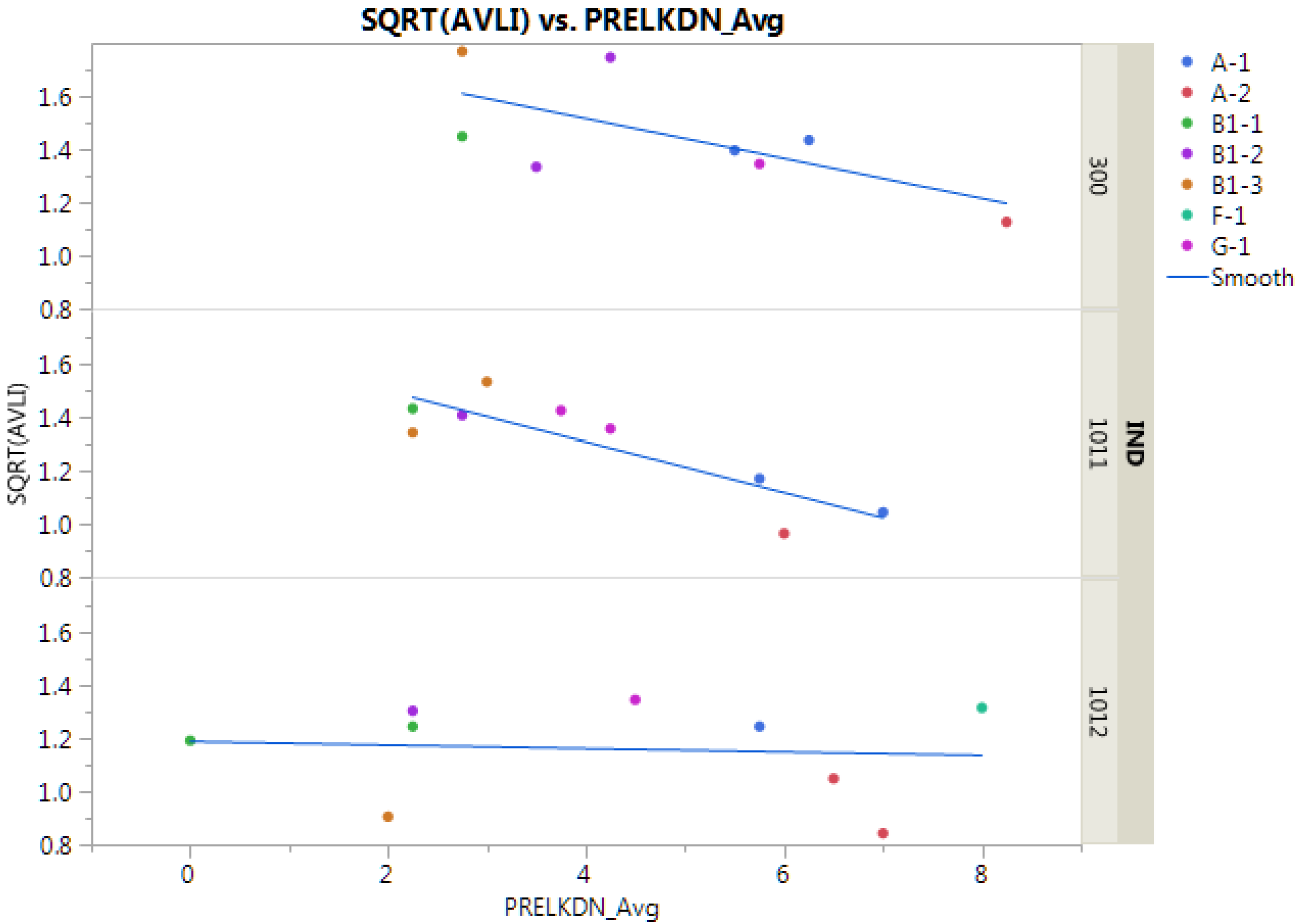

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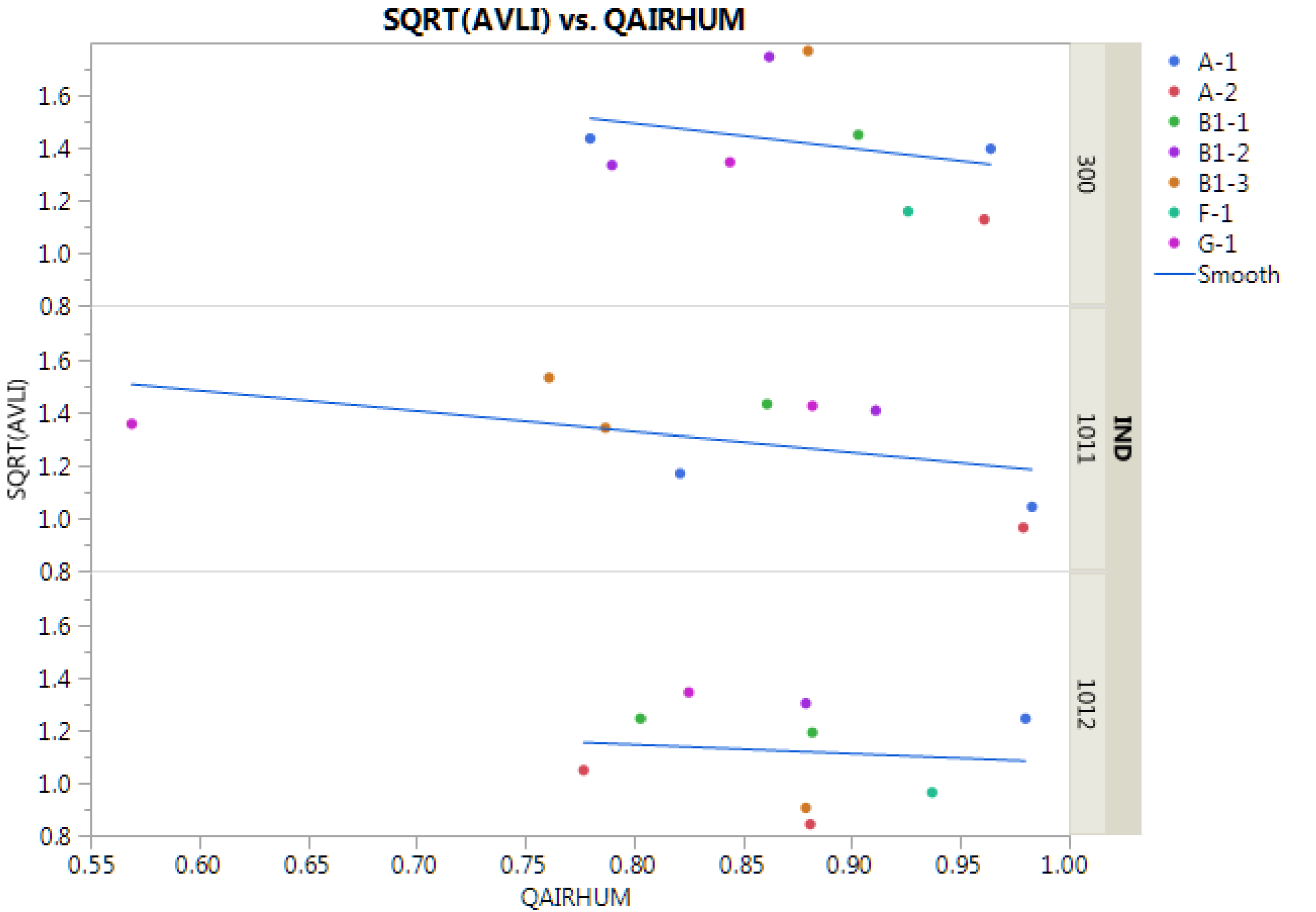

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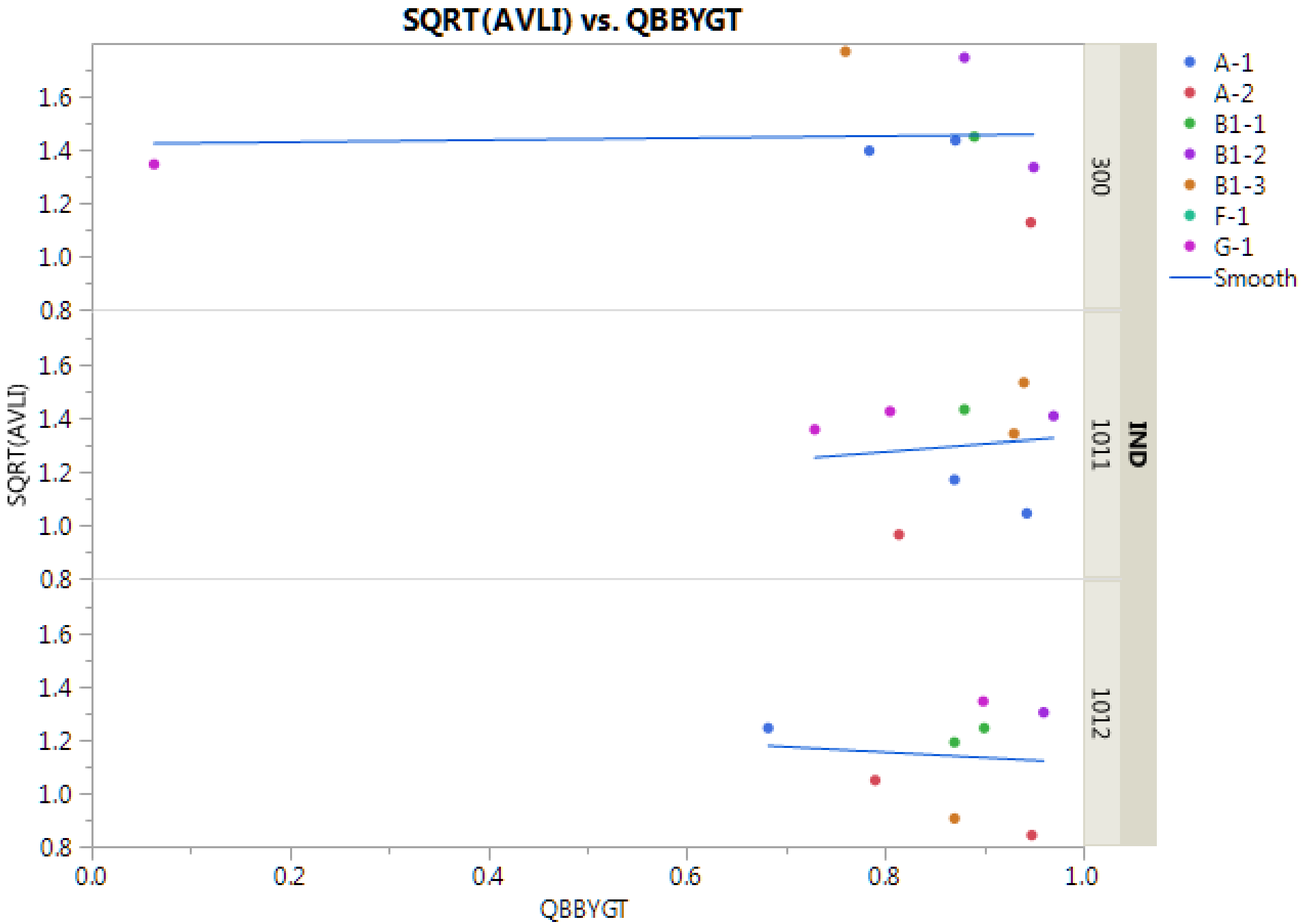
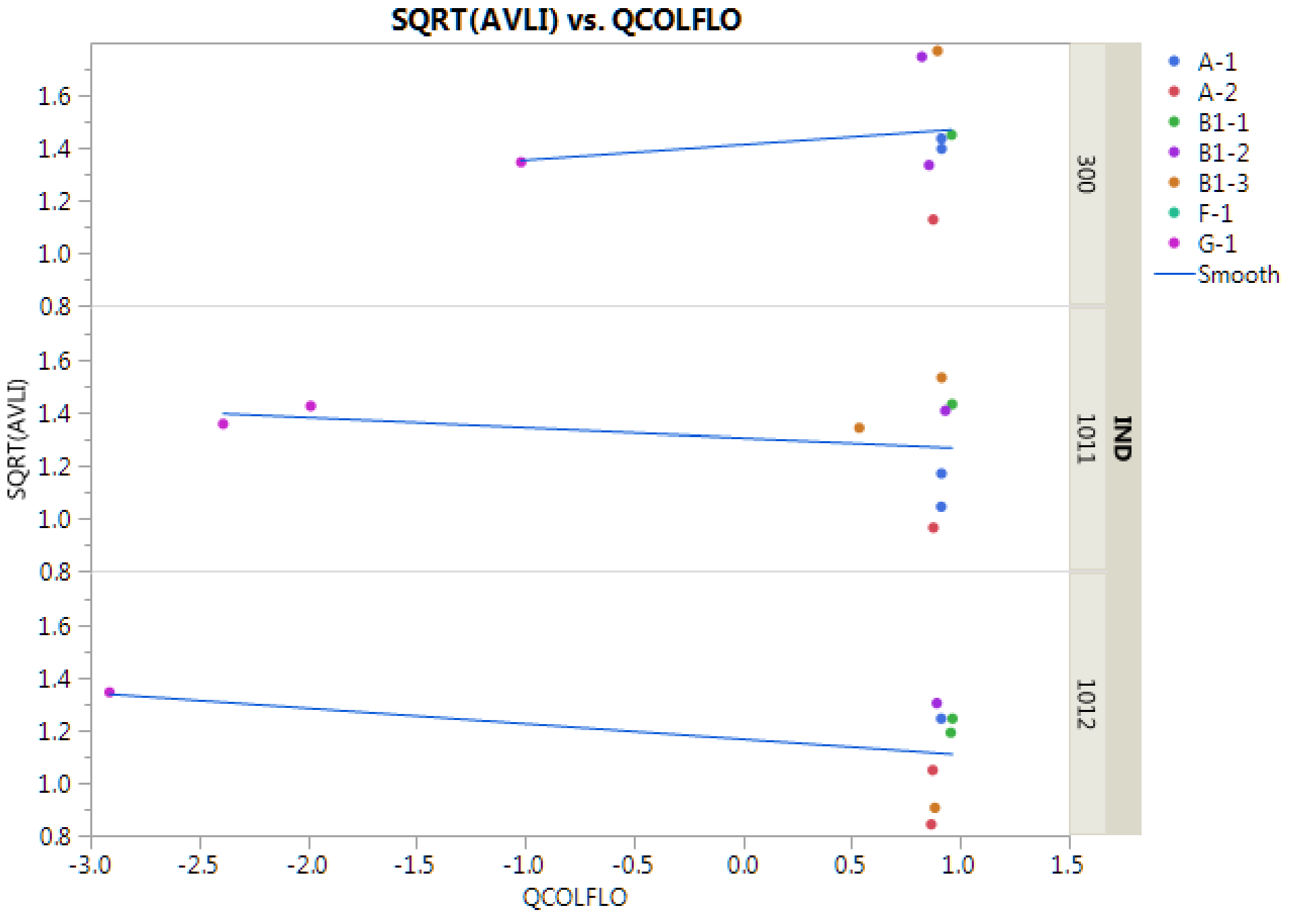


Graph Builder



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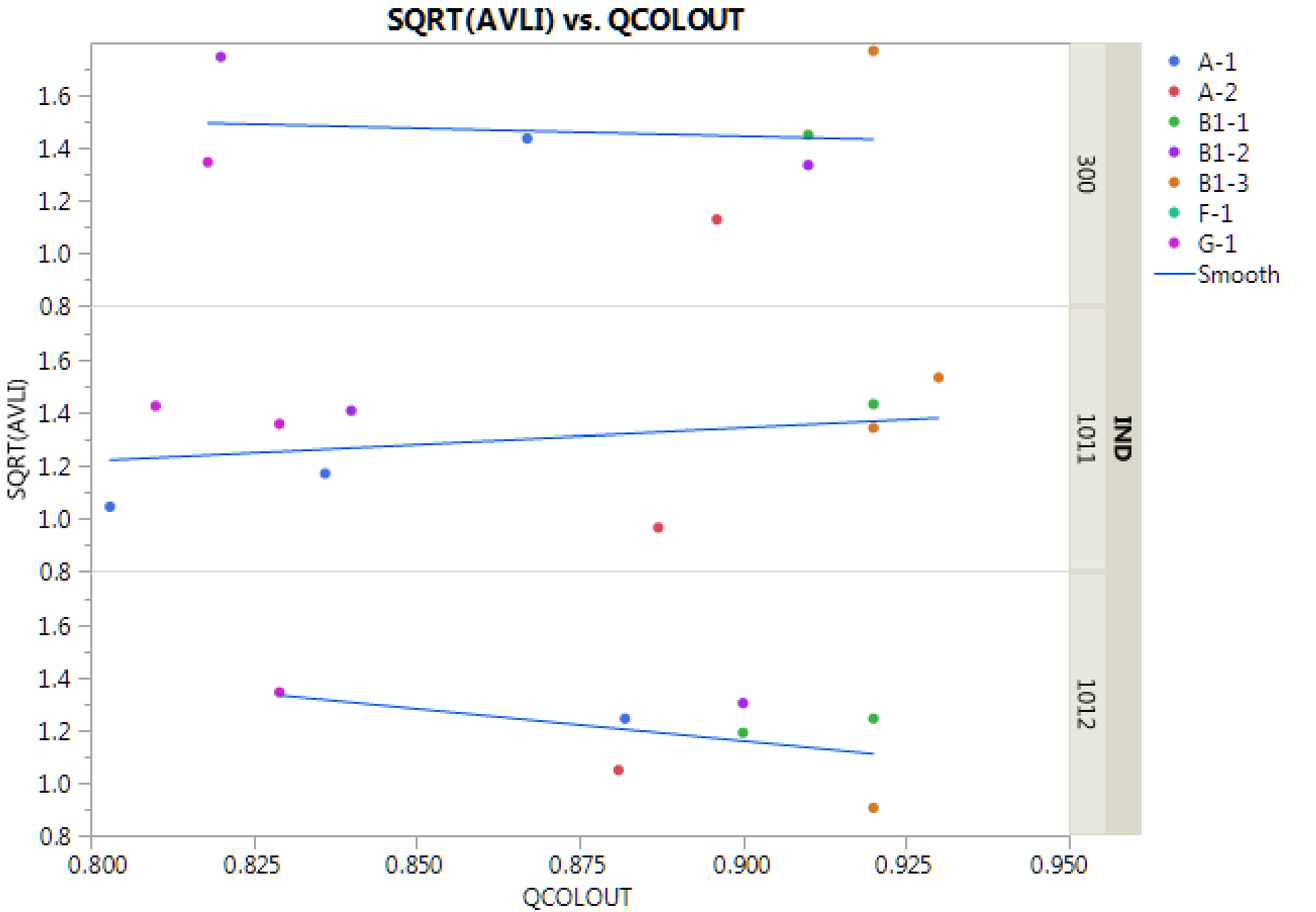

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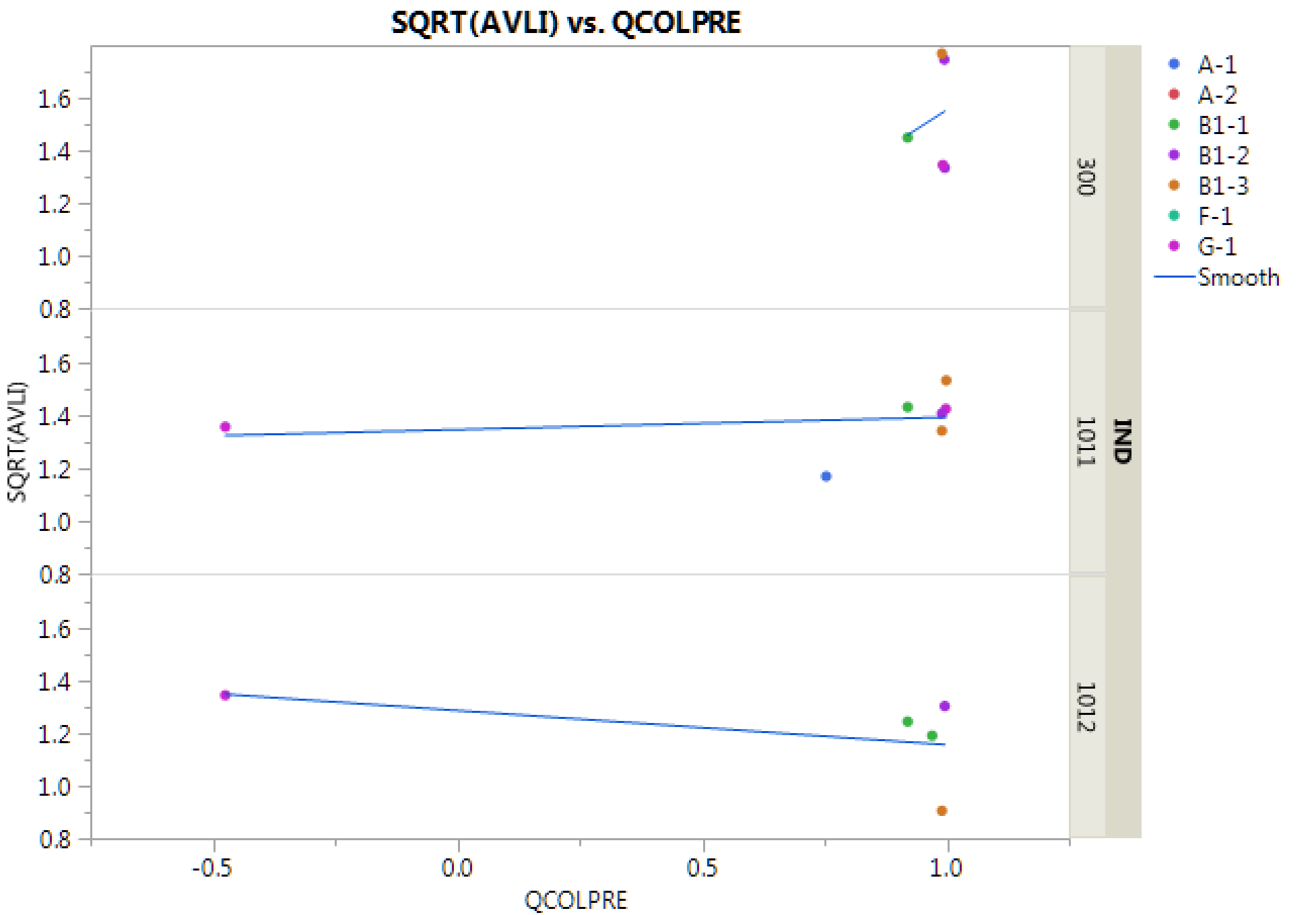

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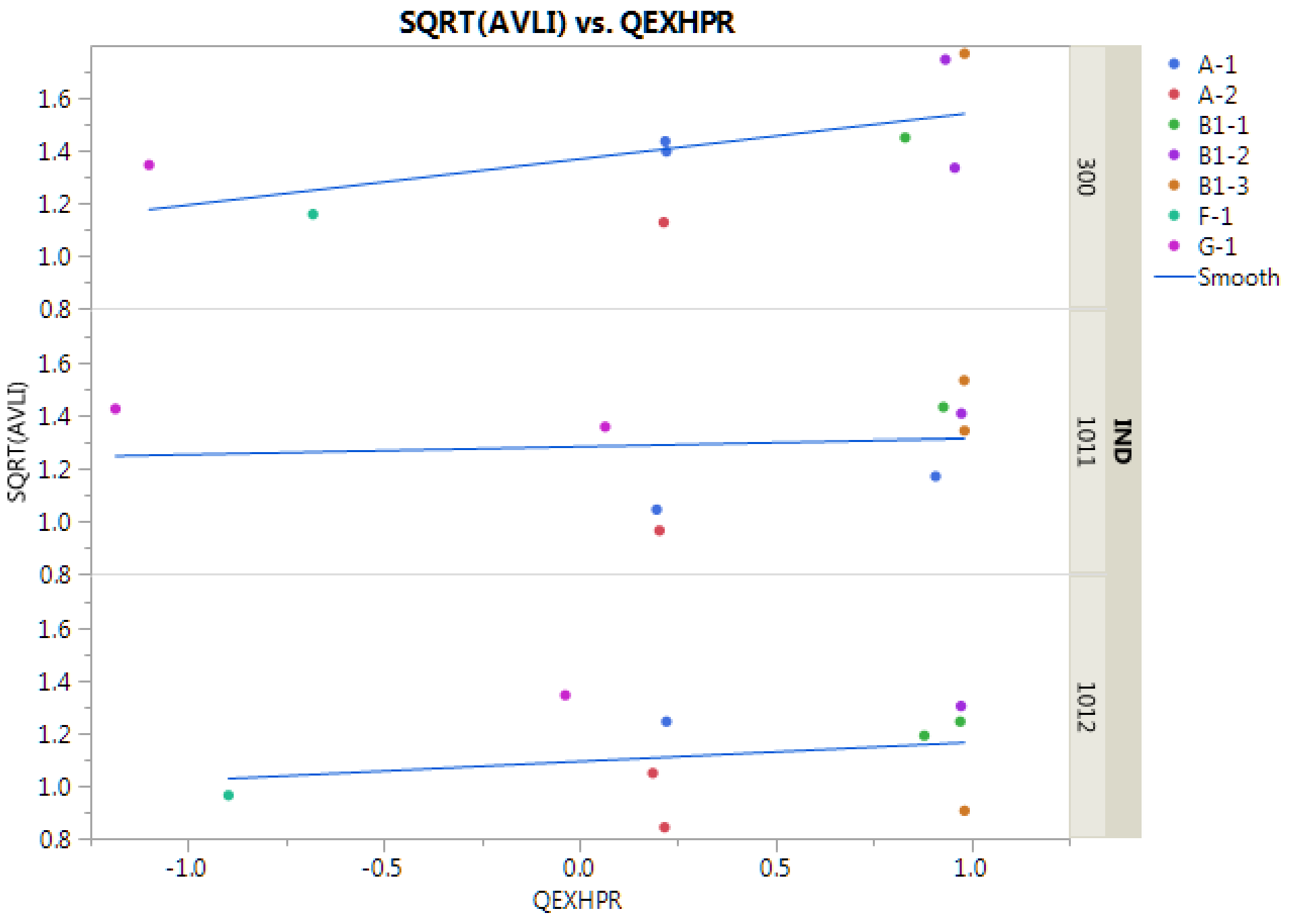

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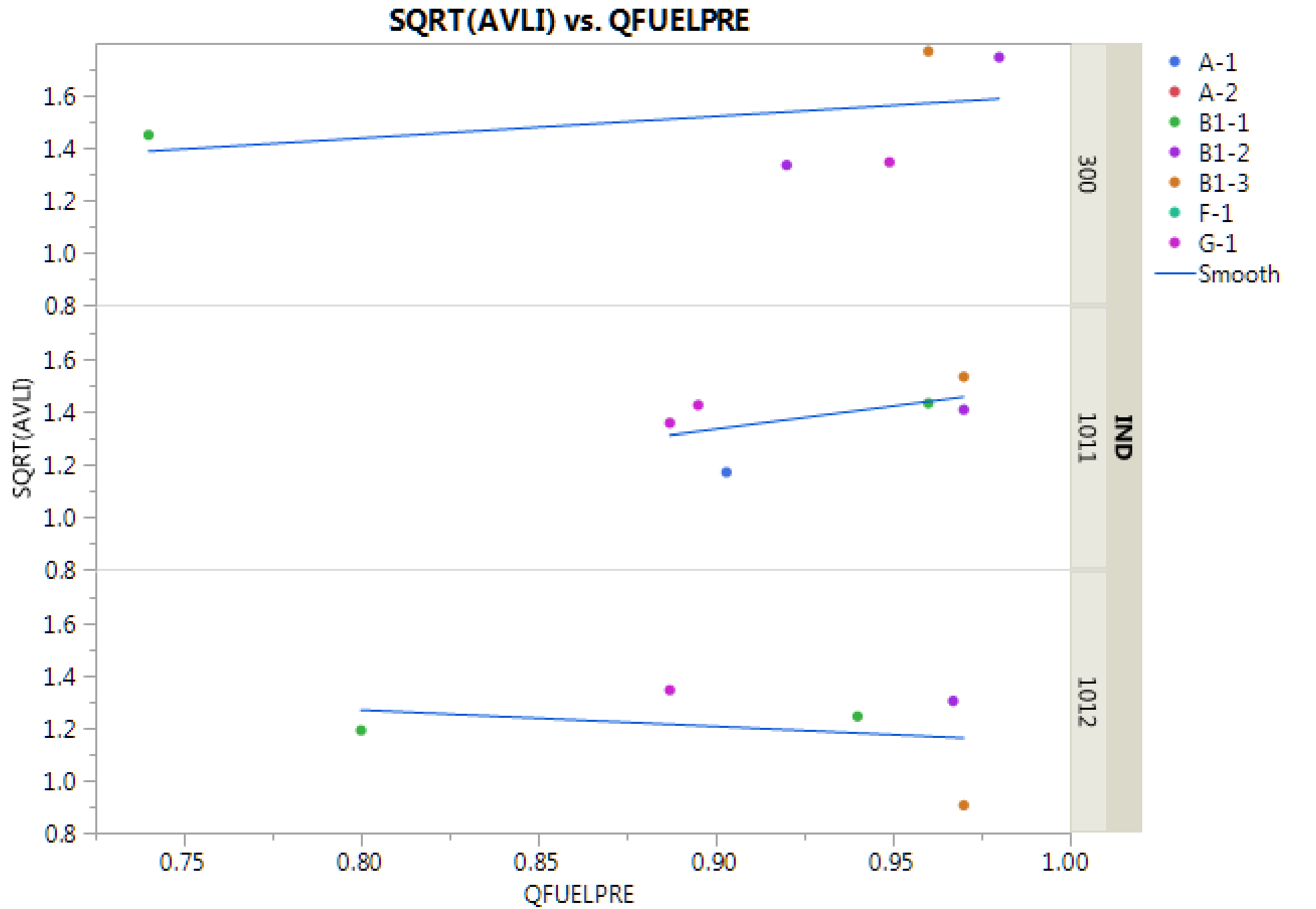

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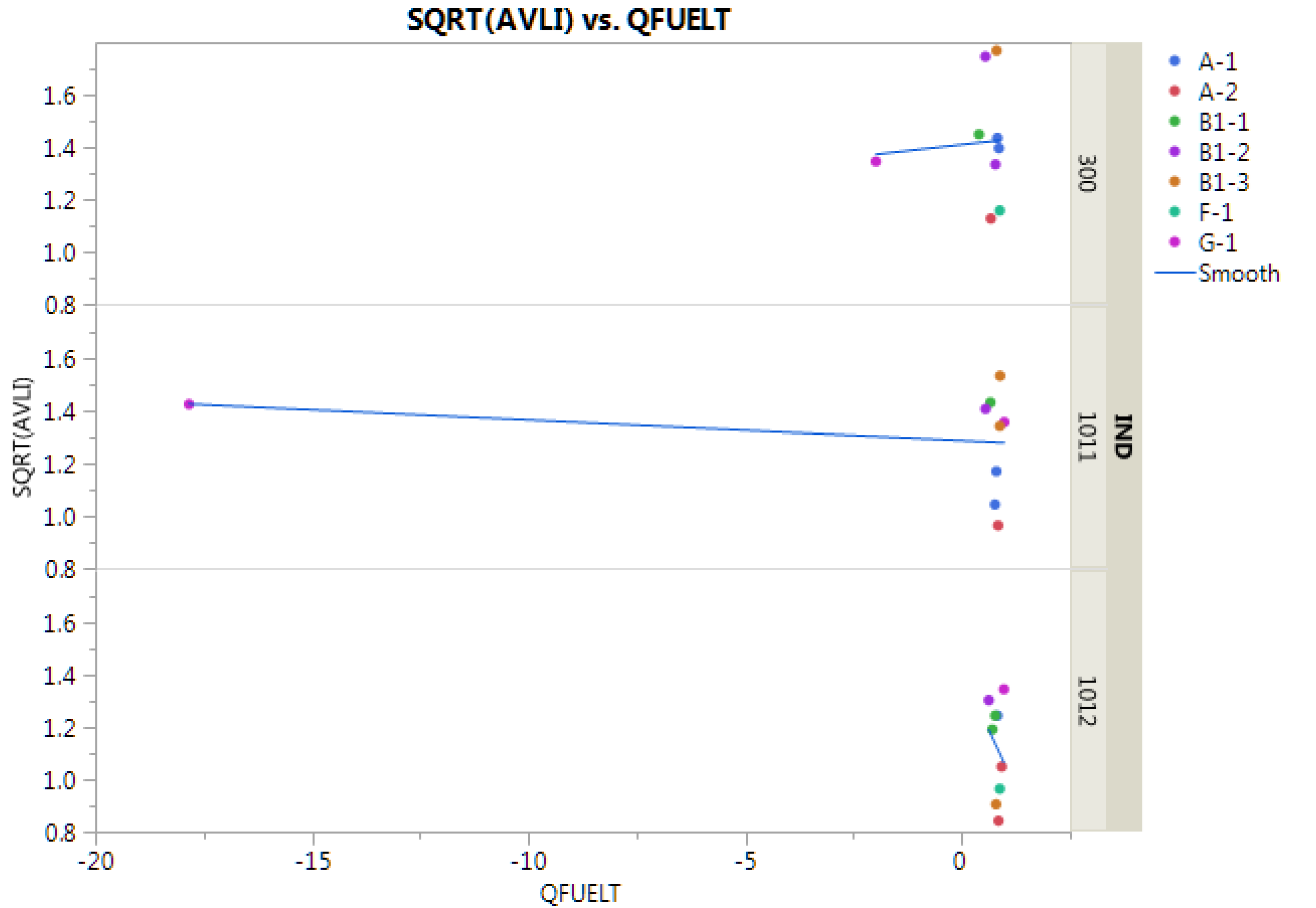

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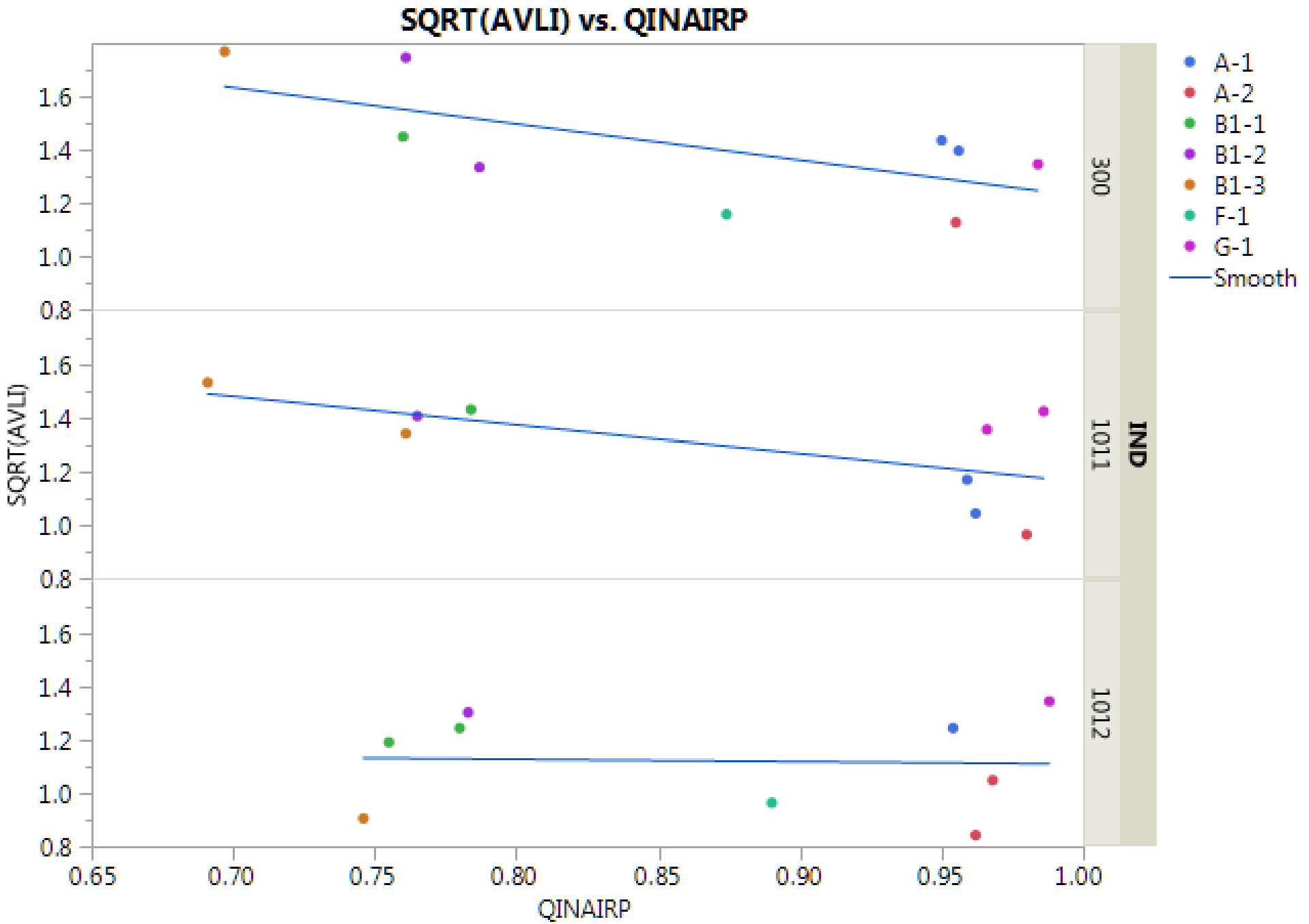
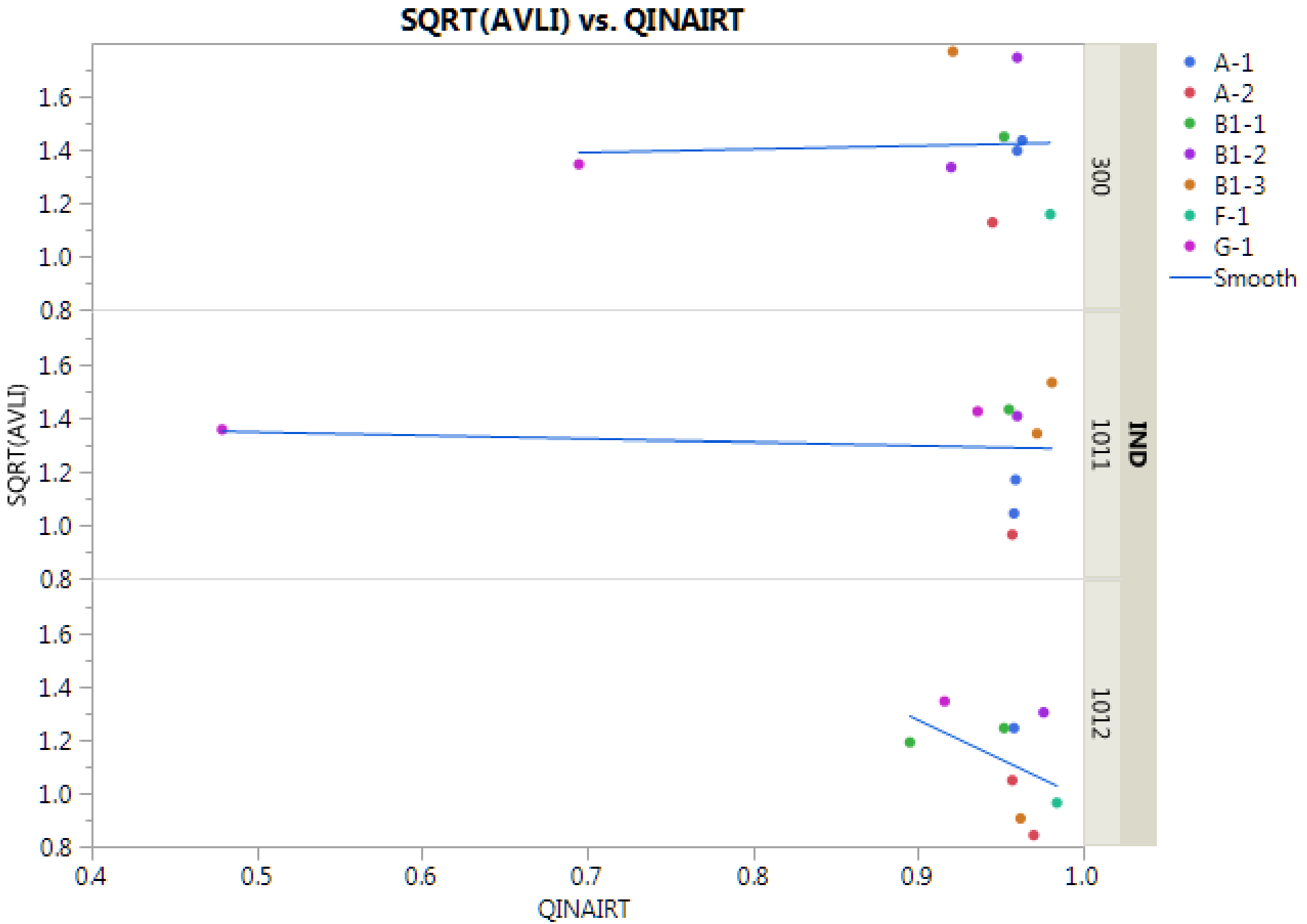
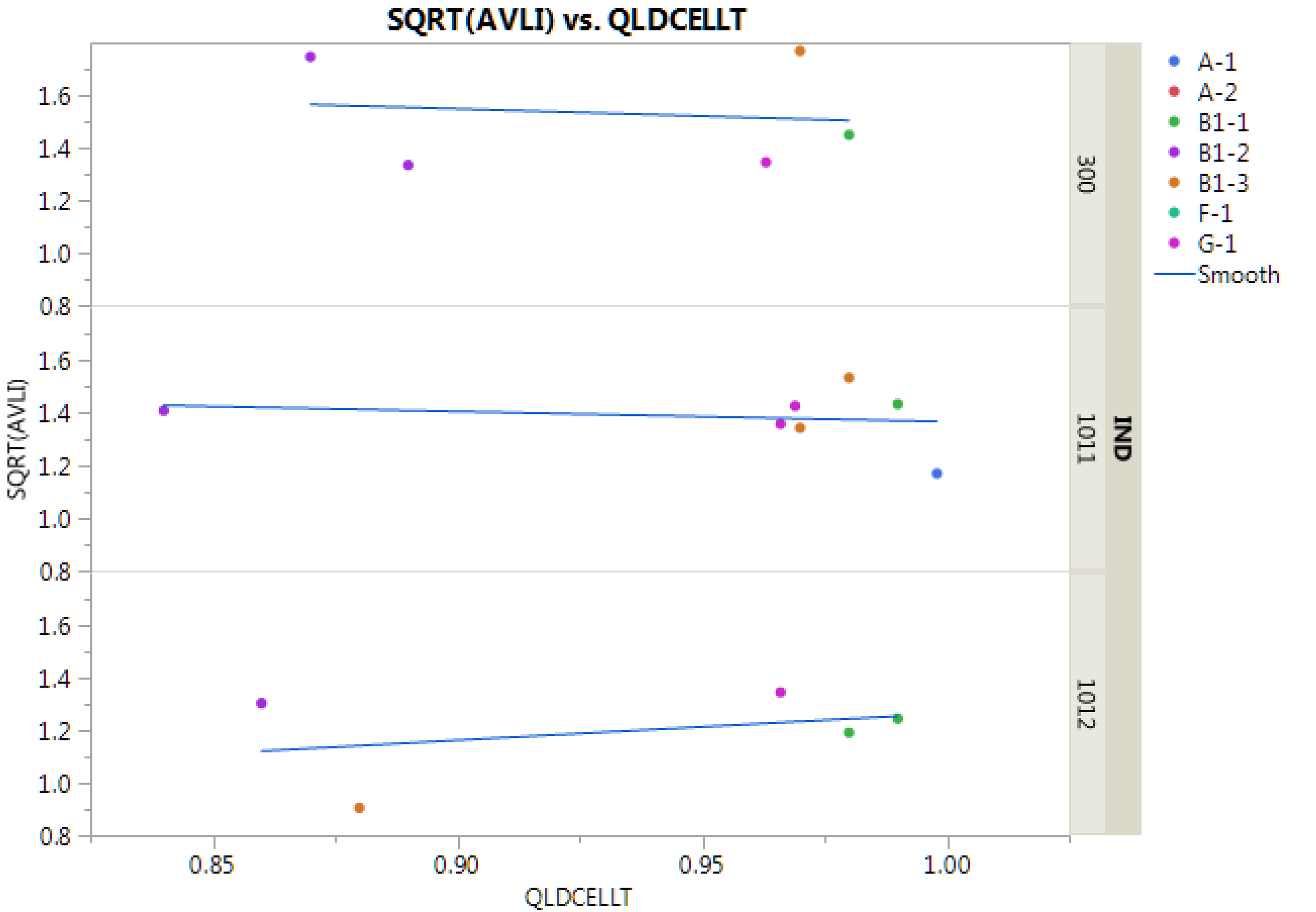


Graph Builder



Graph Builder



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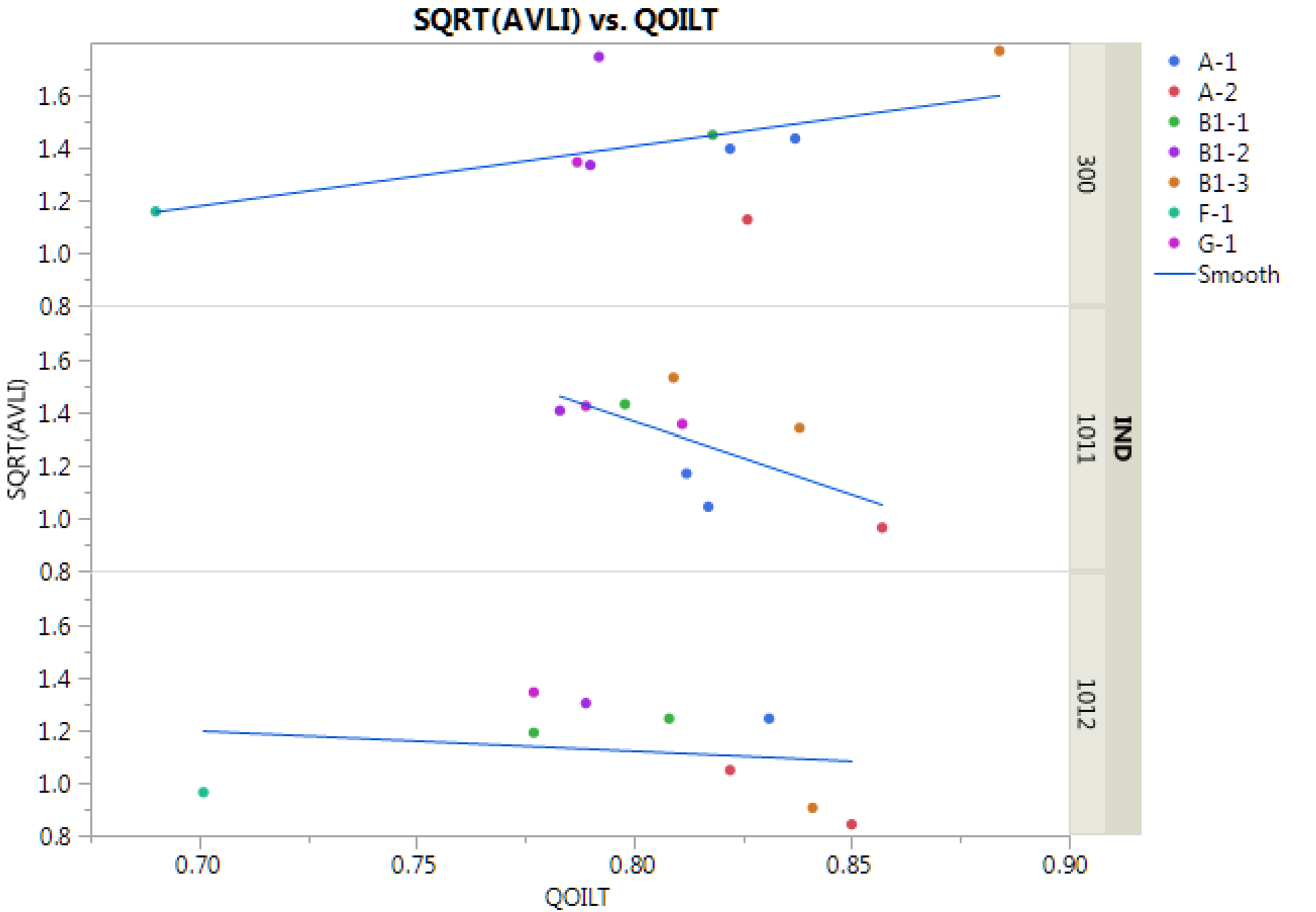

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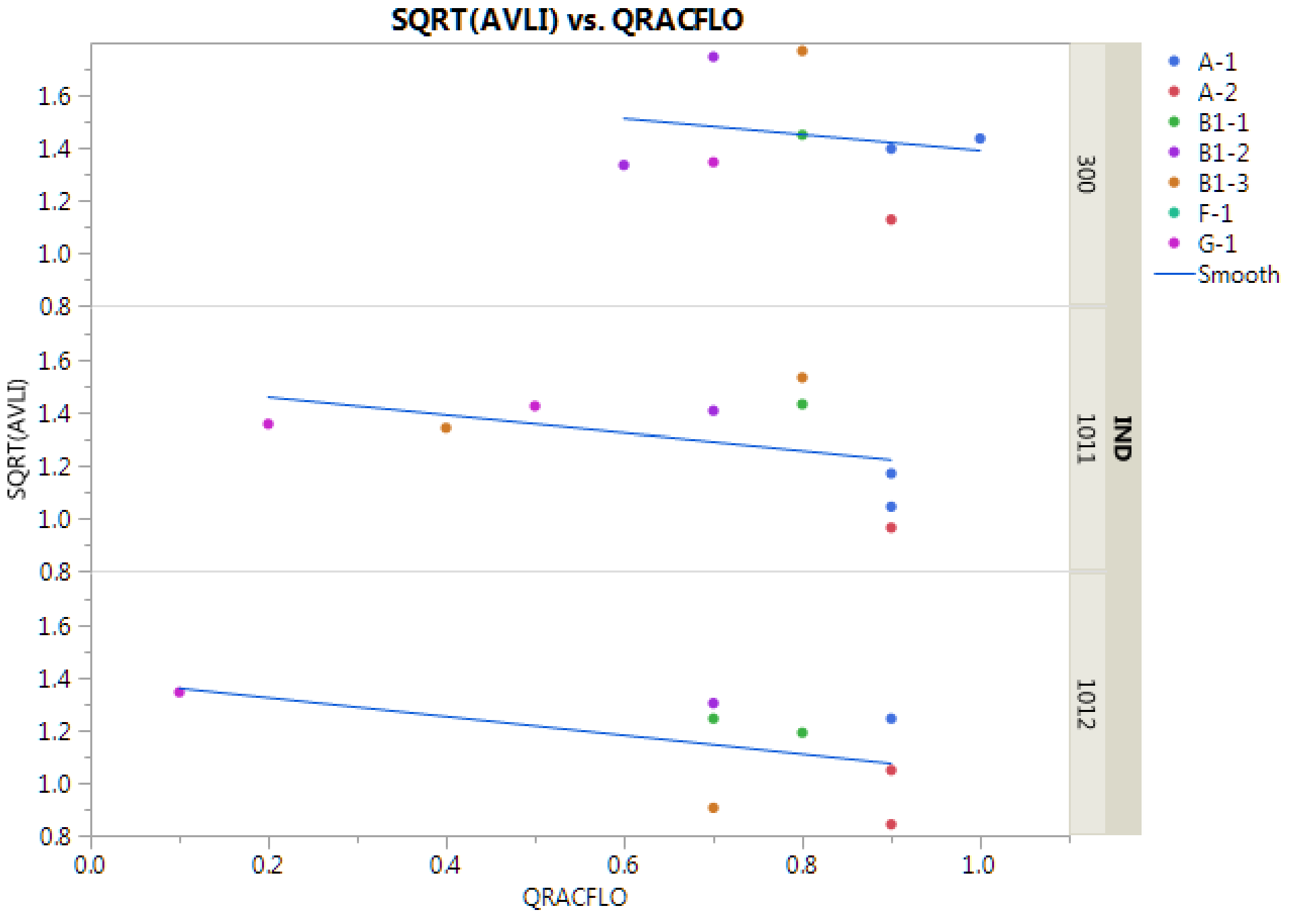
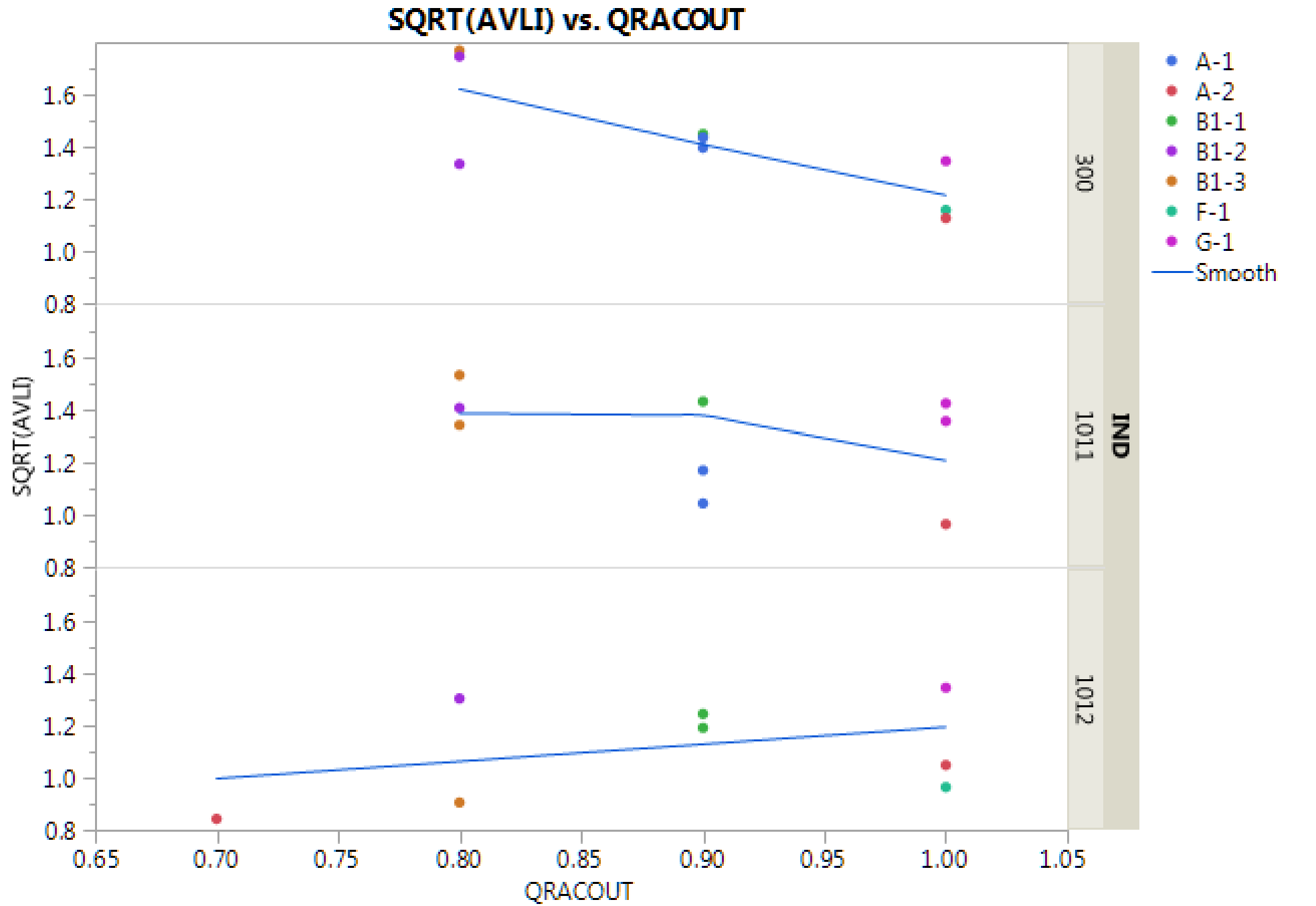


Graph Builder



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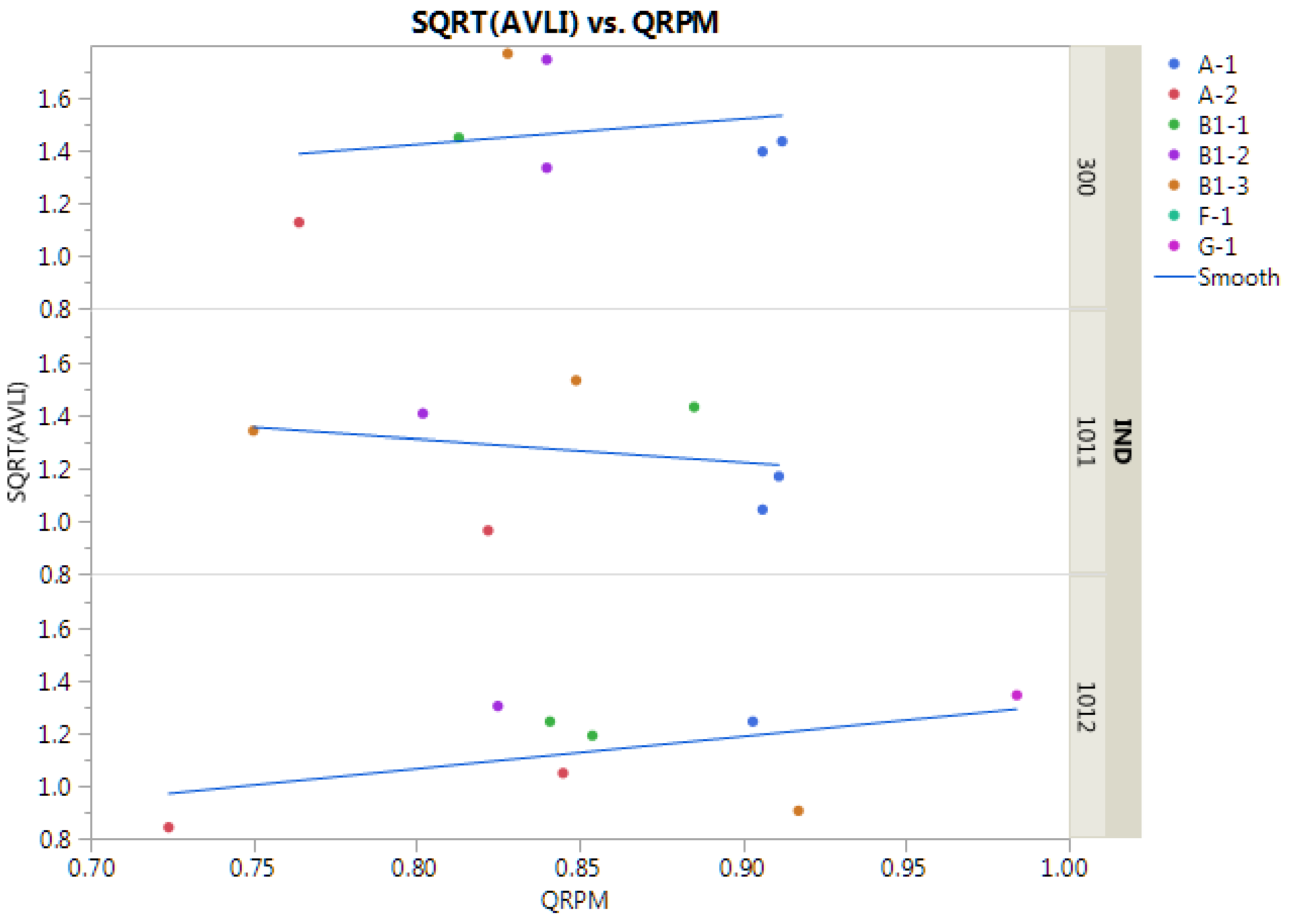

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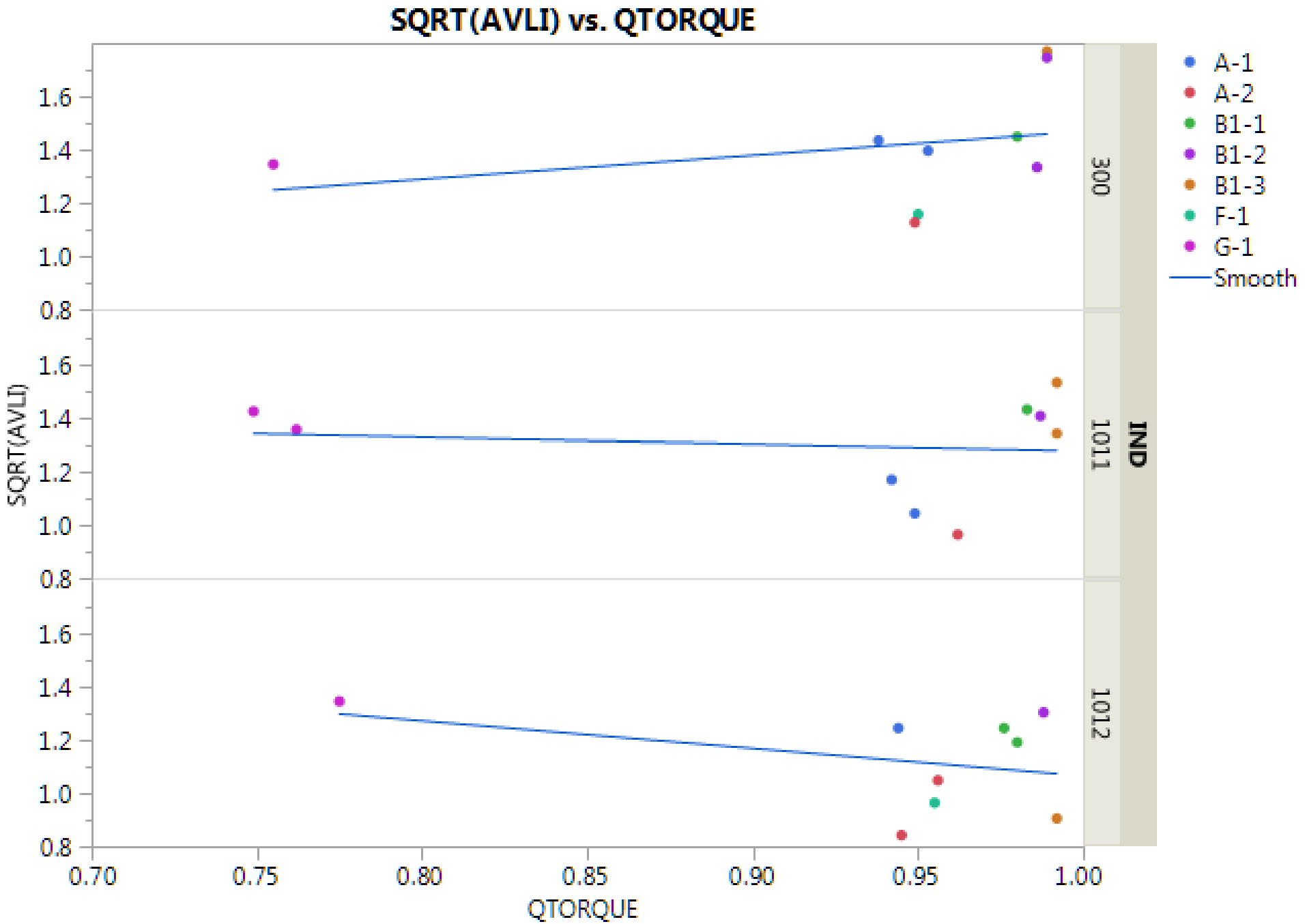

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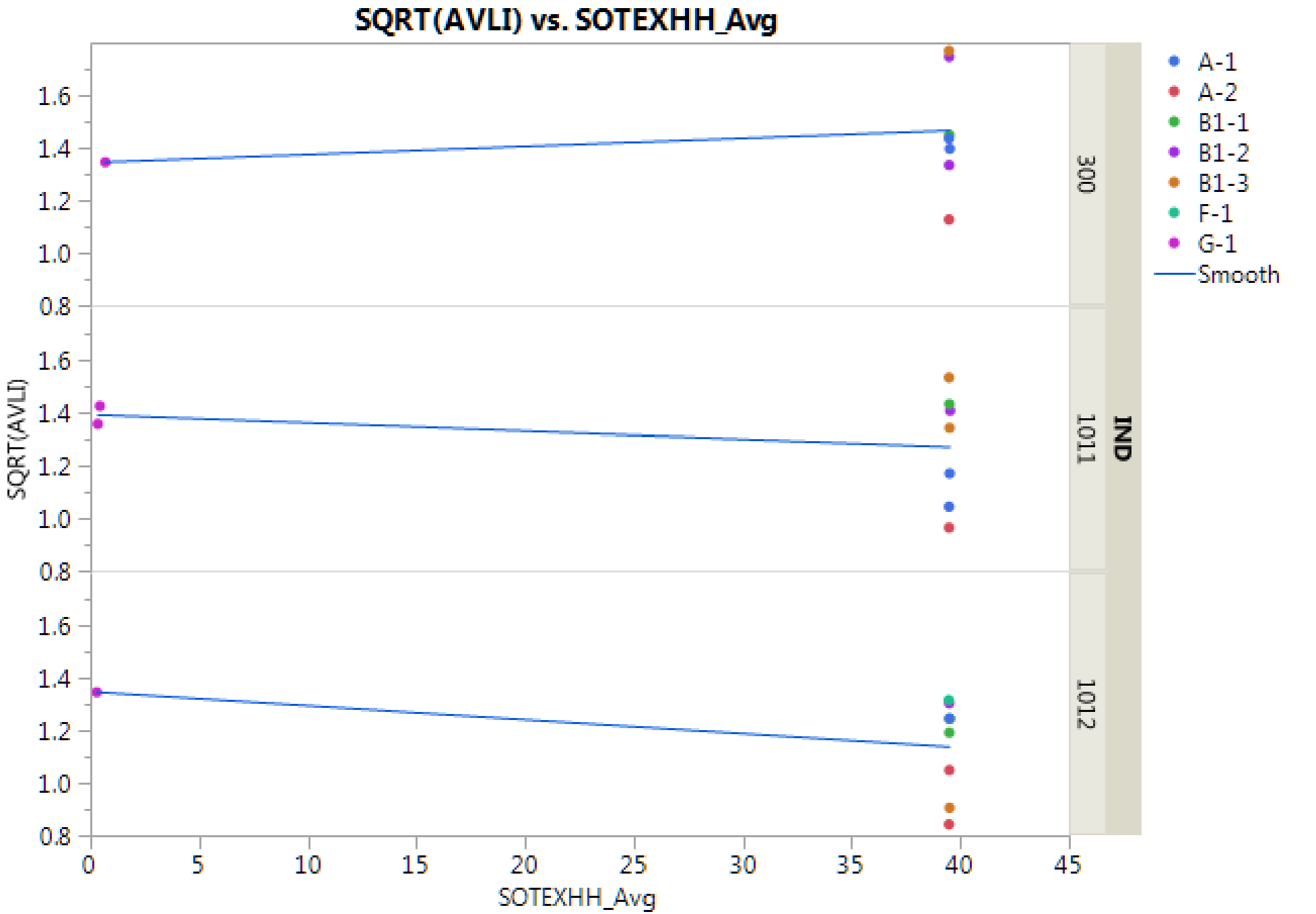

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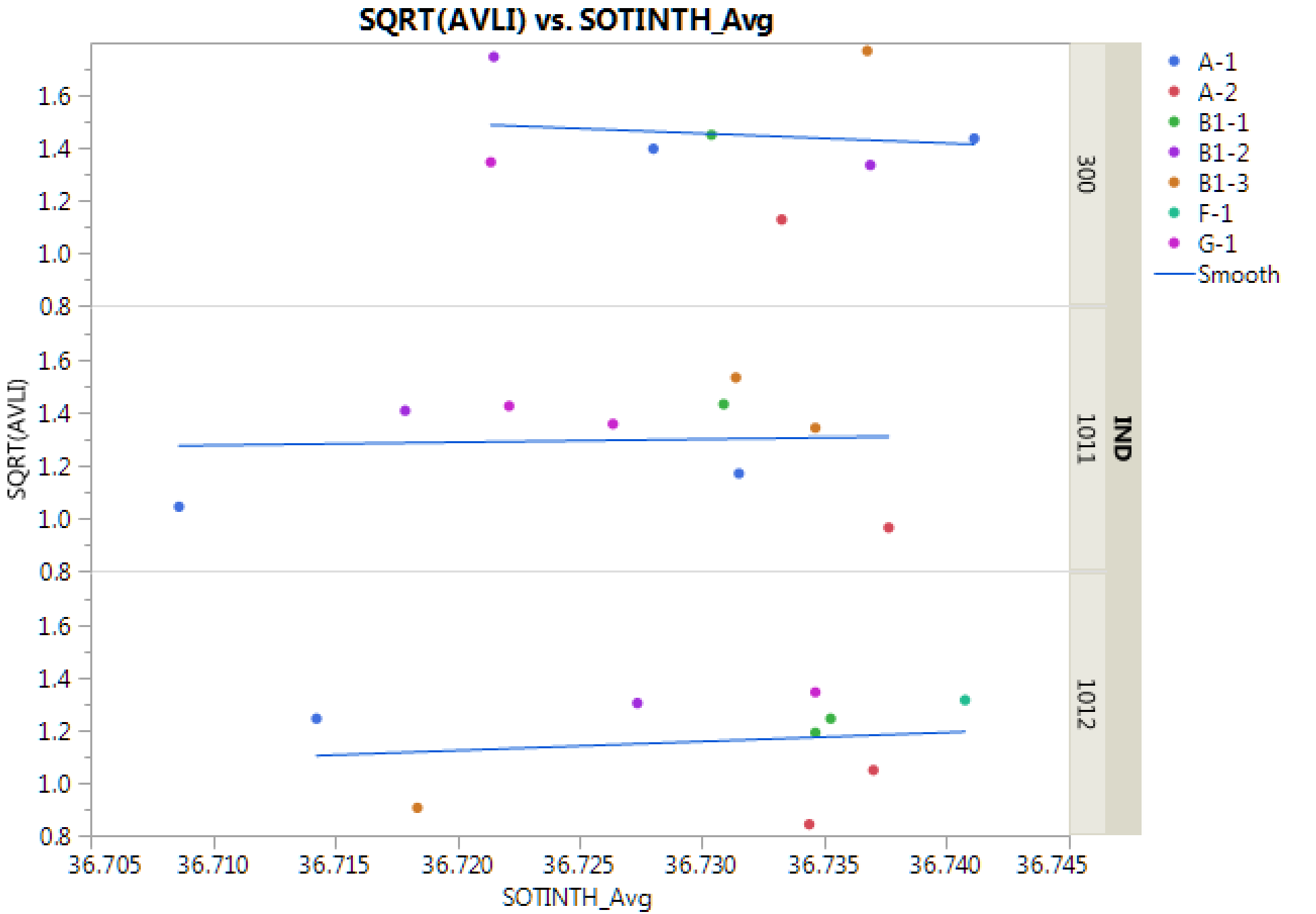

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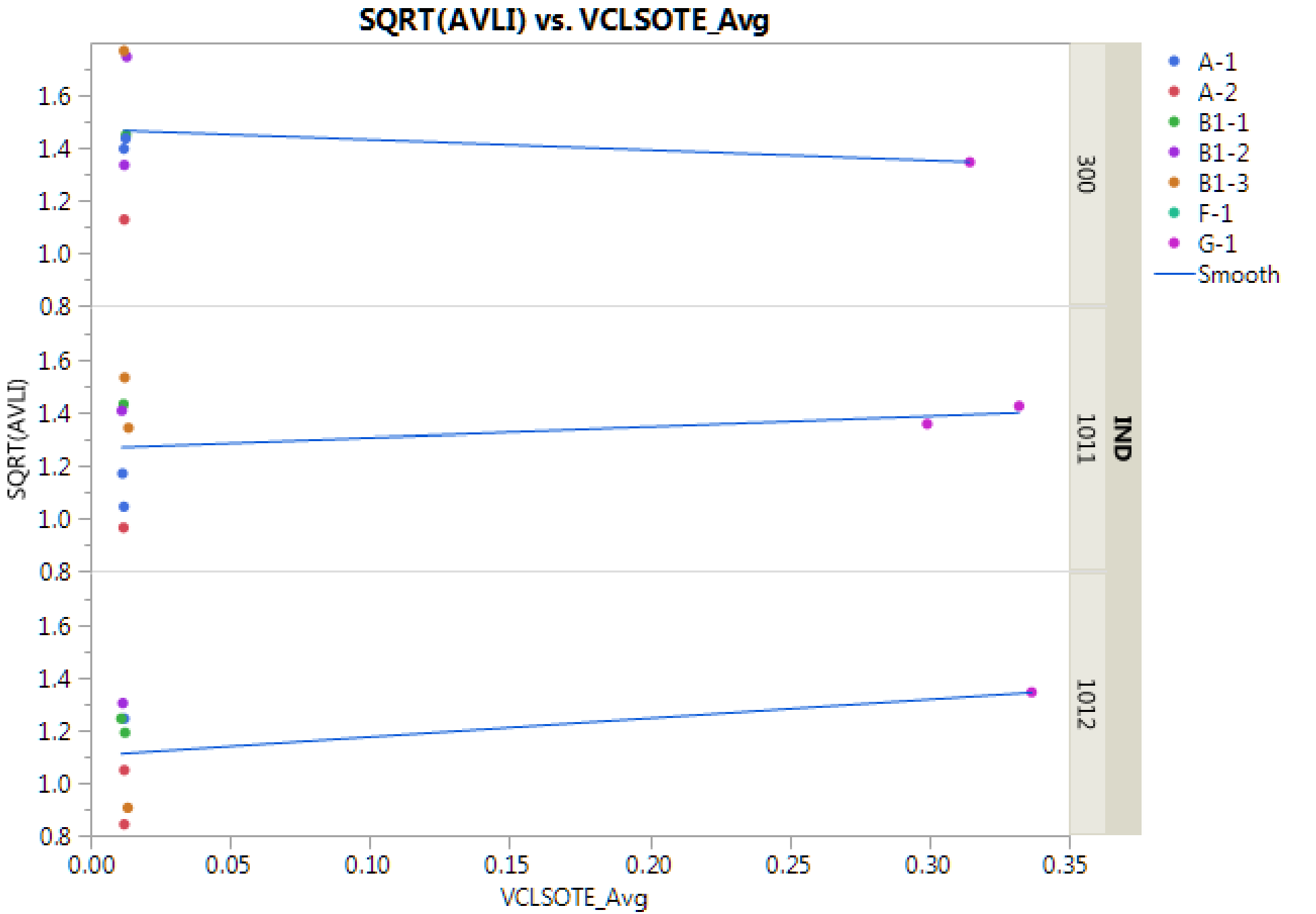

Graph Builder