June 5, 2013

Proxy Methodology Discussion

Office of Research

cfpb Consumer Financial Protection Bureau

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Proxies are already used to measure race and ethnicity in a variety of contexts

- Standard practice uses geography for some groups and surnames for others
  - Each type of information is more/less useful for particular races/ethnicities
- In other applications some businesses use more detailed proxies, incorporating multiple sources of information (e.g., [redacted])
  - Methodologies are proprietary and for fee
  - Codes to high granularity with focus on cultural heritage and self-identity
  - Typically used for marketing purposes

CFPB OR proposes a methodology to improve standard practice of proxying for race/ethnicity

- Want to provide a methodology that:
  - relies on sound foundational statistical principles
  - uses publicly available information
  - can be refined as “state of the art” improves
  - can be easily implemented
- Proposed methodology represents a unified practice that systematically incorporates the clearest information
- Structure of proxy allows for potential future refinement
  - First name for race/ethnicity
  - Use of Block Groups for geography information

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The joint proxy for race and ethnicity proposed by CFPB relies on two sources of information

- Surname
  - □ US Census list of race/ethnicity by surname for all names with >100 appearances
  - □ List from 2000 Census published in 2007
- Geography
  - □ US Census data on race/ethnicity by census tract from 2010 Census

- NOTE: Proxy for gender relies only on Social Security database of infant names by gender
  - □ Remainder of presentation focuses on joint proxy for race/ethnicity

Bayes' Rule, a well known statistical theorem, generates the joint proxy

- Effectively, the rule combines the knowledge we receive from the two sources of information to refine the probability of an individual belonging to a specific race/ethnicity
  - □ Informative data (e.g., a name with a high probability of being Hispanic) will heavily impact the combined probability
  - □ Uninformative data (e.g., living in an area with an equal distribution of races/ethnicities) do not hurt the proxy, only provide little additional refinement

Multiple ways exist for thinking about how accurately proxies capture “truth”

1. Correlations between reported race/ethnicity and proxy
2. Distribution of reported race/ethnicity vs. proxy
3. Receiver Operating Characteristics (ROCs)

1. Correlations tell us how much a proxy relates to reported race/ethnicity

- 0=no relationship, 1=perfect co-movement
- Joint proxy is at least as good as (typically better than) alternatives on this metric
- Our results typically match or exceed rates in other published works

	Joint Proxy	Name Proxy	Geographic Proxy
Hispanic	0.84	0.83	0.49
Asian/Pacific Islander	0.86	0.85	0.47
Black	0.67	0.41	0.53
Non-Hispanic White	0.79	0.72	0.54
Am. Ind/ Native	0.10	0.06	0.07

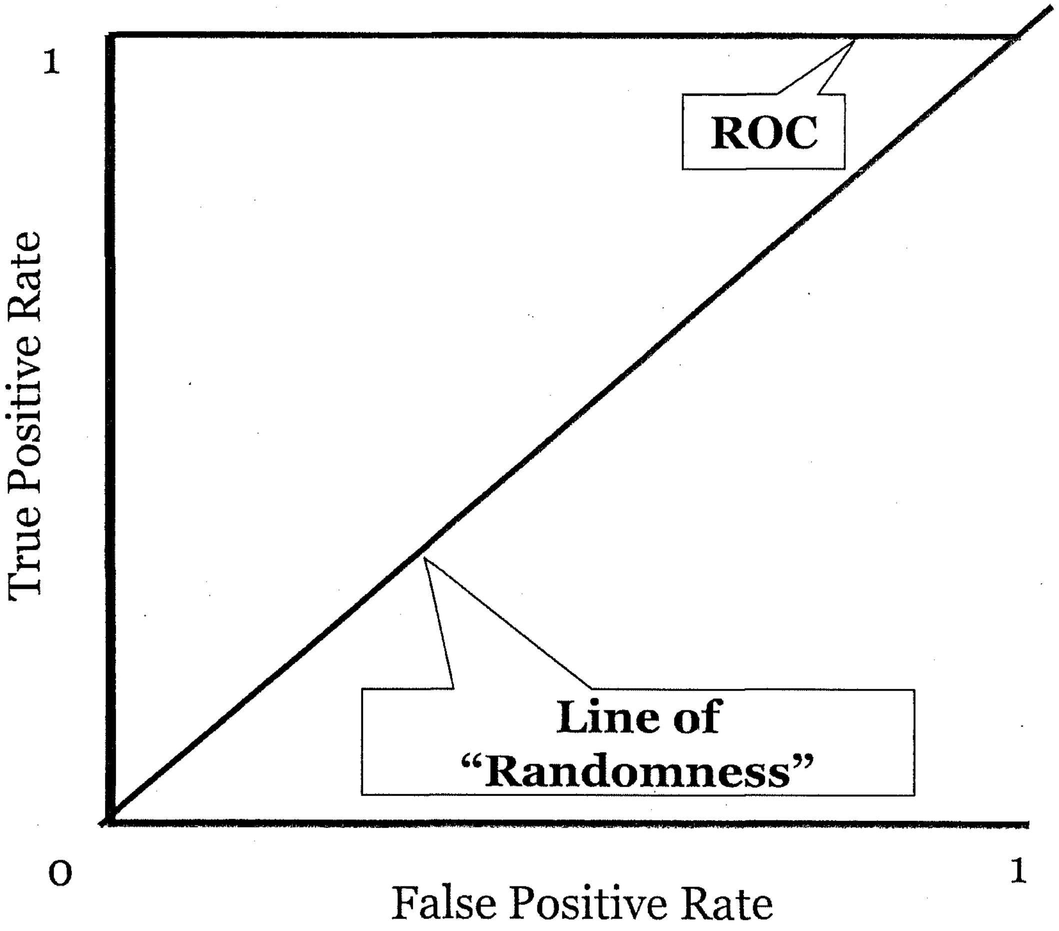
2. The joint proxy more closely matches the distribution of race/ethnicity

	HMDA Reported	Joint Proxy	Name Proxy	Geographic Proxy
Non-Hispanic White	73%	69%	67%	67%
Black	7%	8%	10%	9%
Asian/Pacific Islander	9%	9%	8%	7%
Native	0.3%	0.4%	0.6%	0.5%
Hispanic	11%	12%	12%	15%
Multiracial/Other	1%	2%	2%	2%

3. ROCs provide both a graphical and statistical measure of accuracy

- Receiver Operating Characteristics (ROCs) reflect how well a proxy is able to sort individuals accurately into a race/ethnicity
- The ROC curve measures the number of false positives and true positives that occur for a given threshold, then graphs those numbers as the threshold moves from 1 to 0 (left to right).
- We can statistically compare different proxies by comparing the areas under each of the ROC curves and testing whether they are different

A perfect proxy creates a line that moves along the graph's axes



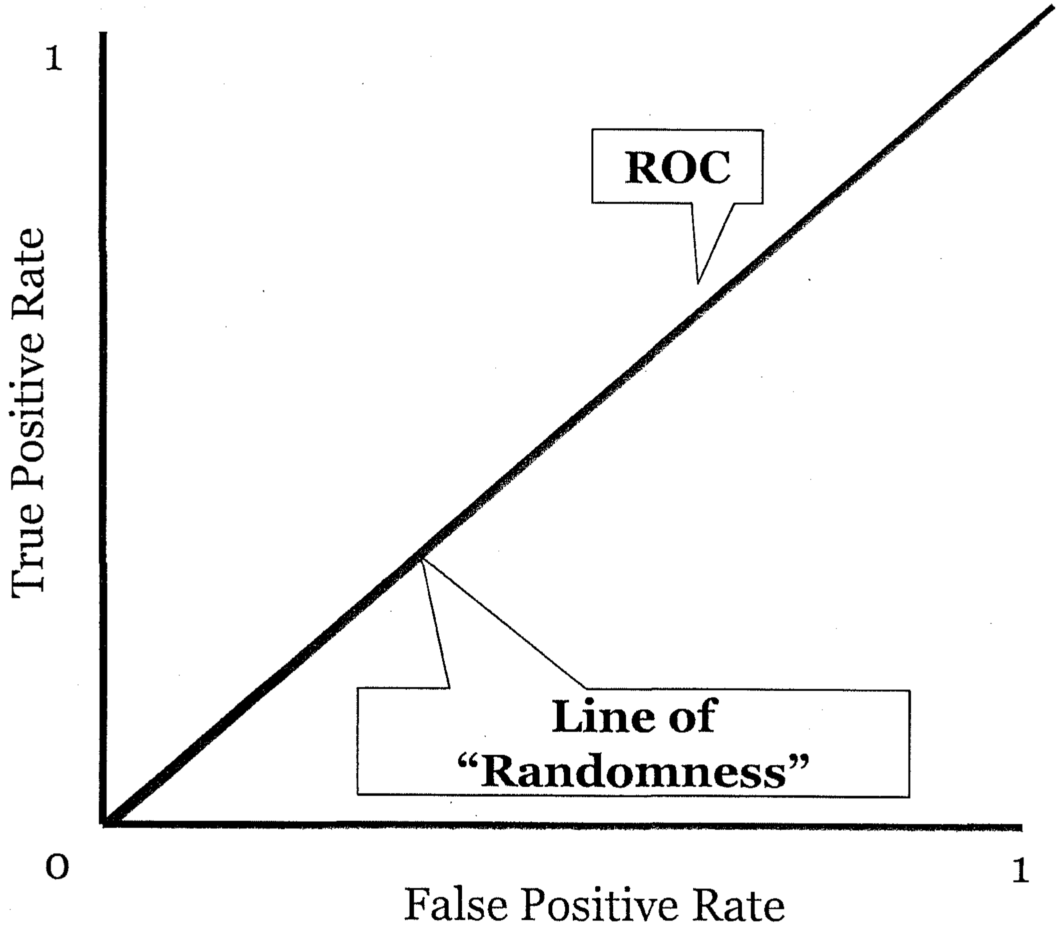
- Y-axis:

$$\frac{\textit{True Positives}}{\textit{All Actual Positives}}$$

- X-axis:

$$\frac{\textit{False Positives}}{\textit{All Actual Negatives}}$$

A poor proxy creates a line that moves along the 45-degree line



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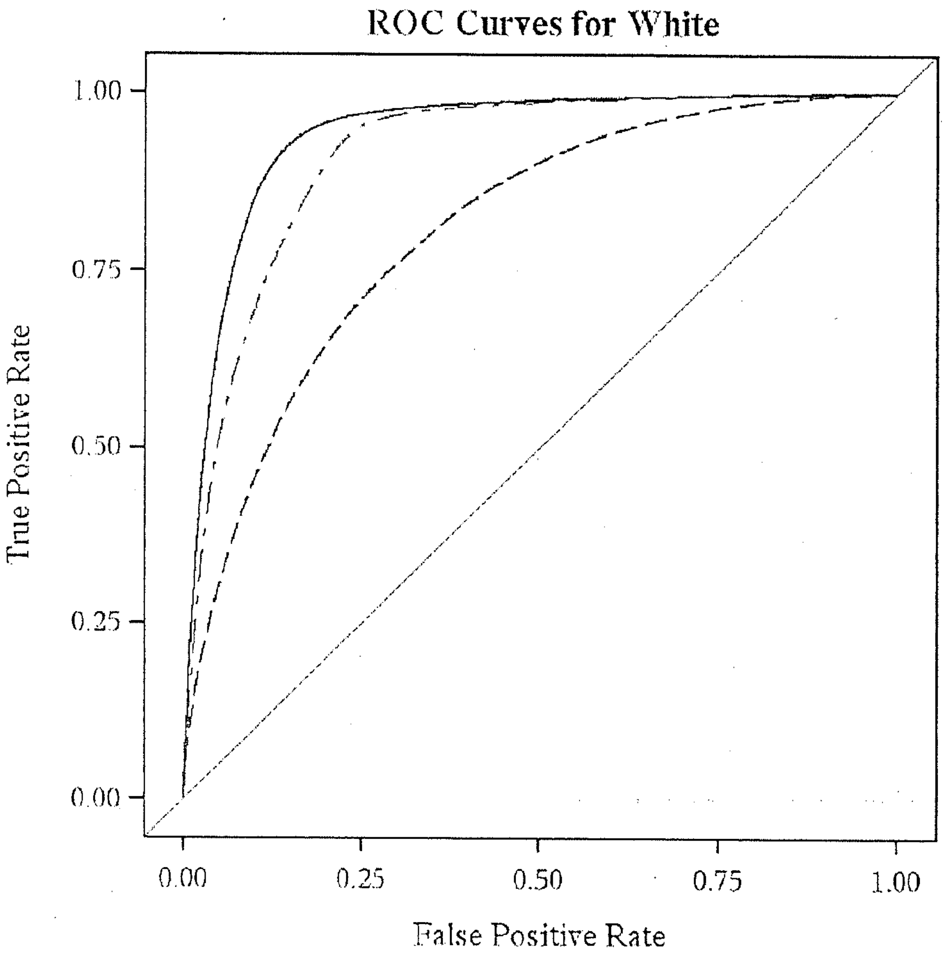
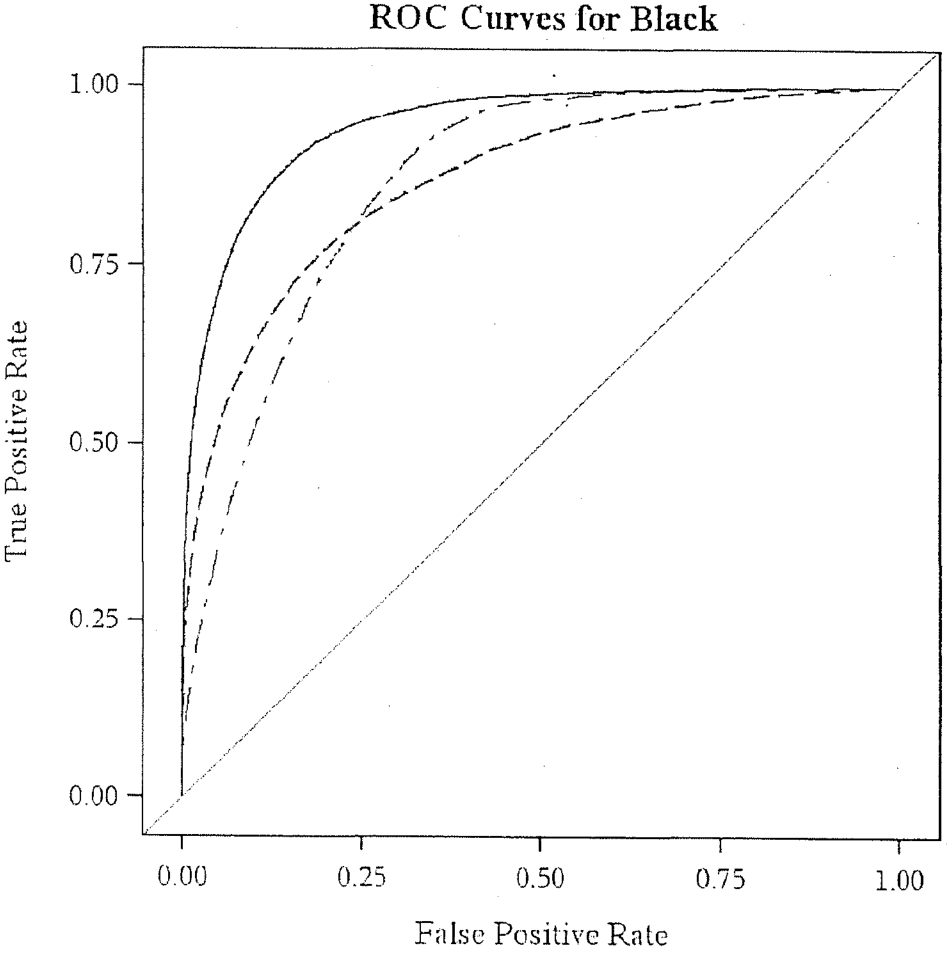
The joint proxy improves sorting for two groups in particular:

1. Non-Hispanic Whites:



The joint proxy improves sorting for two groups in particular:

2. Blacks:


ROC Curves for Black
True Positive Rate
False Positive Rate

ROC Curve (Area)
——— Joint Proxy (0.9442)
— — — Geo Proxy (0.8676)
— - — Name Proxy (0.8657)