For some entities, such as self-employed individuals reporting income taxes or firms reporting value-added taxes, the optimal evasion rate depends substantially on audit features like audit probabilities and penalty rates (Allingham and Sandmo 1972).

Whereas it is easy for firms to find other important information such as inflation rates or exchange rates, it is difficult to find information about the probability of being audited and penalty rates. Indeed, Bérgolo et al. (2017) show evidence that firms have large misperceptions about these audit features. In this paper, we expand their analysis to explore the sources of these misperceptions.

I. Data

See Bérgolo et al. (2017) for details about the survey design and implementation. In a nutshell, the anonymous online survey was conducted in collaboration with the Internal Revenue Service (IRS) from Uruguay. The invitations were sent by email on May 2016 to a sample of 6,181 firms with valid email addresses—whereas Bérgolo et al. (2017) focuses on firms participating in a field experiment, we extend the analysis to a broader sample. The average firm invited to the survey had 5.24 employees, had been in existence for 14 years, and paid $7,887 in value-added taxes and $5,265 in other taxes over the previous year.

Of the 6,181 firms invited to the survey, 3,628 (59 percent) responded. By request of the IRS, responses to all survey questions were voluntary. Across all questions, the average share of missing responses is 52 percent.

One question elicited the perceived probability of being audited: “In your opinion, what is the probability that the tax returns filed by a company like yours will be audited at least in one of the next three years (from 0% to 100%)?”

(2017) combine survey and internal administrative data from the tax agency, which provides a more straightforward comparison of perceptions and reality.

All monetary amounts are expressed in USD, converted from the original Uruguayan pesos using the exchange rate from August 23, 2015. This sample draws heavily from small and medium firms. In the universe of firms, the average number of employees is 10.40, the average age is 13.45 years, and the payment is $19,800 in value-added taxes and $10,943 in other taxes.
We used a three-year period, because when selected for an audit, IRS investigates the firm’s activity over the past three years. Another question elicited the perceived penalty rate: “Let us imagine that a company like yours is audited and that tax evasion is detected. What, in your opinion, is the penalty (in %) as determined by law that the firm must pay in addition to the originally unpaid amount? For example, a fee of X% means that, for each $100 not paid, the firm would have to pay those original $100 plus $X in penalties.” After each question, we elicited certainty in the response using a 1-to-5 scale, from “Not sure at all” to “Very sure.”

To estimate the “actual” audit probability and penalty rate, we use administrative data from the IRS for the sample of firms invited to the survey. The actual audit probability is calculated as the percentage of firms that were audited at least once in 2011–2013. The average penalty rate is calculated among firms who were caught evading in 2011–2013.

II. Average Misperceptions

Figure 1 shows a histogram of the distribution of perceived audit probability among the survey respondents. The vertical line corresponds to the actual value of audit probability among the firms invited to the survey. Figure 1 suggests that most of the firms misperceive the audit probability. Moreover, there is a systematic positive Bias: the average perceived probability (39.50 percent) is substantially higher than reality (7.98 percent), with a statistically significant difference ($p < 0.001$).

One potential explanation for this overestimation of audit probability is given by the availability heuristic model (Kahneman and Tversky 1974): audits are arguably salient events and thus seem more frequent than they are. Figure 2 provides the same analysis as Figure 1, using perceived penalty rates instead of perceived audit probabilities. Again, most firms misperceive the average penalty rate. However, there is no systematic Bias in perceived penalty rates. The average perceived penalty (31.37 percent) is close to the actual average (31.91 percent), with a statistically insignificant difference ($p = 0.462$).

III. Heterogeneity Analysis

In this section, we present some heterogeneity analyses to explore the sources of these misperceptions. Table 1 summarizes the misperceptions using two measures. Panel A shows the results for the entire sample. Bias corresponds to the average difference between perceptions and reality. MAE, which stands for mean absolute error, corresponds to the average absolute difference between perceptions and reality.

First, we explore whether these misperceptions are driven primarily by less sophisticated
Table 1—Results by Subgroups of Respondents

| Panel A. All | Audit probability | Penalty |
|--------------|-------------------|---------|
|              | Bias              | MAE     | N     | Bias | MAE | N |
|              | 31.53             | 33.26   | 1,791 | -0.54 | 23.59 | 1,671 |
|              | (0.663)           | (0.592) |       | (0.736) | (0.457) |       |

Panel B. By occupation of respondent

| Accounts | Audit probability | Penalty |
|----------|-------------------|---------|
|          | Bias              | MAE     | N     | Bias | MAE | N |
|          | 33.80             | 35.13   | 331   | -0.56 | 22.50 | 314 |
|          | (1.531)           | (1.437) |       | (1.631) | (1.022) |       |

| Non-accountants | Audit probability | Penalty |
|-----------------|-------------------|---------|
|                 | Bias              | MAE     | N     | Bias | MAE | N |
|                 | 31.05             | 32.80   | 1,370 | -0.39 | 23.88 | 1,278 |
|                 | (0.729)           | (0.670) |       | (0.851) | (0.527) |       |

Panel C. By size

| >1 employee | Audit probability | Penalty |
|-------------|-------------------|---------|
|             | Bias              | MAE     | N     | Bias | MAE | N |
|             | 32.95             | 35.27   | 605   | 0.89 | 22.79 | 565 |
|             | (1.066)           | (0.935) |       | (1.252) | (0.804) |       |

| ≤1 employee | Audit probability | Penalty |
|-------------|-------------------|---------|
|             | Bias              | MAE     | N     | Bias | MAE | N |
|             | 34.34             | 35.05   | 527   | -4.36 | 24.15 | 483 |
|             | (1.207)           | (1.167) |       | (1.317) | (0.752) |       |

Panel D. By age of the firm

| ≥12 years | Audit probability | Penalty |
|-----------|-------------------|---------|
|           | Bias              | MAE     | N     | Bias | MAE | N |
|           | 30.50             | 32.22   | 807   | -1.37 | 22.99 | 755 |
|           | (0.918)           | (0.842) |       | (1.068) | (0.664) |       |

| ≤12 years | Audit probability | Penalty |
|-----------|-------------------|---------|
|           | Bias              | MAE     | N     | Bias | MAE | N |
|           | 32.78             | 34.52   | 716   | -0.168 | 23.92 | 668 |
|           | (1.051)           | (0.970) |       | (1.181) | (0.733) |       |

Panel E. By history of audits

| Audited 11–13 | Audit probability | Penalty |
|---------------|-------------------|---------|
|               | Bias              | MAE     | N     | Bias | MAE | N |
|               | 46.43             | 47.06   | 209   | 3.24 | 24.74 | 188 |
|               | (1.773)           | (1.691) |       | (2.364) | (1.539) |       |

| Not-audited 11–13 | Audit probability | Penalty |
|------------------|-------------------|---------|
|                  | Bias              | MAE     | N     | Bias | MAE | N |
|                  | 29.10             | 31.02   | 1,397 | -1.27 | 23.34 | 1,307 |
|                  | (0.706)           | (0.645) |       | (0.819) | (0.504) |       |

Panel F. By Tax morale

| High tax morale | Audit probability | Penalty |
|-----------------|-------------------|---------|
|                 | Bias              | MAE     | N     | Bias | MAE | N |
|                 | 32.72             | 34.88   | 1,010 | 1.80 | 25.02 | 965 |
|                 | (0.849)           | (0.782) |       | (1.027) | (0.639) |       |

| Low tax morale | Audit probability | Penalty |
|----------------|-------------------|---------|
|                | Bias              | MAE     | N     | Bias | MAE | N |
|                | 28.39             | 30.12   | 583   | -4.17 | 20.67 | 554 |
|                | (1.089)           | (1.006) |       | (1.102) | (0.688) |       |

Panel G. By degree of confidence in response

| High confidence | Audit probability | Penalty |
|-----------------|-------------------|---------|
|                 | Bias              | MAE     | N     | Bias | MAE | N |
|                 | 31.96             | 34.88   | 760   | 0.49 | 25.12 | 879 |
|                 | (1.118)           | (1.075) |       | (1.081) | (0.671) |       |

| Low confidence | Audit probability | Penalty |
|----------------|-------------------|---------|
|                | Bias              | MAE     | N     | Bias | MAE | N |
|                | 31.06             | 31.91   | 1,016 | -1.58 | 21.92 | 787 |
|                | (0.694)           | (0.655) |       | (0.991) | (0.611) |       |

Panel H. By responses equal or different from 50

| Exactly 50 | Audit probability | Penalty |
|------------|-------------------|---------|
|           | Bias              | MAE     | N     | Bias | MAE | N |
|           | 42.03             | 42.03   | 652   | 18.09 | 18.09 | 212 |
|           | (0.00)            | (0.00)  |       | (0.00) | (0.00)  |       |

| Not exactly 50 | Audit probability | Penalty |
|-----------------|-------------------|---------|
|                 | Bias              | MAE     | N     | Bias | MAE | N |
|                 | 25.52             | 28.24   | 1,139 | -3.25 | 24.39 | 1,459 |
|                 | (0.967)           | (0.592) |       | (0.820) | (0.521) |       |

Notes: Bias is the average difference between perception. MAE is the average absolute difference between perception and reality. N is the total number of non-missing responses. For all panels but C and H, we compare the survey responses to the same estimates of actual probability (7.97 percent) and average penalty rate (31.91 percent). In panels C and H, the actual values of the parameters are computed by subgroups. In panel C, small firms have an actual probability of being audited of 3.47 percent and an average penalty rate of 34.12 percent; large firms have an actual probability of being audited of 11.92 percent and an average penalty rate of 31.33 percent. In panel H, older firms have an actual probability of being audited of 8.93 percent and an average penalty of 31.99 percent; newer firms have an actual audit probability of 6.97 percent and an average penalty of 31.80 percent.

Source: Author calculations based on survey and administrative data.
the previous three years and firms that were not. Consistent with the hypothesis that firms use their own audit histories as their main data sources, firms recently audited have higher perceived audit probabilities. This effect results in a higher Bias for firms with recent audit history (46.43 versus 29.10, \( p < 0.001 \)) and a higher MAE (47.06 versus 31.02, \( p < 0.001 \)). The results for the perceived penalty rate go in the same direction, but the differences are economically and statistically less significant. This finding suggests that this channel at least partially explains how direct contact with audits plays an important role in misperceptions about audit probabilities.

Some firms might pay their taxes because they think it is the right thing to do. For these firms, audits are irrelevant to their decision-making, and thus they have no incentive to be informed about the auditing process. According to this view, misperceptions may be driven exclusively by firms with high tax morale. To test this hypothesis, we use responses to a survey question that measures tax morale: “On a Scale of 1 to 5, where 1 is ‘Not justifiable at all’ and 5 is ‘Completely justifiable,’ how much do you think it is justifiable to evade taxes?” Panel F breaks down the results by high morale (value 1 in the score) and low morale (values 2 to 5). Consistent with this hypothesis, firms with higher tax morale have higher Bias and higher MAE than firms with lower tax morale. However, although these differences are statistically significant, they are moderate in magnitude. For example, the difference in MAE regarding audit probability is 34.38 versus 30.12 (\( p < 0.001 \)).

We also explore whether firms are self-aware of their misperceptions by looking at the self-reported confidence in responses. When asked about audit probabilities, 42.60 percent of subjects reported to be sure or very sure about their answers, whereas 57.40 percent of subjects reported to be a little sure or not sure at all. The distribution of confidence is similar for the perceived audit penalty. In other words, firms are aware of their misperceptions from a collective perspective.

To further explore this question, panel G of Table 1 splits the results by firms that reported high-versus-low confidence in their responses. We find that, despite some statistically significant differences in misperceptions, these differences are economically small and point in the opposite direction than predicted.

Last, we address a confounding factor. It is possible that misperceptions are spuriously driven by firms that responded exactly 50 percent as a way of expressing that they are uncertain (Bruine de Bruin and Carman 2012).3

Since misperceptions are similar between firms that are certain and firms that are uncertain, this confounding factor seems unlikely to account for the findings. As additional evidence, panel H breaks down the results by firms that responded exactly 50 percent and firms that did not. By construction, the Bias and MAE are higher for firms reporting 50 percent. However, the misperceptions are still substantial even after dropping responses of 50 percent. In other words, although this issue with the survey responses may inflate the degree of misperceptions, it is far from explaining the whole puzzle.

IV. Conclusions

We present measures of perceptions about the auditing process in a sample of 6,181 firms from Uruguay. We find large misperceptions about audit probabilities and penalty rates. We also find a systematic overestimation of audit probabilities but no such overestimation for penalty rates. Of all the channels that we explore, recent contact with audits best explains differences in misperceptions.

These findings have direct policy implications. The high level of misperceptions may be attributed to the lack of publicly available and easily accessible information about the auditing process. Our results suggest that if tax authorities were more transparent about the auditing process, perceived audit probabilities would decrease, which could in turn reduce tax compliance. Thus, it may be in the best interest of tax agencies to reduce transparency. Indeed, this may be why tax authorities do not share this information.

3For instance, among firms that report an audit probability of 50 percent, the fraction that report “Not sure” or “A bit sure” is 50.92 percent; in comparison, among firms that report an audit probability different from 50 percent, the fraction that reports “Not sure” or “A bit sure” is 29.06 percent. This difference is statistically significant (\( p < 0.001 \)).
REFERENCES

Allingham, Michael G., and Agnar Sandmo. 1972. “Income Tax Evasion: A Theoretical Analysis.” *Journal of Public Economics* 1 (3–4): 323–38.

Bérgolo, Marcelo L., Rodrigo Ceni, Guillermo Cruces, Matias Giaccobasso, and Ricardo Perez-Truglia. 2017. “Tax Audits as Scarecrows: Evidence from a Large-Scale Field Experiment.” National Bureau of Economic Research Working Paper 23631.

Bruine de Bruin, Wändi, and Katherine G. Carman. 2012. “Measuring Risk Perceptions: What Does the Excessive Use of 50% Mean?” *Medical Decision Making* 32 (2): 232–36.

Hessing, Dick J., Henk Elffers, Henry Robben, and Paul Webley. 1992. “Does Deterrence Deter? Measuring the Effect of Deterrence on Tax Compliance in Field Studies and Experimental Studies.” In *Why People Pay Taxes: Tax Compliance and Enforcement*, edited by Joel Slemrod, 291–305. Ann Arbor: University of Michigan Press.

Kahneman, Daniel, and Amos Tversky. 1972. “Subjective Probability: A Judgment of Representatives.” In *The Concept of Probability in Psychological Experiments*, edited by Carl-Axel S. Staël von Holstein, 25–48. Netherlands: Springer.

Sheffrin, Steven M., and Robert K. Triest. 1992. “Can Brute Deterrence Backfire? Perceptions and Attitudes in Taxpayer Compliance.” In *Why People Pay Taxes: Tax Compliance and Enforcement*, edited by Joel Slemrod, 193–218. Ann Arbor: University of Michigan Press.

US Department of the Treasury. 1988. *Taxpayer Opinion Survey, 1987*. Washington, DC: Internal Revenue Service.