War of the Words: How Elites' Communication Changes the Economy

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Abstract

How does variation in the clarity of elites' communication change the economy? Previous research shows that elites' communication changes the economy, but not all messages are crafted equally. Models of strategic communication suggests that clearer and precise information can improve the economy more than ambiguous messages. In order to test this claim, I develop a new dataset of political elites' inflation statements and measure each statements' information precision. I then test whether or not economic performance depends on how precisely political elites communicate. I find evidence that an increase in information precision, through its attenuating effects on inflation expectations, lowers inflation. Furthermore, I find that this is true when examining a number of developing countries over a relatively volatile time period.

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1 Introduction

People who make economic policy, such as central bankers, also make speeches, and the things that they say moves markets. A growing literature in economics and political science examines how the things that central bankers or governments say shapes consumer and producer expectations and behavior (Bailey and Schonhardt-Bailey, 2008; Blinder et al., 2008; Ehrmann and Fratzscher, 2007; Guisinger and Singer, 2010; Meade and Sheets, 2005; Rosa and Verga, 2007; Sibert, 2009). For example, Guisinger and Singer (2010) find that in the case of exchange rate regimes, governments that credibly announce their economic policies are more likely to have better economic fundamentals. Unfortunately, however, most of these theories ignore the fact that some messages are more precise whereas other messages are more vague. Game theoretic models of communication argue that credible communication is both truthful and clear. If elites' speeches matter for the economy then variation in the presentation of information, whether it is clear of vague, should covary with changes in the economy. One important implication is that by disseminating information more clearly, central bankers, or other economic experts, can improve monetary performance by providing more precise and believable information about inflation to the public.

If precise statements can better guide the economy then clear communication offers large benefits. These potential benefits are not lost on policymakers. In the summer of 2012, for example, the Federal Open Market Committee (FOMC) publicly stated that future interest rates will remain low until "Mid 2015." A more precise statement is where the FOMC declares an actual policy target. Interestingly, the FOMC declared not just one but *two* targets in December 2012, providing more clear information to the public. By declaring a 6.5 percent unemployment target and a 2.5 percent inflation target, households could better understand the goals and objectives of future policy. The new Federal Reserve Bank Chair Janet Yellen has stated that clear communication is important for reducing market volatility and is important for the Fed. The adoption of a numerical target is generally considered more transparent. For example, in January 2013 the Bank of Japan adopted a two precent inflation target, replacing its earlier *price stability in the medium to short run* goal in an effort to reduce ambiguities (Shirai, 2014).

Clear information can change the economy in a number of important ways. First, clear understanding of future policymaking can help the public adjust their short term inflation expectations. Because short term inflation rates influence both short term and long term interest rates, this can change the economy. Second, clear public understanding can decrease the level of uncertainty in the economy, leading to better contracts and less volatility in the economy. This implies that labor contracts, interest rates and asset prices, as well as other purchases are likely to be more efficient.

Empirical research examining whether or not variation in information precision covaries with changes in economic performance remains under explored, however. One reason is that we lack a measure of information precision– message vagueness or message clarity. In order to test whether or not clarity helps improve the economy, I construct a dataset that includes political elite statements about inflation made in the news in a group of Latin American countries between 1993 and 2010. Testing whether or not changes in information precision alters expectations, I find evidence that an increase in information precision (or the inverse, a decline in ambiguity) is systematically associated with lower inflation. The main finding of the paper is that cheap talk is effective in lowering inflation, so long as the message is clear.

In the next section, I apply the logic of cheap talk models to political communication by central bankers and other economic policy experts about the economy. Section three introduces the measurement challenges and the strategy that I pursue. The fourth section presents the statistical analysis, considers alternative explanations, and shows how the model fits to the data. The final section concludes.

2 Political Competition and Signaling

In signaling models, a message sender, S wants to inform a message receiver, R, about something that he knows but that R does not know. This means that S has private information and that R would be better off knowing this information. S is not benevolent, however. In revealing $S's$ private information, S wants to persuade the actions of R in a way that will benefit S. Because R

knows that the message sender is self-interested, R is skeptical about $S's$ message. This skepticism means that only under some conditions will R incorporate information from S into her actions.[1] The key question is how much of $S's$ private information can S credibly reveal?

Cheap talk models are a subclass of signaling models. One influential cheap talk model is by Crawford and Sobel (1982). Crawford and Sobel's model is a single sender-receiver model, meaning that there is a single sender of information and a single receiver. Crawford and Sobel find that the precision of information sent by S to R depends on how far apart R and $S's$ *ex ante* preferences are from one another. When the sender and the receiver are alike– have similar preferences– S can send more precise statements without triggering R's skepticism. Alternatively, when the sender and the receiver want different things– have dissimilar preferences– it is harder for S to reveal his information truthfully. As a result, differences in the quality of credible information flows depends on differences in the preferences of R and S.

Intuitively, the reason why precise information is transmitted when R and S are alike is because the receiver is less skeptical that the sender will say something not in the receiver's self-interest. As they want different things, however, the receiver's skepticism grows. Because it is a strategic model, the sender anticipates the household's skepticism, and adjusts *the clarity* of his message to counter the receiver's expected behavior. In order to have any influence at all, S communicates his private information with more or less strategic ambiguity, taking into account $R's$ likely action. In equilibrium, S crafts a messages which depends on the difference between his own *ex ante* preferences and $R's$ *ex ante* preferences. One testable prediction from the model is that information precision varies as a function of the differences between the sender's and the receiver's preferences.

Modeling advances in economics and political science extend the single sender cheap talk framework to make a number of innovations such as including multiple senders (Austen-Smith and Wright, 1992; Gilligan and Krehbiel, 1989; Krishna and Morgan, 2001; Minozzi, 2011). In these theories, instead of S, more than one sender, A and B, make pronouncements. Like the single sender model, A and B want to influence $R's$ actions. In Krishna and Morgan's model, A and B

[1] In this paper, I use the gender him for the sender and her for the receiver, which is standard in the literature

have some private information and known *ex ante* preferences. The message receiver knows the *ex ante* preferences of the senders but she does not know the message senders' private information, which is common knowledge between the senders. The result of the strategic interaction between A, B, and R is that A and B both strategically craft proclamations to send to the receiver. Like the single sender model above, in equilibrium, the precision of information sent by the senders depends on distance between each sender and R. In addition, in a multi-sender model, information precision now also depends on the distance between A and B, relative to R. In summary, these models depict a political process where elites compete for the hearts and minds of households using strategic speech and the output of this political process is variation in precision of credible information [2].

The benefit of using cheap talk models to depict information exchange is their generalizability. In Crawford and Sobel's as well as in Krishna and Morgan's model, information precision refers to the number partitions in a generic, unidimensional state space, where the greater the number of partitions n, the more precisely information is revealed in equilibrium. In other words, the greater the size of n, the more precisely elites reveal information. In applying this class of models to elite communication about the economy, equilibria no longer refers to partitions on a generic number line, but instead, represents the precision of political elites' public proclamations about the economy. Senders are political elites, or actors engaged in economic policymaking, who have different underlying inflation preferences. The receiver is a less informed household who benefits from learning elites' information. Finally, information revelation refers to how ambiguously or clearly elites reveal their private information to the public.

Applying this strategic framework to monetary policy in this way suggests that in the first stage, two economic policymakers negotiate how to send a message about the economy. If both policymakers coordinate their speech, then the benefit is that policymakers provide better information, and household and market expectations are anchored. Monetary anchoring will be reflected in inflation expectations of the household. If an agreement is not reached in the first stage, however,

[2]There is always a babbling equilibrium in these models where the senders say untruthful things and the receivers do not listen. I restrict the attention to informative equilibrium where credible information is assumed

household and market expectations may become unhinged. If this is true, then the first player never has an incentive to say something that it knows the second player will refute. This means that in equilibrium, strategic speechmaking generates consensual statements about inflation, even when policymakers hold differences in opinions and preferences (THIS AUTHOR).

For example, if the household is totally unsure of the world and political elites provide no information then assuming that the true state of the world lies somewhere with uniform probability between $\in [0,1]$, the household's best guess is $\frac{1}{2}[0,1]$. Information is clearer when elites reveal, with greater precision, a narrower interval. By doing so, elites' communication coordinates the public's beliefs, anchoring them to a more precise focal point such as between $\in [0.25, 0.55]$. What we are interested in in this paper is whether or not a shift from $\in [0,1]$ to $\in [0.25, 0.55]$ in communication attenuates inflation expectations and lowers inflation.

In summary, political elites try to change the economy by making public statements. Not all statements are the same, however. The more precisely elites' communicate, the more information households have. The more true knowledge that households learn, the more efficient their economic decisions. One way that an improvement in information can change their beliefs is by changing their inflation expectations. Because expected inflation matters for actual inflation, the more accurate households' inflation expectations, the less likely countries will experience inflation persistence and inflation traps (Sargent and Wallace, 1982; Sargent, Williams and Zha, 2009; Treisman, 2000).

Applying a multiple sender cheap talk model to the study of communication and message clarity generates a number of important and empirically verifiable claims. One testable implication is that is that an increase in transparency will lead to better economic outcomes. The main proposition that I test in this paper is that,

H1 CLARITY: *An increase in more accurate economic information about monetary conditions will reduce inflation expectations and lower inflation. Alternatively, an increase in more ambiguous economic information about monetary conditions raises inflation expectations and increases inflation.*

In addition to policymakers' speech, institutions provide information by establishing rules and credibility. In fact, good institutions should provide better information than cheap talk because enacting and maintaining good institutions is costly. In a world where there are costly signals, the inclusion of political elites' cheap talk, whether their messages are precise or vague, should not help to explain inflation. If independent central banks, budget targets, and credible exchange rate regimes convey all the information that households need to formulate their expectations, then additional words by political elites should have no independent effect at all.

Alternatively, if communication by diverse and multiple political elites matters and specifically the precision of their speech matters, then we should see that information precision matters independently of the institutional environment. In other words, if cheap talk helps to explain inflation, then this means that we should observe greater degrees of information precision lowering inflation, even when we account for costly signals such as better exchange rate regimes, more balanced budgets, and independent central banks.

Therefore, a corollary hypothesis is that both costly signals and cheap talk messages can provide accurate information about the economy. As a result, the second hypothesis that I test is:

H2 CREDIBILITY: *An increase in more accurate economic information about monetary conditions, even if it is cheap, will reduce inflation expectations and lower inflation*

3 Empirical Analysis

The main dependent variable is changes in monthly, year over year consumer price inflation, π_t. I predict changes in monthly, year over year inflation by regressing last period's average inflation expectations, π^e_{t-1} conditional on information the household receives from political elites today, I_t. This means that the variable of interest is $\pi^e_{t-1} * I_t$. If the costly-signaling hypothesis is correct, then messages should exert no independent effect on inflation expectations once we account for last period's inflation, county and month fixed effects, and a host of other control variables that capture costly signals. [3] I measure households' average inflation expectations using average forecasted inflation. I explain this in greater detail below. The level of elites' information precision is a latent variable. The measurement strategy that I use to construct this variable is also given in greater detail below.

4 The Data

The panel that I use to test the hypothesis consists of six countries from Latin America (Argentina, Brazil, Colombia, Mexico, Peru, and Venezuela). The time period examined, in monthly intervals, is 1993 to 2010. Despite the fact that there are only six countries in the sample and seventeen years, across these six countries and seventeen years, there is enormous variation in the countries' inflation experiences. The variety of experiences offers an excellent test of the theory. Consider some historical examples: In 1991, Argentina enacted the "Convertibility Program." This program attempted to improve the country's macroeconomic policy credibility and to establish inflation stability. The initial success of Argentina's fixed exchange rate regime brought Argentinian inflation down to annual rates as low as negative one percent in 1999, or deflation. In 2002, however, Argentinian inflation rose again to rates over 25 percent. During the same period, other Latin American countries, including Mexico and Brazil, faced economic crises of their own. Mexico faced double-digit inflation, averaging approximately 20 percent over the 1990s, whereas Brazil, despite starting the 1990s, with a major bout of hyperinflation, managed to keep inflation under 10 percent throughout much of the 2000s. Venezuela's economy was less volatile but similarly plagued with inflationary problems. Inflation was as high as 100 percent in 1996, and never fell below double-digits over the decade. Finally, Brazil reported the maximum inflation level in the region in 1993, with annual inflation reported at over 2000 percent. Like earlier attempts to tame hyperinflation in Argentina and in Israel, Brazil attempted to reform the macroeconomy by adopting the "Real plan." Brazil's inflation rates declined from 45 percent during the second quarter of 1994, to less

[3] I also run an alternative model that specifics the first difference of the dependent variable, $\pi_t - \pi_{t-1}$ on the LHS. The results are similar.

than one percent in 1996. Importantly, in addition to their diverse experiences, these countries also have significant similarities. Some of the similarities include regional affiliation which might be important to investors and therefore impact inflation, common external shocks such as changes in world or US interest rates which may transmit inflationary or deflationary shocks, and political institutions such as mixed presidential systems, large parties or neoliberal reform agendas. By restricting our sample to this set of countries, we can discount possible alternative explanations and meanwhile uncover some of the factors that help to explain across country and over time variation.

4.1 Inflation

The main outcome variable is monthly, year over year inflation. Inflation refers to the rate at which the level of prices for goods and/or services are accelerating in the economy. The measure that I use is a weighted basket of goods and services purchased by households, or the consumer price index (CPI). I use a country's monthly report of year over year consumer prices. This data is distributed to the International Labour Organization from national statistical offices and is disseminated by Federal Reserve Bank of Cleveland. [4]

4.2 Inflation Expectations

In order to measure the representative household's inflation expectations, I use averaged professional forecast data of the current year's annual inflation. The professional forecast data is from Consensus Economics and is proprietary data. Consensus Economics is a for-profit organization that polls industry and academic forecasters each month to get their views on expected values of key macroeconomic indicators. The actual series that I use is the current year forecasted change in consumer prices. Coverage starts in 1993 and ends in 2010. The number of forecasters polled in a given month varies, ranging from seven forecasters to twenty-three forecasters, for a total of 13,829 forecasts. While the frequency of the forecast data is monthly, each month, the forecaster forecasts the current year's annual inflation rate. In order to calculate the average household's in-

[4] http://www.clevelandfed.org/research/data/world-inflation/

flation expectations, I take a monthly average of all the forecasters' forecasts for a given country month, and use this as a proxy for the publics' expectations of current year's inflation.

A potential problem with using experts' expected inflation to measure households' expected inflation is that the average forecaster may have similar private information as political elites. If the forecaster is privy to the same expert information as political elites, there may be stronger association between pronouncements by political elites and forecaster inflation expectations because of shared knowledge and not because of information transmission from elites to households. Unfortunately, to my knowledge, a dataset measuring actual household survey of inflation expectations for this sample of countries over time is not available. Fortunately, however, recent work from the Bundesbank comparing German household inflation expectations and professional survey forecasts suggests that the two series have significant overlap. Menz and Poppitz (2013) find that forecaster inflation expectations matches households' inflation expectations in Germany well, and that this is particularly true for higher income, higher educated males that watch the news. People who receive elites communication in the news media, therefore, are more likely to have inflation forecasts that mirror professional forecasters. While using professional forecasters' expectations to proxy the inflation beliefs of households is not exact, there is a strong positive relationship between professional forecast and household forecasts and this relationship is particularly strong for the better educated and employed.

A second problem relates to the timing of the inflation series and the expectations series. On the one hand, inflation is a measurement of monthly changes in year over year inflation whereas the forecast variables are monthly projections of the current year's inflation. While the inflation series and the expectations series are not strictly the same, the persistent nature of inflation allows for comparison across the series.

4.3 Information Precision

Observable to the household are elites' public statements about the economy. My theoretical model suggests that elites' statements are not random talk. Instead, elites' statements are a selection of signals about the economy. Furthermore, inter-elite strategies constrain or enhance the precision of information disseminated to the public. As a result, in order to test the hypotheses listed above, we need a measure of the information precision in elites' statements made in the news media.

In order to measure the precision of information in inflation pronouncements, and following from the methodology presented in Ehrmann and Fratzscher (2010), I construct a new dataset of all public inflation statements by political elites using Factiva, a news source database. Factiva contains newspaper articles and newswire reports from 14,000 news sources. Using this dataset, I extract all database entires containing the words "minister and central bank and inflation and "country name"" from the popular newswire, "Reuters News."

The number of newspaper articles returned by Factiva for a given country and a given year is very large. For instance, running the search of "minister and inflation and Argentina and central bank" generates over 1000 newspaper articles between January 1, 1993 and December 31, 1993 alone. Doing such a search on the entire sample yields over 9,000 newspaper articles for the six Latin American countries in my dataset. With over 9,000 hits, human coding of each document is impossible. In addition to the laboriousness, the use of humans to hand code each newspaper article introduces the potential for measurement error which may then cause problems of reliability and validity. In fact, recent scholarship by Mikhaylov, Laver and Benoit (2012) find that human coding of the Comparative Manifestos Project yields misclassification in serious and systemic ways.

Instead of using human coding, I depend on machine learning techniques to retrieve, parse, filter, and classify the newspaper articles. This allows me to get measurement of my key independent variable, "information precision," that is consistent across newspaper sources, countries, and overtime. Furthermore, recent work by Klebanov, Diermeier and Beigman (2008) and Quinn et al. (2009) demonstrate ways that machine learning can be applied to political textual analysis that yields more reliable (less biased) and consistent estimates despite a less nuanced comprehension of textual language than human coders might achieve.

Like other research that relies on machine classification of textual data, there are a number of important issues with this approach. First, I conduct the database search only in English. As a result of the English search, it is likely that not all statements about inflation are reported. Another potential problem with the English search criteria is that the reported pronouncements may be those of interest to foreigners. This is a potential problem because I am interested in the domestic audience. Nevertheless, while it is very likely that domestic political elites have more than one audience, given that Factiva contains the newswire reports from local offices, I am confident that the statements collected contain a wide sample of all statements made and include statements of relevance to domestic households. One important indicator of the relevancy of the search to domestic households is that the local news media is discussed. For example, one Reuters newspaper article states, "The daily *La Nacion*, quoting Economy Ministry sources, said Peronists and Radicals had agreed to pass a compulsory contribution law for those companies which do not buy solidarity bonds." This example and others suggests that Reuters newswire articles captures domestic political elites' statements reported in the local Spanish-language media.

Second, by using the terms "minister" and "central bank" in the initial search criteria, the search selection may over-select statements from incumbents and under-select statements from opposition members. The search may also not include statements from political elites such as labor union leaders, political opponents, or prominent academics which are included in my definition of political elites. One important indicator that statements from oppositional members are included is that some articles report counter-claims. For example, one newspaper article states, "The [Colombian] government, however, points to the lowest inflation in almost 30 years - 9.98 percent over the last 12 months - as a sign of good housekeeping. Critics say the inflation record is unsurprising given the scale of the economic slump." This example and others like it suggests that the search captures statements made by political elites outside of the government.

4.3.1 Unsupervised Learning

Using text as data to generate a measure of information precision requires two steps - treating text as data and data coding. The first step is conceptualizing each newspaper article as unstructured data that contain political elites' private information. The objective is to structure the newspaper articles in such a way that the private information can be categorized and coded. Through categorization and coding, it is possible to extract a measurement of the variable, "information precision."

Automated content analysis follows a logic very similar to traditional content analysis in qualitative analysis (Laver, Benoit and Gerry, 2003). First the data is unitized. The researcher decides the unit of analysis, whether the unit be words, tokens, sentences, statements, or quotes. Second, the units are assigned a metric. Typical metrics include word frequencies or word counts, measures of semantic relationship between words, a measure of how closely related the words are, and finally, measures of word distance in text (Manning and Schutze, 1999).

For the newspaper articles, I determine that the unit of analysis I am most interested in is token frequency. Tokens are textual data that have been pre-processed to remove whitespace, grammar, punctuation, and stopwords that have little conceptual information but are necessary for sentence comprehension such as "and, if, but, how, then." Once the sentence is tokenized and the stopwords are removed, the article's content is transformed into word tokens. For example, the statement, "Minister Calvo says that inflation will be lower next January" is transformed using the above process into distinct tokens: "Minister" "Calvo" "says" "inflation" "lower" "next" "January."

Once the data is processed into a token frequency table, the next step is filtering. The objective of filtering is to make sure that the articles extracted are relevant. While the initial search criteria, "minister and central bank and inflation and "country name"" pre-processes some of the data, upon examination of the newspaper articles, there are many newspaper articles that are not relevant inflation pronouncements. Again, because the number of newspaper articles is very large, I turn to machine learning techniques to filter the documents into "pertinent" and "non-pertinent" inflation announcements. I apply a K-means clustering algorithm to the tokenized frequency table, which I explain in the next section.

4.3.2 Filtering Pertinent and Non-pertinent Inflation Announcements using Clustering

K-means clustering is an iterative clustering algorithm that takes input data and assigns the data to k number of groups based on how well the data fits to a specified cluster. For example, if there are $k = 2$ groups, then the K-means algorithm will first randomly choose two means; second, it will assign all the input data closest to that particular mean, that mean's label; third, it will determine if the algorithm can do a better job fitting the data, and if so, choose another mean. The algorithm iterates through this process until the best fit is found. It then assigns all data points belonging to that mean a label (Hastie, Tibsgurani and Friedman, 2003).

Used as a filter, K-means clustering classifies the articles into two groups, "pertinent" and "non-pertinent" inflation announcements. "Pertinent" newspaper articles are relevant inflation statements and "non-pertinent" newspaper articles are business journals, weekly reports, or numerical market data reports. I then discard those articles that the classifier identifies as "non-pertinent." Running the filter removes approximately one-third of the newspaper articles. Those articles remaining after filtering are assumed to be relevant inflation statements.

In examining the removed newspaper articles with a random sample of hand coded articles, the K-means clustering algorithm successfully identifies "non-pertinent" in my hand-coded sample; in all cases, the newspaper articles that I remove would be hand-coded as "non-pertinent." While I can be relatively sure that the number of "false negatives" is small by surveying the discarded articles, more difficult to determine is the number of "false positives." So long as any remaining articles are similar to the token frequencies in the "pertinent" category, while "false positives" will increase the noise of the measure, they should not introduce bias. Furthermore, while the K-means classifier is simple, work by Hand (2006) shows that when compared against more complicated classification strategies, simpler classifications tend to outperform more complex models and do not suffer from problems of over-fitting and bias.

4.3.3 Measuring Information Precision using Clustering

Having discarded the non-relevant statements, I then classify the remaining articles into distinct categories of ranked information precision. I run another clustering model and set $k = 3$, the same number of information types that I would classify if I were hand coding the data. Because the method is unsupervised, I make only the assumption that that there are three groupings and that these groupings should be distinguishable due to differences in token frequencies. Like above, the classifier assigns the newspaper articles into three groups based on the best fit of the means. Figure 1 shows the assignment of each individual newspaper article based on an article's token frequency count.

[Figure 1 around here]

[Figure 2 around here]

Finally, from the remaining classified articles, I construct a measure of the proportion of informative news articles for a given country-month. I create a dummy variable for each classified newspaper article and aggregate the total number of counts for each information type by country-month. Finally, I calculate the total proportion of "precise" articles divided by the sum of the total number of articles for a given month. If my theory is correct, then what matters is not the exact content of any particular news article, but instead the overall precision of information in the information environment. In doing so, I control for the fact that while a household may not read a particular article, people are exposed to news about the economy. Figure 2 shows the distribution of the information environment by country-month.

5 Results

This section presents the statistical analysis using the data and the estimation model in equation (1). Inflation in the current period is determined by last period's inflation expectations conditional on the precision of information provided by elites' statements in the news today. β_2 is a vector of parameter estimates, Z is a matrix that includes our variables of interest and control variables. β_1 includes last month's inflation rate to account for the fact that inflation is a highly autoregressive. I also include country, η_i and month τ_t fixed effects to account for spatial and temporal features of the data, like institutions, that are otherwise unspecified in the model. Finally, the inclusion of annual output, as measured by per capita income, also effectively includes a year fixed-effect term in some models. To account for costly signals, I include the number of changes to economic policy reported to the IMF.

$$\pi_{i,t} = \alpha_0 + \beta_1 \pi_{t-1} + \beta_2 Z_t + \eta_i + \tau_t + \epsilon_{i,t} \tag{1}$$

I run this model using standard OLS panel regression techniques and report the findings in Table 3. Table 3 shows that, when information precision is zero, inflation expectations have a positive and significant relationship with inflation. The estimated relationship is 0.9 in the panel with missing data and 0.7 when I account for missing data. I estimate the missing data (approximately 50 percent of the data is missing) two ways, first using multiple imputation using the software Amelia and second, predicting missing values using last period's inflation rate. I do not interpret the coefficient on information precision independent of the interaction term as it specifies the effect of information precision on inflation expectations when expected inflation is zero, which is a value not of theoretical importance.

Figure 3 shows the marginal effects plot. At different levels of information precision, inflation expectations attenuate, contributing to lower predicted inflation.

[Figure 3 around here]

For all ranges of the information variable greater than 0, an increase in information precision attenuates predicted inflation by lowering inflation expectations. What this means is that as information precision increases, the effects of clear and credible information reduces the influence of inflation expectations in the previous period. This provides some evidence that an increase in information clarity helps to improve the economy. Furthermore, what is particularly important is that at very high levels of precision, or values over 0.8, the coefficient on inflation expectations is negative. What this means is that at very high levels of information precision, inflation expectations negatively contribute to inflation. This suggests that when information precision is really high or greater than (0.8), "clear" information not only attenuates the household's last period inflation expectations but actually but may actually cause a reduction in inflation expectations and lower inflation.

This finding provides some evidence for the claim that elites' statements, if they are clear, can steer the economy. While even ambiguous information seems to attenuate inflation expectations, clear information reduces expectations much more than ambiguous information.

In addition to the country fixed effects, the monthly fixed effects, and the lagged dependent variable, for robustness, I also include annual per capita output as measured by GDP normalized to 2005 prices.[5]

We know that countries with better institutions, more credible exchange rates, and better trained policymakers are also countries with higher income. Furthermore, we also know that the higher educated are more likely to have better congruence in their expectations with forecasters. By including this data, I aim to control for these factors. When I include per capita output into the model, however, I find no significant differences in the results. I present these findings and the findings from other robustness checks in Table 4.

In order to test hypothesis 2, or whether cheap talk and costly signals matters for inflation expectations, I include a measure of announced policy changes to the economy as reported in the International Monetary Fund's *Exchange Commitments and Exchange Restrictions, Annual Reports*. The IMF classifies policy changes according to topics including changes to the exchange rate regime, imports, exports, invisibles, capital, gold, non-resident accounts, and changes to the payments system. It is therefore a good record of overall economic policy changes. I count a policy "change" by topic as equal to "1" if there was a policy announcement reported by the IMF in a specific quarter. If there was no announcement in a quarter, I enter "0". For example, if Mexico announced a change to its import restrictions with Argentina in Q1 1999, I code this as 1 import

[5] This data is from the World Development Indicators, http://databank.worldbank.org/

announcement for Mexico. I do not include the Mexican announcement in Argentina's tally as I am interested in the relative frequency for which there is an announced policy change for a given country, not bilateral changes. Because I have this change data at the quarterly frequency and the data that I am using here is monthly, I interpolate the monthly number of policy changes from the quarterly data using a cubic spline.

When I include this variable into the model, the coefficient for costly signals is both negative and significant. As expected, this suggests that the greater the costly signals the lower inflation. More important for the testing of hypothesis 2, however, is that the introduction of costly signals does not change either the coefficient estimate or the significance level of the interaction term. The value of the coefficient and the level of significance are robust to the inclusion of costly signals as is the predicted relationship across the levels of information precision according to the marginal effects plot.

Table 4 presents all of the findings in greater depth including each model specification. Model 1 shows the results from listwise deletion and including country and month fixed effects. Model 2 includes country fixed effects. Model 3 includes the control variable for per capita output which is effectively a year fixed effect term. Model 4 includes the control variable for per capita output and costly signals using the IMF change data. Model 5 corrects for missing data using multiple imputation in Amelia.

Finally, I also check that the results from the model are not sensitive to specification of the dependent variable or extreme values in the sample. I also run the model with a different measure of the dependent variable $\pi_t - \pi_{t-1}$ and the results are similar. I also examine whether extreme values, especially hyperinflation in Brazil in 1993 and 1994, matters. I discard all observations for Brazil in 1993 and 1994 and rerun the analysis. Here I find results are similar to those presented in Table 3 and Table 4. This suggests that the hyperinflation experiences of Brazil are not driving the results.

6 Conclusion

This paper offers a new perspective on how ambiguity and clarity in elites' communication changes the economy. Using text analysis, I develop a new measure of information precision from Reuters News reports in Latin America. I show that there is significant variation in the precision of information contained in elites' statements and that some announcements are clear whilst others are ambiguous.

Using this new measure to predict inflation, I also show that an increase in the precision of political elites' statements lowers inflation, even when talk is cheap. Furthermore, the findings are robust when I include controls for costly signals and output. Given that multiple elites make proclamations, cheap talk models with multiple senders suggest that inter-elite politics generates strategic speech. This paper shows that not all speech affects the economy equally; when elites' communication is more precise, countries have lower levels of inflation expectations and lower inflation.

Finally, researchers with an interest in measuring information precision and its inverse, ambiguity, might apply similar unstructured text analysis strategies as a way to generate new measures useable for theory testing. For example, future research can use this text analysis strategy to test whether a similar empirical relationship exists between information precision and support for fiscal austerity or economic reforms more broadly. Assuming that political elites have an informational advantage and a strategic interest in influencing their audience, the paper contributes an understanding of how and under what conditions political elites can use their words to steer the economy. Being clear is a premium strategy for policymakers.

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Table 1: Inflation episode length, average level, and variation for a selection of countries

Country name	Start Year	End Year	Duration	Average Annual Rate
Argentina	1972	1992	20	471
Bolivia	1972	1977	5	2741
Brazil	1981	1996	15	772
Bulgaria	1991	1998	7	262
Congo, Dem. Rep.	1976	2002	26	1362
Croatia	1986	1995	9	513
Israel	1978	1986	8	165
Peru	1978	1994	16	809
Poland	1988	1993	5	196
Romania	1991	2001	10	121
Russian Federation	1993	2000	7	222
Turkey	1979	2004	25	62
Uruguay	1964	1993	29	64

Table 2: Variation in frequency of country experiences by inflation types (1960 to 2010)

Range of Annualized inflation	Number of Countries
Hyperinflation (Series Average)	13
Chronic Inflation (Average)	31
Chronic Inflation (Series Maximum)	102
Low inflation (Series Average)	185

Table 3: OLS Regression Analysis with Interaction

Regressor	FE Model	Imputed Model
Lagged Inflation	0.9 (0.0)	0.9 (0.0)
Inflation Expectations	0.9 (0.1)	0.7 (0.1)
Information Precision	2.3 (7.8)	1.1 (4.95)
Inflation Expectations * Information Precision	-1.2 (0.2)	-0.9 (0.1)
N Observations	523	1236

Table 4: OLS Regression Analysis with Interaction

Regressor	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Lagged Inflation	0.9 (0.0)	0.9 (0.0)	0.9 (0.0)	0.9 (0.0)	0.9 (0.0)
Inflation Expectations	0.9 (0.1)	0.9 (0.1)	0.9 (0.1)	0.9 (0.1)	0.7 (0.1)
Information Precision	2.3 (7.8)	0.4 (2.9)	2.2 (8.1)	1.1 (5.0)	2.4 (0.9)
Inflation Expectations * Information Precision	-1.2 (0.2)	-1.2 (0.2)	-1.2 (0.2)	-0.9 (0.1)	-1.1 (0.0)
Output (Annual per capita GDP)	No	No	0.0 (0.0)	0.0 (0.0)	No
Announced Policy Changes	No	No	No	-2.4 (1.1)	No
Month Fixed Effects	Yes	No	No	Yes	No
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Effective number of observations	523	523	523	523	1236

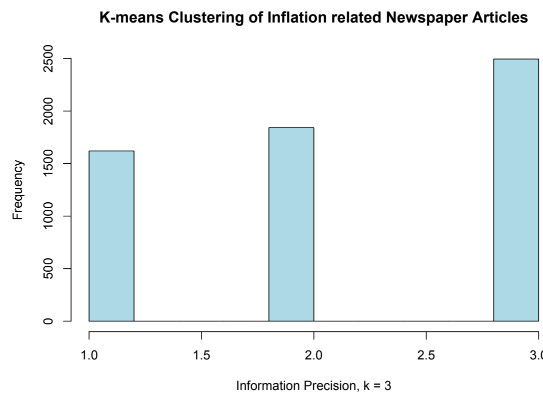

Figure 1: Number of newspaper articles by types of information precision (most informative to least informative)

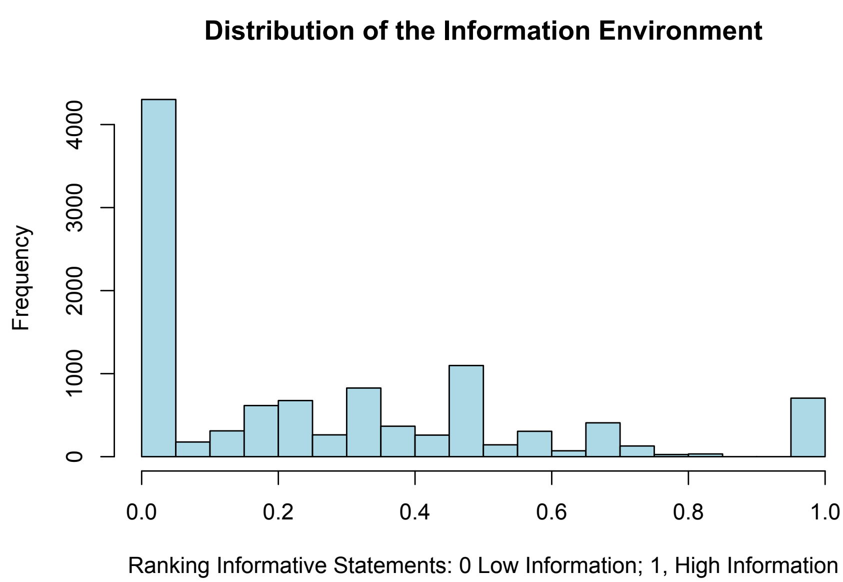

Figure 2: Number of newspaper articles by information precision for a selection of Latin America Countries: 1993-2010

Figure 3: The marginal effect of inflation expectations on inflation