

# ECE 594 Project 1

## A study on the Quality of Random Test Vectors

Kai Zhao

2013 Feb 18



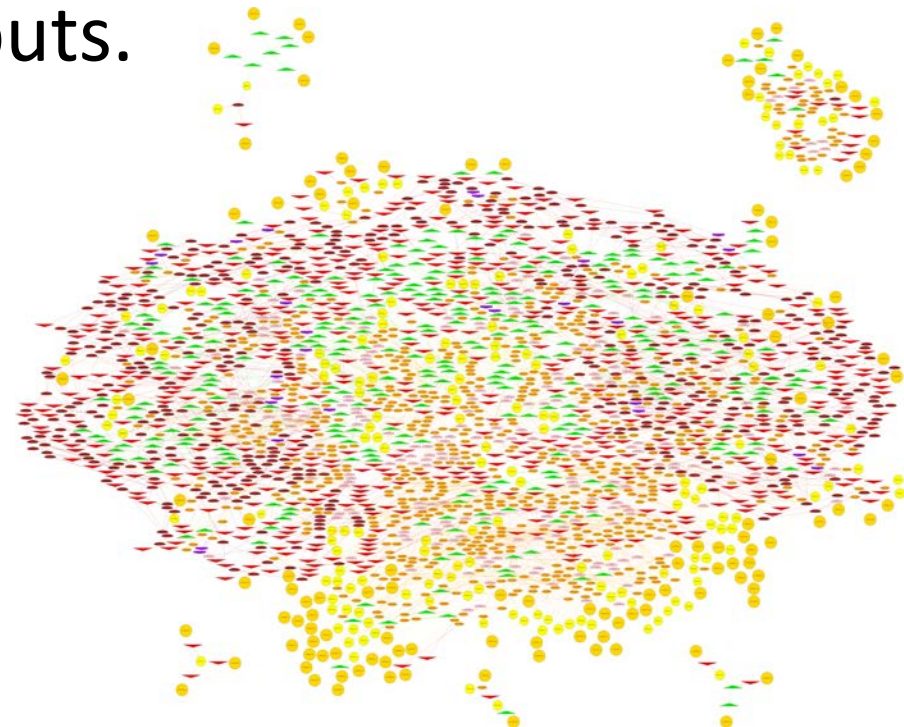
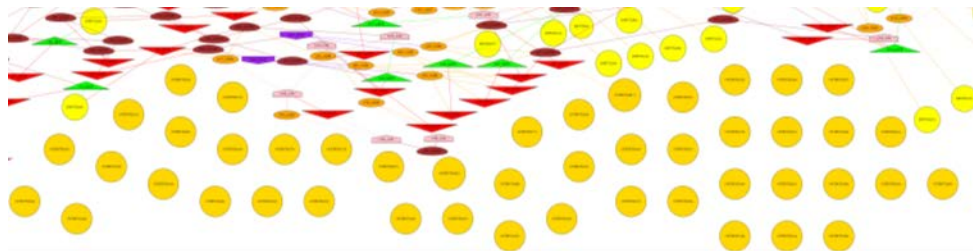
# Main Conclusions



- There are better test vectors than just random.
- On average, the order of test vectors does not influence the number of faults detected.
- Depending on the application, random test vectors are comparable to ATPG generated test vectors.

# Better than Random Test Vectors

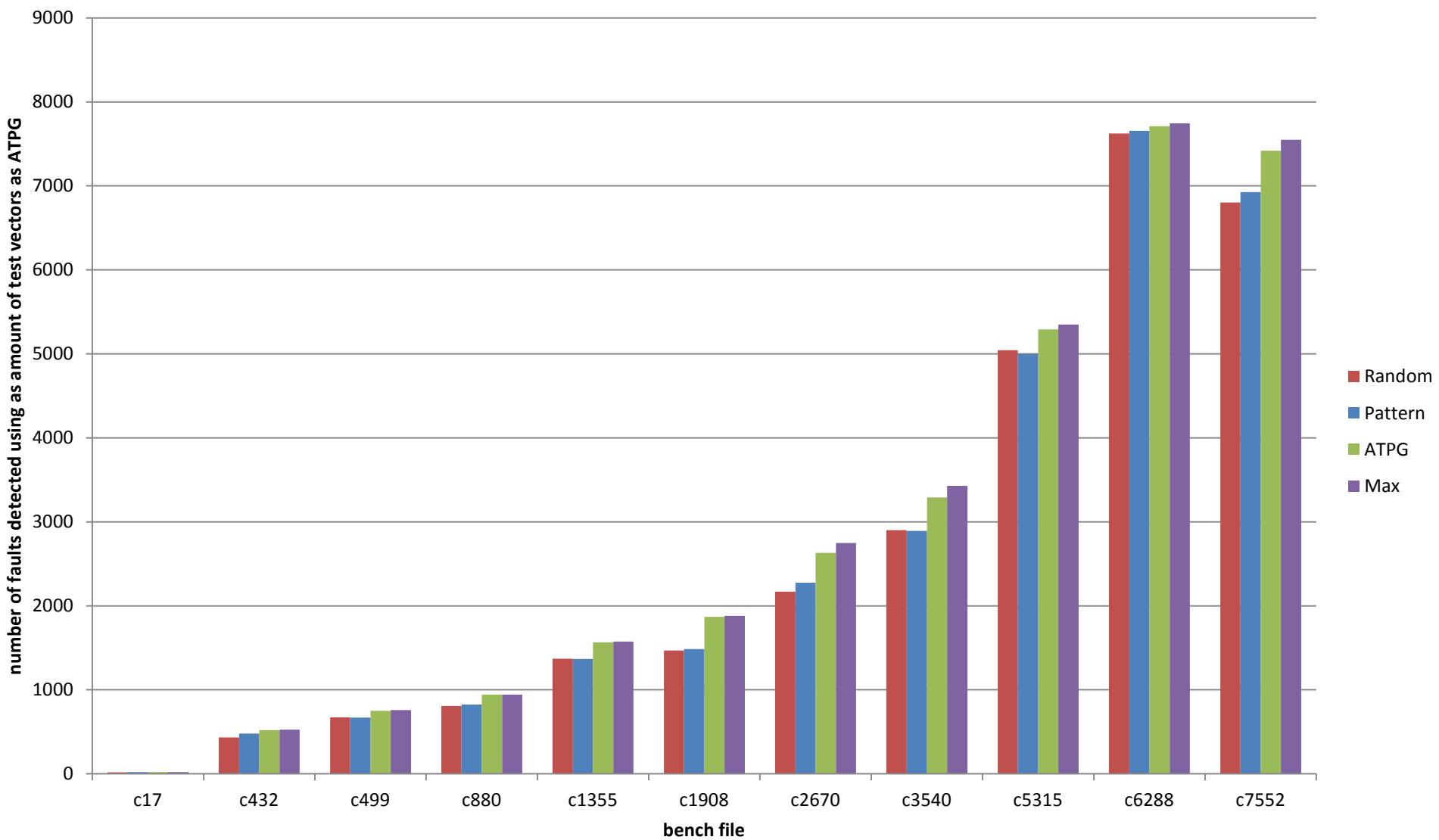
- Faults in independent circuits can only be detected with a fraction of each test vector.
- c5315 have 6 independent circuits.
- c2670 have inputs=outputs.







# Number of Faults Detected for every Method of Test Vector Generator for Every Bench File



# Order of Test Vectors

- Average the number of faults detected from 3 trials for each order of test vectors for most bench files.

```
1 000110100001101101011111000110111110
2 010101011000110000101111001110010110
3 001001010010011011110110001110011001
4 100000000111000011000010110111100100
5 011110000010011101111011011011010000
6 100011001001101101101111101001001010
7 110000100001010010011011011110111010
8 100100000010111100110011010011001010
9 001010100011100111101100101000011010
10 111011010011110111101101100101101110
11 001100101100101101010101011101110110
12 111011110101010111110011001011110010
13 100111011011100000100111001100000010
14 001111001001110110001101011000010001
15 101111011110001000111010111000001101
16 001100001010000011010000011110001110
17 011101100010011001000000000100111111
18 000110010000010100010011110100011100
19 010111010011100101110000000000011011
20 010111001101011011100110011100010111
21 011100010110100000001001101010101011
22 11011110111100010001011010100010100
23 110111011100000100100000001101110110
24 011011101011001011010111101100110000
```

```
1 000000000111011110010000001101011110
2 000000001101111010110110001001000111
3 000000010000100001000111001001100010
4 000000010011000001101000010100011100
5 000000010011100010001001011100111001
6 000000011000000101101010101100111110
7 000000011011111011001101001010110010
8 000000011101111101011001011101000110
9 00000010011000100111110110111110010
10 000000101010011001000011100101100010
11 000000101100000110100111101110011000
12 000000101110100111100000010111001011
13 000000110010111000100000000111010111
14 000000110011001100110001100011011001
15 000000110100001001101011010010110000
16 000000110100010010110100111001000100
17 000000111110001110011110010100110010
18 000000111111101010000100000011001111
19 000001000001110011010100110010100010
20 000001000010000100001000101101010101
21 000001010001111110000001000111010101
22 000001010010100010001000101100101111010
23 0000011010101010100111101001100010111
24 000001101011000001111111010010000010
25 000001111000010010100101100001001110
26 000001111100011001010011100011110110
27 000010000001010000011101001001000111
28 000010000101110010110011110011000110
```

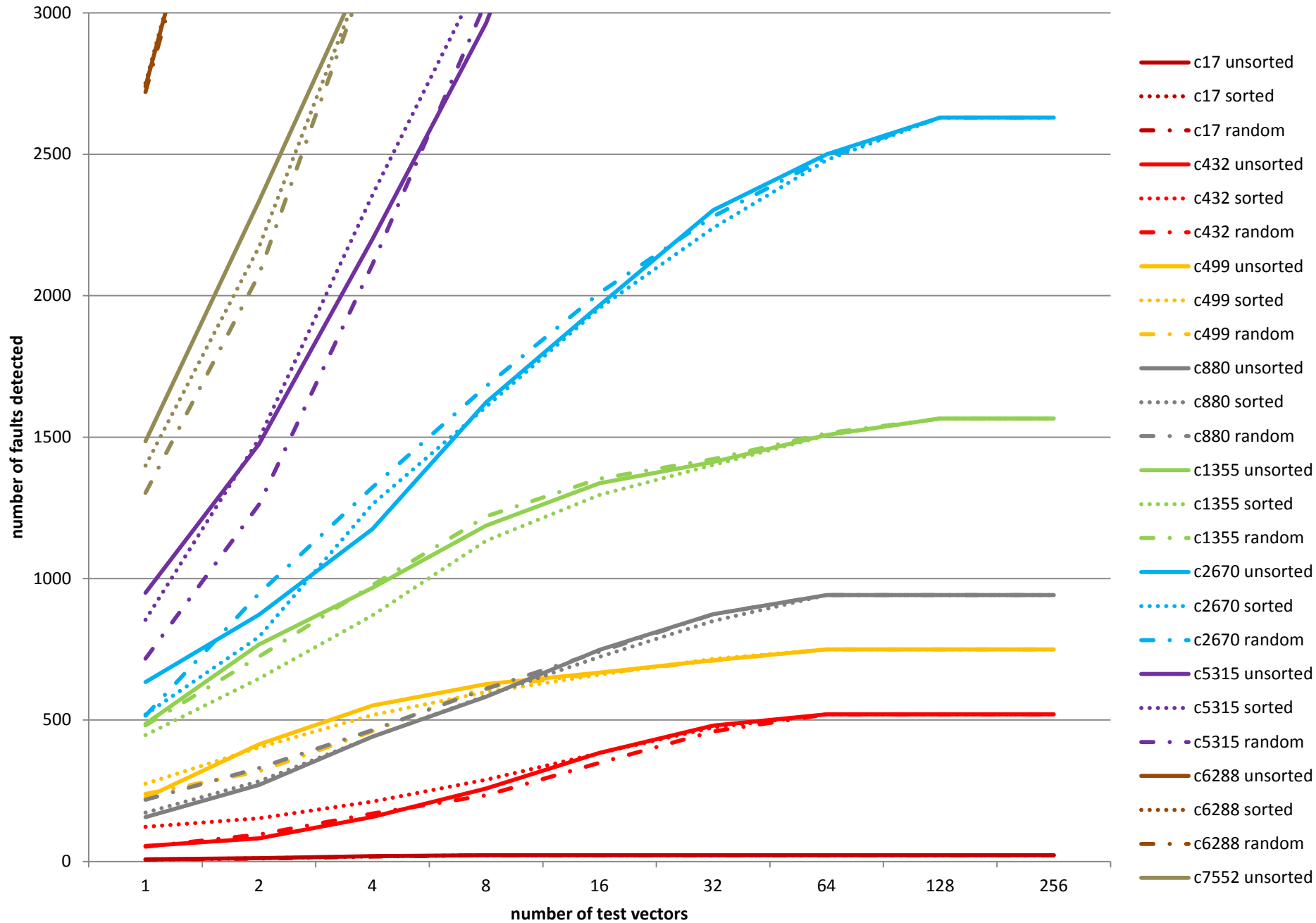
```
1 001110101010110010000011011110111101
2 010100111110000010110010011011010101
3 110000001100101001110101010110100011
4 110011001101101101111111010001000100
5 100110100100100110010011100100101111
6 111100010101001011100001110001010101
7 1101100010011110100000011010111011
8 00100111110010111001101000001001010
9 10000011100101111111110111110011010
10 010101000011010010100001110001101111
11 111000110110010111111101100110100101
12 101100001010000100100000001010010010
13 001101101101011011110010110101101011
14 110001010000100000010000010111001010
15 001100101011101100110000011000111101
16 011100011101000100101100111111100000
17 111001000111110011100011000010001100
18 01100010000011001010111110101011111
19 111111011110111010110101110001010000
20 111011101100000011100100010101100110
21 001100101100101101010101011101110110
22 001111011001101001000011100011100101
23 010001111001010100011101001010110000
24 100110000111110010110010010001011010
25 1110111101110001110001100011000111100
26 110110111110100100101101101110110101
27 100101110001011001010100101011110110
28 11100000111101001110111100010101110
```

**ATPG generated**

**Sorted Order**

**Shuffled Order**

# Number of Detected Faults vs Arrangement of Test Vectors



# Random Test Vectors are Comparable to ATPG Test Vectors

- Compare the average number of faults detected from 3 trials for random test vectors and ATPG test vectors for all bench files.



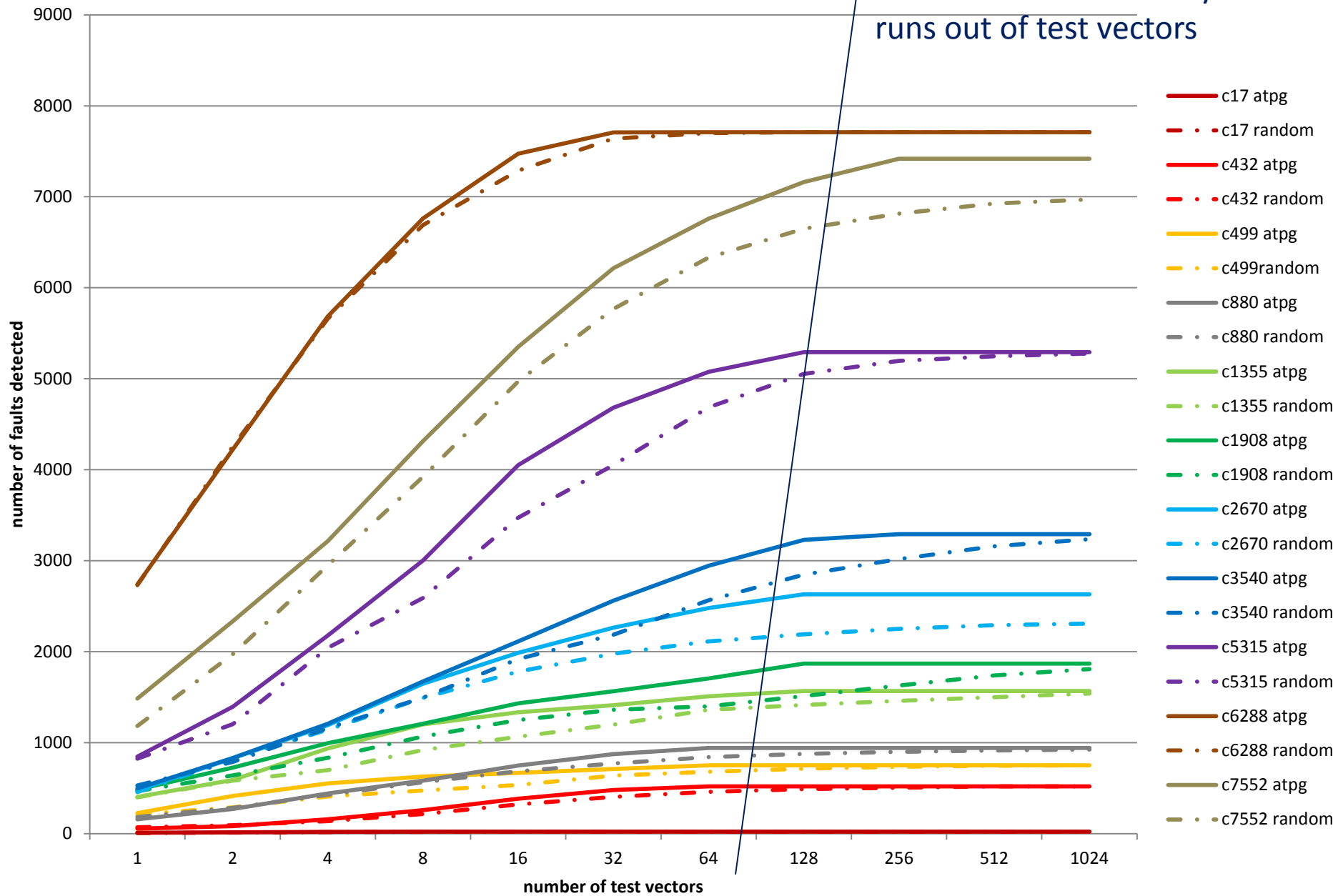
**ATPG**



**Random with  
more Test Vectors**



# Number of Faults Detected for Random Test Vectors and ATPG Test Vectors for all Bench Circuits



Line where ATPG usually runs out of test vectors