Measuring Productivity Dispersion:

Lessons From Counting One-Hundred Million Ballots*

Ethan Ilzetzki† and Saverio Simonelli‡

This Draft: January 28, 2024

Abstract

We measure output per worker in nearly 8,000 municipalities using ballot counting times in the Italian general election of 2013 and two referenda in 2016. We document large productivity dispersion across municipalities in this very uniform and simple task that involves no modern technology and little physical capital. Vote counting productivity has similar variance as–and is highly correlated with–labor productivity in the private sector. The correlation is larger with productivity in firms in labor-intensive and low-skill industries, consistent with a measure of labor-augmenting productivity. We show that this measure of labor efficiency goes beyond traditional measures of human capital and show that a combination of lack of trust and contentious aspects of the job relate to low labor efficiency in this setting. Using a development accounting framework, this measure accounts for up to 40% of the firm-level productivity dispersion across Italian provinces and two-thirds of the north-south productivity gap in Italy.

JEL Classification: E24, O11, Z10

Keywords: Productivity dispersion, development accounting, regional economic development, human capital, social capital.

*We thank the editor, Marco Manacorda, and three anonymous referees for their helpful editorial guidance. We thank Paola Menta and Salvatore Galatioto in the Ministrero dell'Interto–Dipartimento per gli Affari Interni e Territoriali for providing electoral data, Luigi Guiso for sharing additional data, and Sevim Kosem, Sara Moccia, Giuseppe Rossitti, and James Symons-Hicks for outstanding research assistance. We also thank Alberto Alesina, Oriana Bandiera, Filipe Campante, Francesco Caselli, Francesco Drago, Alessandra Fogli, Nicola Gennaioli, Paola Giuliano, Andrea Ichino, Ethan Kaplan, Pete Klenow, Tatiana Komarova, Hamish Low, Nicola Limodio, Emi Nakamura, Tommaso Oliviero, Gerard Padro i Miquel, Marco Pagano, Torsten Persson, Annalisa Scognamiglio, Andrei Shleifer, Morten Ravn, Ricardo Reis, Federico Rossi, Guido Tabellini, John van Reenen, Hans-Joachim Voth, Eran Yashiv, Fabrizio Zilibotti and participants at several conferences and seminars. Research was supported by grants from the EIEF, STICERD, the Centre for Macroeconomics, and UKRI (ERC replacement) grant EP/X025543/1.

†London School of Economics, Centre for Macroeconomics, and CEPR

‡University of Naples Federico II and CSEF.

1 Introduction

Output per worker differs enormously across countries and regions, and productivity is viewed the as main driver of these differences (Caselli 2005). A large literature studies this variation but confronts difficulty even in measuring productivity. While it is occasionally possible to measure workers' productivity in small controlled settings, e.g. an individual production line, it is difficult to isolate their contribution to value added in larger-scale settings, e.g. across an entire country. Moreover, productivity shows substantial dispersion even within narrow industries and the causes for this dispersion are not fully understood (Syverson 2011).

In this paper, we measure the productivity of electoral workers who counted ballots in a general election and two referenda in Italy. While our investigation isn't in a commercial setting, the task is useful in isolating labor efficiency in data spanning every municipality in a country. Using data on ballot counting times from the 2013 Italian general election and two referenda in 2016, we measure electoral volunteers' productivity in close to 8,000 municipalities. Combined, volunteers counted more than one-hundred million ballots. We calculate the number of votes counted per worker-hour: a direct, quantity-based, measure of labor productivity. The dataset accompanying this paper gives quantity-based labor productivity for each municipality in Italy.

Admittedly, vote counting isn't a typical task assigned in workplaces. Nevertheless, there are several advantages to measuring output per hour worked in this setting and that make it illuminating on the causes of productivity dispersion in other settings. First, the task is virtually identical in all polling stations across the country. This contrasts with tasks in the workforce, which vary substantially even within narrowly defined industries and within firms. Second, the task is simple, manual, and repetitive, making it highly labor intensive: essentially no physical capital or modern technology are involved. This creates a quasi-laboratory setting that isolates vote counting teams' efficiency from that of other inputs and technology that affect labor productivity in most settings. Third, volunteers receive identical direct pecuniary incentives across all polling stations in the form of a lump-sum payment that is independent of performance or time spent on the task. (We discuss indirect pecuniary incentives in Section 3.) Wages are often used to measure labor productivity in commercial settings, but compensation may also incentivize productivity (Shapiro & Stiglitz, 1984) or reflect labor-market discrimination. Our setting isolates the team's ability, intrinsic motivation, and group dynamics from financial incentives. Fourth, the non-market setting insulates our measurement from market power, market frictions, and transportation costs that may contaminate productivity measurement in firms. Fifth, the task is administered at the national level, thus controlling for (the direct effects of) sub-national institutional differences. Finally, the task is performed in every municipality in Italy, giving a nation-wide measure of productivity for a large economy.

We document substantial dispersion in Vote Counting Rates (VCR) across Italy. The variance in VCR is roughly the same as that of output per worker in firms. Furthermore, VCR is highly correlated with firms' productivity across Italian municipalities. These facts suggest that similar patterns of labor efficiency emerge in a task that controls for many other factors often cited as drivers of productivity dispersion, such as north-south differences in infrastructure. Supporting this view, the correlation between firm productivity and VCR persists after controlling for traditional measures of education, institutions, and infrastructure. However, measures of social capital are correlated with VCR and weaken its correlation with labor productivity in firms.

The vote counting task captures a labor-specific component of productivity by its nature. We corroborate VCR's role as a labor-augmenting measure of productivity and its relevance for general economic settings using firm-level data. In a two-way fixed effects regression, we show that the correlation between VCR and workers' productivity in firms is greater in labor-intensive firms. This is consistent with VCR capturing labor efficiency as distinct from other factors of production or total factor productivity. (We use the terms labor-augmenting productivity and "labor efficiency" interchangeably.)

The vote-counting task is a one-off task, performed by a group of volunteers assembled ad-hoc for election day. The task is very simple and lacks the high-powered incentives present in the workforce. One might expect the measure to lack external validity. Nevertheless, VCR is highly correlated with firms' productivity, which suggests that the measure captures a local attribute that affects productivity in multiple settings.

What does labor efficiency in the vote counting task capture? Like many workforce tasks, vote counting is a group task and it is plausible that interactions between group members are as important as their individual productivity. We show that social capital plays a role in explaining productivity differences in this setting. A survey measure of interpersonal trust is strongly correlated with VCR. Further, the share of contested votes (when committee members disagreed on how to assign a vote) in a municipality reduces the vote counting rate substantially, but this is true only in low-trust provinces. This indicates that trust may play a role in facilitating productivity in a group task involving disagreement. Trust has been shown to be associated with other drivers of economic development (e.g. financial market development, as in Rajan & Zingales 1998; Guiso *et al.* 2004, 2008b). Given that these factors are absent in the vote counting setting, our measure usefully isolates the role of trust in a group task from these additional factors. [1]

We then use our measure to assess the importance of labor efficiency in accounting for differences in output per worker across the country. We do so in a development accounting framework, as in Klenow & Rodriguez-Clare (1997), Caselli (2005), and Hsieh & Klenow (2010). In our preferred specification, labor efficiency accounts for 40% of the productivity variation across Italian provinces. We estimate that if labor efficiency, as measured by VCR, were equated across the country, the north-south gap in measured TFP would decline by two thirds and the gap between the 75th and the 25th percentile province in terms of value added per worker would decline by 40%.

We address a number of factors that might lead to mis-measurement of vote counting productivity or to a spurious correlation with productivity in firms. We use rich electoral data to control for task complexity; control for vote counter demographics; and explore the possibility that VCR was driven by the opportunity cost of time. On this last point, our setting makes opportunity cost in its most obvious form an unlikely driver of VCR. Employers are obliged to give vote-counting volunteers paid time off on the day of, and the day following, the election, so that poll workers received wages on those days regardless of the time they devoted to vote counting. Nevertheless, we use the time dimension of our data to explore the importance of the opportunity cost of time. Using province-level unemployment and wages as proxies for the opportunity cost of time, we find no within-province correlation over time between VCR and these measures of opportunity cost.

This paper relates to a large literature studying differences in output per worker across countries or regions (Mankiw *et al.* 1992, Hall & Jones 1999). Methodologically, we follow the development accounting literature (Klenow & Rodriguez-Clare 1997, Caselli 2005, Hsieh & Klenow 2010). Our setting usefully isolates the human component of productivity from technological, institutional, and infrastructure inputs to production. In a related contribution, Hendricks & Schoellman 2018 show that immigrants' location of birth–and therefore their human capital–accounts for roughly half of the variation in their wage once employed in the US. Their setting has the advantage of observing the same individual in two settings (countries), while we have to rely on municipal-level correlations. On the other hand, our setting has the advantage of a direct measure of productivity, rather than relying on wages, whose association with labor productivity depends

[1] Anelli *et al.* (2021) have used our data to show that cheating in school exams is correlated with VCR, further corroborating the social capital component of VCR.

on labor market efficiency. Syverson (2004) studies productivity in concrete production, a highly uniform good. We complement this literature by studying productivity where workers face uniform tasks and incentives.

Labor efficiency has been studied in smaller, controlled settings (Bandiera *et al.* 2011, Finan *et al.* 2015), but measuring productivity in a highly comparable task across an entire economy or across countries is rare. Similar in spirit to our study is Clark (1987, 2007), who compares labor costs in cotton mills in several countries in the early industrial period. He provides historical evidence that differences in technology, capital quality, transportation and raw material costs, and market frictions are insufficient to explain the large differences in labor costs. He concludes that human capital is the residual explanation. In our setting, these confounding factors are mostly absent, allowing us a direct measure of labor efficiency and our data speaks to the role of social capital. Chong *et al.* (2014) send letters to non-existent addresses in every country in the world and measure the "return to sender" time. Their objective is to measure institutional efficiency rather than isolating labor efficiency as we do.

Our evidence on the role of social capital in the vote-counting process relates our study to a large literature on the importance of trust and "civicness" in economic development, harking back to Banfield's (1958) and Putnam *et al.*'s (1993) studies of Italy. Guiso *et al.* (2004, 2006, 2008a,c) and Cohn *et al.* (2019) have studied the role of trust and civicness empirically.[2] Our labor efficiency measure complements existing measures of intrinsic motivation in contributing to common efforts (e.g. blood donations) with the advantage of being cardinal: It is measured in units of output per worker that relate directly to other quantities of interest to economic researchers. Our development accounting exercise in Section 5 is an example of analysis that requires a cardinal measure. Our finding that intrinsic motivation may play a role in the vote counting task relates to the work of Ichino & Maggi (2000) and Ichino & Riphahn (2005) work on shirking in and absenteeism from the workplace.

The remainder of the paper is organized as follows. Section 2 describes the institutional setting of the 2013 elections and the 2016 referenda, and the vote counting process. Section 3 describes the data and our measurement of vote counting rates. In Section 4 we relate the vote counting productivity to productivity in commercial settings and investigate the role of social capital in the group vote-counting task. Section 5 provides a development accounting framework that assesses the importance of labor efficiency in productivity differences across provinces. Section 6 concludes.

[2]See Alesina & Giuliano (2015) for a review of the broader literature on culture and economic development.

2 Institutional Setting: Vote Counting in Italy

Our main variable of interest is vote counting times in three separate polls: The Italian general election of 2013; the oil and natural gas drilling referendum of April 2016; and the constitutional referendum of December 2016. Full details on the polls can be found in Appendix B. Here, we briefly describe these polls and the broader administrative setting.

The 2013 general election determined 630 members of the Chamber of Deputies (*Camera dei Deputati*) and the 315 elective members of the Senate (*Senato della Repubblica*). The election was held on Sunday and Monday, February 24-25, with polling stations closing at 3pm on Monday. The April and December nationwide referenda related to oil-drilling licenses and constitutional changes, respectively. They were held on the Sundays of April 17 and December 4, 2016, respectively, with polling stations closing at 11pm.

In each of these polls, voters entering a polling station received a pencil and a ballot (or two in the election). They were required to mark one party on each election ballot or "Yes" or "No" in the referenda. Figure A.1. in the appendix shows sample Senatorial ballots from two Regions: Piemonte in the north and Sicily in the South. While there were slight differences due to the presence of Regional parties and in the ordering of coalitions, the ballots were similar in their design and complexity. Ballots for the Chamber of Deputies were even more uniform across Regions. Ballots in the referenda were identical across the country and are shown in Figure A.2 in the appendix.

Italy is divided into 20 administrative Regions, 110 provinces, and around 8000 municipalities (*comuni*). For electoral purposes, each municipality is divided into polling stations (*sezioni*). Clear rules regulate the number of registered voters per polling station, with a range of 500 to 1200 voters per polling station.[3] Each polling station in the election had a 6-member committee: A president, 4 poll workers (*scrutatori*), and one secretary. In the referenda, each polling station had a 5-member committee, with 3 rather than 4 poll workers. In addition, political parties are entitled to appoint observers, who may report irregularities, but do not take part in the counting process itself.

Poll work was voluntary and included supervising the entire voting process until polling station closing times, followed by the vote counting task studied here. Poll workers are selected by the municipal electoral commission (*commissione elettorale comunale*) from a list of volunteers. Prior

[3]Municipalities with more than 2,000 registered voters were divided into polling stations of 750 (for municipalities with 2,001 to 40,000 voters), 850 (for municipalities with 40,001 to 500,000 voters) or 900 (for larger municipalities) registered voters. Municipalities with 1,200 to 2,000 voters had two polling stations and smaller municipalities had one polling station. Source: MINISTERO DELL'INTERNO 2 aprile 1998, n. 117 - "regolamento recante i criteri per la ripartizione del corpo elettorale in sezioni".

to 2005, poll workers were selected via lottery. In the polls studied here, municipalities differed in the degree of discretion given to the electoral commission.[4] Poll workers require eight or more years of education and must reside in the municipality where they wish to volunteer. The president of the committee is selected by the Regional court of appeals (*corte d'appello*) from a list of volunteers and requires 12 or more years of education. The secretary is appointed by the president and requires eight or more years of education.[5]

Poll workers and the secretary received financial compensation of €145 for their participation in the election and €104 in the referenda. Presidents received €187 in the election and €130 in the referenda. Importantly, this was a lump-sum reward for the entire one to two day process and did not depend on the number of hours devoted to counting votes. There was no direct pecuniary incentive to prolong the vote counting task, nor any reward for completing it rapidly.

Employers were required by law to give poll workers a day of paid leave to compensate for their electoral work on the polling days and the day following the elections (Sunday through Tuesday in the election of 2013, and Sunday and Monday in both referenda). Poll workers were also eligible for an additional day of paid leave if vote counting extended beyond midnight. Given that polling stations closed at 3pm in the general elections, almost all polling stations completed work before midnight. In both referenda, polling stations closed at 11pm, so that the majority of polling stations completed work after midnight. Hence in the typical polling station in all polls considered, employed poll workers were paid by their employers for the Monday and Tuesday of the week following the election.

All polling stations were required to follow the following procedures. These procedures are outlined in very precise detail in the polling station handbook provided to polling station presidents. First, a number of preliminaries are conducted related to the voter registry. Turnout is computed and the list of voters is sent to the municipality. Second, Senate votes are counted and reported. And third, Chamber of Deputies votes are counted and reported. (In the referenda, these two steps are replaced by a single vote-counting step.) There are therefore two potential measures for vote counting time for the general election: the time Senate results were reported and the time Chamber of Deputies results were reported. In addition, there is a vote counting time from each of

[4]Our results are robust to restricting attention to municipalities where volunteers were randomly selected. We discuss volunteers' selection into the task in Section 3.

[5]Poll worker absenteeism or tardiness isn't a concern for our measurement. Municipalities replace absent poll workers with others from the volunteer rolls. The vote counting task begins either at 11pm on the day or 3pm on the second day of the election, so that a replacement is obtained well before vote counting begins. Our data on poll workers contains the characteristics of those who actually served.

the two referenda.

During vote counting, the following procedures were to be followed. The committee counts and records one vote at a time. If a vote is contested (e.g. by a party observer), the president is authorized to assign the vote, but must record in the register that the vote was contested. This helps ensure that contested votes don't delay the process.[6] When vote counting is complete, the president reports unofficial results to the municipality. This is done by phone, fax, or in a small number of municipalities by PDA application. The municipality then communicates the unofficial result to the Ministry of Interior. Official hard copies are then transported to the municipality.

Further details on electoral institutions and the role of informal institutions (e.g. the Mafia) in Italian electoral politics can be found in Appendix B.

3 Data and the Vote Counting Rate

Vote Counting We obtained data from the Ministry of Interior on reporting times of electoral results for each municipality in Italy. Municipalities reported *unofficial* results for each polling station and each election (Senate, Chamber of Deputies, referenda) in real time. The unofficial results were typically reported via phone, so they reflect vote counting times more accurately than official results, which require physical transportation of the hard copy of results to regional courts of appeals. For each municipality, we have two observations for the election and one for each referendum. Each observation is a time stamp indicating the reporting time of the municipality's last reporting polling station.[7] From the raw data, we construct four vote counting times per municipality. A municipality's *Senate time* and *total time* are the times that Senatorial and Chamber of Deputy results, respectively, were reported, minus 3pm–polling station closing time.[8] A municipality's *referendum time* in either referendum is the time at which referendum results were reported minus 11pm.

Figure 1 shows the distribution of (total) vote counting times in the election (left-hand panel)

[6]We control for the number of contested votes in robustness exercises and use the share of contested votes to study the causes for vote counting rate dispersion in Section 4.

[7]The Ministry kept records at the polling station level for municipalities in only 17 provinces and only in the most recent referendum, a point we revisit below.

[8]In principle, we could construct a third measure: *Chamber of Deputies* time, as the difference between *total time* and *Senate time*. But this measure is harder to interpret as the last polling station reporting Senate results may differ from the last polling station reporting Chamber of Deputies results in a given municipality. This might therefore reflect a vote counting time that did not occur at any polling station in the municipality. Our results are robust to using this third measure, with slightly weaker results as could be expected from a noisy measure.

and the December referendum (right-hand panel).[9] The distribution for the April and December referenda are reported in Figure A.3 and A.4, and for the Senate elections in Figure A.5, all in the appendix. The average vote counting time was 5 hours and 16 minutes in the election, 1 hour and 31 minutes in the April referendum, and 1 hour and 54 minutes in the December referendum. This means that the average municipality completed the vote counting task at 8:16PM in the election, half past midnight in the April referendum, and nearly 1AM in the December referendum.[10]

Adjusting for Task Complexity While the vote counting task is very uniform across the country, there are some factors that may make the task more challenging in some municipalities than in others. To address this, we adjust the vote counting rate for information from the electoral rolls. Tables A.1 and A.2 in the appendix show results from a regression of (log) VCR on a number of factors that might affect the complexity of the task. These include the number of challenged, blank, and invalid votes; the closeness of the election, the dispersion of votes across parties, and the number of parties. Having controlled for the complexity of the task, we use residuals from these regressions as "Adjusted VCR", reflecting a measure of vote counting productivity that is adjusted for the complexity of the task. The left-hand panel of Figure A.6 in the appendix shows a strong correlation between the adjusted and raw VCR measures.

Vote Counter Characteristics We surveyed Italian municipalities to learn more about vote-counters' characteristics. Municipalities are required to keep a record of electoral volunteers, but aren't required to report these data to the Ministry of Interior. We sent an email to the relevant contact in each municipality in Italy. We requested an anonymized list of volunteers' characteristics in the 2013 election. 19% of municipalities, covering 22% of polling stations in Italy, responded. They provided information about volunteers (presidents, secretaries, and poll workers) at each polling station, their age, gender, years of education, and employment status. In addition we

[9] We trimmed the bottom two and top two percentiles of the distribution to eliminate outliers.

[10] We noted earlier that there was a potential incentive to complete the task after midnight, as this gave employed poll workers an additional day of unpaid leave. However, very few municipalities in the election completed counting after midnight. In contrast, in the referenda, the majority of municipalities completed vote counting after midnight. In all cases, we do not observe an excess mass (bunching) of vote counting times immediately after midnight, so that the incentive to extend voting beyond midnight does not seem to have affected vote counting rates in practice. Excluding the small number of municipalities that did report after midnight in the election or before midnight in the referenda does not alter our results. In the election, dinner time may have served as a focal point for completing electoral activities. Indeed, we do see an increase in vote counting times ending around 7:30-8:00 and right before 9:00PM. One concern is that vote counting times might be affected by regional differences in dinner times. However, we do not see any patterns (e.g. an unusual number of southern municipalities around 9PM) around these times. Moreover, results are robust when using only referendum results, where dinner time was not a factor.

asked whether the president had experience in previous elections.[11]

Table 1 gives summary statistics of presidents, secretaries, and poll workers in the 2013 election. Poll workers and secretaries were in their mid-30s on average, and over 60% were women. Presidents were nearly a decade older on average and nearly 55% were men. Poll workers had 12 years of education on average, secretaries 14, and presidents nearly 15. The average years of schooling in the general Italian adult population is 10.1, so that vote counters had above-average education. The vast majority of presidents participated in the vote counting process in previous elections. While the majority of presidents and secretaries were employed, only 42% of poll workers were in full-time employment. Instead, 31% of poll workers were students and nearly 13% were unemployed. The remainder were primarily stay-at-home spouses. At the time, the Italian unemployment rate was around 12%, so that the unemployed are roughly proportionally represented in our sample, while students are greatly over-represented.

Vote counting is voluntary and volunteers' characteristics may differ across the country. Of particular concern is that volunteers in low-productivity provinces are negatively selected, creating a spurious correlation between vote counting rates and firm-level productivity. To address this, we control for observables based on our survey of vote counter characteristics. Table A.4 in the appendix shows results of a regression of (log) VCR on vote counters' characteristics. Results in the table are at the municipal level for the nearly 1,000 municipalities that responded and provided complete information on vote-counters' characteristics.[12] We control separately for the characteristics of polling station presidents and other polling station workers.[13]

Vote counters' age and gender had no consistent impact on vote counting productivity. In contrast, measures of human capital did appear to have an effect. Interestingly, it is the team's human capital, rather than the president's that appears to have impacted vote counting productivity. Employment status also had an effect: a municipality comprised entirely of employed team members was 24-26% more productive than a committee entirely comprised of volunteers who were not employed. Students were even more productive than employed vote counters.[14] Finally, experienced

[11] Table A.3 in the appendix compares municipalities that responded to our survey to the full population. The survey appears representative.

[12] In case a volunteer was replaced, we observe the characteristics of the volunteer that participated, not the absent volunteer.

[13] Results are robust to controlling for all three categories of workers separately or pooling the characteristics of all types of electoral volunteers.

[14] This is initial suggestive evidence that the opportunity cost of time was not central in determining vote counting rates. Presumably workers have a higher opportunity cost of time than do students, yet students counted votes more rapidly.

presidents presided over more productive polling stations.[15]

We label residuals from this regression as "Controlled VCR". The right-hand panel of Figure A.6 in the appendix shows that this measure is strongly correlated with Adjusted VCR, with a statistically significant Spearman correlation of 0.7.[16]

Labor Productivity in Firms We use the ORBIS database from Bureau van Dijk to measure labor productivity in firms. The dataset provides balance sheet information for 3.7 million Italian firms: more than half of all firms in Italy. The firms in our data employ 15.8 million workers, or more than 80% of all private sector employment. These firms create a total value added of €600 billion, nearly 40% of GDP. We measure labor productivity as value added per employee averaged over 2004-2013. We average productivity for each firm over the decade preceding the election to smooth out any differential business cycle conditions across the country. In studying industry-level variation, industries are defined by NACE Rev.2 at the three digit level. Data on labor intensity and skill intensity of each industry (for manufacturing industries only) are taken from the NBER-CES Manufacturing Industry Database (Bartelsman & Gray 1996). When we aggregate value added per worker to the municipal or province level, we weight firms using firm-level employment weights. This translates our measure from value added per worker in the average firm to the average value added of workers. Our level results are robust to using the former measure.[17]

The Vote Counting Rate We now translate vote counting times and the number of votes into a productivity measure. We define the vote counting rate (VCR) for election s in municipality m as

$$VCR_{ms} \equiv \frac{\tau_{ms} v_{ms}}{\sigma_m h_{ms}}, \tag{1}$$

[15] Past experience of other electoral volunteers was not available.

[16] Results are also robust to controlling for *differential* selection on observables between the north and south of Italy. Results of this regression, which includes interactions between poll workers' characteristics and North and South dummies are shown in Table A.5 in the appendix. No clear North-South pattern emerges from this regression. This regression also controls for whether poll workers were randomly selected. Vote counting was similarly slower where poll workers were randomly selected in both the north and the south of Italy, suggesting no differential selection between the two areas due to differences in appointment methods. This also suggests that non-randomly-selected vote counters weren't negatively selected in either part of the country.

[17] One limitation of firm-level (as opposed to plant-level) data is the existence of multi-plant firms, with plants in several provinces. We code the firm's province based on its registered headquarters, but the firm may employ workers in plants located in other provinces as well. We therefore exclude the 10% largest firms in terms of value added when calculating average labor productivity, eliminating firms that are likely to have multiple plants. Our results are robust to including all firms or excluding the top 20% or top 50% of firms.

where h_{ms} is counting time in hours; τ_{ms} is turnout as a share of total eligible voters; v_{ms} is the number of eligible voters; and σ_m is the number of polling stations. Hence $\tau_{ms} v_{ms} / \sigma_m$ is the number of votes to be counted per polling station. VCR_{ms} approximates of the number of votes counted per polling station per hour. The task is a group task and VCR gives the vote counting committee's productivity. The number of polling workers is constant across polling stations within an election, so that the cross-sectional variation in votes counted per worker is the same as the variation in this measure of group productivity.

A challenge with this measure is that we observe the counting time h_{ms} for the last polling station in each municipality. In contrast we observe the average number of ballots per polling station in a municipality. Hence in equation (1) we are dividing the *average* number of votes per polling station in municipality m with the *largest* vote counting time in the municipality. While we would ideally observe mean vote counting times, data from the few provinces for which we have the full distribution of polling station reporting times in the December referendum shows that this isn't a problem in practice.

Regressing VCR calculated using times from the last polling station on VCR using times from the average polling station gives a nearly one-to-one mapping between the two measures, with an R^2 of 0.8. The primary problem with using "last" rather than "mean" time is that the former might relatively understate VCR for municipalities with higher variance, likely those with more polling stations, following the predictions of extreme value theory.[18] Despite this concern, Table A.6 in the appendix shows that VCR measured with last polling station time is neither correlated with the number of polling stations nor with its interaction with VCR at the average polling station. Municipalities with a higher *variance* of vote counting times across polling stations do exhibit lower VCR based on the last polling station for a given VCR in the average polling station. A higher variance leads to more extreme values, as expected. However, controlling for the variance of VCR across polling stations has minimal impact on the mapping between VCR at the average and last polling station, indicating minimal bias when measuring VCR at the last polling station.[19] [20]

[18]Imagine that vote counting times are drawn randomly from the same distribution in all municipalities, so that average VCR is the same in all municipalities.Nevertheless, municipalities with more polling stations receive more draws from the distribution, increasing the probability that they obtain an extreme value, leading to a lower VCR measured at the last polling station. Similarly, municipalities with the same number of polling stations but with a higher variance in vote counting times are more likely to obtain an extreme draw.

[19]We show in Section 4 that our results are robust to excluding large cities and in Section 5 that our results are robust to restricting attention to municipalities with one or two polling stations where the difference between mean and max vote counting time is smaller or non-existent.

[20]Table A.7 in the appendix shows that the sample of municipalities that have provided polling-station level data are representative in terms of value added per worker and VCR (measured at the last polling station). Larger municipalities,

Figure 2 shows VCR in the election on the left panel and in the December referendum on the right. (Similar figures for the April referendum and the Senate elections can be found in Figures A.3 and A.5 in the appendix.) The vote counting rate is largely in the 100-300 range and averages 190 in the election, with a standard deviation of 65.[21] Table A.8 in the appendix shows that VCR is highly correlated across electoral events.[22]

Opportunity Cost of Time The correlation between VCR and labor productivity in firms is not meant to represent a causal relationship. Rather, these are two separate measures of output per worker in two different settings. One causal concern nevertheless arises, relating to the opportunity cost of time. The opportunity cost of time may affect electoral workers' incentive to complete the vote counting task rapidly, on one hand, and may be correlated with wages and therefore labor productivity in firms, on the other. If this incentive drives vote counting rates, VCR is simply an indirect measure of labor productivity in firms. Although employers were required to compensate volunteers during their absence, so that opportunity cost is not reflected directly in forgone wages, workers in high-wage municipalities may nevertheless face a higher opportunity cost due to a high value placed on scarce leisure. (This would arise if workers choose working hours and leisure optimally in the workplace.)

To address this concern, we exploit the time series dimension of our data. We observe VCR in the 2013 election and the 2016 referenda. If VCR captures a deeper measure of human capital, its cross-sectional distribution is unlikely to have changed dramatically within 3 years. If, on the other hand, VCR merely captures the opportunity cost of time then it should change with incentives reflected in underlying economic conditions. We investigate whether the change in unemployment and wages from 2013-15 affected vote counting rates. The correlation between the change in these variables and and the log change in VCR is shown in Figure A.9 in the appendix.[23]

There was much variability in the economic recovery from 2013 to 2015. In fact, provinces were as almost as likely to experience an increase in unemployment as they were to experience a decrease, with the change varying from -5 to +10 percentage points. There were also changes in

having a greater number of polling stations, are over-represented in this sub-sample, but these are precisely where we would expect the bias due to the last polling station to be most acute.

[21] 134 in the Senate, 145 in the April referendum, and 254 in the December referendum, with standard deviations of 55, 63, and 100, respectively.

[22] There is a mechanical correlation between the total and Senate time for the 2013 election. We therefore omit Senate VCR from the analysis except for robustness tests.

[23] The figure shows the change in VCR from the election to the referendum of December 2016, but results are similar when using the April referendum or the average VCR of both referenda.

vote counting rates, but these are largely an upward shift reflecting faster vote counting rates in the referendum in all provinces. Regressing the change in VCR on the change in unemployment (or wages) gives a tightly estimated zero with an R-square of essentially zero. There may be slower moving components of opportunity cost of time that aren't reflected in cyclical changes in wages and employment but that may affect vote counting rates. However, the test we conduct here shows no evidence that the opportunity cost of time was a factor in determining VCR.

4 VCR as Labor Efficiency and the Role of Social Capital

We now relate vote-counting productivity to private sector productivity. First, we show a correlation between productivity in the vote-counting task and labor productivity in Italian provinces. The correlation goes beyond (survives controls for) traditional explanations for labor productivity. We then use firm-level data to show that VCR relates to a labor-augmenting component of productivity. Finally, we give evidence that VCR is related to social capital.

Dispersion of VCR and Labor Productivity Figure 3 shows the distribution of (log) value added per worker across Italian provinces (in red) alongside the distribution of VCR. The primary explanations for labor productivity–technology, capital per worker, factor misallocation–aren't present in the vote counting task. Similarly, many of the measurement issues present in firm-level data–revenue based measures of productivity, confounding market power, different organizational structures and workers' tasks–are absent from the vote counting task. VCR isolates labor productivity from all these factors and one might therefore expect it to show lower dispersion than labor productivity in firms. Instead, VCR shows roughly the same variation as does value added per worker. Labor productivity shows high variation through VCR even in a setting where that controls for the most common explanations for productivity dispersion.[24]

VCR and Productivity in Firms are Correlated Not only do VCR and labor productivity in firms show similar variance: they are also strongly correlated. The left-hand panel of Figure 4 shows a map of Italy with average VCR at the province level for the 2013 elections. Shades reflect quartiles of the VCR distribution, with darker shades reflecting faster vote counting. This is compared with the right-hand panel, which shows the average value added per worker in each province, again shaded by quartiles. Vote counting is faster in the north of Italy than in the south,

[24]The figure averages VCR in the elections and the two refernda after normalizing the three to have the same mean.

mirroring the north-south divide in labor productivity. But there is also significant within-area variation in, and correlation between, the two variables. For example, Emilia Romagna was among the fastest in vote counting and is among the most productive regions in northern Italy. Figure 5 shows this information as a scatter plot with the top panel showing the correlation at the province level and the bottom panel at the municipality level. Value added per worker in firms is highly correlated with VCR, with a Spearman correlation of 0.71 at the province level (both variables in logs, statistically significant at the 99% confidence level and a regression coefficient of 0.50). The correlation at the municipal level is 0.39 (also significant at 99% and a regression coefficient of 0.52). Figure A.7 in the appendix show that these correlations also hold in the referenda.

VCR Goes Beyond Traditional Explanations of Labor Productivity Table 2 shows regressions of the labor productivity in Italian municipalities on VCR. All elections and referenda are pooled and the regressions include poll by area fixed effects (South, Center, North). Standard errors are clustered at the Area-by-election level. Column (1) shows a statistically significant relationship with a percent increase in VCR predicting more than a fifth of a percent increase in firms' labor productivity in the same municipality.

We posited that VCR gives a measure of labor-augmenting productivity that goes beyond traditional explanations for productivity differences across regions. Supporting this, the remaining columns include controls, organized in blocks that correspond to prevalent explanations for productivity differences across regions. Column (2) shows that other factors of production including private capital (the capital to labor ratio) and public capital do little to alter the correlation between labor productivity and VCR.[25] Provinces with greater capital intensity and more infrastructure have higher labor productivity, but the coefficient on VCR remains of similar magnitude. This is as expected given the minimal role that physical capital plays in the vote-counting task.

Column (3) includes several measures of human capital. We control for years of schooling, health, and local managerial quality.[26] Labor productivity is correlated with education, but we see that the VCR goes beyond traditional measures of human capital in accounting for labor productivity.

[25]Public capital is measured as the logarithm of kms of road per capita. Source: ISTAT

[26]Years of schooling are from ISTAT. Health is measured as deaths of individuals aged 0-74 years whose cause of death is identified as treatable (most deaths for this reason could be avoided through timely and effective healthcare, including secondary prevention and treatments) or preventable (most deaths for this reason could be avoided with effective primary prevention and public health interventions) per 10,000 residents. Source: ISTAT. Managerial quality is and index from Bloom & Van Reenen (2007, 2010) and is measured at the regional level.

Column (4) controls for measures of local institutional quality: corruption and Mafia presence.[27] The correlation between VCR and labor productivity in the private sector appears unrelated to these institutional features. We have noted that the vote counting task is administered at the national level, detaching it from local institutions. See Appendix B for further discussion of electoral institutions and the Mafia's interference in Italian election (and lack thereof in the elections we study).

Finally, in Column (5), we control for variables related to social capital. These include a survey measure of interpersonal trust, a measure of civicness, and a measure of work ethic.[28] We see that labor productivity in firms is particularly correlated with trust, and that this variable weakens the relationship between labor productivity and VCR. This suggests that VCR and trust share explanatory power for labor productivity in firms. We will use this observation to shed further light on VCR as a measure of social capital in what follows.

Tables A.9 to A.13 in the appendix show several robustness exercises. Table A.9 repeats the regressions, using Adjusted VCR (VCR adjusted for task complexity) instead of the raw measure of VCR. Table A.10 uses Controlled VCR: VCR residualized from vote counter characteristics, as in Table A.4 in the appendix. Table A.11 excludes large cities (the capital of each province). We see that the results are nearly identical and aren't driven by the largest cities. Table A.12 adds a control for population density. More densely populated municipalities do contain more productive firms, but the correlation between labor productivity in firms and vote counting survives this control. The correlation between labor productivity and VCR does decline with this control, reflecting an urban-rural productivity gap both in the workforce and in the vote counting process. Finally, although our baseiline results uses a sample that trims the top and bottom 1% of the VCR distribution, Table A.13 shows that the un-trimmed sample shows an even stronger correlation between VCR and

[27] The Mafia presence variable gives the average (2005-13) annual number of penal actions taken due to mafia-type association in the province per 100,000 inhabitants. Corruption is measured through the average (2005-10) annual number of crimes and prosecutions for corruption in the province per 100,000 inhabitants. Source: Ministero della Giustizia. We include corruption as in institutional variable, but note that Fisman & Miguel (2007) suggest that corruption is both an institutional and a cultural trait.

[28] For "trust", we use survey data collected for the World Value Survey at the provincial level asking citizens how much they trust other citizens. The survey was conducted across 2,000 Italian households in the 1990s. Respondents were asked how much they trusted other Italians in general. Responses were on a scale of 1 to 5, with 5 indicating that they trust them completely and 1 indicating that they do not trust them at all. The measure is then normalized to range from zero to one. The data contains one observation per province, more granular than publicly available data. We don't use the time series component of the WVS data. We thank Luigi Guiso for sharing these data. To measure civic duty, we use the common metric of blood donations: Number of blood bags per million inhabitants. Source: Guiso *et al.* (2004). We thank Luigi Guiso for sharing his data. For work ethic, we used a measure of worker absenteeism as suggested by Ichino & Maggi (2000); Ichino & Riphahn (2005). The measure captures absenteeism among public employees and may confound some aspects of institutional quality. We view absenteeism as largely reflecting an aspect of social capital, although it admittedly may also reflect human capital, for example a disutility of providing work effort.

labor productivity in firms.

Firm-level Analysis We now turn to firm-level data to further investigate the labor-augmenting nature of productivity differences across Italy. To clarify the analysis, we first outline the conceptual framework we use.

Let y_{fim} denote the (logarithm of) output per worker of firm f operating in industry i in municipality m. The firm operates a Cobb-Douglas production function:

$$y_{fim} = \alpha_i \left(e^K_{fim} + k_{fim} \right) + (1 - \alpha_i)\, e^L_{fim}, \tag{2}$$

where α_i gives the (log of) capital-intensity of production in industry i (assumed to be the same across municipalities and firms within the industry), k_{fim} is capital per worker. e^K_{fim} and e^L_{fim} give capital- and labor-augmenting productivity, respectively.

We assume that labor efficiency is (log-)linearly separable across industries and municipalities, so that $e^L_{fim} = e^L_f + e^L_i + e^L_m$.[29] e^L_m gives the mean value of labor efficiency in municipality m; e^L_i is the relative labor efficiency of industry i, with a mean value of zero; and e^L_f is the residual labor efficiency of workers in firm f.

Let us now treat vote counting as an "industry" $i = v$ that is highly labor-intensive as described in Section 2. At the extreme, assume that $\alpha_v = 0$, so that vote counting productivity in polling station f is given by

$$y_{f,i,m} = e^L_f + e^L_{i=v} + e^L_m,$$

where $e^L_{i=v}$ is the average efficiency of vote counters relative to workers' efficiency in other industries. VCR_m is the average vote counting rate in municipality m and is given by $VCR_m = \bar{y}_{i=v,m} = e^L_{i=v} + e^L_m$.[30]

Using this last result, We can write for any firm f in *any* industry:

$$e^L_{fim} = e^L_f + e^L_i - e^L_{i=v} + VCR_m.$$

Using this result in (2) gives

[29] The implicit assumption here is that there is no municipality-by-industry variation in labor-augmenting productivity.

[30] As we noted, we observe the vote counting rate of the slowest, not the average polling station. We discuss the implications in Section 3.

$$y_{fim} = \alpha_i k_{fim} + (1-\alpha_i)\left(e_i^L - e_{i=v}^L\right) + (1-\alpha_i)\, VCR_m + \alpha_i e_{fim}^K + (1-\alpha_i)\, e_f^L. \tag{3}$$

The second term on the right hand side of (3) contains only industry-specific variables and represents the average labor efficiency in industry i (relative to the vote-counting "industry"). This term will be absorbed by industry fixed effects in what follows. The third term is the key term: it gives a mapping between labor productivity in the vote-counting task, VCR, and labor productivity. It predicts that VCR will be more correlated with firm productivity in more labor intensive industries. The final two terms combine to give the residual (relative) productivity of firm f, including capital efficiency and the firm's idiosyncratic labor productivity. Capital-augmenting productivity may exhibit municipal-level variation that correlates with VCR, but this variation will be absorbed by municipal fixed effects below.

We can now translate this equation into an estimating equation of the form.

$$y_{fim} = \delta_i + \delta_m + \beta_k k_{fim} + \beta\,(1-\alpha_i)\, VCR_m + \varepsilon_{fim}. \tag{4}$$

δ_i and δ_m are industry and municipal fixed effects, respectively. The assumption that labor efficiency can be decomposed into additively separable municipal and industry components is akin to assuming that there is no *differential* selection into vote counting across municipalities. However, industry fixed effects absorb any selection into vote counting that is *common* to all municipalities, for example the fact that students are more likely to volunteer to the electoral process. We discuss an important potential driver of differential selection–differences in the opportunity cost of time–in Section 3.

Municipal fixed effects absorb all municipality-specific drivers of productivity, including those that VCR itself measures. Remaining, however, are industry-by-municipality productivity variation captured by the term $(1-\alpha_i)\, VCR_m$. In words: because VCR_m captures a particularly labor-augmenting component of productivity, we expect it to be more correlated with output per worker in industries that are more labor intensive. We obtain the capital share α_i of each industry using US data, giving a more exogenous classification of industries, consistent with Rajan & Zingales's (1998) methodology.[31]

While we aren't making a causal statement, it is worthwhile noting factors that might confound

[31] We use the NBER-CES Manufacturing Industry Database, Bartelsman & Gray (1996). This restricts our sample to manufacturing industries only. α_i is measured as one minus the ratio of production worker wage income to value added.

the correlation between $(1 - \alpha_i)\, VCR_m$ and output per worker. Given the industry and municipal fixed effects, confounding factors would have to be productivity differences across municipalities that are increasing in firms' labor-intensity and are correlated with vote counting rates, but not due to differences in labor efficiency.

Our analysis is in the spirit of Rajan & Zingales (1998). To investigate the relationship between growth and financial development, they show that financially-dependent firms grow disproportionately fast in countries with more developed financial markets. In a similar two-way fixed effects specification, we investigate the importance of regional differences in labor-augmenting productivity, by showing that productivity in the labor-intensive vote-counting process shows a disproportionate regional correlation with more labor-intensive firms.

The results are shown in Table 3. Our main hypothesis is $\beta > 0$, which holds if the correlation between measured labor productivity and VCR is greater for firms that in relatively more labor intensive sectors. In the first two columns we don't control for firms' capital-to-labor ratio, k_{fim} The coefficient is indeed positive and statistically significant. Note that we need only include VCR_m interacted with $(1 - \alpha_i)$ because the direct correlation between VCR_m and TFP is absorbed by municipal fixed-effects.

The second column in the table adds a control for the interaction between an industry's labor intensity $(1 - \alpha_i)$ and the average years of schooling in province m. In doing, so it replaces VCR_m in our analysis with a traditional measure of human capital. We have posited that $VCR_m = e^L_{i=v} + e^L_m$ so that we can control for any other factor that might affect labor efficiency, similarly interacted with $(1 - \alpha_i)$. In particular, we'd expect that labor productivity would be more correlated with years of schooling in industries that are more labor intensive. Table 3 shows that this is indeed the case, but that the relationship between VCR interacted with labor intensity remains statistically significant and virtually unchanged. This is again indicates that VCR captures a component of labor efficiency that is orthogonal to traditional measures of human capital.

Columns (3) and (4) in the table repeat the regressions, now controlling for the capital to labor ratio. The last two columns use TFP as the dependent variable instead of labor productivity, where $TFP_{fim} \equiv y_{fim} - \alpha_i k_{fim}$ residualizes labor productivity from capital's contribution. The results are virtually unchanged.

Social Capital and Labor Efficiency in Contentious Tasks We have seen that VCR captures a labor-augmenting component of productivity that is correlated with labor productivity in firms.

We have also seen that this measure goes beyond conventional explanations for labor productivity, including traditional measures of human capital. Table 2 indicated a correlation between VCR and measures of *social* capital. As we previously noted, the correlation between VCR and a measure of interpersonal trust appears particularly robust.

We further investigate the role of trust using features of the vote counting process itself. We hypothesize that trust is particularly important when a group task is contentious. We noted earlier that the polling station president is required to keep a record of disagreement among vote counters on how to allocate a vote: whether a vote was invalid, for example. Adjusted VCR controls for the share of contested votes in an election. But the share of contested votes also provides useful information: it can be seen as a measure of the degree of conflict and disagreement among the vote-counting team. We use this insight to investigate the relationship between trust and teams' performance.

Results can be seen in Table 4. As before, we find that vote counting was slower where the share of challenged votes was higher. The cost of conflict is substantial: an increase of one-hundredth of a percent in the share of contested votes in a municipality is associated with a one percent productivity decline.[32] Consistent with Table 2 we also find that provinces with a higher degree of self-reported trust were more productive in counting votes.[33] This measure comes from an external source and reflects generalized trust in the province, not in a particular polling station. Moving from a province with the median trust score to one with the top trust score is associated with a productivity increase of close to a third.

However, our focus is on the interaction between challenged votes and trust. The interaction term is positive, large, and statistically significant. The "trust" variable is normalized to range from zero to one. The estimated coefficient predicts that challenged votes would have no effect on vote counting productivity in provinces with the highest level of trust: a hypothetical province where all respondents said that in general, they "trust other Italians completely".

Moving from a fully trusting province to the polar opposite, a province where all respondents "do not trust them at all", reduces vote counting productivity by 1% when 0.01% of votes are contested. The results point to the importance of trust in affecting productivity, particularly when the task involves conflict resolution.[34] Contested ballots affect productivity but far less so when

[32] The median municipality had no contested votes. The median share of contested votes for municipalities that had at least one contested vote was one hundredth of a percent.

[33] Trust is measured at the provincial level: we assign the same trust score to all municipalities in the province.

[34] The regression controls for the number of blank and invalid votes. Results are also robust to controlling for their interaction with "trust" as well.

trust is high, indicating that trust may lubricate conflict resolution.

Our setting doesn't provide a "smoking gun" for the root causes of labor efficiency dispersion. In addition, the role of trust in resolving the conflict of challenged votes cannot be the full explanation for differences in labor efficiency: The majority of municipalities had no contested votes. However, the heterogeneity patterns shown here are indicative that trust may play an important role in facilitating productivity in a contentious group task and that VCR may be associated with social capital.

Takeaways We have illustrated that productivity in the vote-counting task, VCR, is correlated with and shows similar spatial dispersion as does labor productivity in firms. This correlation goes beyond conventional explanations for productivity dispersion, such as infrastructure, institutions, and education. The nature of the vote counting task suggests a labor-augmenting aspect of productivity, an intuition that is corroborated by the stronger correlation between VCR and labor productivity in labor-intensive industries. VCR is correlated with other measures of social capital, most robustly with the World Value Survey measure of "Trust". We provide further support for the importance of social capital by showing that contested aspects of the group task only affect productivity when trust is low.

5 Labor Efficiency in Development Accounting

Having ascertained VCR's relevance as a measure of labor-augmenting productivity, we now assess its quantitative importance. We use a development accounting variance decomposition to explore this question. In this exercise, output per worker is given by

$$y_p = A_p + \alpha k_p + (1 - \alpha) \left(h_p + VCR_p \right). \tag{5}$$

A_p (log TFP) summarizes the contribution of all other factors, including capital efficiency, to output per worker in province p. We allow for two components of labor-augmenting productivity: a traditional measure of human capital h_p, that derives from years of schooling, and VCR, our measure of labor efficiency. Including both measures allows a "horse race" between the two.

We set $\alpha = \frac{1}{3}$ as is standard in the literature and follow the convention of predicting the value added of a year of schooling from micro-data Mincerian regressions of years of schooling on wages. Formally, if ϕ is the return to a year of schooling and Y_p is the average number of years of schooling in province p, then the logarithm of the educational component of human capital is given by

$$h_p = \frac{\phi}{1-\alpha} Y_p.$$

Ciccone *et al.* (2006) estimate an average return to a year of schooling of 6% for Italy, but with some heterogeneity across different levels of educational attainment. As in Hall & Jones (1999), we allow for a piece-wise linear relationship between years of schooling and the educational component of human capital, extending the simple linear relationship in (5).[35] [36]

We use Klenow & Rodriguez-Clare's 1997 variance decomposition to obtain the share of the variance that can be attributed to each factor of production:

$$\text{Accounted Variation}\left(X_p\right) = \frac{cov\left(f\left(X_p\right), y_p\right)}{var(y_p)},$$

where X_p is a vector of measured production inputs and $f\left(.\right)$ summarizes the role of factors of production (everything but A_p) in (5). Residual unexplained variation is attributed to TFP and given by one minus this measure.[37]

Results are summarized in Table 5. A production function including capital per worker alone ($f\left(X_p\right) = \alpha k_p$) accounts for merely 13% of the of the variance in output per worker. This reaffirms the now-standard result in the literature on development accounting that under-investment alone is insufficient to explain low incomes in under-developed countries and regions. When the contribution of educational attainment is included ($f\left(X_p\right) = \alpha k_p + \phi h_p$) factors of production account for 20% of the variance. These standard factors of production leave that vast majority of the variation unexplained and attribute it to TFP. When we add our measure of labor efficiency, measured by VCR, to the production function ($f\left(X_p\right) = \alpha k_p + \phi h_p + (1-\alpha) VCR_p$) we now account for more than half of the variance in our baseline scenario. VCR alone accounts for nearly a third of the variance.

Our preferred specification measures VCR averaged across all elections and referenda, to re-

[35] We allow different returns on years of schooling up to 8 years, between 8 and 12 years, and above 12 years.

[36] Hanushek & Woessmann (2012) argue that quality of education needs to be taken into account alongside years of schooling. As a robustness check, we introduced the average PISA score to the Mincer regression. The quality-adjusted schooling measure of human capital increases the contribution of human capital in explaining the variance of output per worker across provinces by around 10 percentage points, but doesn't affect the contribution of labor efficiency as measured by VCR.

[37] Caselli (2005) proposes an alternative measure: Accounted Variation $\left(X_i\right) = \frac{var(f(X_i))}{var(y_i)}$. Our results are robust to this approach. Weil (2007) builds on this but displays the full variance-covariance decomposition of output per worker. Appendix table A.14 shows a similar table in our setting. In this table, a production function corrected for VCR accounts for more than 100% of the variance in, i.e. over-explains, output per worker.

duce idiosyncratic factors and measurement error in any specific poll. When using the elections alone, VCR accounts for more–nearly half–of the variation in labor productivity and leaves only a third of the variation unexplained. The referenda alone account for slightly less. The two measurements bound the role of labor-augmenting productivity as measured by VCR between 26% and 44%.

The remainder of the table reports several robustness checks. These include controlling for possible differences in task complexity (Adjusted VCR), vote counters' demographic characteristics (Controlled VCR), residualizing VCR from fixed effects for the number of polling stations in the municipality, and restricting the sample to municipalities with only one or two polling stations. Results vary slightly across specifications, but VCR accounts for a substantial amount of the variation in labor productivity across provinces in all cases.

Counterfactual Exercises using VCR as Labor Efficiency This framework allows us to conduct a number of counterfactual "experiments", to which we now turn. The provincial distribution of output per worker y_p as measured in firms is shown (in red) in Figure 6. The distribution is bimodal, reflecting the north-south productivity gap. The figure also plots (in black) the distribution in terms of efficiency units of labor, given by $\frac{Y_p}{e_p L_p}$. This can be viewed as the distribution of labor productivity that would prevail if labor efficiency as captured by VCR were equalized across provinces. This distribution is "better behaved", with a single peak and lower variance. Quantitatively, the 75%-25% interquartile gap (IQR) in output per worker is 28%, but it is only 17% in value added per efficiency units of labor, cutting the IQR by nearly 39%. The decline in the IQR is reported for all the exercises described above in the last column of Table 5.

Thinking along north-south lines, value added per worker is 26% higher in northern Italian firms than in the south. As a counterfactual, we assign the median labor efficiency of northern provinces to all southern provinces whose labor efficiency is below the northern median. Under this counterfactual, the north-south gap in output per worker would decline to 9%, cutting the north-south labor productivity gap by nearly two thirds.

6 Conclusions

We measure output per worker in the vote counting process of the Italian election of 2013 and two referenda in 2016. The vote counting task is simple, uniform, and readily comparable across municipalities. The task involved little physical capital, no modern technology, and minimal skills. The process was governed at the national level and provided workers with identical incentives. This measure captures labor-specific efficiency that is clean from many of the confounding factors when measuring output per worker using firm level data. We nevertheless find that this measure shows similar geographical dispersion as does labor productivity in firms and the two measures are correlated. Vote counting productivity is particularly correlated with firm level productivity in labor intensive industries, further suggesting that our measure captures labor-specific productivity. A strong correlation with trust suggests a role for social capital and high-trust provinces appear to be able to resolve conflicts involving contested votes with greater ease. A development accounting exercise estimates that labor efficiency accounts for 40% of the variation in output per worker across provinces. Equalizing labor efficiency would substantially compress the provincial dispersion in labor productivity and would halve the north-south productivity divide

We hope our newly collected data will be of use to future empirical researchers. Our measure captures labor efficiency, measured in units of output per worker, is available for all Italian municipalities with four observations in three separate years. This approach should be replicable in other countries where the vote counting process is similarly uniform across the country and we hope that future research will find use for the methodology proposed here in other settings.

References

ALESINA, ALBERTO, & GIULIANO, PAOLA. 2015. Culture and institutions. *Journal of economic literature*, **53**(4), 898–944.

ANELLI, MASSIMO, COLUSSI, TOMMASO, & ICHINO, ANDREA. 2021. Aversion to breaking rules and migration.

BANDIERA, ORIANA, BARANKAY, IWAN, & RASUL, IMRAN. 2011. Field Experiments with Firms. *The Journal of Economic Perspectives*, **25**(3), 63–82.

BANFIELD, EDWARD C. 1958. *The Moral Basis of a Backward Society*. Glencoe, IL: The Free Press.

BARTELSMAN, ERIC J., & GRAY, WAYNE. 1996 (October). *The NBER Manufacturing Productivity Database*. Working Paper 205. National Bureau of Economic Research.

BLOOM, NICHOLAS, & VAN REENEN, JOHN. 2007. Measuring and Explaining Management Practices Across Firms and Countries. *The Quarterly Journal of Economics*, **122**(4), 1351–1408.

BLOOM, NICHOLAS, & VAN REENEN, JOHN. 2010. Why Do Management Practices Differ across Firms and Countries? *Journal of Economic Perspectives*, **24**(1), 203–24.

CASELLI, FRANCESCO. 2005. Accounting for Cross-Country Income Differences. *Chap. 9, pages 679–741 of:* AGHION, PHILIPPE, & DURLAUF, STEVEN (eds), *Handbook of Economic Growth*. Handbook of Economic Growth, vol. 1. Elsevier.

CHONG, ALBERTO, PORTA, RAFAEL LA, DE SILANES, FLORENCIO LOPEZ, & SHLEIFER, ANDREI. 2014. Letter Grading Government Efficiency. *Journal of the European Economic Association*, **12**(2), 277–299.

CICCONE, ANTONIO, CINGANO, FEDERICO, & CIPOLLONE, PIERO. 2006. The private and social return to schooling in Italy. *Bank of Italy Occasional Paper*.

CLARK, GREGORY. 1987. Why Isn't the Whole World Developed? Lessons from the Cotton Mills. *The Journal of Economic History*, **47**(01), 141–173.

CLARK, GREGORY. 2007. *Farewell to Alms: A Brief Economic History of the World*. Princeton, NJ: Princeton University Press.

COHN, ALAIN, MARÉCHAL, MICHEL ANDRÉ, TANNENBAUM, DAVID, & ZÜND, CHRISTIAN LUKAS. 2019. Civic honesty around the globe. *Science*, **365**(6448), 70–73.

FINAN, FREDERICO, OLKEN, BENJAMIN A., & PANDE, ROHINI. 2015 (Dec.). *The Personnel Economics of the State*. NBER Working Papers 21825. National Bureau of Economic Research, Inc.

FISMAN, RAYMOND, & MIGUEL, EDWARD. 2007. Corruption, norms, and legal enforcement: Evidence from diplomatic parking tickets. *Journal of Political economy*, **115**(6), 1020–1048.

GAMBETTA, DIEGO. 1996. *The Sicilian Mafia: The Business of Private Protection*. Cambridge, MA: Harvard University Press.

GUISO, LUIGI, SAPIENZA, PAOLA, & ZINGALES, LUIGI. 2004. The Role of Social Capital in Financial Development. *American Economic Review*, **94**(3), 526–556.

GUISO, LUIGI, SAPIENZA, PAOLA, & ZINGALES, LUIGI. 2006. Does Culture Affect Economic Outcomes? *Journal of Economic Perspectives*, **20**(2), 23–48.

GUISO, LUIGI, SAPIENZA, PAOLA, & ZINGALES, LUIGI. 2008a (Aug.). *Long Term Persistence*. NBER Working Papers 14278. National Bureau of Economic Research, Inc.

GUISO, LUIGI, SAPIENZA, PAOLA, & ZINGALES, LUIGI. 2008b. Trusting the Stock Market. *The Journal of Finance*, **63**(6), 2557–2600.

GUISO, LUIGI, SAPIENZA, PAOLA, & ZINGALES, LUIGI. 2008c. Trusting the Stock Market. *Journal of Finance*, **63**(6), 2557–2600.

HALL, ROBERT E, & JONES, CHARLES I. 1999. Why do some countries produce so much more output per worker than others? *The quarterly journal of economics*, **114**(1), 83–116.

HANUSHEK, ERIC, & WOESSMANN, LUDGER. 2012. Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation. *Journal of Economic Growth*, **17**(4), 267–321.

HENDRICKS, LUTZ, & SCHOELLMAN, TODD. 2018. Human Capital and Development Accounting: New Evidence from Wage Gains at Migration. *The Quarterly Journal of Economics*, **133**(2), 665–700.

HESS, HENNER. 1973. *Mafia and Mafiosi: The Structure of Power*. Lexington, MA: Lexington Books.

HSIEH, CHANG-TAI, & KLENOW, PETER J. 2010. Development Accounting. *American Economic Journal: Macroeconomics*, **2**(1), 207–23.

ICHINO, ANDREA, & MAGGI, GIOVANNI. 2000. Work environment and individual background: Explaining regional shirking differentials in a large Italian firm. *The Quarterly Journal of Economics*, **115**(3), 1057–1090.

ICHINO, ANDREA, & RIPHAHN, REGINA T. 2005. The Effect of Employment Protection on Worker Effort: Absenteeism During and After Probation. *Journal of the European Economic Association*, **3**(1), 120–143.

KLENOW, PETER, & RODRIGUEZ-CLARE, ANDRES. 1997. The Neoclassical Revival in Growth Economics: Has It Gone Too Far? *Pages 73–114 of: NBER Macroeconomics Annual 1997, Volume 12*. NBER Chapters. National Bureau of Economic Research, Inc.

MANKIW, N. GREGORY, ROMER, DAVID, & WEIL, DAVID N. 1992. A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, **107**(2), 407–437.

PUTNAM, ROBERT D., LEONARDI, ROBERT, & NANETTI, RAFFAELLA. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

RAJAN, RAGHURAM G., & ZINGALES, LUIGI. 1998. Financial Dependence and Growth. *The American Economic Review*, **88**(3), 559–586.

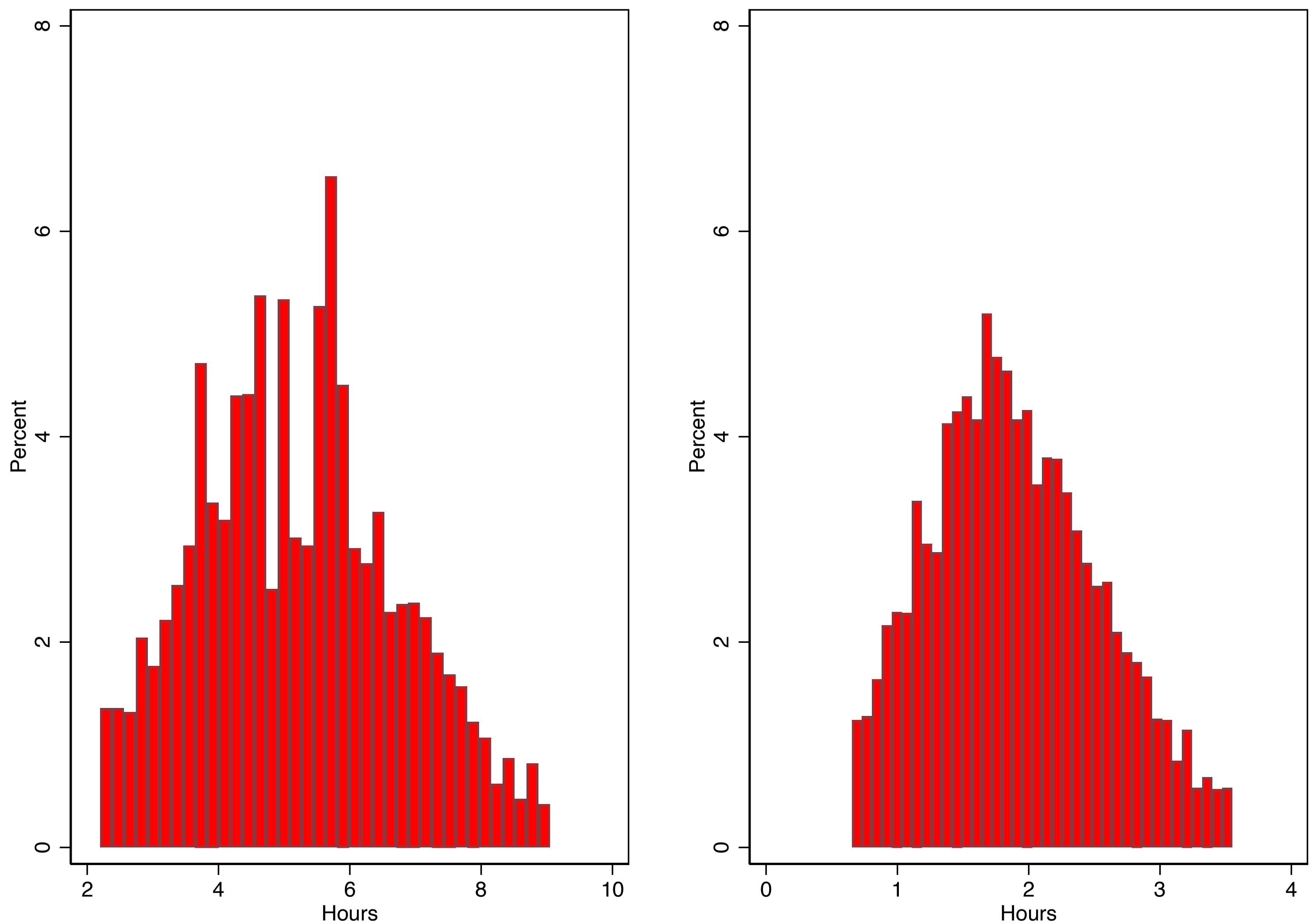
SHAPIRO, CARL, & STIGLITZ, JOSEPH E. 1984. Equilibrium Unemployment as a Worker Discipline Device. *American Economic Review*, **74**(3), 433–44.

SYVERSON, CHAD. 2004. Market Structure and Productivity: A Concrete Example. *Journal of Political Economy*, **112**(6), 1181–1222.

SYVERSON, CHAD. 2011. What Determines Productivity? *Journal of Economic Literature*, **49**(2), 326–365.

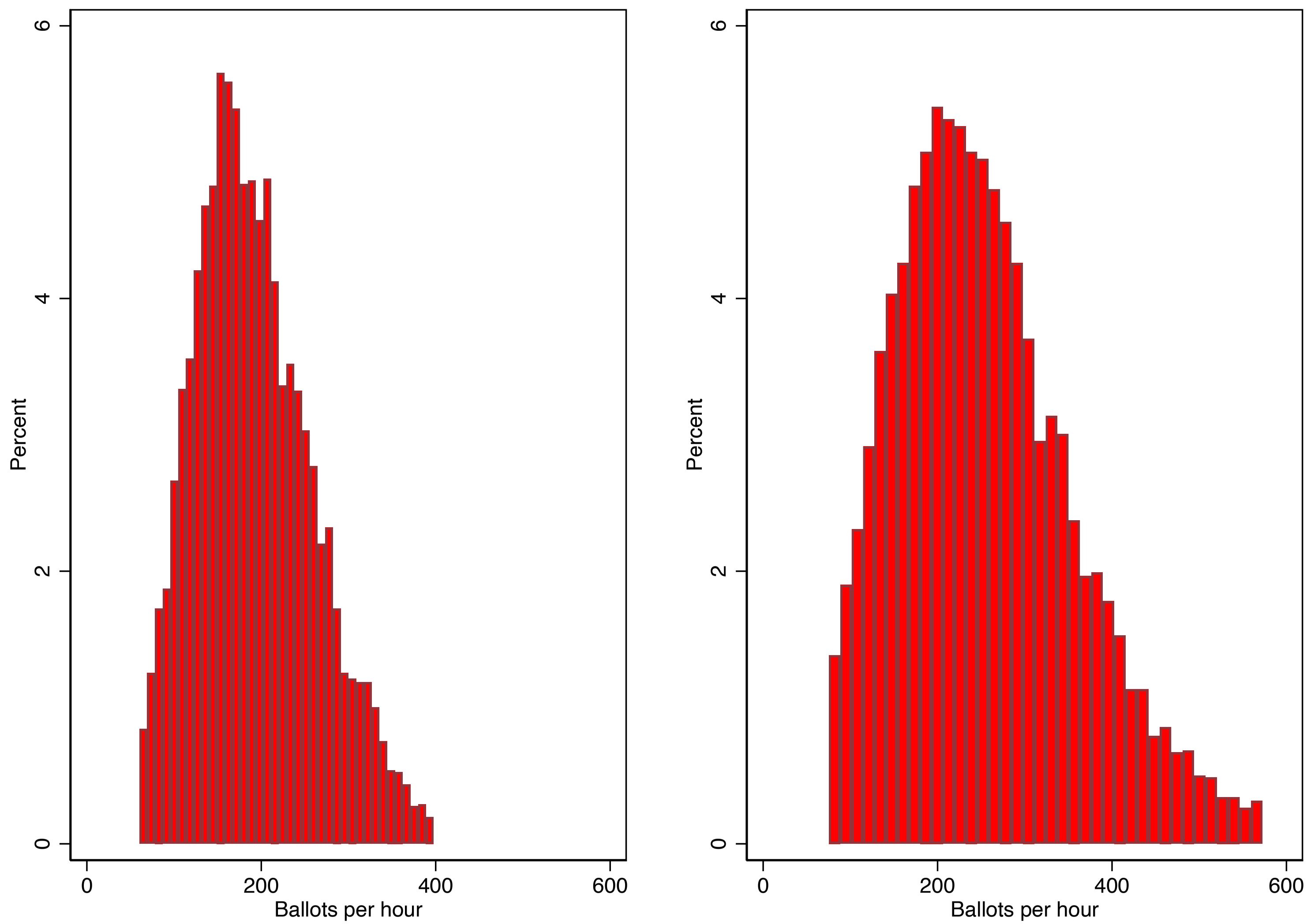
WEIL, DAVID N. 2007. Accounting for the Effect Of Health on Economic Growth*. *The Quarterly Journal of Economics*, **122**(3), 1265–1306.

Figure 1: **Vote Counting Times**



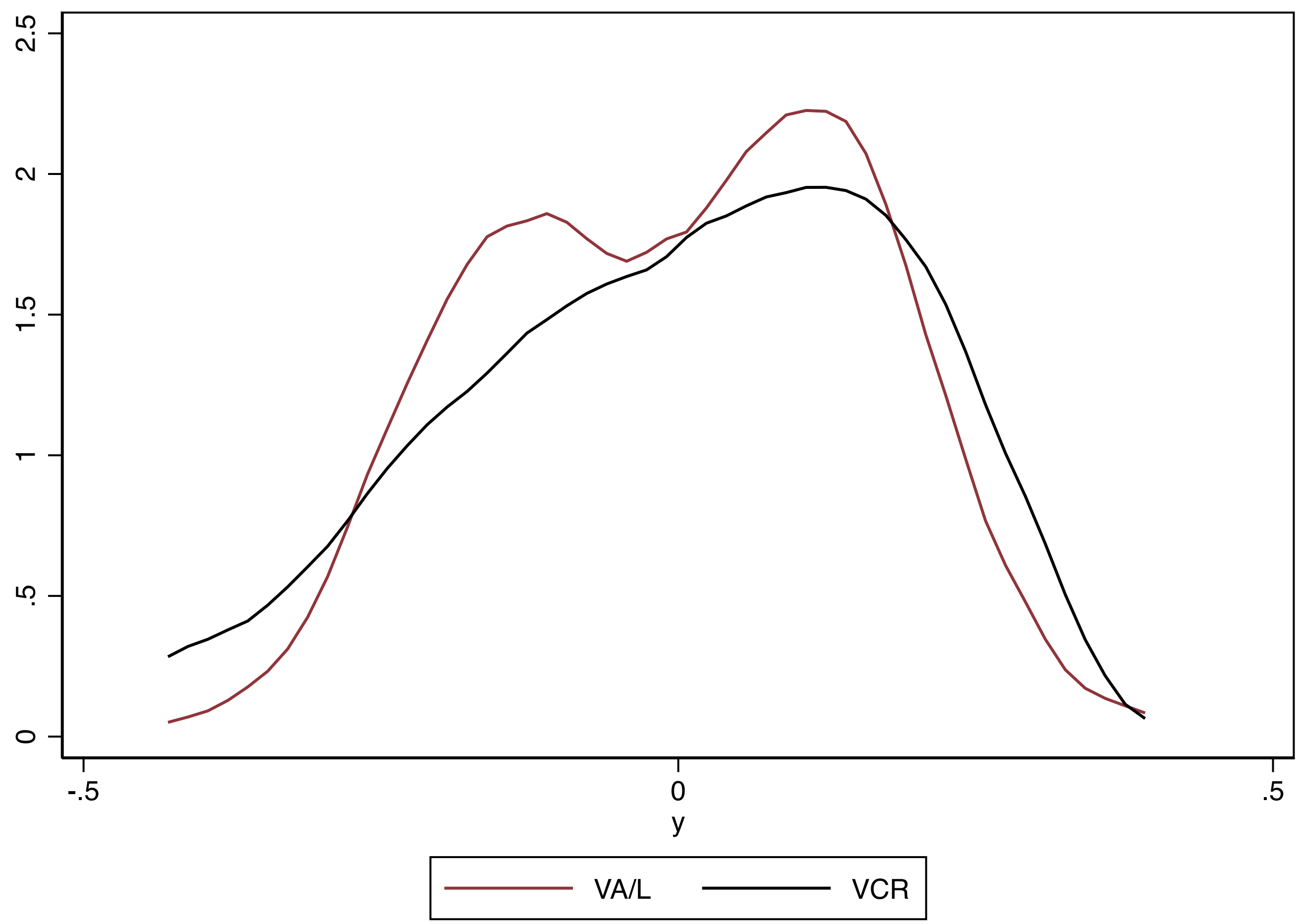
Note: The figure shows the distribution of (total) vote counting times in the election (left panel) and the December referendum (right panel).

Figure 2: **Vote Counting Rates**



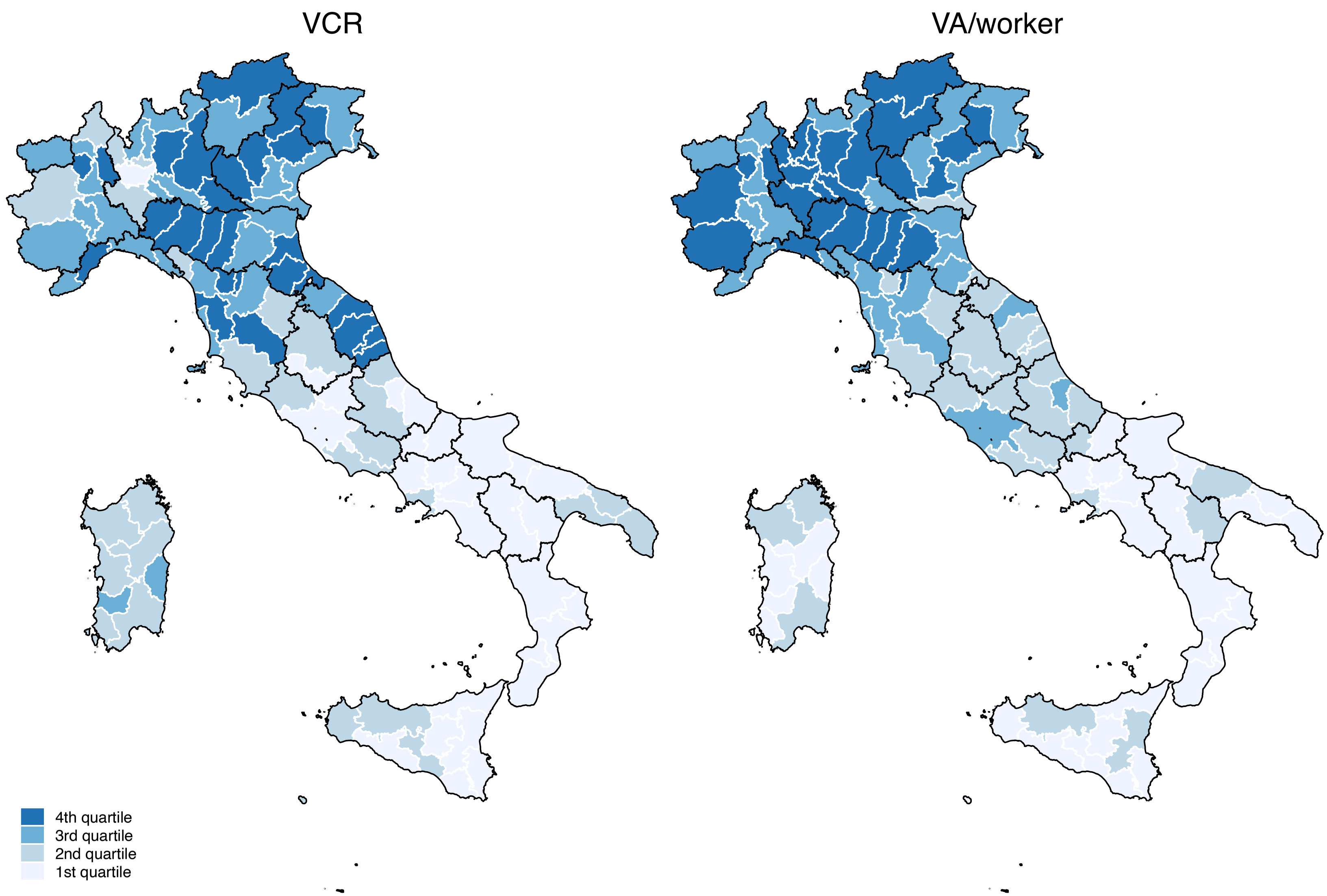
Note: The figure shows the distribution of vote counting rates (VCR) in the election (left panel) based on total counting times and in the December referendum (right panel).

Figure 3: **Distribution of Value Added Per Worker and Vote Counting Rates**



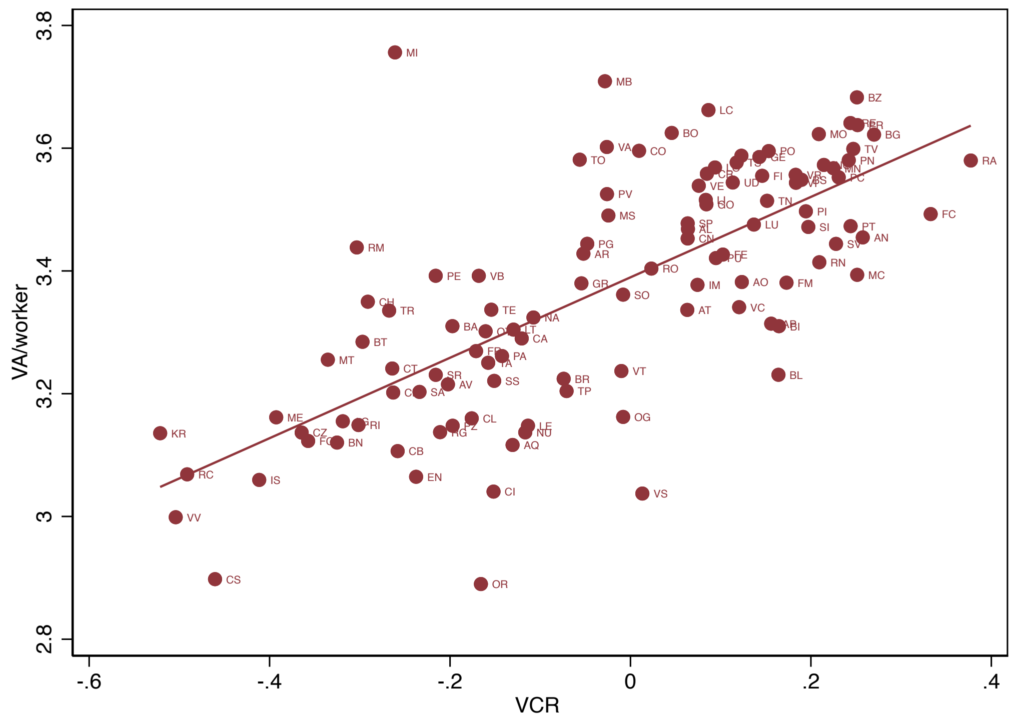
Note: The figure plots the provincial distribution of (log) output per worker as measured in firms (red line) with the distribution of (log) Vote Counting Rates (black line). Both measures are normalized around zero. The two productivity measures show similar geographical dispersion.

Figure 4: **Vote Counting Rates and Value Added Per Worker across Italian Provinces**

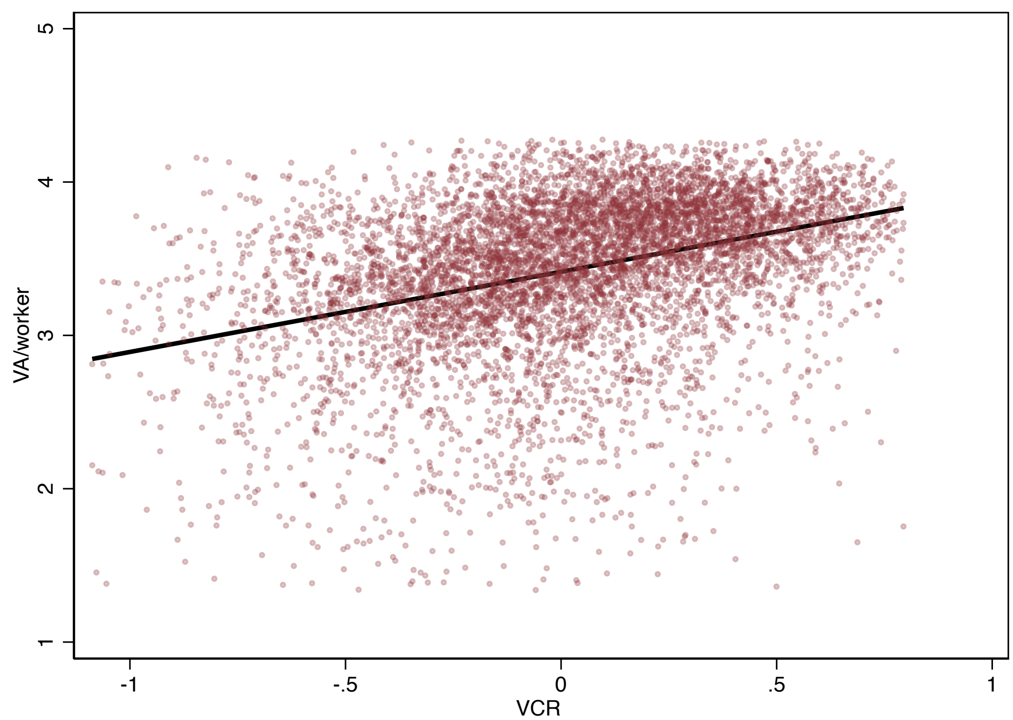


Note: The left panel shows a map of Italy with vote counting rates (VCR) averaged at the province level for the 2013 election (total time). Shades reflect quartiles of the VCR distribution, with darker shades reflecting faster vote counting. The right panel shows value added per worker, shaded by quartiles, with darker shades reflecting more productive provinces.

Figure 5: **Vote Counting Rates and Value Added Per Worker**



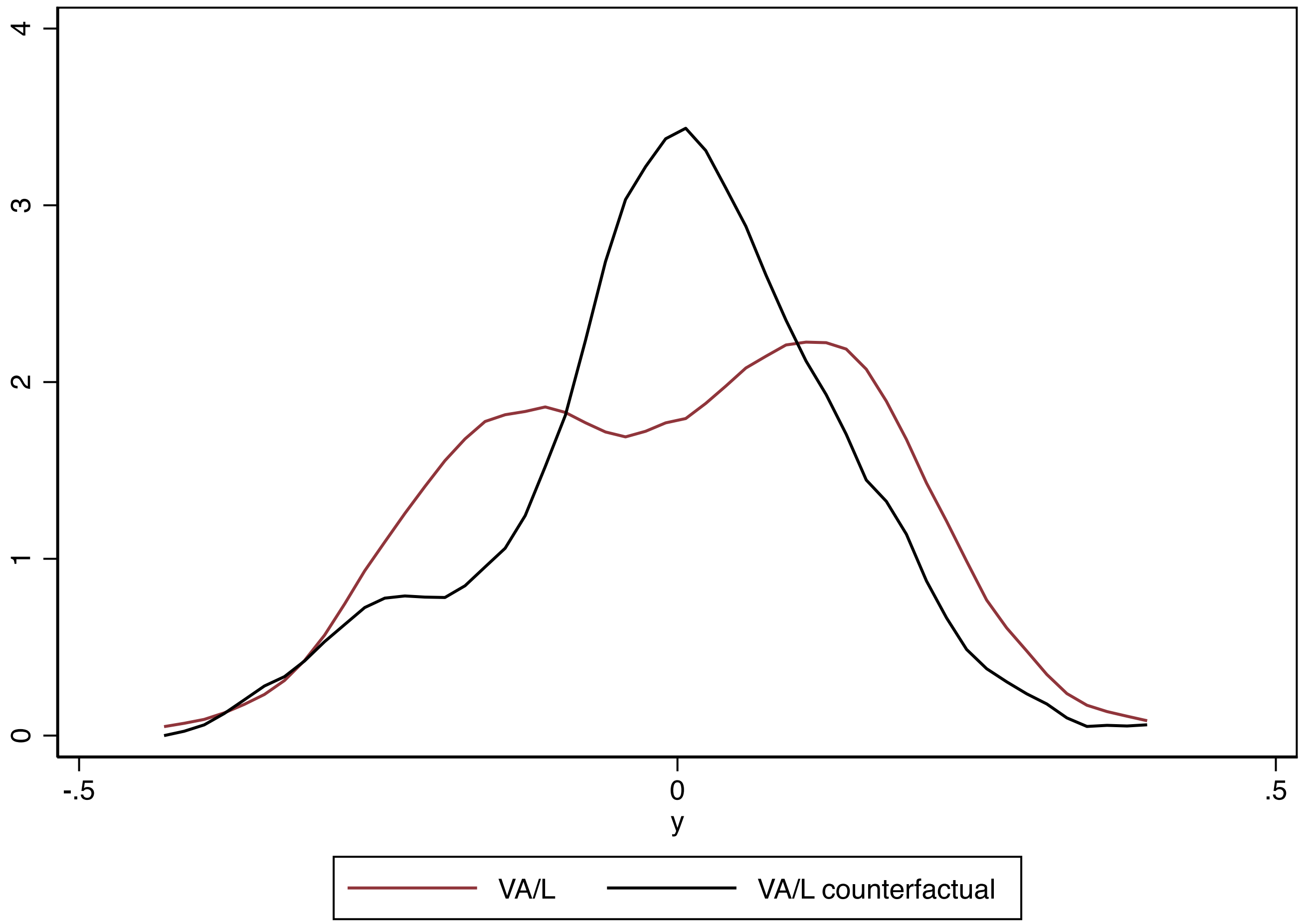
(a) Provinces



(b) Municipalities

Note: The figure compares (log) vote counting rates in the election of 2013 with (log) value added per worker in Italian provinces (panel a) and municipalities (panel b). VCR is normalized to have mean zero. The top and bottom 2% of observations by value added per worker have been trimmed from both panels. At provincial level: correlation=0.71, Spearman's rho = 0.7095***, Slope=.495307***. At municipal level: correlation= 0.36, Spearman's rho = 0.39***, Slope= 0.52***.

Figure 6: **Distributions of Value Added per Worker and Value Added per Efficiency Unit**



Note: The figure plots the provincial distribution of (log) output per worker as measured in firms (red line) and under the counterfactual that all provinces had the same labor efficiency (black line). Both measures are normalized around zero.

Table 1: **Vote Counter Characteristics**

	Presidents	Secretaries	Poll Workers
Age	43.46	35.32	32.89
% Male	.54	.36	.35
Years of Education	14.73	14.04	12.16
% With Experience	.89		
% Not Working	.08	.27	.44
% Students	.04	.2	.31
% Unemployed	.04	.08	.13
% Working	.88	.66	.42

Note: This table reports vote counters' characteristics in the 2013 elections as per our survey of all municipalities in Italy. The response rate was 19%. Each column gives statistics for one category of electoral volunteer. *With Experience* gives the share of polling station presidents who presided in a previous election.

Table 2: **Labor Productivity in Firms, VCR and Other Common Explanations for Productivity**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR	0.218***	0.183***	0.199***	0.222***	0.112***	0.087***
	(0.035)	(0.033)	(0.031)	(0.036)	(0.022)	(0.020)
K/L		0.208***				0.189***
		(0.011)				(0.012)
Infrastructure		0.043***				0.045***
		(0.002)				(0.002)
Education (years)			0.970***			1.080***
			(0.252)			(0.180)
Health			0.258			0.199*
			(0.228)			(0.096)
Management Quality			-0.097**			0.030***
			(0.039)			(0.007)
Mafia				0.017		0.067**
				(0.015)		(0.023)
Corruption				-0.003*		-0.007*
				(0.001)		(0.003)
Trust					1.138***	0.517***
					(0.095)	(0.074)
Absenteeism					-0.000	-0.004
					(0.006)	(0.003)
Blood Donations					-0.125	0.302
					(0.446)	(0.195)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.11	0.25	0.11	0.11	0.15	0.27
ElectionXArea	9	9	9	9	9	9
Observations	20615	19992	19397	20044	15881	14940

Note: The dependent variable is average value added per worker in the municipality. VCR is the vote counting rate in the municipality, as described in Section 3, with three observations: one for the election and one for each of the two referenda. K/L gives the average capital to labor ratio for firms in the municipality. Infrastructure is given by the logarithm of km of paved roads, measured at the province level. Education is years of schooling. Health is number of preventable deaths per 10,000 inhabitants. Management Quality is the average quality of management in the Region, from the World Management Survey. Mafia gives the average (2005-13) annual number of penal actions taken due to mafia-type association in the province per 100,000 inhabitants. Corruption gives the average (2005-10) annual number of crimes and prosecutions for corruption in the province per 100,000 inhabitants. Trust is the average trust score in the province based on the World Value Survey for Italy between 1990 and 1999. Absenteeism gives number of annual sick days taken by public employees in the municipality. We use this as a measure of "work ethic". Blood Donations measures the number of blood bags per million inhabitants in each province (ranging from 0 to .11). It is used to measure "civic duty". All regressions include fixed effects for the two referenda and for broad geographical Areas. The standard errors reported in parentheses are clustered at the area-by-election level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: **VCR and Labor-Augmenting Productivity in Firms**

	(1)	(2)	(3)	(4)	(5)	(6)
Labor Intensity × VCR	0.10***	0.10***	0.10***	0.10***	0.09*	0.09**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)
Labor Intensity × ln (Yrs. Schooling)		0.14		0.12		0.40
		(0.94)		(0.83)		(1.33)
ln (Capital)			0.08***	0.08***		
			(0.00)	(0.00)		
Adjusted R^2	0.19	0.19	0.23	0.23	0.23	0.23
Municipality FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	219,504	219,504	219,504	219,057	219,057	219,057

Note: The dependent variable is value added per worker at the firm level in columns (1) - (4) and TFP in columns (5) and (6). Capital intensity and skill intensity are industry-level variables calculated from the NBER-CES database. Capital intensity is measured as one minus the ratio of the cost of employees to value added. Labor intensity is measured as the ratio of production workers' compensation to total employee compensation. ln(Capital) is the log of capital per worker at the firm level. ln(Yrs. Schooling) is the log of years of schooling at the province level. The standard errors reported in parentheses are clustered at the industry level. Similar results hold when clustering at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: **The Role of Trust in a Contentious Task**

	(1)	(2)	(3)
Challenged	-135.65***	-134.78***	-119.82***
	(43.68)	(43.06)	(44.30)
Trust	1.76***	1.83***	1.40***
	(0.19)	(0.38)	(0.34)
Challenged × Trust	154.12***	153.14***	135.75**
	(52.73)	(52.05)	(53.55)
Blank			-5.21***
			(0.82)
Invalid			-5.28***
			(0.62)
Adjusted R^2	0.12	0.12	0.15
Province	99	99	99
Observations	21435	21435	21435

Note: The dependent variable is the Vote Counting Rate at the municipal level, with data pooled from the election and both referenda. *Challenged*, *blank*, and *invalid* are the percent of challenged, blank, and invalid votes in the municipality, respectively. *Trust* is the average trust score based on the World Value Survey for Italy between 1990 and 1999. The original survey asked "how much [do] you trust other Italians in general?" with responses ranging from (1) "Do not trust them at all" to (5) "Trust them completely". The measure is then normalized to be between zero and one. Regressions include fixed effects for both referenda. VCR is negatively correlated with challenged votes and positively correlated with Trust. Challenged votes have a smaller impact on productivity where trust is high. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: **Variance Decomposition of Output per Worker**

	k	k ,h	k, h ,VCR	A	IQR	% Decline in IQR
Standard Production Function	.128	.19	0	.81	.282	0
Baseline	.128	.19	.513	.487	.173	38.7
Election 2013	.128	.19	.643	.357	.13	53.9
Referenda	.128	.19	.448	.552	.203	28.0
VCR Adjusted for task complexity	.128	.19	.493	.507	.168	40.4
Controlling for Volunteer Characteristics	.128	.19	.372	.628	.215	16.1
# Polling Stations FE	.128	.19	.521	.479	.185	34.4
Municipalities w /1-2 Polling Stations	.128	.19	.362	.638	.228	17.7

Note: This table gives results from a development accounting exercise that decomposes output per worker into variance that can be captured with factors of production (physical capital K, the educational component of human capital h deriving from years of schooling), labor efficiency as measured by the vote counting rate (VCR), and residual variation (TFP, A). It then gives the difference in TFP between provinces at the 25^{th} and 75^{th} of the TFP distribution. Finally, the last column gives the reduction in the IQR resulting from TFP being further residualized from labor efficiency as captured by VCR, relative to a production function without VCR. The production function is given by (2). The first row uses a production function without VCR. The remaining rows use different measures of VCR. *Baseline* averages VCR across all elections and all polls for each municipality. *Election 2013* uses only the election, *Referenda* uses only the referenda. The next two rows use VCR in the elections, and control for variation in vote counting complexity and vote-counter characteristics as outlined in Section 3. The 7^{th} row uses VCR after controlling for fixed effects for the number of polling stations. The final row uses VCR averaged only across municipalities with one or two polling stations. These last two rows allay concerns that results are driven by extreme values in municipalities with many polling stations as discussed in Section 3.

Appendix (For Online Publication)

A Appendix: Supplementary Figures & Tables

Figure A.1: **Sample Ballots: Election 2013**

Panel A: Piemonte

Panel B: Sicily

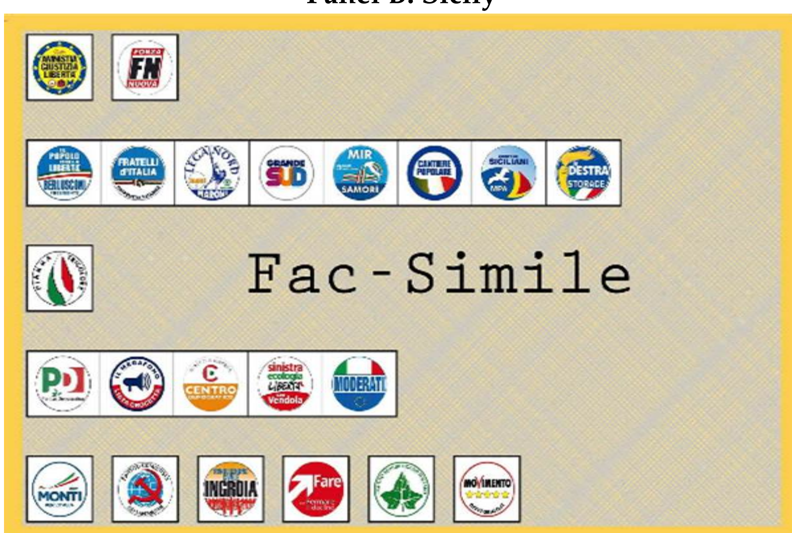
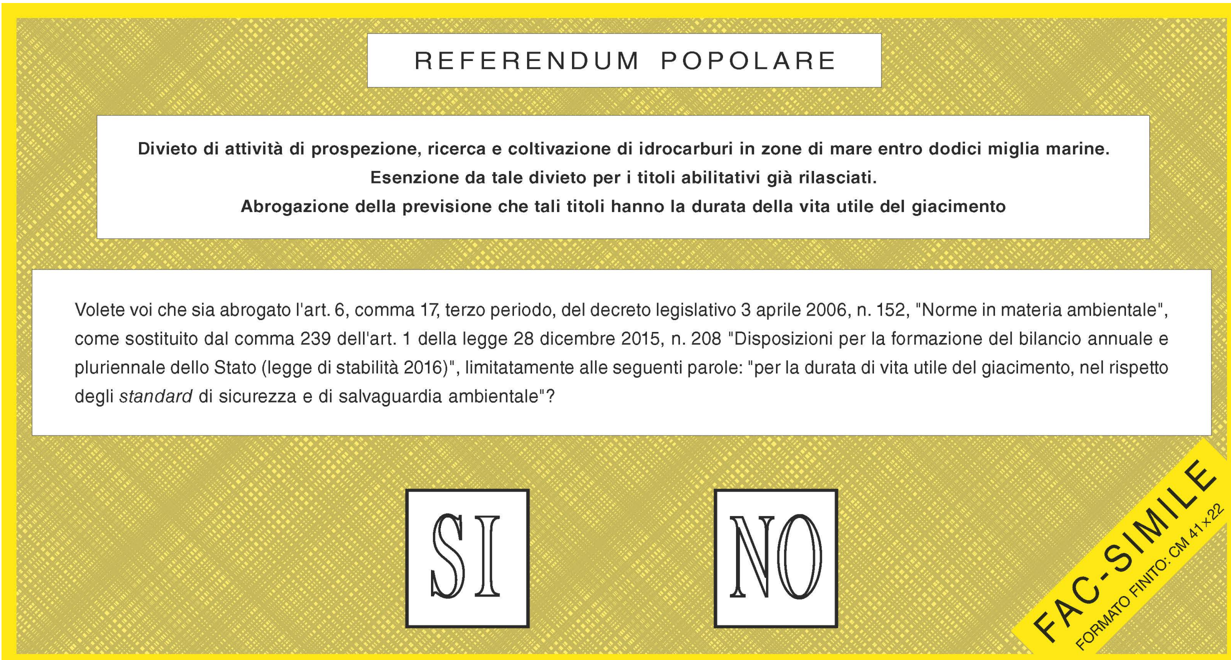


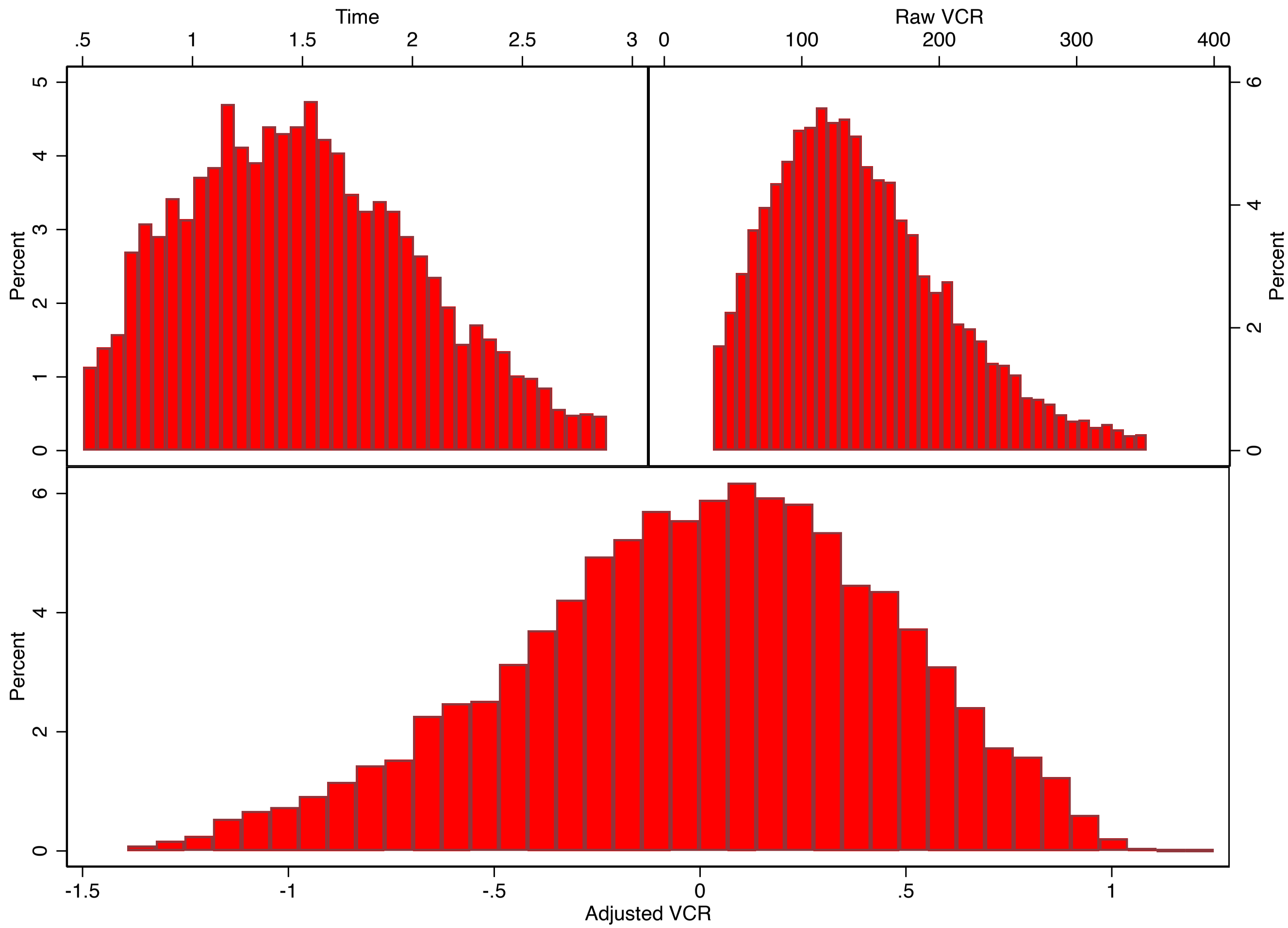
Figure A.2: **Sample Ballots: Referenda**

Panel A: April 2016



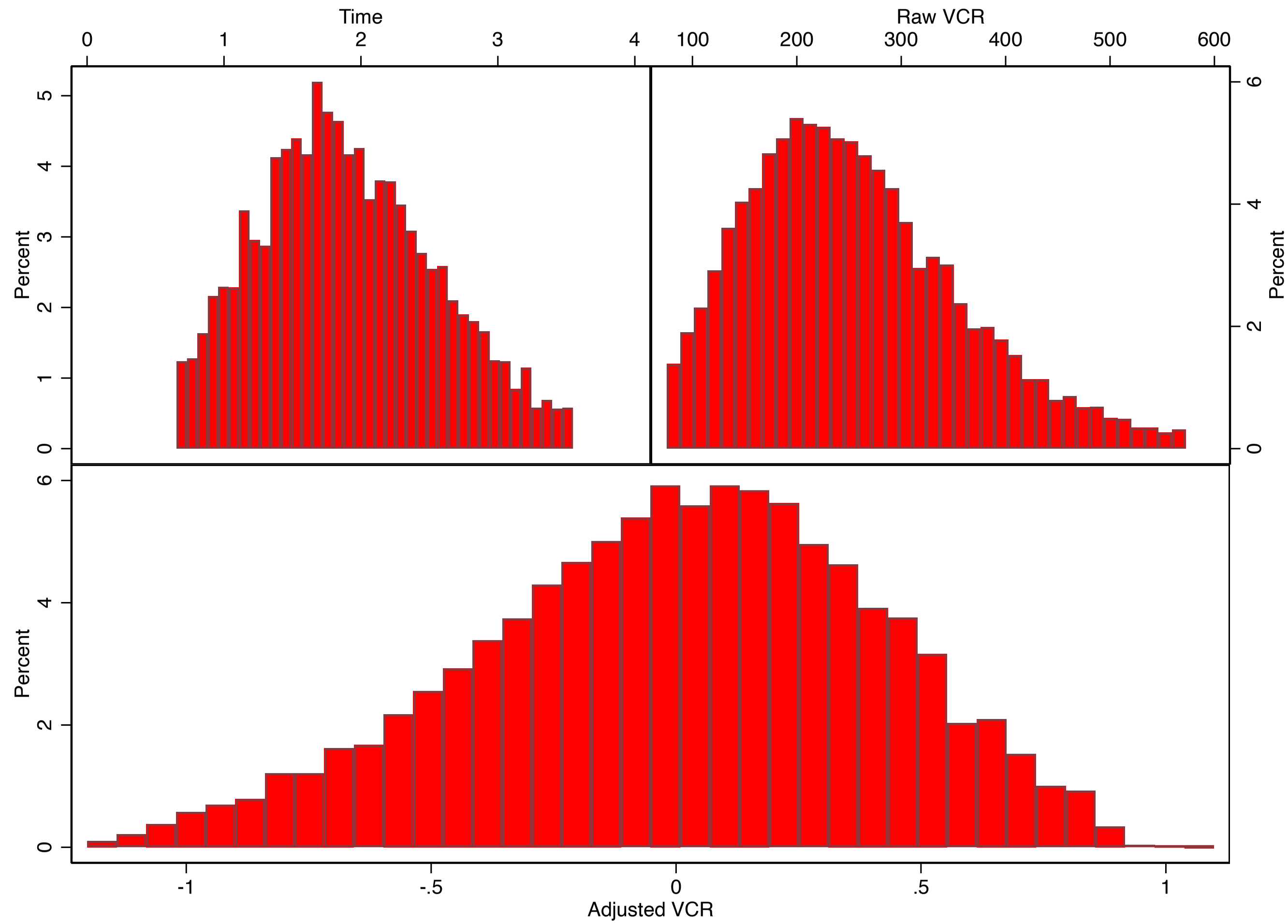
Panel B: December 2016

Figure A.3: **Vote Counting Time and Rates in the April 2016 Referendum**



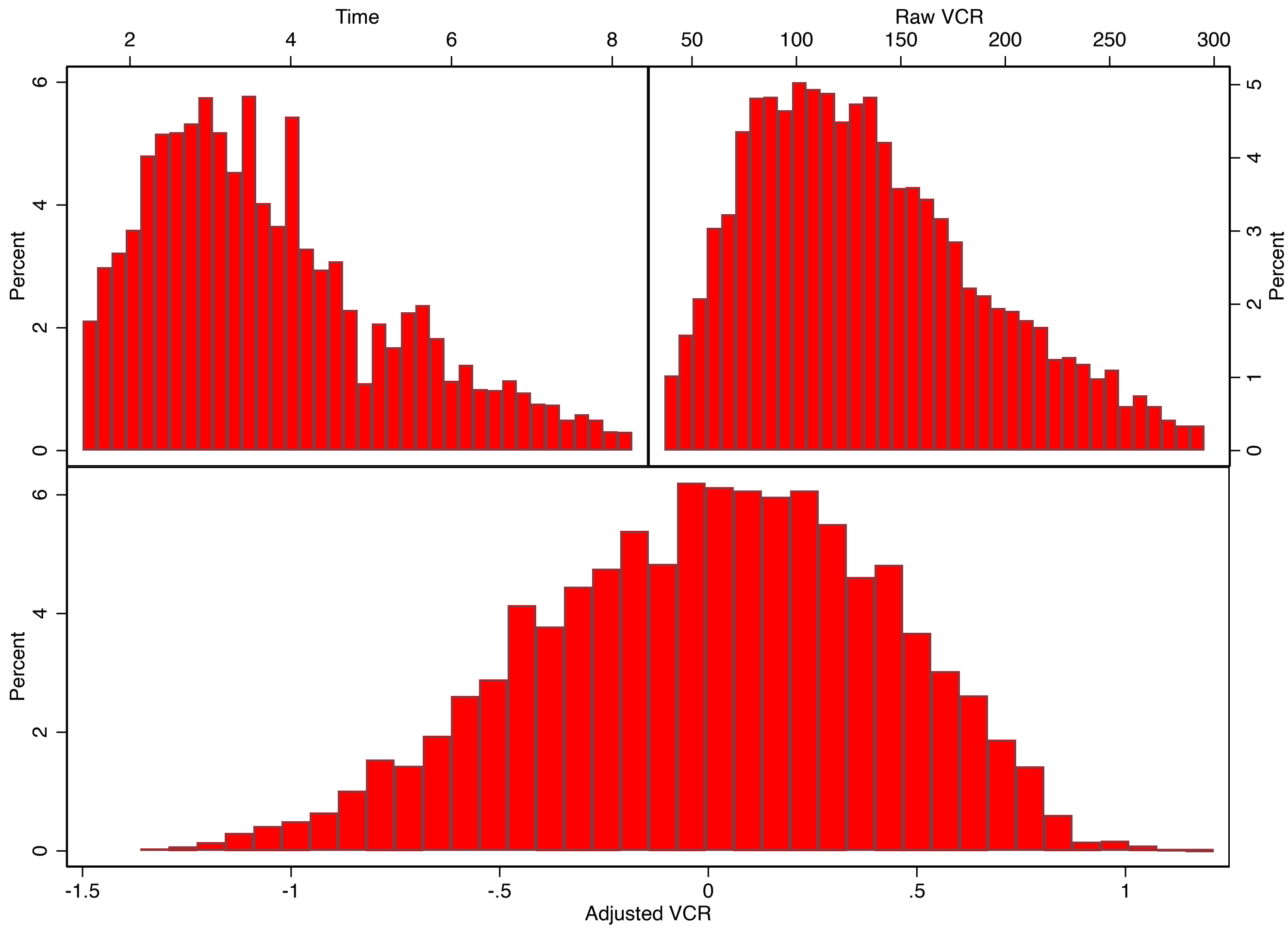
Note: The figure plots the distributions of vote counting times (top left), vote counting rates (top right) and Adjusted Vote Counting Rates (bottom) in the referendum of April 2016. The adjusted vote counting rate adjusts for the complexity of the vote counting task, as reported in Table A.1.

Figure A.4: **Vote Counting Time and Rates in the December 2016 Referendum**



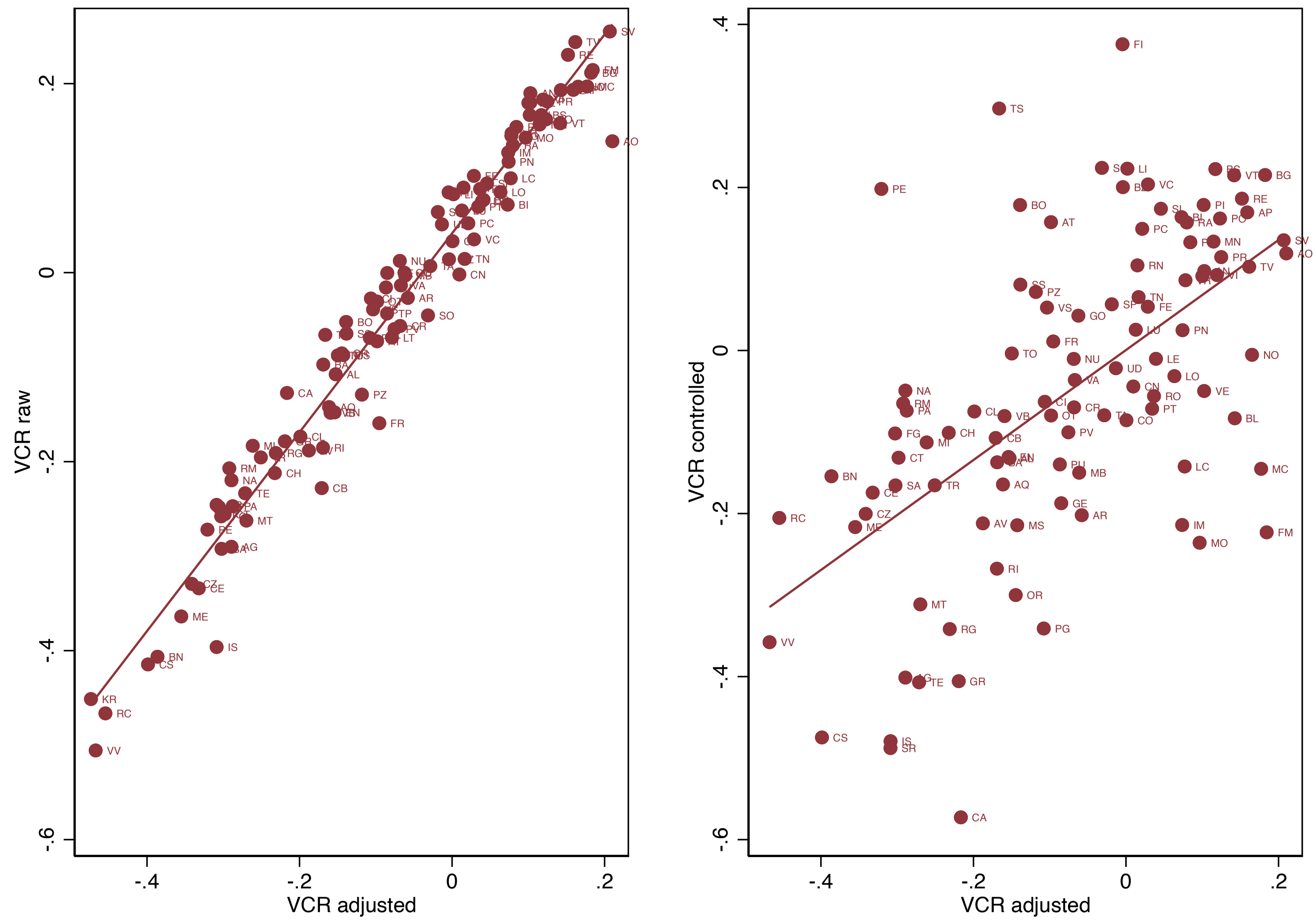
Note: The figure plots the distributions of vote counting times (top left), vote counting rates (top right) and Adjusted Vote Counting Rates (bottom) in the referendum of December 2016. The adjusted vote counting rate adjusts for the complexity of the vote counting task, as reported in Table A.1.

Figure A.5: **Vote Counting Time and Rates in the Senate Election 2013**



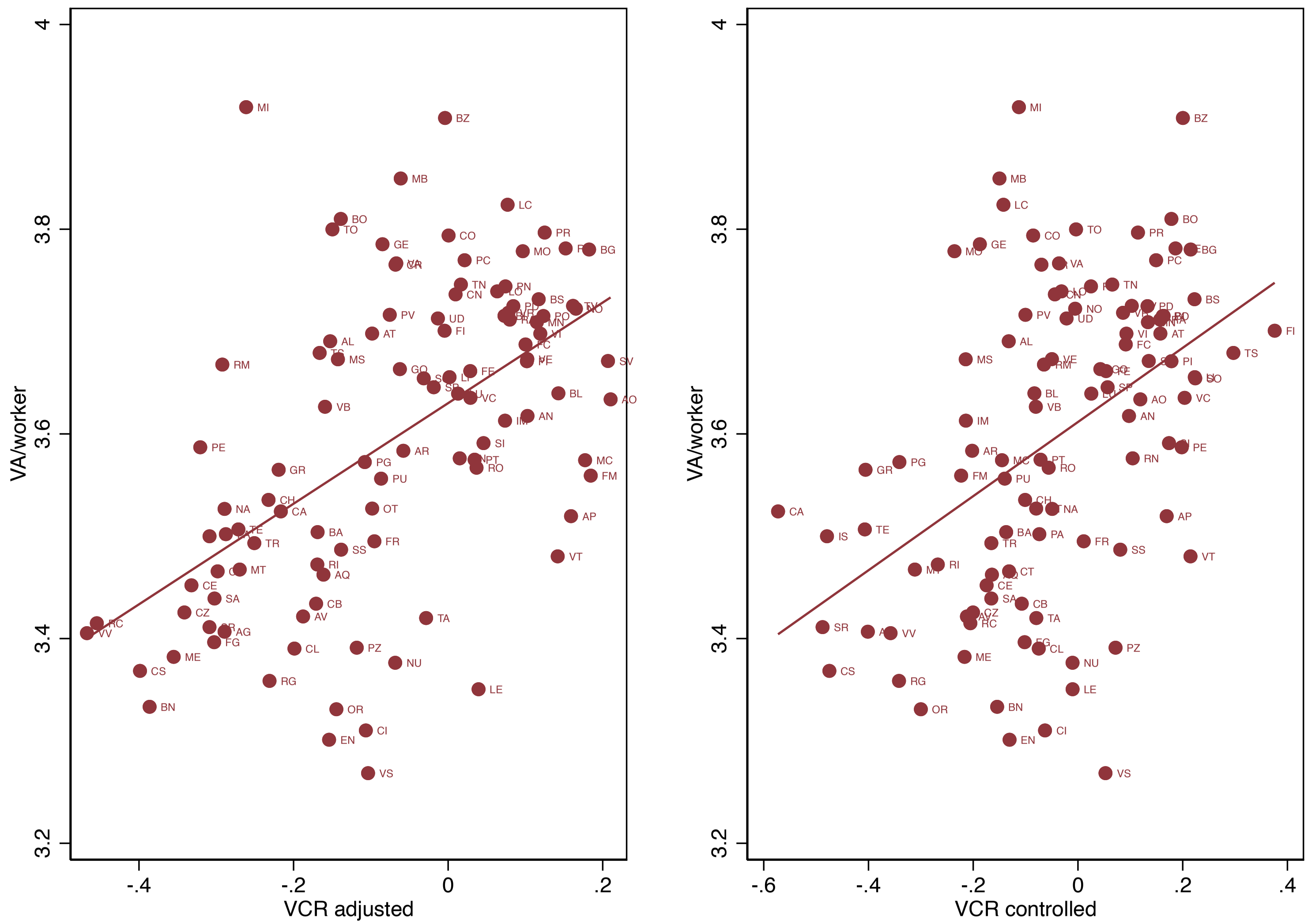
Note: The figure plots the distributions of vote counting times (top left), vote counting rates (top right) and Adjusted vote counting rates (bottom) in the election of 2013, using vote counting times in the senate. The adjusted vote counting rate adjusts for the complexity of the vote counting task, as reported in Table A.1.

Figure A.6: **VCR, Adjusted VCR, and Controlled VCR**



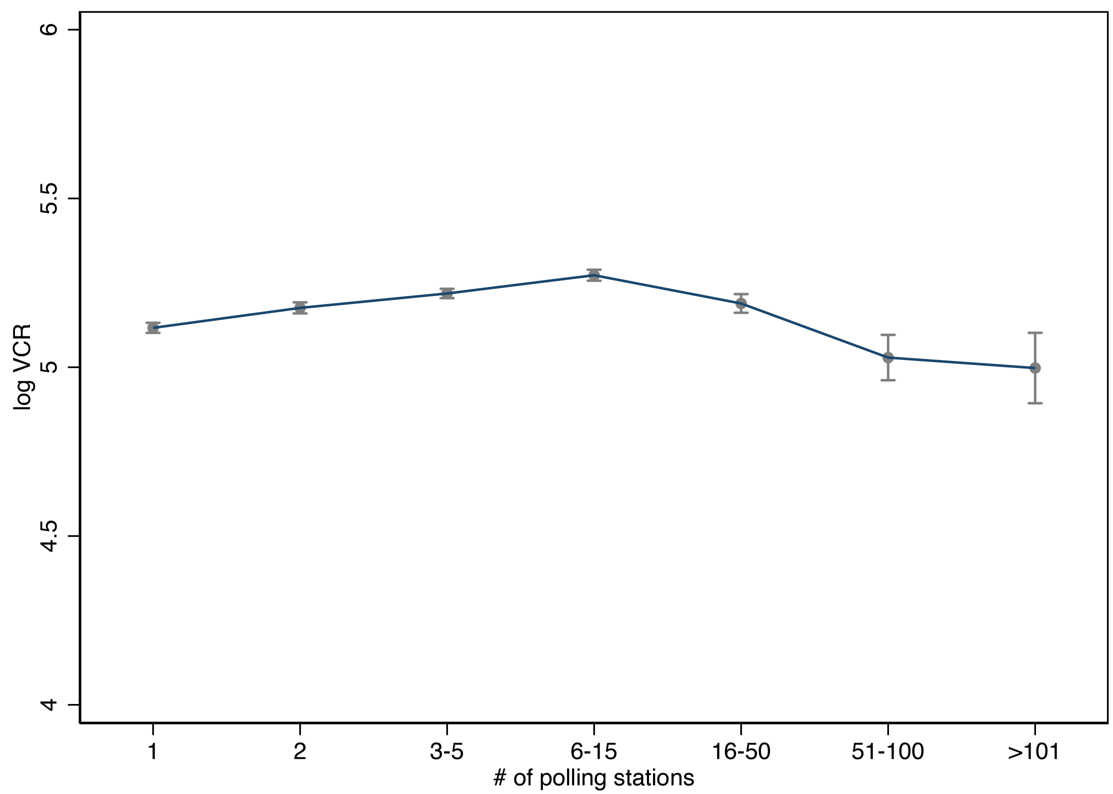
Note: The figure compares three measures of vote counting rates. The left panel compares (log raw) VCR with Adjusted VCR, which controls for the complexity of the vote counting task. Raw VCR is normalized around zero and Adjusted VCR is centered around zero by construction. The Spearman correlation coefficient is 0.98. The right panel compares Controlled VCR and Adjusted VCR, where the former controls also for vote-counter characteristics. The Spearman correlation coefficient is 0.70.

Figure A.7: **Adjusted/Controlled VCR and Value Added per Worker**



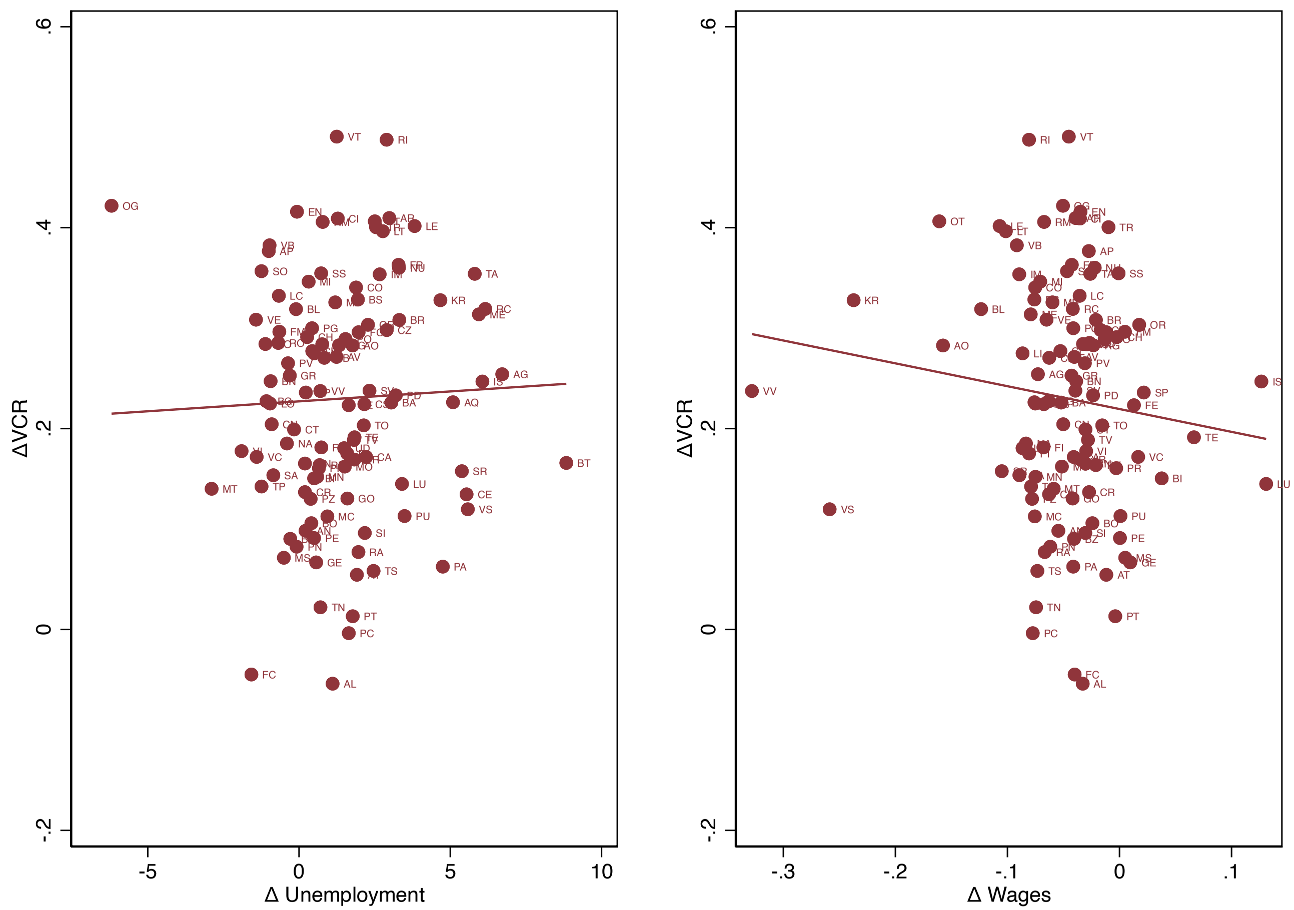
Note: The figure compares VCR with value added per worker. The left panel uses Adjusted VCR, which controls for the complexity of the vote counting task. The right panel uses Controlled VCR, which also controls for vote-counter characteristics.

Figure A.8: **Number of Polling Stations and Vote Counting Rate**



Note: The figure plots the parameters from a regression of vote counting rates (in the 2013 elections) on bins of number of polling stations, with standard errors shown with whiskers. Vote counting rates don't appear to be associated with the number of polling stations in a municipality.

Figure A.9: **Changes in VCR (2013-16) and Unemployment/Wages (2012-15)**



Note: The figure compares the change in (log) unemployment (left panel) or wages (right panel) from 2013 to 2015 with the change in (log) vote counting rates from the election of 2013 to the referendum of December 2016. This suggests that opportunity cost of time was not an important incentive in driving vote counting times. The correlations have the "wrong signs", are statistically significant, with R^2 close to zero.

Table A.1: **Vote Counting Rates and Complexity of Vote Counting Task**

	Election 2013 - Total			Election 2013 - Senate		
	(1)	(2)	(3)	(4)	(5)	(6)
Challenged	-11.04	-10.47	-8.03	-18.36	-16.51	-29.59***
	(8.64)	(9.17)	(12.10)	(12.23)	(11.85)	(10.63)
Blank	-7.37***	-7.04***	-5.47***	-4.66***	-4.40***	-3.98***
	(1.16)	(1.10)	(0.94)	(1.02)	(0.81)	(0.79)
Invalid	-4.87***	-5.07***	-2.97***	-4.13***	-4.34***	-3.03***
	(0.83)	(0.72)	(0.51)	(0.83)	(0.68)	(0.64)
Close Chamber		-0.19	-0.30			
		(0.33)	(0.35)			
Close Senate		0.22*	0.12		0.19	-0.12
		(0.12)	(0.13)		(0.14)	(0.15)
HHI Chamber		-0.35	-0.27			
		(0.43)	(0.56)			
HHI Senate		0.05	0.28		-0.22	0.36
		(0.39)	(0.43)		(0.29)	(0.34)
# parties (Chamber)		0.01	0.03***			
		(0.00)	(0.01)			
# parties (Senate)		-0.01***	-0.01***		-0.01***	-0.00
		(0.00)	(0.00)		(0.00)	(0.00)
Adjusted R^2	0.13	0.15	0.13	0.06	0.08	0.05
Province	110	110	102	110	110	103
Observations	7585	7585	3316	7585	7585	3330

Note: The dependent variable is the log of Vote Counting Rates. In the first three columns VCR is measured for the general election of 2013 using *total time*: the time that Chamber of Deputy election results from the last polling station in the municipality were reported, minus 3pm. In the last three columns, VCR is measured for the general election of 2013 using *Senate time*: the time that Senatorial election results from the last polling station in the municipality were reported, minus 3pm. Columns three and six include only municipalities with no more than two polling stations. *Challenged* is the percentage of challenged votes. *Blank* is the percentage of ballots that were left blank. *Invalid* is the percentage of ballots that were deemed incompatible with the voting procedure. # *parties* is the number of parties on the ballot in municipality *i*. *HHI* is the Herfindahl-Hirschman index of the distribution of votes across parties in the elections. *Close* is the percentage point difference between the first two coalitions with the highest vote shares. # *parties*, *HHI* and *close* are computed separately for the Chamber of Deputies (*Chamber*) and Senatorial (*Senate*) elections. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.2: **Vote Counting Rates and Complexity of the Vote Counting Task: Referenda**

	Referendum - April 2016			Referendum - December 2016		
	(1)	(2)	(3)	(4)	(5)	(6)
Challenged	3.46	3.66	4.56	-18.22	-21.71	-19.09
	(2.89)	(2.80)	(3.35)	(19.15)	(18.73)	(20.88)
Blank	-6.82***	-6.46***	-4.51***	-13.70***	-18.09***	-13.10***
	(1.09)	(1.05)	(1.06)	(2.95)	(2.22)	(2.04)
Invalid	-9.17***	-8.93***	-6.91***	-5.74***	-5.79***	-5.26***
	(0.90)	(0.95)	(0.79)	(0.78)	(0.74)	(0.77)
Yes vote share		0.21	0.78***		0.72***	0.20
		(0.26)	(0.23)		(0.11)	(0.14)
Adjusted R^2	0.07	0.07	0.07	0.03	0.05	0.03
Province	110	110	103	110	110	103
Observations	7585	7585	3329	7583	7583	3321

Note: The dependent variable is the log of Vote Counting Rates. In the first three columns, VCR is measured for the Referendum of April 2016 . In the last three columns VCR is measured for the Referendum of December 2016. Columns three and six include only municipalities with no more than two polling stations. *Challenged* is the share of challenged ballots. *Blank* is the share of ballots that were left blank. *Invalid* is the share of ballots that were deemed incompatible with the voting procedure. *Yes vote share* is the percentage of votes in favour of "YES". The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: **Representativeness of Survey Sample of Vote Counter Characteristics**

		Surveyed Municipalities				All Municipalities			
		Mean	SD	Min	Max	Mean	SD	Min	Max
North West	VCR	218.5	68.5	61.5	396.6	202.0	68.3	60.3	397.5
	# Polling Stations	6.3	31.8	1	653	5.1	31.8	1	1248
North East	VCR	238.4	67.6	83.5	397.6	234.0	66.3	63.0	397.5
	# Polling Stations	7.2	15.9	1	187	8.5	23.7	1	445
Center	VCR	213.9	65.9	82.1	365.4	193.2	61.6	60.6	379.2
	# Polling Stations	8.6	14.8	1	103	12.4	90.0	1	2600
South and Islands	VCR	151.1	47.6	61.1	318.3	153.7	46.4	60.5	370.8
	# Polling Stations	5.8	8.5	1	71	8.9	28.7	1	886

Note: The table compares vote counting rates and the number of polling stations in municipalities that responded to our survey on vote counter characteristics with those in all municipalities. The four rows correspond to four macro areas of the country. The sample appears representative in terms of municipality size and vote counting productivity.

Table A.4: **Vote Counting Rates and Vote Counter Characteristics**

		Election 2013 - Total			Election 2013 - Senate		
		(1)	(2)	(3)	(4)	(5)	(6)
Age	President	0.00	0.00	0.00	0.00*	0.00*	0.00*
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Team	-0.00	-0.00	-0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
% male	President	0.08**	0.08**	0.08**	0.07	0.07	0.08*
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
	Team	-0.13*	-0.12	-0.11	-0.26***	-0.25***	-0.21**
		(0.08)	(0.08)	(0.08)	(0.09)	(0.09)	(0.09)
Education	President	0.01	0.01	0.00	0.01	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
	Team	0.06***	0.06***	0.06***	0.07***	0.07***	0.07***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
% students	President	-0.12	-0.14	-0.14	-0.15	-0.17	-0.14
		(0.11)	(0.11)	(0.11)	(0.16)	(0.16)	(0.16)
	Team	0.42***	0.40***	0.40***	0.35***	0.31***	0.34***
		(0.08)	(0.08)	(0.08)	(0.10)	(0.10)	(0.10)
% employed	President	-0.03	-0.04	-0.05	-0.00	-0.02	-0.02
		(0.05)	(0.05)	(0.05)	(0.08)	(0.07)	(0.07)
	Team	0.26***	0.24***	0.24***	0.12	0.07	0.09
		(0.07)	(0.07)	(0.07)	(0.09)	(0.09)	(0.08)
% previous experience	President	0.07	0.05	0.05	0.12**	0.11*	0.10*
		(0.04)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
Other controls		Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2		0.24	0.25	0.25	0.15	0.15	0.18
Provinces		104	104	104	104	104	104
Observations		919	919	919	916	916	916

Note: The dependent variable is the log of Vote Counting Rates (VCR). In the first three columns VCR is measured for the general election of 2013 using *total time*. In the last three columns VCR is measured for the general election of 2013 using *Senate time*. Columns 1 and 4 include controls from the first column of Table A.1. Columns 2 and 5 include the full set of controls from Table A.1. Columns 3 and 6 include additional dummies for the number of polling stations in each municipality. Rows indicated with "President", control for characteristics of polling station Presidents in the municipality. Rows indicated with "Team" control for characteristics of non-managerial polling station workers (poll workers and secretaries) in each municipality. *% male* is the percent of male vote counters. *Age* is their average age. *Education* represents years of schooling. *% students* is the share of vote counters who listed their occupation as "student". *% employed* is the share of vote counters who were employed. *% previous experience* is the percent of Presidents who had pervious experience as polling-station president. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table A.5: **VCR and Vote Counter Characteristics: Additional controls and interactions.**

	Election 2013 - Total			Election 2013 - Senate		
	(1)	(2)	(3)	(4)	(5)	(6)
South-Center × Age	0.00	0.00	0.00	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
North × Age	0.00	0.00	0.00	0.01	0.01	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
South-Center × % male	-0.32*	-0.33**	-0.30*	-0.30	-0.29	-0.25
	(0.16)	(0.16)	(0.16)	(0.22)	(0.21)	(0.21)
North × % male	0.01	0.04	0.06	-0.10	-0.09	-0.06
	(0.11)	(0.10)	(0.10)	(0.12)	(0.11)	(0.11)
South-Center × Education	0.06***	0.05***	0.05***	0.07***	0.07***	0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
North × Education	0.06***	0.06***	0.06***	0.08***	0.09***	0.08***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
South-Center × % students	0.14	0.13	0.14	0.16	0.14	0.18
	(0.15)	(0.15)	(0.15)	(0.23)	(0.22)	(0.23)
North × % students	0.34***	0.26***	0.27***	0.17	0.14	0.17
	(0.09)	(0.08)	(0.08)	(0.13)	(0.12)	(0.12)
South-Center × % employed	0.22*	0.22*	0.22*	0.11	0.05	0.08
	(0.12)	(0.12)	(0.12)	(0.16)	(0.15)	(0.14)
North × % employed	0.04	-0.04	-0.04	-0.16	-0.21	-0.19
	(0.09)	(0.10)	(0.10)	(0.13)	(0.13)	(0.13)
South-Center × % experience	0.07	0.10	0.11	0.05	0.05	0.05
	(0.08)	(0.07)	(0.07)	(0.11)	(0.11)	(0.11)
North × % experience	0.14***	0.10*	0.09	0.26***	0.23***	0.22***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)
South-Center × random	-0.08*	-0.09*	-0.09**	-0.07	-0.06	-0.06
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
North × random	-0.09**	-0.08*	-0.08*	-0.08**	-0.09**	-0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Adjusted R^2	0.28	0.30	0.31	0.15	0.16	0.18
Province	104	104	104	104	104	104
Observations	870	870	870	869	869	869

Note: See notes to Table A.4. The dependent variable is the log VCR. This regression interacts vote counter characteristics with dummies for the north of Italy or the South-Center. *random* is a dummy equalling one if vote counters were randomly selected among the list of volunteers in the municipality and zero otherwise. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: **VCR Using Counting Times from the Last and Mean Polling Stations**

	(1)	(2)	(3)
VCR (mean)	0.872***	0.881***	0.855***
	(0.022)	(0.021)	(0.017)
# of polling stations		-0.003	-0.001
		(0.005)	(0.004)
VCR (mean) $\times$ # of polling stations		0.000	0.000
		(0.001)	(0.001)
VCR (standard deviation)			-0.671***
			(0.042)
Observations	554	554	554
Adjusted R^2	0.747	0.785	0.853

Note: The dependent variable is the (logarithm of) the Vote Counting Rate calculated using the vote counting time of the last polling station in the municipality. VCR (mean) is the (log of the) Vote Counting Rate of the average polling station in the municipality. There is nearly a one-to-one mapping between the two VCR measures. "Last" VCR isn't correlated with the number of polling stations and the number of polling stations doesn't affect the mapping between "mean" and "last" VCR. VCR(standard deviation) gives the variance of the vote counting rate across polling stations in the municipality. This coefficient is negative as expected: the slowest polling station will be slowest relative to the mean where the variance is higher. However, the inclusion of this control barely affects the correlation between "last" VCR and mean VCR, suggesting no systematic relationship between the mean and variance of VCR. This means that using the last polling station introduces measurement error, but little bias in the measurement of VCR. Municipalities with a single polling station were dropped as mean and last VCR are identical in these municipalities. Standard errors in parentheses are clustered at the provincial level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.7: **Balance Test for Municipalities with Polling-Station Level Data**

Polling-station level data?	NO				YES			
	N	Mean	Std.Dev.	Median	N	Mean	Std.Dev.	Median
VA/L	6,697	3.25	0.66	3.41	588	3.32	0.50	3.41
VCR	7,009	142.13	63.20	132.94	576	168.05	68.75	162.01
# of polling stations	7,291	7.10	37.59	3.00	610	15.13	63.91	4.00

Note: The table compares municipalities for which polling-station-level data is available. Polling-station-level data is available for larger municipalities, but these don't have different average value added per worker in firms or VCR (measured by the last polling station).

Table A.8: **VCR Correlations Across Elections and Referenda**

	Election 2013 Total	Election 2013 Senate	Referendum April 2016	Referendum December 2016
Election 2013: Total	1			
Election 2013: Senate	0.853***	1		
Aril 2016: Referendum	0.616***	0.575***	1	
December 2016: Referendum	0.717***	0.668***	0.690***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.9: **Labor Productivity, VCR, and Common Explanations for Productivity: Adjusted VCR**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR (Adjusted)	0.169***	0.149***	0.151***	0.171***	0.069***	0.061**
	(0.030)	(0.029)	(0.028)	(0.032)	(0.015)	(0.018)
K/L		0.209***				0.190***
		(0.011)				(0.012)
Infrastructures		0.044***				0.045***
		(0.002)				(0.002)
Education (years)			0.973***			1.092***
			(0.255)			(0.179)
Health			0.298			0.215*
			(0.232)			(0.097)
Management Quality			-0.098**			0.028***
			(0.039)			(0.007)
Mafia				0.011		0.069**
				(0.016)		(0.023)
Corruption				-0.004**		-0.007*
				(0.002)		(0.003)
Trust					1.236***	0.556***
					(0.093)	(0.069)
Absenteeism					-0.001	-0.005
					(0.006)	(0.003)
Blood Donations					-0.162	0.278
					(0.421)	(0.185)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.10	0.25	0.10	0.10	0.15	0.27
ElectionXArea	9	9	9	9	9	9
Observations	20615	19992	19397	20044	15881	14940

Note: Repeats Table 2, using Adjusted VCR instead of Raw VCR. Adjusted VCR residualizes VCR from the task complexity, as in Section 3 and Tables A.1 and A.2. See Table 2 for definitions. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.10: **Labor Productivity, VCR, and Common Explanations for Productivity: Controlled VCR**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR (Controlled)	0.304**	0.244	0.241**	0.310**	0.136***	0.110
	(0.060)	(0.108)	(0.050)	(0.061)	(0.009)	(0.075)
K/L		0.173				0.186
		(0.067)				(0.096)
Infrastructures		0.075**				0.051
		(0.010)				(0.024)
Education (years)			0.800			1.224*
			(0.377)			(0.408)
Health			0.227			0.282
			(0.391)			(0.179)
Management Quality			-0.059			0.067
			(0.064)			(0.097)
Mafia				0.108**		0.069
				(0.012)		(0.048)
Corruption				-0.015		-0.013
				(0.009)		(0.022)
Trust					-0.425	-0.613**
					(0.323)	(0.094)
Absenteeism					-0.005	-0.012
					(0.023)	(0.013)
Blood Donations					1.340	1.872
					(1.179)	(0.751)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.18	0.31	0.17	0.18	0.20	0.38
ElectionXArea	3	3	3	3	3	3
Observations	847	817	796	821	643	624

Note: Repeats Table 2, using Controlled VCR instead of Raw VCR. Controlled VCR residualizes VCR from the task complexity and vote-counter characteristics, as described in Section 3 and Table A.4. See Table 2 for definitions. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.11: **Labor Productivity, VCR, and Common Explanations for Productivity: Dropping Large Cities**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR	0.224***	0.188***	0.205***	0.228***	0.118***	0.092***
	(0.036)	(0.033)	(0.031)	(0.037)	(0.023)	(0.020)
K/L		0.207***				0.189***
		(0.011)				(0.012)
Infrastructures		0.044***				0.046***
		(0.002)				(0.002)
Education (years)			0.976***			1.094***
			(0.252)			(0.177)
Health			0.250			0.194*
			(0.234)			(0.099)
Management Quality			-0.096**			0.031***
			(0.039)			(0.007)
Mafia				0.020		0.070**
				(0.015)		(0.024)
Corruption				-0.003*		-0.007*
				(0.001)		(0.003)
Trust					1.117***	0.508***
					(0.100)	(0.074)
Absenteeism					-0.001	-0.005*
					(0.006)	(0.003)
Blood Donations					-0.120	0.327
					(0.465)	(0.199)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.11	0.25	0.11	0.11	0.16	0.27
ElectionXArea	9	9	9	9	9	9
Observations	20324	19707	19121	19756	15626	14697

Note: Repeats Table 2, excluding the capital city of every province. See Table 2 for definitions. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.12: **Labor Productivity, VCR, and Common Explanations for Productivity: Controlling for Population Density**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR	0.112***	0.090***	0.088**	0.101***	0.036*	0.018
	(0.025)	(0.018)	(0.027)	(0.028)	(0.017)	(0.016)
K/L		0.191***				0.178***
		(0.011)				(0.011)
Infrastructures		-0.029***				-0.009*
		(0.002)				(0.004)
Education (years)			0.323			0.480**
			(0.222)			(0.160)
Health			0.400***			0.154**
			(0.062)			(0.046)
Management Quality			-0.016			0.040**
			(0.040)			(0.012)
Mafia				-0.072***		-0.032*
				(0.012)		(0.015)
Corruption				-0.002		-0.010*
				(0.002)		(0.005)
Trust					1.285***	0.600***
					(0.114)	(0.045)
Absenteeism					-0.009**	-0.008**
					(0.004)	(0.002)
Blood Donations					0.938***	0.768***
					(0.089)	(0.032)
popuplation density	0.139***	0.124***	0.137***	0.143***	0.122***	0.105***
	(0.002)	(0.005)	(0.005)	(0.004)	(0.002)	(0.001)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.18	0.30	0.18	0.18	0.22	0.32
ElectionXArea	9	9	9	9	9	9
Observations	20615	19992	19397	20044	15881	14940

Note: Repeats Table 2, with an additional control for population density (population per squared km). See Table 2 for definitions. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.13: **Labor Productivity, VCR, and Common Explanations for Productivity: Un-trimmed sample**

	(1)	(2)	(3)	(4)	(5)	(6)
VCR	0.217***	0.189***	0.196***	0.220***	0.114***	0.083***
	(0.025)	(0.025)	(0.025)	(0.026)	(0.018)	(0.014)
K/L		0.208***				0.189***
		(0.011)				(0.012)
Infrastructures		0.044***				0.043***
		(0.002)				(0.002)
Education (years)			0.966***			1.107***
			(0.252)			(0.172)
Health			0.253			0.183
			(0.227)			(0.105)
Management Quality			-0.097**			0.024**
			(0.040)			(0.008)
Mafia				0.015		0.055**
				(0.011)		(0.020)
Corruption				-0.003**		-0.007*
				(0.001)		(0.004)
Trust					1.150***	0.507***
					(0.097)	(0.075)
Absenteeism					-0.000	-0.004
					(0.005)	(0.002)
Blood Donations					-0.106	0.337
					(0.449)	(0.185)
Area FE	Yes	Yes	Yes	Yes	Yes	Yes
Election FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.12	0.26	0.11	0.11	0.16	0.27
ElectionXArea	9	9	9	9	9	9
Observations	21274	20569	20002	20692	16264	15286

Note: Repeats Table 2, without trimming the sample of , as described in Section 3, footnote 9. See Table 2 for definitions. The standard errors reported in parentheses are clustered at the provincial level. Statistical significance is denoted as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.14: **Decomposition of Output Per Worker Including all Variances and Covariances**

Production Function:	Conventional	with VCR
var(ln(y))	.04	.04
var(α ln(k))/var(ln(y))	.19	.19
var((1 − α) ln(h))/var(ln(y))	.01	.01
var(ln(A))/var(ln(y))	.83	.5
cov(α ln(k), (1 − α) ln(h))/var(ln(y))	0	0
cov(ln(A), α ln(k))/var(ln(y))	-.07	-.03
cov(ln(A), (1 − α) ln(h))/var(ln(y))	.05	.04
var((1 − α) ln(vcr))/var(ln(y))	.	.38
cov(α ln(k), (1 − α) ln(vcr))/var(ln(y))	.	-.04
cov((1 − α) ln(h), (1 − α) ln(vcr))/var(ln(y))	.	.01
cov(ln(A), (1 − α) ln(vcr))/var(ln(y))	.	-.03
Fraction of variance in ln(y) attributable to productivity	.79	.47
Proportional reduction in variance of ln(y) from eliminating vcr gaps	.	.26

Note: Variance decomposition of output per worker with full variances and covariances, following Weil (2007). The left hand column uses a production function $y_p = \alpha k_p + (1-\alpha) h_p$, where p is the province, y is output per worker, k is physical capital per worker, and h is education's contribution, all in logs. The right hand column gives a production function that includes labor efficiency, measured by the vote counting rate VCR: $y_p = \alpha k_p + (1-\alpha)(h_p + VCR_p)$.

B Institutional Setting: Further Details on Vote Counting in Italy

The raw data, obtained from the Italian ministry of interior, consists of vote counting times in three separate polls: The Italian general election of 2013; the oil and natural gas drilling referendum of April 2016; and the constitutional referendum of December 2016. We first describe each of these polls and then discuss the vote counting process and the broader administrative setting, which were similar in all three polls.

B.1 The General Election of 2013

The general election of 2013 was held on Sunday and Monday, 24-25 of February, 2013. Modern Italian elections take place over two days to avoid congestion and delays towards polling station closing times. In the 2013 elections, polls closed at 3pm on Monday, following a full election day on Sunday.

The elections determined 630 members of the Chamber of Deputies (*Camera dei Deputati*) and the 315 elective members of the Senate (*Senato della Repubblica*). Constituencies for the Senate correspond to the 20 Italian Regions (plus 6 Senators representing Italians living abroad). For the Chamber of Deputies, the country is divided into 26 constituencies, corresponding to the 20 Regions, with most Regions containing one constituency and with six multi-constituency Regions. Political parties may organize in coalitions (e.g. left and right). Representation for parties and coalitions is proportional: at the national level for the Chamber of Deputies and at the regional level for the Senate.[38] More than 40 parties participated in the election, but all viable ones were in one of four coalitions. Turnout in the election was 75% at 35 million.

Voters entering a polling station received ballots for the two elections and a pencil. They were required to mark one party on each ballot, fold the ballots, and insert them into a ballot box. Figure A.1 in the appendix shows sample Senatorial ballots from two Regions: Piemonte in the north and Sicily in the South. While there were slight differences due to the presence of regional parties and in the ordering of coalitions, the ballots were similar in their design and complexity. Ballots for the Chamber of Deputies were even more uniform across Regions.

B.2 The Oil-Drilling Referendum of April 2016

A nationwide referendum on oil and natural gas drilling was held in Italy on Sunday, April 17, 2016, with polling stations closing at 11pm. The referendum was called by nine regional councils in response to a law passed by the national government that allowed existing offshore drilling facilities to remain in operation until they are fully depleted.[39] The referendum asked whether the government should stop renewing offshore drilling licenses within 12 nautical miles of the coast. The ballot contained two options: "Yes" and "No".[40]

[38] In addition, the largest party or coalition receives a bonus that increases its representation to 55% of the seats, with the remaining parties and coalitions represented proportionally within the remaining 45%.

[39] The nine Regions were Basilicata, Calabria, Campania, Liguria, Marche, Molise, Puglia, Sardegna, and Veneto.

[40] According to Italian electoral law, a turnout of at least 50% is required if a referendum is to alter existing laws. In this case, restrictions on offshore drilling would have been adopted only if 50% of eligible voters participated and in addition the majority of participating voters voted "Yes". Due to the turnout requirement, Prime Minister Matteo Renzi–who was opposed to the referendum–called on voters to abstain from voting. Proponents of the proposition encouraged voters to participate and vote "Yes". While 85% of participants voted "Yes", turnout (at nearly 16 million) was only 31%, so that the proposition was rejected.

B.3 The Constitutional Referendum of December 2016

A nationwide constitutional referendum was held in Italy on Sunday, December 4, 2016, with polling stations closing at 11 pm. The referendum bundled together a number of constitutional changes relating to the size of parliament, the division of powers between the legislative bodies and between national and regional institutions, and additional reforms. The ballot contained two options: "Yes" and "No", with a "Yes" vote affirming all proposed reforms. Turnout in this referendum was 65%, with 59% of votes rejecting the constitutional reforms.

In both referenda, voters entering a polling station received a ballot and a pencil. They were required to mark either "Yes" or "No". Sample ballots used in all polling stations in Italy in each of the referenda is shown in Figure A.2 in the appendix.

B.4 Electoral Institutions, Local Institutions, and the Mafia

The Central Directorate for Electoral Services (*Direzione Centrale dei Servizi Elettorali*) is the main body responsible for managing and overseeing elections for the entire country. It is responsible for ensuring that polling stations are properly equipped and for providing formal polling station guidelines for all polling stations in Italy. It also tabulates the unofficial results, used in our study, that determine initial seat allocations. The Directorate is within the Italian Ministry of Interior, so that electoral institutions ensuring that electoral results are reported in a timely manner are national rather than local. Polling stations are staffed by volunteers who are typically not public employees (a plurality is students), so that vote counters' productivity isn't directly confounded with the quality of local institutions. Local governments are involved in selecting volunteers: Poll workers are selected by the municipality (in most cases randomly) and Presidents by the Regional Court of Appeals. We control for observable characteristics of both presidents and poll workers in Section **??**, in part to address differential selection of Presidents in this process.

The mafia's role in Italian society and politics is well documented (Gambetta 1996). One might be concerned that variation in mafia presence might confound measurement of vote counting productivity. However, there are several indications that the mafia had no direct effect on vote counting rates.

First, there is no indication of electoral fraud or mafia intervention in the elections and referenda studied here. Following a comprehensive study of the process, the Organization for Security and Co-operation in Europe (OSCE) expressed confidence in the integrity of the 2013 elections in Italy. OSCE reports from the last three elections in Italy (since 2006) don't mention the mafia.[41]

Second, while the mafia was historically involved in electoral fraud, the techniques used by the mafia didn't include attempts to affect vote counting itself. Hess (1973) reports a number of methods used by the mafia to influence electoral outcomes including assassination or intimidation of opponents, voting on behalf of the dead or infirm, and voter bribery and intimidation. But even in the heyday of mafia influence, it didn't attempt to affect vote counts directly. In addition, by the 1970s, such election-day mafia interventions "have been progressively stopped. Pressure on the voters has become more diffuse. [Instead, a]ttempts are made to create a general atmosphere of fear and then identifying a candidate with mafioso power, so that people will not dare vote against him." (Hess 1973). Eurorpol also notes that the mafia uses threats and favors to control large amounts of votes but does not report attempts to directly

[41] OSCE/ODIHR Needs Assessment Mission Report, "The Italian Republic, Early Parliamentary Elections, 24 and 25 February, 2013", 7-10 January 2013.

affect election day proceedings in polling stations.[42]

Finally, while the mafia may have had some stake in the results of the 2013 election, it is less likely that the mafia would have been involved in the referenda, which had low stakes for the mafia's interest in local political control. Our results in the referenda are very similar to those in the election.

[42] Europol, "Threat Assessment: Italian Organized Crime," June 2013.

C Data Appendix

C.1 Vote counting data

Vote counting data, obtained from the Ministry of Interior, are described in the main text.

C.2 Value Added Per Worker in Firms

The data spans the period 2006-2013 and was downloaded from ORBIS database of Bureau van Dijk. We construct the average across these years for 110 Italian provinces. The variables are measured in thousand EUR at 2010 prices. The Italian CPI index was obtained from EUROSTAT.

Value added per worker We measure value added as the sum of average cost of employee and profit per employee. We drop observations with negative values.

Capital per worker Following Gopinath et al (2015), we construct the capital stock as the sum of tangible fixed assets and intangible fixed assets. We drop observations with negative values for intangible fixed assets and observations with negative or zero values for tangible fixed assets.[43] We delete firm-year observations where the ratio of tangible fixed assets to total assets is greater than one. We then divide the firm's capital stock with its number of employees.

Winsorization and trimming We Winsorize at the 1st and 99th percentile the variables average cost of employee, profit per employee, tangible fixed assets and intangible fixed assets. We also drop capital per worker values that are above the 99th percentile. We trimmed the sample with respect to turnover (last available year) to control for distribution of firms across provinces. We exclude the firms that are in the top decline and conduct robustness for an untrimmed sample and samples trimming the top 20 or 50 percentiles. We restrict attention to the subset of firms for which both Capital per worker and VA per worker can be calculated. Per year around 20% of the firm observations are dropped due to lack of matched data.

Weighting We weigh each firm in the province by its employment share. Results are robust to using an un-weighted sample.

Industry Control In order to control for the differences that could arise from industry decomposition across provinces, we run the following regression:

$$y_{ijp} = \beta_0 + \delta_i + \delta_p + \varepsilon_{ijp},$$

where y_{ijp} is the value added of the firm, and δ_i and δ_p are industry and province fixed effects. Province fixed effects give output per worker controlled for industry composition.

[43] For 2006 total assets were unavailable, so we didn't drop observations based on this criterion.

C.3 Factor Intensities

Factor intensities were calculated using manufacturing industry data base retrieved from the NBER-CES database based on 1997 NAICS codes. (Bartelsman & Gray 1996).[44]. Industry classifications in ORBIS were based on NACE codes. We matched NACE to NAICS codes. Where no one-to-one match was available, we took the median factor intensities for the broader NAICS industry for the corresponding NACE one.

The capital share of an industry α_i was calculated as one minus the ratio of total cost of employees to value added. The skill intensity of an industry γ_i was taken as the income share of high-skilled workers, calculated as the ratio of non-production worker wages to total wages.

C.4 Survey on Vote Counter Characteristics

Data on vote counters (*presidenti*, *segretari* and poll workers were collected directly from individual municipalities for the Italian general election on 24-25 February 2013.

First e-mail data request

We obtained a list of the e-mail addresses of 7,533 municipalities from the National Association of Italian Comuni (ANCI). Between April 18, 2016 and April 22, 2016, we contacted every address in the list using an automated e-mail. We asked them to indicate, for every individual involved in the counting process:

1. Role (*presidente*, *segretario* and *scrutatore*);
2. Birthplace;
3. Birthdate;
4. Gender;
5. Highest degree earned;
6. Occupation;
7. For Presidents: whether they had served as polling station president in the past..

Residence is known as vote counters can only be appointed in their town of residence. Finally, we also asked the municipality to indicate whether the vote counters were drawn randomly or selected by the electoral committee. We received a low initial response. This may partially be due to outdated addresses in the contact list. In many cases municipalities refused our request, directed us to a higher official, or requested further information.

Second e-mail data request

In the hope of increasing the response rate, we decided to rewrite the content of the e-mail (asking for the same set of data) and run a second round from the April 27 to April 29 , sending 7,157 emails to all those that had not yet replied. The response rate was higher, possibly by increasing the salience of the first request. In total, we were able to collect data on 1,456 of the 8,093 Italian municipalities that existed in 2013. A total of 179 municipalities refused to share data

[44]http://www.nber.org/data/nberces5809.html

because of administrative cost, privacy concerns, or data unavailability. An additional 188 municipalities replied expressing willingness to share the data but have shared the data to date

We computed the age at the time of the election using date of birth. Information on the highest degree earned was used to calculate years of schooling. Occupational data was used to determine whether vote counters were employed, self-employed, students, unemployed or out of the labor force. Given the large number of students in the sample, we employed two additional definitions of *student*, to ensure that this category was not misused. In the first we restrict students to be younger than 29; in the second we exclude individuals older than 29 or, alternately, that did not complete upper-secondary school. We used the resulting individual level variables to compute municipal and provincial average characteristics of the poll workers.