Sentiment, productivity, and economic growth

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Abstract

Earlier research finds correlation between sentiment and future economic growth, but disagrees on the channel that explains this result. We shed new light on this issue by exploiting cross-sectional variation in country size and market efficiency. We find that sentiment shocks in the largest advanced economies increase economic activity, but only temporarily and without affecting productivity. Conversely, sentiment shocks in smaller or less advanced economies predict prolonged economic growth and a corresponding increase in productivity. The results support the view that sentiment can create economic booms, although only in economies where sentiment and fundamentals are harder to disentangle.

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I. Introduction

A growing body of evidence shows that business cycles are mainly driven by expectations (see Beaudry and Portier (2014) for an excellent review). The underlying idea is intuitive and actually rather old. For example, Pigou (1927) suggests that economic fluctuations are directly caused by businessmen's beliefs, so that booms and busts are related to bouts of optimism and pessimism. Keynes (1936) proposes the notion that "animal spirits" lie at the core of economic activity. However, the exact channel through which expectations affect the macroeconomy is not entirely clear.

In this respect, previous literature has proposed three competing hypotheses. First, optimism is the result of a positive signal (or "news") over future fundamentals, so that positive sentiment anticipates economic growth but does not cause it (Beaudry and Portier (2004, 2006, 2014); Barsky and Sims (2012)). Second, macroeconomic mood swings have no relation with economic fundamentals and, therefore, only create short-lived economic fluctuations (Akerlof and Shiller (2009)). Third, sentiment has a direct and long-lasting effect on future fundamentals, for example by relaxing financial constraints (Baker et al. (2003); Baker (2009); McLean and Zhao (2014)) or through a self-fulfilling feedback loop (Benhabib and Farmer (1994); Benhabib et al. (2015); Benhabib et al. (2016); Shiller (2017)). To a large extent, these hypotheses are empirically difficult to disentangle (Beaudry et al. (2011)).

In this paper, we propose a novel solution to this problem. Instead of considering a single country, we exploit cross-sectional variation in country size and market efficiency. Using cross-country data from the OECD over the period 1975-2019, we find that sentiment shocks in the largest advanced economies increase consumption, employment, and income, but only in the short run and without affecting future productivity. Conversely, sentiment shocks in smaller or less advanced (for

example, capital constrained) economies lead to prolonged economic booms and correspondingly predict an increase in productivity. The results support the view that sentiment can create economic growth, although only in economies where sentiment and fundamentals are harder to disentangle.

The main hurdle in this empirical exercise is the distinction between sentiment, i.e., a genuine bias in economic expectations, and news over future fundamentals (Beaudry et al. (2011)). Consistent with our interpretation of sentiment as a genuine distortion of beliefs, we find that a wave of high sentiment is followed by lower stock returns (Baker and Wurgler (2006)), a shift from credit to equity markets (Baker and Wurgler (2000)), and a short-term increase in capital investments (Baker et al. (2003)). All three empirical patterns are again largely confined to economies that are comparatively smaller or less advanced. This interpretation is further corroborated by instrumental variable regressions where we find that our main results also hold for an exogenous measure of sentiment based on weather patterns (Hirshleifer and Shumway (2003)).

In our baseline specifications, we identify sentiment with the country-specific consumer confidence index from the OECD. Both the US and the international version of this index have been used extensively in the finance literature as a proxy for sentiment among economic agents (Lemmon and Portniaguina (2006); McLean and Zhao (2014); Benhabib and Spiegel (2019); Montone and Zwinkels (2020); Birru and Young (2022)). This measure is based on surveys and captures economic expectations for the short term (12 months ahead) among the households of a given country. As such, it represents the cross-country counterpart to the US consumer confidence index from the Conference Board. The advantage of using the consumer confidence index is that it is the only widely-recognized and consistent measure of sentiment that is available at the country-level for a large set of countries.

We acknowledge that local sentiment may partly reflect the level of sentiment of US or global

investors (Baker et al. (2012); Montone and Zwinkels (2020)). This is a particularly pressing concern in light of the positive correlation between global sentiment and economic growth in a number of large and advanced economies (Dees (2017)). While this issue is hard to tackle in a single-country setting, our panel analysis enables us to purge the local consumer confidence index from the effect of either US or global sentiment by simply using year fixed effects.[1] Furthermore, we also introduce country fixed effects to capture the potential impact of time-invariant country characteristics on our estimates. Finally, we purge the index from a potential business cycle component using several macroeconomic variables, either including them as controls or to break down the index into an explained and an unexplained (or orthogonalized) component (Baker and Wurgler (2006); Lemmon and Portniaguina (2006)).

In addition to analyzing the full sample, we also conduct our main analyses on two subsamples of interest. First, following the International Monetary Fund's guidelines as well as previous literature, we identify the largest advanced economies as the G7 countries (Colacito et al. (2018); Huo et al. (2023)). The strength of the G7 block lies not only in the economic size of its members, both individually and collectively, but also in the implementation of common policies aimed at various socio-economic goals that increase economic stability (Sobel and Stedman (2006); Cormier et al. (2024)). Supporting these points, we show that G7 countries exhibit significantly lower macroeconomic uncertainty, as measured by Ozturk and Sheng (2018). With less noise, their economic fundamentals are comparatively easier to evaluate and tease out from sentiment. Consequently, these fundamentals are more readily available to economic agents and also more accurately reflected in

[1]This specification also captures the potential confounding effect of US or global business cycles.

stock prices.[2] Correspondingly, we expect sentiment to play a minor role in these economies.

In contrast, the non-G7 block consists of economies that are comparatively smaller, less advanced, or both. Consistent with our findings on macroeconomic uncertainty, previous literature shows that economic fundamentals are more volatile and harder to assess for smaller economies (Furceri and Karras (2007); Alouini and Hubert (2019); Armstrong and Read (2020)) and less advanced ones (Mobarak (2005)). In the presence of noisier economic signals, we expect sentiment to have a more pronounced effect on economic growth in these countries. We test these predictions in the analysis below.

We begin the analysis by studying the relation between sentiment and future productivity. To this end, we estimate panel regressions of productivity, measured up to four years ahead, on sentiment, and a set of controls including macroeconomic factors and fixed effects. We find that the coefficient of sentiment from these regressions aligns with our theoretical predictions. An increase in sentiment predicts a prolonged increase in productivity among non-G7 countries, whereas the effect is absent among G7 countries. This result is robust to several alternative empirical specifications.[3]

Next, we analyze two possible transmission channels through which sentiment can affect the real economy. First, a wave of positive sentiment inflates the prices of assets that are difficult to value (Baker and Wurgler (2006, 2007); Baker et al. (2012)), thereby primarily benefiting firms

[2]We show that stock returns in G7 markets exhibit lower alphas, relative to non-G7 markets, in global versions of the Capital Asset Pricing Model (CAPM) and the Fama-French three-factor model (Adler and Dumas (1983); Griffin (2002); Post et al. (2015); Fama and French (1998, 2012)). This is consistent with the theoretical prediction that reduced uncertainty makes arbitrage forces stronger in the presence of finite risk aversion (Shleifer and Vishny (1997); Hirshleifer and Teoh (2003)).

[3]We obtain similar estimates when we alternatively consider an extended G7 group that also includes the most advanced economies from the non-G7 cohort, such as Switzerland and the Netherlands, which also addresses the concern that the difference in results may simply reflect a difference in statistical power. We also find that the results are stronger in magnitude for the least advanced economies in the non-G7 group.

that are financially constrained (Baker (2009); McLean and Zhao (2014)). The reason is that when stock prices deviate from fundamentals, managers of financially constrained firms can opportunistically issue new shares and undertake investments that could not be funded otherwise (Baker et al. (2003)). This transmission channel is then characterized by an immediate investment boom (Arif and Lee (2014)), with a corresponding increase in employment and (to some extent) wages, as capital flows to more productive firms and labor (e.g., Bai et al. (2018); Caggese et al. (2019); Fonseca and Van Doornik (2022)).

Second, high sentiment can directly stimulate the real economy by increasing aggregate demand (e.g., Benhabib et al. (2015); Acharya et al. (2021)), generating immediate and protracted economic booms through endogenous growth.[4] The mechanism works as follows. Optimistic households expect higher asset returns and productivity. As a result, they consume more and provide more labor supply to increase their labor income savings (e.g., Barsky and Sims (2012); Benhabib et al. (2015); Benhabib et al. (2016)), thereby creating an aggregate demand shock. This shock is then primarily characterized by a jump in consumption and employment growth, which gives rise to a self-fulfilling feedback loop leading to long-run economic growth.[5] Since consumer sentiment also represents a proxy for sentiment in financial markets, we can test whether either of these two transmission channels is operational in our sample.[6]

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[4]See Barsky and Sims (2012), pp. 1363-1364, for an excellent discussion on this point.

[5]In principle, high sentiment can also lead to self-fulfilling business cycles through financial markets. If stock market prices represent a noisy signal for future economic prospects, the presence of high noise can increase the sensitivity of real economic activity to sentiment (Benhabib et al. (2016)). However, such sensitivity can also decrease when price informativeness is low (Foucault and Frésard (2012); Goldstein (2023)).

[6]The index from Baker and Wurgler (2006), the most widely-used proxy for investor sentiment, is only available for the US. However, economic theory suggests that there is an overlap between investor and consumer sentiment (Shefrin (2008)). Correspondingly, several empirical asset pricing studies use these two measures interchangeably, obtaining similar results (Lemmon and Portniaguina (2006); McLean and Zhao (2014); Montone and Zwinkels (2020); Birru and Young (2022)). Consistent with this interpretation, we find that country-level price-dividend ratios are posi-

To tease them out, we proceed as follows. First, we test whether the predictive power of sentiment over future productivity is moderated by the degree of financial development of the country, measured as in Rajan and Zingales (1998). If sentiment helps relax financial constraints, the effect of sentiment on future productivity should be stronger in less developed financial systems, where funding is comparatively less available and firms are correspondingly farther from first-best investment levels. We find strong empirical evidence consistent with this conjecture. Conversely, the findings are inconsistent with an alternative interpretation of sentiment as a latent rational signal for future growth, as this hypothesis counterfactually predicts that the signal should be incorporated more strongly in more developed financial systems.

Further corroborating the financial constraints channel, we show that an increase in sentiment is followed by an increase in capital formation growth. The effect occurs within one year and is confined to non-G7 countries, which is in line with our findings that stock prices in these markets include a larger mispricing component. We also find a similar empirical pattern for investment in research and development, suggesting that the sentiment-driven increase in productivity partly reflects an increase in innovation. These findings support the view that managers are more willing to invest in innovation at times of high sentiment (Dang and Xu (2018)), especially when fundamentals are uncertain (Dicks and Fulghieri (2021)). Finally, we find that sentiment is a positive predictor of the labor share of income to GDP. The effect is delayed, taking place only three and four years ahead, and again entirely concentrated in non-G7 countries. This is consistent with the idea that wages are sticky, and especially so for non-G7 countries, which are typically characterized by less flexible labor markets.

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tively correlated with the component of consumer sentiment orthogonalized to macroeconomic fundamentals, and the two time-series plots follow similar patterns (see Figure C1).

On the other hand, we also find some empirical evidence for the aggregate demand channel. We find that an increase in sentiment predicts a short-run increase in real consumption, employment, and income among non-G7 countries for up to three years into the future. Among G7 countries, the effect is short-lived and weaker in both magnitude and significance. Overall, these additional findings suggest that sentiment plays an important role in the relaxation of financial constraints in the macroeconomy, in a similar manner to other well-known financial channels such as monetary policy (Almeida et al. (2024)). However, the sentiment-driven economic booms we observe in non-G7 countries suggest that sentiment also exerts a direct effect on aggregate demand.

We further validate our identification of sentiment through two additional tests. First, we show that high sentiment is followed by lower stock returns (Lemmon and Portniaguina (2006); Baker and Wurgler (2006, 2007); Baker et al. (2012); Stambaugh et al. (2012)). The magnitude of the effect is smaller and short-lived in G7 countries, consistent with the presence of stronger arbitrage forces.[7] Second, we show that high sentiment and its associated lower cost of equity makes equity markets relatively more attractive than credit markets (Baker and Wurgler (2000, 2002)). The results are again confined to non-G7 countries, which is in line with our finding that such markets are characterized by greater and more prolonged overpricing.

In further tests, we show that sentiment has no relation with future government bond returns, consistent with the view that sentiment primarily affects the returns on risky assets such as stocks (Baker and Wurgler (2006)). Then we analyze whether sentiment effectively captures economic expectations by looking at analysts' forecasts of macroeconomic fundamentals. We find that sentiment shocks in non-G7 countries are followed by a large and protracted increase in domestic

[7]The lower fundamental uncertainty that characterizes G7 countries makes equity valuations less subjective and arbitrage correspondingly less risky (Baker and Wurgler (2006); Birru and Young (2022)).

demand forecasts, whereas the effect is small and short-lived for G7 countries. Consistent with the expectation channel, and also with the prominent role of financial markets in the transmission of sentiment shocks, we find that the relation between sentiment and economic growth is partly moderated by country-level price-dividend ratios. Finally, we find that sentiment shocks, unlike fundamental shocks, have no predictive power over investments from foreign countries. Put together, these results suggest that sentiment-driven business cycles in non-G7 countries reflect an increase in domestic demand due to optimistic expectations.

The paper proceeds as follows. In Section II, we discuss related literature and further highlight our contribution. In Section III, we introduce the data and methodology. In Section IV, we present our main empirical findings. In Section V, we explore the channel underlying our results. In Section VI, we offer some concluding remarks.

II. Related literature

Our paper makes several contributions to the literature. Barsky and Sims (2012) propose a model with exogenous technology growth, where the relationship between sentiment and subsequent economic activity is not causal but rather reflects advance knowledge of future productivity developments. Using US data, they provide empirical evidence for their prediction. They also point out that if technology growth were in fact endogenous, sentiment should cause a short-run jump increase in economic activity, thereby leading to a rise in productivity through learning-by-doing. We speak to their paper in two ways. First, we find similar empirical evidence for the United States and the G7 countries more broadly. Second, we find that sentiment-driven endogenous growth actually seems to be operational for non-G7 countries.

Beaudry et al. (2011) find that consumer confidence shocks predict economic growth in the US,

suggesting that further research is needed to understand whether the effect is driven by economic news or genuine sentiment. Benhabib and Spiegel (2019) propose a novel strategy to address this issue. While previous literature analyzes individual countries or blocks of countries (Beaudry and Portier (2014); Dees (2017)), they exploit cross-sectional variation in local sentiment across US states and find that exogenous shocks to state-level sentiment are followed by higher short-run economic growth.

In a similar vein, we exploit cross-country variation in our analysis. This strategy grants us two important advantages. First, we study how differences in country size and market efficiency affect the extent to which economic agents mistake sentiment for economic fundamentals. Second, we test a specific channel through which sentiment affects economic growth, i.e., a decrease in the local cost of capital due to the overpricing of stocks. Our focus on the unique cross-sectional predictions of sentiment is in line with previous sentiment literature (Baker and Wurgler (2006, 2007); Baker et al. (2012)). Together with an instrumental variable approach (Benhabib and Spiegel (2019)), these tests address the concern that sentiment may capture unobserved economic shocks (Cochrane (1994); L'Huillier et al. (2022)).

Previous studies find that the impact of sentiment shocks on economic growth is only temporary (Starr (2012); Benhabib and Spiegel (2019)) and small (Ludvigson (2004); Barsky and Sims (2012)). To the best of our knowledge, our paper is the first to show that sentiment can create long-lasting economic booms, as predicted by theory (Benhabib et al. (2015); Acharya et al. (2021)). The key difference between our results and theirs is that we carry out a cross-country analysis instead of focusing on the largest advanced economy (the US). Our findings are consistent with the view that sentiment affects the real economy through the equity markets (Baker et al. (2003); Baker (2009)), and lend novel support to the idea that the financial sector can influence economic

growth in its own right (Levine (2005)).

A recent strand of research analyzes macroeconomic outcomes more broadly by looking at international comovement, either through production networks (Huo et al. (2023)) or non-technological business shocks (Levchenko and Pandalai-Nayar (2020)). Furthermore, these studies are centered on the US because this is the only country for which a wide collection of identified shocks is available. Our paper complements this literature by looking at the effect of sentiment on local business cycles rather than cross-country transmission. In doing so, we significantly expand the number of countries in the analysis by using a sentiment decomposition from the asset pricing literature (Baker and Wurgler (2006, 2007); Baker et al. (2012)).

More generally, our paper contributes to a burgeoning literature on expectations not grounded on macroeconomic fundamentals. Previous research shows that such expectations can be extrapolative (Bacchetta et al. (2009); Amromin and Sharpe (2014); Greenwood and Shleifer (2014); Barberis et al. (2015, 2018); Giglio et al. (2021)), sensitive to extreme events (Kozlowski et al. (2019, 2020)), or characterized by rational inattention and frictions (Angeletos and Lian (2016, 2022, 2023); Gabaix (2019)). More recent studies provide evidence for overreactive expectations (Bordalo et al. (2023); Bianchi et al. (2024); Maxted (2023)). The role of sentiment we identify in our paper is more in line with this latter strand of research.

In particular, Bordalo et al. (2023) also connect financial markets to economic fluctuations. Using a mechanism of overreacting expectations in a setup à la Angeletos et al. (2020), they show that waves of optimism among US analysts are followed by a short-term increase in US macroeconomic activity. Our paper is complementary to theirs in two ways. First, we show that their findings apply not only to the US but more generally to the largest advanced economies. Second, we show that sentiment generates a stronger and more persistent overreaction among small or less advanced

economies, both in financial markets and real economic activity, which ultimately translates into an increase in productivity. Our findings then highlight the importance of country-level development in mediating the real effects of sentiment.

Previous research shows that the financial sector can affect the real economy through the financing of capital (Bernanke and Gertler (1989); Kiyotaki and Moore (1997)) and the production of information about investment opportunities (Levine (2005)). Our findings suggest that sentiment operates through both channels. First, we show that sentiment shocks affect capital financing by decreasing the local cost of equity. Second, we find evidence that sentiment shocks hinder the production of information in non-G7 capital markets, where economic agents mistake genuine sentiment for a signal about better investment opportunities.

The findings also speak to the relation between sentiment and managerial market timing. When investor optimism boosts company valuations in financial markets, corporate managers rationally take advantage of the lower cost of equity by timing their investments or issuing new shares (Morck et al. (1990); Stein (1996); Baker and Wurgler (2000, 2002); Baker et al. (2003); Polk and Sapienza (2009), McLean and Zhao (2014)). Arif and Lee (2014) show that high sentiment also increases aggregate investment in the US. In this paper, we find that this channel is also operational in a large sample of OECD countries.

Finally, we acknowledge that models of trade based on non-informational reasons make similar predictions to sentiment models. For example, Campbell et al. (1993) show that changes in the level of risk aversion for a large subset of investors can affect short-term equity returns and the cost of capital for firms. This alternative interpretation of investor behavior is closer in nature to the idea of animal spirits, partly overlapping with the modern concept of investor sentiment (Baker and Wurgler (2006); Tetlock (2007)).

III. Data and methodology

We retrieve macroeconomic variables from the Penn World Table V.10, consumer confidence data from the OECD, and the price-dividend ratio from Kenneth French's website for foreign countries and Robert Shiller's website for the US. Overall, the sample includes data for seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland).[8]

We start with the following test equation:

$$y_{c,t+h} = \beta_1 S_{c,t} + \delta' Z_{c,t} + \epsilon_{c,t+h}, \tag{1}$$

where the dependent variable is alternatively defined as productivity growth or economic growth in country c measured from one to four years ahead ($h = 1, 2, 3, 4$); $S_{c,t}$ is sentiment in country c in year t, calculated as an annual average across calendar months; and $Z_{c,t}$ is a vector of controls that includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009), and country fixed effects.[9]

[8]We exclude Japan due to the highly unusual distribution of its price-dividend ratio, which lies three standard deviations to the right of the distribution for the other countries in the sample. Although the OECD also provides consumer confidence data for other countries, we are unable to include them in our main analyses as we do not have data for their price-dividend ratios. However, we form an extended sample that includes all these countries in some of our tests (see Section IV)).

[9]We run annual regressions as productivity data is unavailable at higher frequencies. Although sentiment can potentially drive business cycles also within the same year, we only estimate predictive regressions to mitigate endogeneity concerns.

Previous research warns that sentiment measures may partly reflect economic fundamentals and should then be purged from the effect of macroeconomic indicators (Baker and Wurgler (2006, 2007); Baker et al. (2012)). We follow the same strategy. The presence of a rich set of US fundamentals in the test equation is important to capture potentially omitted fundamentals also at the local level, as the US plays a leading role in the world economy (Harvey (1991), Campbell and Hamao (1992), Kwark (1999), Kim (2001), and Lumsdaine and Prasad (2003)). The use of country fixed effects also helps us purge our local sentiment measures from the effect of time-invariant country-specific characteristics.

Following Baker and Wurgler (2006) and Lemmon and Portniaguina (2006), we further identify two sentiment components:

$$S_{c,t} = S^{E}_{c,t} + S^{\perp}_{c,t}, \tag{2}$$

where $S^{E}_{c,t}$ is the sentiment component explained by economic fundamentals and $S^{\perp}_{c,t}$ is the sentiment component that is orthogonal to fundamentals. Specifically, the two components come from the following panel regression:

$$S_{c,t} = \delta' Z_{c,t} + \epsilon_{c,t}, \tag{3}$$

where the vector of explanatory variables is defined as above but replaces the US macroeconomic variables with year fixed effects, so as to capture the potential confounding effect of global sentiment or business cycles. The fitted values from this regression constitute the explained sentiment component ($S^{E}_{c,t} \equiv \widehat{S}_{c,t}$), whereas the residuals are the unexplained, or orthogonalized, component

($S^{\perp}_{c,t} \equiv S_{c,t} - \widehat{S}_{c,t}$).

Although consumer confidence captures forward-looking economic expectations, one potential issue with this identification strategy is that the macroeconomic variables themselves may be contemporaneously affected by sentiment to some extent. To address this concern, we alternatively estimate sentiment in a given year using the monthly value for December instead of considering the average across all calendar months. The latter approach grants the advantage of smoothing out variation in sentiment over the year, thereby decreasing the impact of potential outliers, whereas the former approach effectively identifies end-of-year expectations for the subsequent year, thereby decreasing the likelihood that the right-hand side variables are spuriously affected by sentiment. Reassuringly, the two measures of sentiment are highly correlated (around 90%) and yield similar results in the analysis that follows. Additionally, we estimate a more conservative model that controls for several lags of all the variables of interest and we also exploit exogenous variation in sentiment related to weather patterns.

Table 1 presents some summary statistics. On average, we find that non-G7 countries exhibit a similar level of sentiment to G7 countries but higher values of the price-dividend ratio and total factor productivity growth. They also exhibit higher rates of growth for real GDP, real consumption, and employment. The empirical pattern is similar when considering medians instead of means, which suggests that these estimates are not driven by outliers. In the analysis that follows, we shed more light on these relations and especially on how similar levels of sentiment can have different real effects on these two groups of countries.

[Table 1 here]

We acknowledge that some of our test equations make use of generated regressors, which

implies a potential downward-bias in the standard errors of the coefficients of interest. To address this issue, we follow Engelberg et al. (2018) and correct standard errors using a block bootstrap with 200 repetitions. Since blocks correspond to the unit of observation (countries in our case), this methodology performs bootstrapping at the country-level instead of using the entire sample indiscriminately. As a result, we are able to impose a more precise autocorrelation structure in our standard errors.[10]

In the analysis that follows, we take these predictions to the data.

IV. The unexplained sentiment

We begin our empirical analysis by identifying the effect of "unexplained" sentiment, defined as the sentiment component that does not reflect economic fundamentals, on total factor productivity. To this end, we study a potential lead-lag relation between sentiment and productivity (subsection A), control for a wide array of macroeconomic fundamentals (subsection B), and carry out a sample breakdown into G7 and non-G7 countries (subsection C).

A. VAR model

As a preliminary test, we estimate a panel VAR model to study the lead-lag relation between productivity and raw sentiment. Although this is a coarse specification that does not distinguish between explained and orthogonalized sentiment, it is nonetheless useful because it allows us to test our basic conjecture through a more unified approach while controlling for several lags of our two key variables of interest.

[10] See Greene (2018) for a theoretical discussion. We find similar estimates when using "naive" bootstrapping (i.e., without country-level clustering) or replacing bootstrapping altogether with raw standard errors clustered by country.

The model includes four lags and uses forward orthogonal deviation from the Helmert transformation to remove panel-specific fixed effects. As customary, we estimate an orthogonalized impulse-response function based on the Cholesky decomposition. As our identifying assumption, we impose the coefficient restriction that sentiment has no contemporaneous effect on productivity. The intuition is that it takes time for the impulse of sentiment to propagate through the economy, ultimately affecting productivity.[11]

The results, reported in Figure 1, provide evidence consistent with our expectations in two ways. First, we find that a sentiment shock predicts an increase in future productivity. Second, the magnitude of the effect is monotonically decreasing and effectively becomes zero by year five, which seems to reflect the fleeting nature of sentiment.[12] The importance of this test is that sentiment shocks can be thought of as exogenous, in the sense that they do not spuriously reflect past productivity shocks.

[Figure 1 here]

However, this specification does not distinguish between different sentiment components and does not necessarily establish causality (Blanchard et al. (2013)). We address these two issues in the analysis that follows.

[11]Previous studies show that asset prices do not immediately affect productivity (Beaudry and Portier (2006); Colacito et al. (2018)). In our framework, sentiment captures short-term economic beliefs (Hirshleifer (2001); Baker and Wurgler (2006)).

[12]We obtain similar results when controlling for our vector of local macroeconomic variables, although with wider confidence intervals due to the limited number of degrees of freedom. Although it is also possible to estimate this model using productivity expressed in levels rather than changes, we only have data for the latter.

B. Macroeconomic fundamentals

To analyze whether these results are driven by the explained or the unexplained sentiment component, we run panel regressions of future productivity on sentiment, controlling for the five country-level macroeconomic variables introduced above, the US macroeconomic variables from Ludvigson and Ng (2009), and country fixed effects (see equation 3). Thanks to the Frisch–Waugh–Lovell theorem, the coefficient of sentiment in this type of regression can be interpreted as the effect of orthogonalized sentiment without performing the associated decomposition, because we are purging the results from the potential confounding effect of other explanatory variables by including them on the right-hand side of the test equation.

The results are in Table 2. We find that a one-standard-deviation increase in sentiment is associated with a positive and highly significant increase in one-year-ahead productivity growth of 0.90% (t-stat 2.84). Consistent with the transient nature of sentiment, and similarly to the VAR results, we find that the magnitude of the effect decreases monotonically over time. A one-standard-deviation increase in sentiment is followed by an increase in productivity growth of 0.71% (t-stat 2.25), 0.68% (t-stat 2.20), and 0.62% (t-stat 2.12) for horizons of two, three, and four years ahead respectively.

[Table 2 here]

With persistent variables, it is possible that the current level of sentiment partly reflects its past values. To address this concern, we estimate a more conservative model that includes two lags of all of our variables on interest. This specification allows us to estimate the effect of a sentiment shock holding constant current and past macroeconomic conditions and sentiment realizations. The results are in Table A1. Reassuringly, our estimates are by and large unchanged. In unreported tests,

we also find similar results when measuring sentiment in the month of December only. Finally, we obtain similar estimates when considering welfare-relevant total factor productivity as dependent variable, which is calculated using prices that are more relevant to consumers rather than firms (Basu et al. (2012)).

As a robustness check, we also re-estimate our test equation using the entire set of countries for which consumer confidence data is available. This extended sample includes 42 countries, of which 36 are from the OECD (Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States) and six are non-OECD countries (Brazil, China, India, Indonesia, Russia, and South Africa).[13]

The results, reported in Table A2, become even stronger in magnitude and significance. We find that a one-standard-deviation increase in sentiment is followed by an increase in productivity growth of 2.21% (t-stat 9.17), 1.92% (t-stat 7.40), 1.61% (t-stat 5.94), and 1.38% (t-stat 5.40) for horizons of one, two, three, and four years ahead respectively. Our findings are therefore robust in the extended sample. In the analysis below, we shed further light on the larger magnitude of these coefficients. In Appendix B, we find similar results when we identify exogenous variation in sentiment using weather patterns.

[13]The only OECD countries that are not covered are Iceland and Norway.

C. *Sample breakdown*

In addition to the full sample, we consider two subsamples of interest that respectively include G7 and non-G7 countries. The former group, established in 1975 as an international organization, is classified by the International Monetary Fund as the set of the largest advanced economies in the world. These economies are characterized by greater stability, due to their large size, as well as coordination for economic and social development. They set common goals and make them publicly known through the use of regular communiqués (Sobel and Stedman (2006);Cormier et al. (2024)). Conversely, non-G7 economies are smaller or less advanced and do not feature a comparable system of economic coordination.[14]

We exploit these cross-sectional differences between G7 and non-G7 countries to identify the channel through which sentiment affects real macroeconomic outcomes. We hypothesize that the economic stability and policy coordination of G7 countries should make their economic fundamentals comparatively easier to evaluate. Therefore, it should also be easier for economic agents in these countries to distinguish purely psychological mood swings in sentiment from genuine changes in fundamentals. As a result, the effect of sentiment on economic growth should be more pronounced in non-G7 countries.

To test whether macroeconomic fundamentals are indeed easier to evaluate in G7 countries, we carry out a preliminary analysis of how macroeconomic uncertainty varies across the G7 and the non-G7 block. To this end, we consider the index of macroeconomic uncertainty from Ozturk and

[14] Although a few non-G7 economies are part of the G20, the latter group was established much later (in 1999), is more heterogeneous, and is mostly focused on global issues (Viola (2015)).

Sheng (2018) which is the only one available for a large number of countries in our sample.[15] Since the original data set is available at the monthly frequency, we construct annual indices by taking simple country-level averages across calendar months. We run panel regressions of the resulting annual country-level indices on a dummy variable that takes on value one for countries of the G7 block, and zero otherwise, with year fixed effects.

The results are in Table A3. Consistent with our conjecture, we find that country-level annual macroeconomic uncertainty is about 20% lower for countries from the G7 block. A breakdown of total macroeconomic uncertainty into a common and an idiosyncratic component reveals that the results are entirely driven by the common component, thereby providing further support to the idea that economic coordination helps G7 countries tackle common sources of macroeconomic (and geopolitical) uncertainty. We find similar estimates when repeating the analysis at the monthly frequency, indicating that our transformation into an annual index does not alter the results. These findings are also in line with previous literature, which shows that fundamentals are more volatile in economies that are smaller (Furceri and Karras (2007); Alouini and Hubert (2019); Armstrong and Read (2020)) or less advanced (Mobarak (2005)).

Having established that macroeconomic fundamentals are comparatively less uncertain for G7 countries, we now re-estimate our test equation separately in subsamples of G7 and non-G7 countries, respectively. The results are in Table 3, Panels A and B. Consistent with our expectations, we find that the coefficient is near zero and insignificant for G7 countries whereas it is positive and highly significant for non-G7 countries. In the latter subsample, the estimates are respectively

[15]The index covers all six countries of our G7 block and seven of the eleven countries of our non-G7 block (Australia, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland), although data coverage only begins in 1989 and therefore after the start of our sample period.

equal to 0.99% (t-stat 3.04), 0.86% (t-stat 2.46), 0.82% (t-stat 2.50), and 0.77% (t-stat 2.45) for each of the four time horizons under consideration.[16] The results from the full sample are therefore entirely driven by the non-G7 subsample, where the coefficient of interest is stronger in both magnitude and significance.

[Table 3 here]

A potential concern with these results is that the size of the G7 and non-G7 groups are unequal. Although the economic magnitude is quite small, the lack of significant results for the G7 group may still partly reflect lower statistical power. To address this concern, we perform an alternative country breakdown. In the first subsample, we include our six countries from the G7 block with the addition of Switzerland and the Netherlands from the non-G7 group for a sum total of eight countries. In Panel B, we include the remaining nine countries. The choice of these two countries reflects the fact that they feature highly developed financial systems, and therefore can be considered as relatively more advanced than their non-G7 peers.[17] The results, reported in Table A4, are virtually unchanged as they are again confined to the non-G7 group.

We also carry out a sample breakdown using the extended sample. The presence of 42 countries allows us to identify three groups of interest. First, we consider the G7 block including Japan. Second, we consider the residual 35 non-G7 countries. Third, we only consider the non-G7 economies that are not included in our previous analysis (Table 3) for a sum total of 24 countries. We refer to the latter group as the least advanced non-G7 economies as they include some non-OECD coun-

[16] Furthermore, sentiment accounts for around one fourth of the within R-squared of these regressions, indicating that it explains a nontrivial part of within-country variation in productivity among non-G7 economies.

[17] However, their economies are both smaller and therefore comparatively less stable than those of their G7 counterparts.

tries as well.

The results are in Table A5. In Panel A, we find that the coefficient of sentiment is again insignificant in any of the specifications for G7 countries also when including Japan. In Panel B, we find that the coefficient of sentiment in the non-G7 cohort is similar in both magnitude and significance to its counterpart from the extended sample (Table A2), indicating again that the results are driven by non-G7 countries. In Panel C, we find similar estimates when we exclude the eleven non-G7 countries we use in our main analysis, i.e., the relatively more advanced ones.

Altogether, these results indicate two takeaways. First, our results are confined to non-G7 countries. Second, the magnitude of the effect of sentiment on future productivity seems inversely related to the degree of development of the country, as the least advanced non-G7 economies exhibit the strongest effect. This is consistent with our conjecture that sentiment in these countries is harder to tease out from economic fundamentals.

V. Testing the channel

In this section, we explore the economic channel underlying our results. We propose four sets of tests. In subsection A, we study the role of the financial sector. In subsection B, we analyze the impact of sentiment on future economic growth. In subsection C, we further validate our identification of sentiment by testing two specific predictions of the investor sentiment literature. In subsection D, we explore further implications by analyzing bond returns, macroeconomic forecasts, and global capital flows.

A. The financial sector

If sentiment relaxes financial constraints, we expect the effect of sentiment on future productivity to be stronger in less developed financial systems. To identify a country's degree of financial development, we follow the methodology from Rajan and Zingales (1998). We estimate financial development prior to the start of the sample to avoid any spurious correlation with future market trends or economic outcomes. In particular, our primary measure of financial development is real per capita income as it is the only one that covers our entire sample. In the spirit of Rajan and Zingales (1998), we consider the value of per capita income in 1970.[18] The results, reported in Table 4, provide evidence for our conjecture. The coefficient of sentiment is positive and significant whereas the coefficient of its interaction with financial development is negative and significant, indicating that the relation between sentiment and future productivity becomes weaker for more financially developed countries.[19]

[Table 4 here]

In additional tests, we consider alternative measures of financial development constructed as total bank or domestic credit over real GDP, calculated as an average over the 15-year period prior to the start of our sample (1960-1974).[20] Due to missing values, the sample includes eight OECD countries in Panel A (Australia, Canada, Denmark, New Zealand, Sweden, Switzerland, United Kingdom, and United States) and seven of these countries in Panel B (data is unavailable for New

[18] Similarly, Rajan and Zingales (1998) consider the value of year 1980 in their analysis of a post-1980 sample period.

[19] The standalone coefficient of financial development is absorbed by country fixed effects.

[20] Stock-market-based measures of financial development, such as total market capitalization or total stock market trading over GDP, are unfortunately unavailable before the start of our sample and therefore we cannot use them.

Zealand) over the period 1975-2019. The results, reported in Table A6, reveal a similar empirical pattern and are therefore robust to these alternative specifications despite the smaller data coverage.

Finally, a potential concern with these results is that a country's degree of financial development may partly overlap with the quality of its institutions. To address this point, in Table A7 we run a horse race with two measures of institutional quality from La Porta et al. (1999). Specifically, we consider a country's corruption score (Panel A) and democracy score (Panel B). Reassuringly, we find that the coefficients of our variables of interest hardly change in both magnitude and statistical significance.

Overall, the results provide empirical support to the predictions of the financial constraints channel, and more generally to our interpretation of sentiment as biased economic beliefs. The alternative hypothesis that sentiment may represent a latent rational signal for future growth counterfactually predicts that the signal, due to its fundamental nature, should be incorporated more strongly in financially developed countries.

B. Future economic growth

We further explore the predictions of the two transmission channels by analyzing the relation between sentiment and future economic growth. To this end, we propose a decomposition of sentiment into an explained and an unexplained component based on equation 2. This is an instructive exercise because if our identification of sentiment is correct, we expect different empirical patterns (and often signs) for the explained and unexplained sentiment. This approach also allows us to potentially identify multiple sources of sentiment, also weather-unrelated, and directly compare the coefficients of the two sentiment components. The presence of year fixed effects also allows us to capture the potential confounding effect of any variables that are global in nature, such as the level

of sentiment of global investors (Baker et al. (2012); Montone and Zwinkels (2020)), which may drive economic growth in its own right (Dees (2017)).

In the analysis that follows, we first analyze the effect of the two sentiment components on capital investment and labor income. Then we study the impact on aggregate demand. In this analysis, we consider the subsample of G7 countries in Table 5 and the subsample of non-G7 countries in Table 6.

[Table 5 here]

[Table 6 here]

1. Capital investment and labor income

The shift towards equity that follows periods of high sentiment should be driven by rational managers, who bring forward capital investments to exploit the lower cost of capital (McLean and Zhao (2014)). This strategy represents an instance of market timing and takes place both at the micro and the macro level (Arif and Lee (2014)). In light of this mechanism, we expect sentiment shocks to predict a short-term increase in capital investment.

Consistent with our conjecture, we find that the orthogonalized sentiment predicts an increase in capital growth and the effect is entirely confined to non-G7 countries over a one-year horizon. A one-standard-deviation increase in orthogonalized sentiment is followed by a large and highly significant 2.27% increase in the one-year-ahead capital growth in non-G7 countries (t-stat 6.72), whereas the effect is much smaller and largely insignificant for G7 countries. Conversely, the explained component of sentiment is a negative predictor of future capital growth. This result seems

to reflect the fact that the stock of capital is high during good economic times, which in turn decreases the subsequent rate of growth of capital.

We find a similar empirical pattern for investment not only in physical capital but also in research and development (see Table A8).[21] This is further confirmation of the mechanism we hypothesize, namely that high equity prices make it optimal to bring forward long-term investment, and also suggests that the corresponding increase in productivity partly comes from an innovation channel.

We also analyze the effect of sentiment on country-level labor income, defined as the ratio of labor income to GDP. The estimates indicate that sentiment is a positive predictor of future labor income. The effect is delayed, taking place only three years ahead (0.51%, t-stat 2.83) and four years ahead (0.63%, t-stat 2.90), and again entirely concentrated in non-G7 countries. The results support the idea that wages are sticky especially for non-G7 countries, which typically feature less flexible labor markets.

Overall, these results from the analysis of capital formation and labor income are consistent with the financial constraints channel in two ways. First, the very short-term nature of the effect on capital investment suggests that our measure of sentiment represents a distortion of short-term beliefs rather than a signal for long-term economic growth. Furthermore, the concentration of the effect among non-G7 countries matches the findings from the analysis of equity returns, which shows that mispricing is much larger and more persistent in these countries (see Table 7). Specifically, mispricing is not corrected yet one year ahead, which is exactly when managers seem to engage in market timing to exploit the lower cost of capital. Second, the positive (and delayed) re-

[21] Unfortunately, we are unable to carry out this test separately for G7 and non-G7 countries due to small data coverage.

lation between sentiment and future labor income is consistent with a firm-driven increase in labor demand, as predicted by the financial constraints channel, rather than an increase in labor supply predicted by the aggregate demand channel.

2. Aggregate demand

Nonetheless, it is still possible that the aggregate demand channel may be operational in our sample. If so, high sentiment should be followed by a rapid increase in aggregate demand, particularly consumption and employment. This is the set of empirical tests we turn to next.

We find that orthogonalized sentiment is a positive predictor of future real consumption growth and again the results are largely driven by non-G7 economies. Among G7 countries, a one-standard-deviation increase in sentiment is followed by a 0.57% increase in one-year-ahead real consumption growth (t-stat 2.76), and a marginally significant 0.23% increase at a two-year horizons. For three and four years ahead, the coefficient is insignificant. For non-G7 countries, the coefficient of orthogonalized sentiment is positive and highly significant for up to three years ahead. The magnitude is equal to 0.91% (t-stat 8.42), 0.64% (t-stat 6.80), and 0.41% (t-stat 3.27), respectively. In year four, the effect vanishes (0.05%, t-stat 0.40). The coefficient of interest again follows a monotonically decreasing pattern, tailing off to zero.

We find a similar empirical pattern for employment growth. A one-standard-deviation increase in orthogonalized sentiment is followed by a 0.28% increase in one-year-ahead employment growth in G7 countries (t-stat 3.71). In years two and three, the coefficient is small and insignificant. In year four, the coefficient becomes negative although marginally significant (0.11%, t-stat -1.70), indicating a reversal of the sentiment effect on employment growth. For non-G7 countries, the coefficient is again positive and significant for up to three years ahead, with magnitude equal

to 0.88% (t-stat 7.78), 0.65% (t-stat 5.72), and 0.35% (t-stat 2.81), respectively. In year four, the effect vanishes (0.09%, t-stat 0.57).

It is interesting to compare these results to those from the capital investment tests. The magnitude of the sentiment shock coefficient is much larger for capital than it is for employment. Correspondingly, in additional tests we find that a sentiment shock leads to a persistent increase in capital intensity, defined as the ratio of physical capital to labor, and the effect is again entirely concentrated among non-G7 countries (see Table A9).

The results are also similar for real GDP. Following a one-standard-deviation increase in orthogonalized sentiment, the one-year-ahead GDP growth increases by a 0.27% among G7 countries (t-stat 2.11). The effect is insignificant and close to zero in year two, and becomes negative although marginally significant in year three (0.23%, t-stat -1.79), thereby implying a reversal of the sentiment effect from year one. In year four, the coefficient is again insignificant. For non-G7 countries, the coefficient of orthogonalized sentiment is highly significant in years one and two. The magnitude is equal to 0.78% (t-stat 7.41) and 0.37% (t-stat 3.48), respectively. Notably, the one-year effect is almost three times as large as that for G7 countries. At longer horizons, the estimates are insignificant.

Finally, we re-examine the relation between sentiment and productivity in this more parsimonious specification with a sentiment breakdown. We obtain similar estimates to those from our previous analysis (Table 3). Among non-G7 countries, the coefficient of the orthogonalized sentiment is equal to 1.11% (t-stat 3.94), 0.98% (t-stat 3.30), 0.92% (t-stat 2.89), and 0.80% (t-stat 2.34) for each of the four time horizons under consideration. By contrast, the coefficient is close to zero and insignificant for the subsample of G7 countries.

Overall, unexplained sentiment is a positive predictor of future growth in consumption, em-

ployment, and income. Importantly, the results differ across G7 and non-G7 countries. The effect is small and short-lived in the former cohort, whereas it is large and lasts for up to three years in the latter. Taken together, the estimates suggest that sentiment shocks do not affect economic fundamentals in G7 countries, as they only create short-term fluctuations that do not affect productivity. Conversely, high sentiment in non-G7 countries leads to prolonged economic growth and higher productivity.

Altogether, these findings are consistent with the aggregate demand channel. Therefore, both the hypothesized transmission mechanisms seem to be operational in our sample.

C. Sentiment-specific predictions

Previous literature cautions that sentiment may reflect news on future fundamentals that is not included in current and past fundamentals (L'Huillier et al. (2022)). Although our analysis so far already speaks to this concern, we further address this point by testing two predictions from the investor sentiment literature that would not otherwise hold if our measure of sentiment captures unobservable future fundamentals. Namely, we expect a wave of high sentiment to be followed by lower stock returns and a shift of financing from credit to equity.

1. Stock returns

Periods of high sentiment should be characterized by stock overpricing and a subsequent correction, where prices revert back to fundamentals. As a result, high sentiment should be followed by lower stock returns (see Baker and Wurgler (2006, 2007) for US evidence and Baker et al. (2012) for international evidence). To test this channel, we analyze the relation between future country-level stock returns, defined as the first difference of the log price-dividend ratio, and the two sentiment components, explained and orthogonalized sentiment.

The results are in Table 7. Consistent with the hypothesized mechanism, we find that orthogonalized sentiment predicts negative one-year-ahead equity returns. The effect is concentrated in G7 countries, which indicates the presence of more effective arbitrage forces. Specifically, a one-standard-deviation increase in orthogonalized sentiment is followed by a decrease in stock returns of 1.91% (t-stat -2.74). By contrast, explained sentiment is a positive predictor of one-year-ahead equity returns, as expected from a measure of economic fundamentals. For non-G7 countries, these two effects have the right signs but are close to zero and insignificant.

[Table 7 here]

In additional tests, we find that innovations in inflation and employment represent the two driving forces behind the positive relation between explained sentiment and subsequent equity returns (see Table A10). This is consistent with previous research showing that these variables play an important role in explaining aggregate equity prices (Constantinides and Ghosh (2021)). The results again only hold among G7 countries, which lends further support to our conjecture that stock prices in these markets more closely reflect economic fundamentals.

We also analyze stock returns at longer horizons. An interesting empirical pattern emerges. For G7 countries, the mispricing correction fully occurs within one year, which matches the findings of previous studies on mispricing correction in large and advanced economies (Baker et al. (2012)). Conversely, the coefficient is negative and significant for two- and three-year-ahead stock returns among non-G7 countries and becomes insignificant in year four. To get a sense of the magnitude, a one standard deviation increase in orthogonalized sentiment is followed by a decrease in stock

returns of 1.98% two years ahead (t-stat -2.14) and 2.70% three years ahead (t-stat -3.36).[22]

A large literature shows that unsophisticated investors participate less in equity markets when they hold pessimistic beliefs, partly due to short-sales constraints (Chen et al. (2002); Stambaugh et al. (2012); Hong and Sraer (2013); Antoniou et al. (2016)). Therefore, sentiment tends to have an asymmetric effect on stock prices. When sentiment is high, the high demand by unsophisticated traders inflates stock prices, thereby causing overpricing, whereas the low demand that characterizes low-sentiment periods has little impact on equity valuations. As a result, the distortionary effect of sentiment mostly occurs when sentiment is high. In additional tests, we find evidence in support of this mechanism (see Table A11). Mispricing correction only takes place in the high-sentiment subsample (i.e., above-median), but not in the low-sentiment one (i.e., below-median).[23]

Overall, these results present a clear picture. The orthogonalized component of sentiment is a negative predictor of future stock returns, consistent with mispricing correction. The explained component of sentiment, on the other hand, is a positive predictor of future stock returns, consistent with the well-known positive relation between economic fundamentals and stock prices. The opposite signs of these two effects lend support to the validity of our identification strategy, suggesting that the measure of orthogonalized sentiment is correctly identified.

More generally, the results lend support to our conjecture that G7 economies exhibit more advanced financial markets. Mispricing correction is faster in G7 countries, as it fully occurs within one year and smaller, which indicates the presence of lower initial mispricing. Conversely, mispricing correction is slower in non-G7 countries, as it takes place two and three years ahead and

[22]Mutual funds and ETFs, such as the Fidelity Emerging Markets Fund, may take advantage of this predictability by increasing the investment weight in countries with predicted high market return.

[23]Unfortunately, the relatively small number of observations in these two subsamples does not allow us to perform a further breakdown into G7 and non-G7 countries.

larger, which attests to the presence of greater mispricing.

We provide further evidence that arbitrage forces are stronger in G7 markets through a direct test of market efficiency. We estimate global versions of the CAPM (Adler and Dumas (1983)) and the Fama-French three-factor model (Griffin (2002); Post et al. (2015); Fama and French (1998, 2012)). In particular, we analyze the alphas from these models expressed either in absolute value or as a squared term (Post et al. (2015)). To estimate the alphas, we first estimate country-level betas through regressions of monthly country-level excess returns, calculated using the three-month treasury bill rate, on risk factors using a 36-month rolling window (Hong and Kacperczyk (2009)). Then we define alphas as a country's excess returns minus the product of betas, defined as annual averages from the monthly estimates, and the risk premia.

The results are in Table A12. In Column (1) to (3), we consider absolute alphas. In column (1), alphas are estimated from a global CAPM in which the market portfolio is defined as an equal-weighted portfolio of returns calculated using all the countries in our sample. We find that the coefficient of the G7 dummy is negative, highly significant, and equal to -4.53% (t-stat 2.80). The results indicate that the pricing error in G7 stock markets is indeed significantly (and substantially) smaller than in non-G7 ones, thereby supporting our interpretation of the findings from Table 7 as mispricing correction.

It is still possible however that the significant alphas merely reflect the omission of other risk factors, notably size and book-to-market. To address this issue, we consider two alternative versions of a global Fama-French three-factor model. In column (2), we estimate a three-factor model using US risk factors. In so doing, we draw on the fact that international financial market are partly integrated and the US plays a leading role in them (Rapach et al. (2013)). Consistent with the CAPM results, we find again a negative and significant coefficient for the G7 dummy (-7.67%,

t-stat -2.34). Finally, we estimate a three-factor model that includes risk factors estimated using data from all developed countries.[24] The results are again similar in this alternative specification (-7.05%, t-stat -2.13), and also when we repeat the analysis for squared alphas in columns (4) to (6).

Altogether, these tests indicate that G7 stock markets are indeed comparatively more efficient than their non-G7 counterparts. This result is also consistent with our previous finding that macroeconomic fundamentals in G7 countries are less uncertain and easier to assess (see Table A3). In the presence of finite risk aversion, lower fundamental uncertainty implies stronger arbitrage forces (Hirshleifer and Teoh (2003)), because it makes equity valuations less subjective and therefore arbitrage less risky (Baker and Wurgler (2006); Birru and Young (2022)).[25]

2. Equity and credit markets

The high stock valuations that characterize periods of high sentiment decrease the cost of equity for companies (Baker et al. (2003)), thereby generating an aggregate shift from credit to equity markets (Baker and Wurgler (2000, 2002)). In light of this, our measure of orthogonalized sentiment should predict an increase in the size of local equity markets relative to the size of credit markets. To test this conjecture, we identify these two measures as the country-level total stock market capitalization and total bank lending from the World Bank, and express them as a ratio.[26] Then we study the relation between this ratio and the two sentiment components introduced above.

The results are in Table 8. We find that an increase in the orthogonalized sentiment indeed pre-

[24]Unfortunately, the data for these factors is only available from 1991.

[25]This is an important distinction with respect to some other non-G7 financial markets which might qualify as efficient, such as the Swiss and the Dutch ones, but the underlying economies lack the size and coordination of G7 countries.

[26]Although the data is available for all the countries in our sample, there are several missing observations.

dicts an increase in the size of the local equity market relative to the credit market. The magnitude monotonically decreases over time and the results are confined to non-G7 countries, which is in line with our previous finding that such markets are characterized by greater and more prolonged overpricing. Conversely, an increase in the explained sentiment component predicts a decrease in the equity to credit ratio in non-G7 countries, indicating a relaxation of borrowing constraints in good economic times (e.g., Mian et al. (2017)). The opposite signs of these effects provides further validation to our identification of sentiment.

[Table 8 here]

D. Additional tests

1. Bond returns

We shed further light on the channel underlying our results by looking at bond returns. The reason is as follows. The inverse relation between sentiment and future stock returns from subsection 1 can alternatively be interpreted as changes in time-varying risk aversion rather than mispricing correction, as economic booms can be followed by a decrease in risk aversion (Campbell and Cochrane (1999)). If so, we should observe a positive relation between sentiment and future bond returns, reflecting a decrease in future bond prices due to lower risk-aversion.

To test this hypothesis, we estimate panel regressions of future country-level 10-year government bond returns on orthogonalized and explained sentiment. The results are in Table A13. We find that the coefficient of orthogonalized sentiment is close to zero in both magnitude and significance in virtually all specifications, including those for the subsamples of G7 and non-G7 countries. These estimates indicate that there is no sentiment-driven shift from bonds to equities,

thereby providing support to the interpretation of our earlier results on stock returns as mispricing correction.

2. Macroeconomic forecasts

Next, we carry out a direct test of whether sentiment captures economic expectations. To this end, we look at forecasts of final domestic demand from the OECD, defined as the sum of final consumption, investment, and stock building expenditures by the private and general government sectors in real terms. The results are in Table A14. We find that an increase in orthogonalized sentiment in non-G7 countries is followed by a large and protracted increase in domestic demand forecasts, whereas the effect is small and short-lived for G7 countries. In unreported tests, we find similar results for real GDP forecasts.

The results indicate that local sentiment indeed exhibits a positive relation with local macroeconomic expectations, consistent with the economic patterns from subsection B. In Appendix C, we provide further evidence for the role of expectations. We show that the relation between sentiment and economic growth is partly moderated by country-level price-dividend ratios.

3. Global capital flows

Finally, we look at the relation between sentiment and global flows. This is an interesting test because an increase in a country's level of sentiment may generate an increase in outward capital flows, for example through a wealth effect (Colacito et al. (2018)), or an increase in inward capital flows driven by an improvement of the local economy (Albuquerque et al. (2005)). To shed light on these potential mechanisms, we study the relation between sentiment and net foreign direct investments (FDIs), defined as the difference between outward and inward FDIs and expressed as a percentage of a country's real GDP.

The results are in Table A15. We find that the orthogonalized sentiment has no relation with future net FDIs, both in the full sample and in the subsamples of G7 and non-G7 countries. In unreported analyses, we find similar results when considering inward and outward FDIs separately, thereby indicating that neither of the above channels is operational for orthogonalized sentiment. Put together with our previous results on local macroeconomic forecasts, these findings suggest that sentiment-driven business cycles in non-G7 countries reflect an increase in domestic demand due to local optimistic expectations. More generally, the absence of a relation between local sentiment and net FDIs for non-G7 countries is consistent with the idea that capital flows towards these countries are shaped by global rather than local economic conditions.[27]

Conversely, explained sentiment is associated with a significant decrease in FDIs that is entirely concentrated in the G7 subsample. A further breakdown of this result into inward and outward FDIs shows that the results are entirely driven by inward FDIs, indicating that a genuine improvement in economic fundamentals in the largest advanced economies is associated with a substantial increase in capital flows towards these countries.

VI. Conclusion

A growing body of evidence shows that business cycles are positively related to sentiment. Previous literature has proposed three competing channels to explain this result. First, optimism captures positive signals over future fundamentals so that positive sentiment anticipates changes in fundamentals but does not cause them. Second, sentiment merely represents a psychological fac-

[27]For example, this is in line with models of vertical integration, which represents an important motive for cross-border investments for large and advanced economies (Hanson et al. (2001); Hummels et al. (2001); Braconier et al. (2005)). In such models, multinationals receive funding in their local markets (Montone and Zwinkels (2020)). Therefore, changes in a foreign country's sentiment does not alter capital flows towards the country.

tor that has no effect on economic fundamentals and therefore only creates short-term economic fluctuations. Third, sentiment has a direct effect on future fundamentals, for example by relaxing financial constraints or through a self-fulfilling feedback loop. These stories are empirically difficult to disentangle.

We propose a novel solution to this problem. We analyze how cross-sectional variation in country size and market efficiency affects the relation between sentiment and economic activity. The largest advanced economies, which we identify as G7 countries, exhibit greater coordination and lower macroeconomic uncertainty. Facing less noisy signals, agents in these countries should find it comparatively easier to distinguish pure sentiment from economic fundamentals. Conversely, the task should be harder in economies outside of the G7 block where macroeconomic fundamentals are more uncertain. In the latter economies, the effect of sentiment on economic growth should then be more pronounced.

Using cross-country data from the OECD, we find evidence consistent with these predictions. In G7 countries, the real effects of sentiment are confined to the short run and do not affect productivity. By contrast, we find that sentiment shocks in non-G7 countries are associated with immediate and prolonged economic booms and a corresponding increase in total factor productivity. We also show that the latter economies are slower to identify sentiment as a noise component in stock prices and exhibit comparatively less efficient financial markets. In further tests, we find that the likely mechanism that underlies these results is indeed the formation of optimistic expectations, which helps relax financial constraints and boost aggregate demand.

One of the main hurdles of this empirical exercise is the correct identification of sentiment, because it may potentially include unobservable news on future economic fundamentals. We address this issue in several ways. First, we find that the real effects of sentiment are inversely related to a

country's degree of financial development, consistent with sentiment relaxing financial constraints rather than signaling future growth opportunities. We also find that sentiment, unlike economic fundamentals, predicts a decrease in local stock returns, an aggregate shift from credit to equity, and a short-term increase in capital investment. Finally, we show that an exogenous measure of sentiment related to weather patterns exhibits a strong relation with future productivity. Crucially, these relations are stronger for economies that are expected to be more sensitive to sentiment – those in the non-G7 group. These empirical patterns are hard to reconcile with the alternative story that our measure of sentiment might just reflect some omitted fundamentals.

Our findings provide an explanation for the apparent discrepancy between the theoretical literature of sentiment-driven business cycles and its empirical applications. Previous empirical studies have focused on large and highly-advanced individual countries (the US) or country blocks (the G7), finding little evidence that sentiment affects future fundamentals. Using a broader set of countries, we show that this result is specific to the largest advanced economies with more efficient financial markets. Among other economies, which are comparatively smaller or less advanced, we find strong evidence for the theoretical predictions of sentiment-driven business-cycle models.

Overall, the results indicate that sentiment is an important catalyst for economic growth in non-G7 countries. From the perspective of firms, this finding may also reflect the differential ability to internalize the benefits of innovation between G7 and non-G7 economies. Firms operating in non-G7 countries may face greater challenges related to market size, access to resources, and regulatory uncertainty. The presence of high sentiment, along with its associated lower cost of capital, may partly offset these issues and incentivize firms to invest more. This is a potentially interesting avenue for further research on sentiment and growth.

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Figure 1. Panel VAR between total factor productivity and sentiment

Graph of the impulse-response function from the panel vector autoregression model of country-level annual total factor productivity growth and sentiment. Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. Sentiment is defined as the country-level consumer confidence index. The model includes four lags and the Choleski decomposition assumes that sentiment cannot have a contemporaneous effect on productivity. The sample includes seventeen OECD countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. Country-level productivity data is from the Penn World Table V.10, and country-level consumer confidence data is from the OECD.

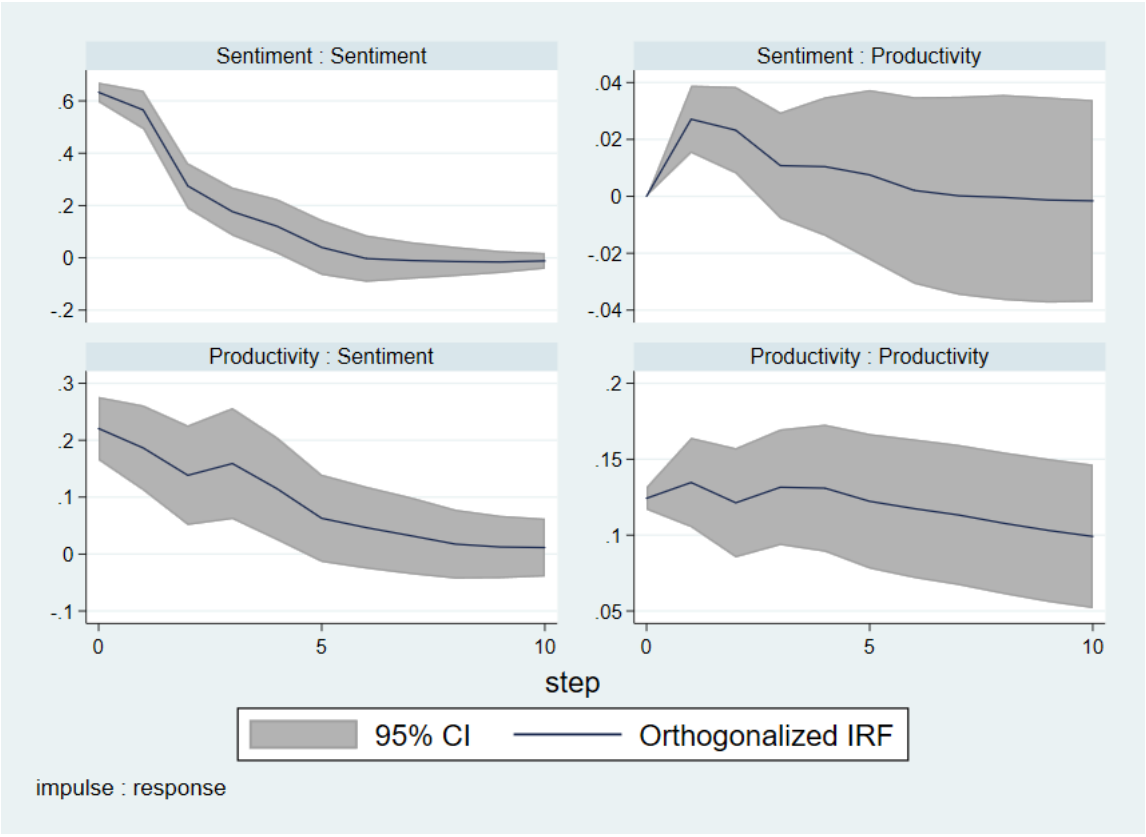

Table 1. Summary statistics

Summary statistics for the main variables in our sample. We consider the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. The variables are total factor productivity growth (TFP), which is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time; the price-dividend ratio (PD); the consumer sentiment index; and the rate of growth of real GDP, real consumption, and employment. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). All variables are annual. The macroeconomic variables are from the Penn World Table V.10, the price-to-dividend ratios are from Kenneth French's and Robert Shiller's websites, and sentiment data is from the OECD.

Panel A. All countries

Variable	Mean	Std. Deviation	P25	Median	P75
TFP	0.9388	0.1137	0.8746	0.9635	1.0013
PD	35.4332	18.0821	22.8777	31.0078	43.7639
Sentiment	100.1150	1.9868	99.0016	100.2743	101.3452
Real GDP	0.0270	0.0297	0.0140	0.0280	0.0418
Real consumption	0.0243	0.0365	0.0068	0.0248	0.0433
Employment	0.0096	0.0189	0.0016	0.0108	0.0199

Panel B. G7 countries

Variable	Mean	Std. Deviation	P25	Median	P75
TFP	0.9285	0.1154	0.8481	0.9563	0.9989
PD	33.5821	13.6745	24.0674	30.7238	41.4966
Sentiment	100.0862	1.6759	98.9081	100.2743	101.2354
Real GDP	0.0218	0.0200	0.0117	0.0230	0.0340
Real consumption	0.0216	0.0222	0.0090	0.0234	0.0367
Employment	0.0083	0.0123	0.0024	0.0096	0.0159

Panel C. Non-G7 countries

Variable	Mean	Std. Deviation	P25	Median	P75
TFP	0.9419	0.1131	0.8788	0.9665	1.0029
PD	36.7420	20.5551	22.2718	31.1043	46.6203
Sentiment	100.1234	2.0698	99.0391	100.2737	101.3730
Real GDP	0.0285	0.0319	0.0151	0.0300	0.0439
Real consumption	0.0251	0.0397	0.0065	0.0254	0.0464
Employment	0.0100	0.0204	0.0010	0.0116	0.0211

Table 2. Total factor productivity and sentiment: Full sample

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0090***	0.0071**	0.0068**	0.0062**
	2.84	2.25	2.20	2.12
Δ RGDP	0.0094**	0.0088**	0.0075*	0.0089**
	2.22	1.98	1.73	2.04
Δ Employment	-0.0194***	-0.0206***	-0.0189***	-0.0193***
	-3.34	-4.14	-3.75	-4.00
Δ Consumption	0.0046	0.0053	0.0063	0.0049
	1.11	1.27	1.51	1.29
Δ Labor share	-0.0033	-0.0015	-0.0024	-0.0034
	-0.98	-0.49	-0.78	-1.25
Δ Inflation	-0.0330***	-0.0297***	-0.0299***	-0.0283***
	-3.73	-3.21	-3.20	-3.01
F1	0.0403***	0.0401***	0.0409***	0.0372***
	5.56	5.94	5.78	4.89
F2	-0.0210	-0.0193	-0.0304**	-0.0320**
	-1.38	-1.31	-2.04	-2.19
F3	0.0126	0.0123	0.0285*	0.0337**
	0.72	0.72	1.70	2.18
F4	-0.0053	-0.0046	-0.0087	-0.0108
	-0.67	-0.58	-1.20	-1.58
F5	-0.0376***	-0.0389***	-0.0332***	-0.0251***
	-5.08	-5.23	-4.76	-3.85
F6	-0.0219***	-0.0203***	-0.0198***	-0.0195***
	-3.26	-3.10	-3.23	-3.42
F7	0.0155***	0.0142***	0.0165***	0.0149***
	3.33	3.21	3.49	2.82
F8	0.0259***	0.0218***	0.0244***	0.0260***
	4.16	3.68	4.12	4.30
Country FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6655	0.6592	0.6550	0.6492

Table 3. Total factor productivity and sentiment: G7 breakdown

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes six G7 countries in Panel A (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven non-G7 countries in Panel B (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland) over the period 1975-2019. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	-0.0001	-0.0017	-0.0021	-0.0022
	-0.01	-0.34	-0.43	-0.48
Δ RGDP	0.0095**	0.0094*	0.0080*	0.0108**
	2.08	1.95	1.67	2.43
Δ Employment	-0.0137*	-0.0163**	-0.0156**	-0.0175***
	-1.86	-2.54	-2.36	-2.74
Δ Consumption	0.0056	0.0060	0.0074	0.0049
	1.21	1.27	1.52	1.16
Δ Labor share	-0.0130**	-0.0101*	-0.0101*	-0.0087
	-2.17	-1.73	-1.75	-1.54
Δ Inflation	-0.0424***	-0.0434***	-0.0413***	-0.0384**
	-2.75	-2.89	-2.67	-2.43
US macro variables	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.7228	0.7194	0.7159	0.7077

Panel B. Non-G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0099***	0.0086**	0.0082**	0.0077**
	3.04	2.46	2.50	2.45
Δ RGDP	0.0857***	0.0613***	0.0689***	0.0604**
	3.43	2.64	3.25	2.55
Δ Employment	-0.0811**	-0.0624*	-0.0542	-0.0347
	-2.30	-1.72	-1.52	-1.00
Δ Consumption	0.0013	0.0114	0.0006	-0.0060
	0.06	0.55	0.03	-0.26
Δ Labor share	0.0072*	0.0061	0.0056	0.0031
	1.73	1.62	1.65	0.93
Δ Inflation	-0.0260***	-0.0210**	-0.0218***	-0.0210**
	-3.37	-2.50	-2.61	-2.41
US macro variables	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.6080	0.5885	0.5808	0.5678

Table 4. Total factor productivity and sentiment: Financial development

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, an interaction between sentiment and financial development (FD), defined as in Rajan and Zingales (1998) as a country's real per capita income, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. Financial development is calculated before the start of the sample in year 1970. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.1405***	0.1474***	0.1494***	0.1289***
	3.60	3.56	3.74	3.25
Sentiment × FD	-0.0062***	-0.0066***	-0.0067***	-0.0057***
	-3.34	-3.37	-3.53	-3.07
Δ RGDP	0.0096**	0.0090**	0.0077**	0.0091**
	2.48	2.24	1.99	2.27
Δ Employment	-0.0200***	-0.0213***	-0.0196***	-0.0199***
	-3.72	-4.77	-4.34	-4.32
Δ Consumption	0.0063	0.0070*	0.0080**	0.0064*
	1.57	1.76	2.00	1.76
Δ Labor share	-0.0035	-0.0018	-0.0027	-0.0036
	-1.03	-0.56	-0.85	-1.27
Δ Inflation	-0.0328***	-0.0294***	-0.0297***	-0.0280***
	-3.74	-3.20	-3.23	-2.96
F1	0.0396***	0.0394***	0.0403***	0.0367***
	5.54	5.93	5.81	4.90
F2	-0.0196	-0.0180	-0.0293**	-0.0305**
	-1.32	-1.26	-2.03	-2.11
F3	0.0113	0.0111	0.0275*	0.0322**
	0.66	0.67	1.69	2.09
F4	-0.0048	-0.0041	-0.0083	-0.0104
	-0.62	-0.53	-1.17	-1.55
F5	-0.0383***	-0.0397***	-0.0340***	-0.0261***
	-5.23	-5.43	-5.02	-4.05
F6	-0.0227***	-0.0212***	-0.0207***	-0.0204***
	-3.38	-3.26	-3.45	-3.64
F7	0.0151***	0.0138***	0.0162***	0.0146***
	3.23	3.09	3.43	2.76
F8	0.0259***	0.0218***	0.0245***	0.0259***
	4.22	3.75	4.25	4.26
Country FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6715	0.6665	0.6629	0.6554

Table 5. Sentiment and economic growth: G7 countries

Panel regressions of country-level economic growth one, two, three, and four years ahead on orthogonalized and explained sentiment. Economic growth is defined as capital formation growth in Panel A, the labor share of income to GDP in Panel B, consumption growth in Panel C, employment growth in Panel D, GDP growth in Panel E, and total factor productivity growth in Panel F. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes six G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States). All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Capital growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0061	-0.0061	-0.0044	-0.0026
	1.25	-0.91	-0.84	-0.50
Explained sentiment	-0.0074**	-0.0095*	-0.0082	-0.0044
	-2.10	-1.66	-1.51	-1.29

Panel B. Labor income

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0023	-0.0002	0.0012	0.0023
	-0.79	-0.07	0.32	0.54
Explained sentiment	0.0106***	0.0112***	0.0119***	0.0112***
	5.19	5.47	5.47	5.94

Panel C. Consumption growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0057***	0.0023*	-0.0015	-0.0007
	2.76	1.85	-0.92	-0.36
Explained sentiment	0.0047***	0.0007	-0.0009	-0.0004
	2.62	0.67	-0.38	-0.14

Panel D. Employment growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0028***	0.0010	-0.0004	-0.0011*
	3.71	1.48	-0.50	-1.70
Explained sentiment	0.0012	-0.0027***	-0.0052***	-0.0041***
	1.16	-4.88	-5.75	-3.56

Panel E. GDP growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0027**	-0.0008	-0.0023*	-0.0017
	2.11	-0.64	-1.79	-1.06
Explained sentiment	-0.0002	-0.0005	-0.0009	-0.0004
	-0.30	-0.51	-0.64	-0.36

Panel F. Productivity growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0018	-0.0028	-0.0048	-0.0053
	-0.33	-0.56	-0.89	-0.94
Explained sentiment	0.0019	0.0010	0.0029	0.0046
	0.30	0.19	0.58	0.92

Table 6. Sentiment and economic growth: Non-G7 countries

Panel regressions of country-level economic growth one, two, three, and four years ahead on orthogonalized and explained sentiment. Economic growth is defined as capital formation growth in Panel A, the labor share of income to GDP in Panel B, consumption growth in Panel C, employment growth in Panel D, GDP growth in Panel E, and total factor productivity growth in Panel F. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes eleven non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Capital growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0227***	0.0037	-0.0021	-0.0019
	6.72	0.68	-0.42	-0.35
Explained sentiment	-0.0390***	-0.0100	0.0084	-0.0499*
	-3.45	-0.50	0.50	-1.71

Panel B. Labor income

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0003	0.0030	0.0051***	0.0063***
	-0.13	1.51	2.83	2.90
Explained sentiment	0.0225***	0.0206**	0.0203**	0.0217**
	2.85	2.45	2.20	2.01

Panel C. Consumption growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0091***	0.0064***	0.0041***	0.0005
	8.42	6.80	3.27	0.40
Explained sentiment	0.0019	0.0110***	-0.0061	-0.0023
	0.57	3.20	-1.34	-0.42

Panel D. Employment growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0088***	0.0065***	0.0035***	0.0009
	7.78	5.72	2.81	0.57
Explained sentiment	0.0040*	-0.0058***	-0.0076***	-0.0073*
	1.95	-2.75	-2.80	-1.92

Panel E. GDP growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0078***	0.0037***	0.0016	-0.0002
	7.41	3.48	1.59	-0.14
Explained sentiment	-0.0027	-0.0004	-0.0061	-0.0088
	-0.73	-0.09	-1.12	-1.42

Panel F. Productivity growth

	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0111***	0.0098***	0.0092***	0.0080**
	3.94	3.30	2.89	2.34
Explained sentiment	0.0021	0.0085	0.0063	0.0043
	0.35	1.41	0.75	0.47

Table 7. Future stock returns

Panel regressions of country-level annual stock returns one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10, stock market data is from Kenneth French's and Robert Shiller's websites, and country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Stock returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0120	-0.0171***	-0.0176***	-0.0048
	-1.48	-3.45	-3.21	-0.75
Explained sentiment	0.0334*	0.0082	0.0257**	0.0010
	1.74	0.63	2.03	0.07
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6549	0.6625	0.6643	0.6680

Panel B. G7 countries

Dependent variable:	1	2	3	4
Stock returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0191***	-0.0129	-0.0091	0.0012
	-2.74	-1.54	-0.66	0.08
Explained sentiment	0.0607***	0.0159	0.0052	0.0193
	4.99	1.47	0.37	1.43
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.6754	0.6795	0.6755	0.6810

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Stock returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0078	-0.0198**	-0.0270***	-0.0103
	-0.58	-2.14	-3.36	-1.33
Explained sentiment	0.0367	-0.0134	0.0528	-0.0056
	0.77	-0.29	1.29	-0.14
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.6800	0.6874	0.6928	0.6956

Table 8. Equity and credit markets

Panel regressions of the annual growth rate of the relative size of the country-level equity and credit markets one, two, three, and four years ahead on orthogonalized and explained sentiment. The size of the equity market is defined as total stock market capitalization, whereas the size of the credit market is defined as total bank lending. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Equity/credit ratio	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0364	0.0245	0.0242	0.0156
	0.98	0.75	0.87	0.53
Explained sentiment	-0.0658	-0.0435	-0.0265	-0.0230
	-0.82	-0.48	-0.25	-0.23
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	373	368	362	356
R-squared	0.4113	0.4112	0.4163	0.4228

Panel B. G7 countries

Dependent variable:	1	2	3	4
Equity/credit ratio	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0152	0.0264	0.0628	0.0606
	0.18	0.39	1.52	1.02
Explained sentiment	0.0119	0.0653	0.0951	0.0825
	0.15	0.57	0.65	1.04
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	144	143	141	139
R-squared	0.6375	0.6421	0.6479	0.6427

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Equity/credit ratio	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0834**	0.0627*	0.0306	-0.0084
	2.52	1.65	0.65	-0.17
Explained sentiment	-0.2656***	-0.2633***	-0.2279*	-0.1512
	-3.77	-2.78	-1.78	-0.97
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	229	225	221	217
R-squared	0.4410	0.4307	0.4186	0.4038

Appendix A. Additional tables

Table A1. Total factor productivity and sentiment: Additional controls

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). All specifications also include the past two lags of productivity, sentiment, and the macroeconomic variables as additional controls. Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0069***	0.0064***	0.0060***	0.0063***
	6.18	4.01	3.45	3.85
Δ RGDP	0.0070***	0.0067***	0.0067***	0.0060**
	5.23	3.45	2.88	2.27
Δ Employment	-0.0171***	-0.0178***	-0.0181***	-0.0171***
	-6.22	-4.20	-4.08	-3.58
Δ Consumption	-0.0029**	-0.0027	-0.0026	-0.0015
	-2.10	-1.55	-1.30	-0.67
Δ Labor share	-0.0073***	-0.0060***	-0.0074***	-0.0062**
	-5.87	-4.78	-4.32	-2.05
Δ Inflation	-0.0081***	-0.0022	-0.0035	-0.0040
	-3.01	-0.76	-1.06	-0.99
F1	-0.0054***	0.0025	0.0034	0.0084**
	-2.96	0.76	1.01	2.16
F2	-0.0015	-0.0079	-0.0155**	-0.0067
	-0.29	-1.53	-2.54	-0.96
F3	0.0042	0.0038	0.0187***	0.0101
	0.83	0.74	3.00	1.40
F4	-0.0032**	-0.0038*	-0.0055**	-0.0041
	-2.28	-1.80	-2.06	-1.34
F5	0.0008	-0.0034	0.0017	-0.0028
	0.32	-1.09	0.41	-0.58
F6	0.0063***	0.0097***	0.0116***	0.0081**
	3.68	3.43	3.43	2.32
F7	0.0014	0.0051**	0.0055**	0.0083***
	1.01	2.08	2.20	2.81
F8	0.0011	-0.0018	0.0028	0.0020
	0.54	-0.59	0.71	0.43
Country FE	Y	Y	Y	Y
Additional controls	Y	Y	Y	Y
Observations	625	608	591	574
R-squared	0.9673	0.9461	0.9249	0.9082

Table A2. Total factor productivity and sentiment: Extended sample

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes 36 OECD countries (Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States) as well as six non-OECD countries (Brazil, China, India, Indonesia, Russia, and South Africa) over the period 1975-2019. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0221***	0.0192***	0.0161***	0.0138***
	9.17	7.40	5.94	5.40
Δ RGDP	0.0116***	0.0113***	0.0122**	0.0138**
	3.52	2.61	2.34	2.38
Δ Employment	-0.0088***	-0.0083***	-0.0073**	-0.0068**
	-2.83	-2.59	-2.25	-2.08
Δ Consumption	0.0193***	0.0191***	0.0184***	0.0160***
	6.42	5.14	4.13	3.09
Δ Labor share	-0.0014	-0.0013	-0.0019	-0.0034**
	-0.66	-0.64	-0.95	-2.03
Δ Inflation	-0.0073**	-0.0074**	-0.0074**	-0.0087**
	-2.15	-2.19	-2.14	-2.41
F1	0.0370***	0.0382***	0.0387***	0.0364***
	6.27	6.63	6.16	5.34
F2	-0.0111	-0.0107	-0.0193	-0.0231*
	-0.82	-0.80	-1.35	-1.72
F3	0.0113	0.0111	0.0220	0.0288**
	0.77	0.81	1.58	2.29
F4	-0.0053	-0.0035	-0.0078	-0.0129*
	-0.59	-0.39	-0.93	-1.67
F5	-0.0370***	-0.0400***	-0.0365***	-0.0286***
	-5.81	-6.40	-5.94	-4.72
F6	-0.0257***	-0.0222**	-0.0219***	-0.0221***
	-2.81	-2.41	-2.65	-2.98
F7	0.0218***	0.0199***	0.0202***	0.0181***
	4.36	4.12	4.03	3.29
F8	0.0174***	0.0148***	0.0176***	0.0213***
	3.03	2.87	3.10	3.84
Country FE	Y	Y	Y	Y
Observations	1,262	1,221	1,179	1,137
R-squared	0.7048	0.7017	0.6946	0.6877

Table A3. Macroeconomic uncertainty and G7 countries

Panel regressions of country-level macroeconomic uncertainty, defined as in Ozturk and Sheng (2018) and expressed in natural logs, on a dummy that takes on value one for G7 countries, and zero otherwise. We consider total macroeconomic uncertainty in columns (1) and (4), common macroeconomic uncertainty in columns (2) and (5), and idiosyncratic macroeconomic uncertainty in columns (3) and (6). In columns (1) to (3), we consider annual indices, constructed as averages of their monthly values. In columns (4) to (6), we consider monthly indices. The sample includes thirteen countries over the period 1989-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and seven are non-G7 countries (Australia, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). All specifications include year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

	Annual indices			**Monthly indices**		
Dependent variable:	1 Total	2 Common	3 Idiosyncratic	4 Total	5 Common	6 Idiosyncratic
G7 dummy	-0.2203***	-0.1999***	-0.2695	-0.2151**	-0.1942***	-0.2501
	-2.69	-2.99	-1.60	-2.55	-2.84	-1.38
Observations	338	338	338	3,976	3,976	3,976

Table A4. Total factor productivity and sentiment: Alternative country breakdown

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). In Panel A, we include the six G7 countries with the addition of Switzerland and the Netherlands from the non-G7 group for a sum total of eight countries. In Panel B, we include the remaining nine countries. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. G7 countries + Switzerland + Netherlands

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0028	0.0010	0.0006	0.0005
	0.67	0.24	0.13	0.12
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	362	354	346	338
R-squared	0.7207	0.7153	0.7101	0.7049

Panel B. Non-G7 countries − Switzerland − Netherlands

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0109***	0.0095**	0.0092**	0.0083**
	2.88	2.38	2.53	2.33
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	297	288	279	270
R-squared	0.5841	0.5670	0.5599	0.5390

Table A5. Total factor productivity and sentiment: Extended sample breakdown

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes 36 OECD countries (Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States) as well as six non-OECD countries (Brazil, China, India, Indonesia, Russia, and South Africa) over the period 1975-2019, of which seven are G7 countries (Canada, France, Germany, Italy, Japan, United Kingdom, and United States). We include the subsample of G7 countries in Panel A, the subsample of non-G7 countries in panel B, and the subsample of least advanced non-G7 countries in Panel C (Brazil, Chile, China, Colombia, Costa Rica, Czech Republic, Estonia, Greece, Hungary, India, Indonesia, Israel, Latvia, Lithuania, Luxembourg, Mexico, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, South Korea, and Turkey). All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. G7 countries (all)

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	-0.0019	-0.0045	-0.0055	-0.0057
	-0.38	-0.90	-1.10	-1.22
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	318	311	304	297
R-squared	0.7123	0.7110	0.7087	0.7043

Panel B. Non-G7 countries (all)

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0262***	0.0232***	0.0200***	0.0174***
	9.35	7.70	6.37	5.83
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	944	910	875	840
R-squared	0.7209	0.7180	0.7085	0.6983

Panel C. Non-G7 countries (least advanced)

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0224***	0.0203***	0.0165***	0.0138***
	6.42	5.36	4.25	3.62
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	508	485	461	437
R-squared	0.7458	0.7341	0.7162	0.7041

Table A6. Total factor productivity and sentiment: Alternative financial development measures

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, an interaction between sentiment and financial development (FD), defined as in Rajan and Zingales (1998) as a country's ratio between total bank credit (Panel A) or total domestic credit (Panel B) and real GDP, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes eight OECD countries in Panel A (Australia, Canada, Denmark, New Zealand, Sweden, Switzerland, United Kingdom, and United States) and seven of these countries in Panel B (data is unavailable for New Zealand) over the period 1975-2019. Financial development is calculated as a country-level average in the fifteen-year period before the start of the sample (1960-1974). All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Bank credit over GDP

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0461***	0.0462***	0.0444***	0.0495***
	3.36	2.92	2.93	3.48
Sentiment × FD	-0.0059***	-0.0063**	-0.0060**	-0.0068***
	-2.64	-2.42	-2.39	-2.88
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	315	307	299	291
R-squared	0.7276	0.7194	0.7081	0.7140

Panel B. Domestic credit over GDP

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.0705***	0.0658***	0.0643***	0.0679***
	4.38	3.63	3.79	4.23
Sentiment × FD	-0.0098***	-0.0094***	-0.0092***	-0.0097***
	-3.78	-3.25	-3.35	-3.78
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	284	277	270	263
R-squared	0.7407	0.7338	0.7217	0.7289

Table A7. Total factor productivity and sentiment: Financial development and quality of institutions

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, an interaction between sentiment and financial development (FD), defined as in Rajan and Zingales (1998) as a country's real per capita income, an interaction term between sentiment and quality of institutions, defined as a country's corruption score (Panel A) or democracy score (Panel B) from La Porta et al. (1999), a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. Financial development is calculated before the start of the sample in year 1970. All specifications include country fixed effects and standard errors clustered by year. The country-level macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Corruption score

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.1642***	0.1673***	0.1696***	0.1473***
	4.20	3.88	4.05	3.59
Sentiment × FD	-0.0093***	-0.0092***	-0.0093***	-0.0082***
	-3.76	-3.40	-3.43	-3.07
Sentiment × Quality	0.0051*	0.0043	0.0044	0.0040
	1.66	1.39	1.36	1.20
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6742	0.6685	0.6652	0.6575

Panel B. Democracy score

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment	0.1555***	0.1569***	0.1521***	0.1269***
	3.94	3.74	3.80	3.18
Sentiment × FD	-0.0082***	-0.0079***	-0.0071***	-0.0055**
	-3.76	-3.44	-3.32	-2.57
Sentiment × Quality	0.0024	0.0016	0.0005	-0.0003
	1.45	0.97	0.32	-0.23
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6724	0.6668	0.6629	0.6555

Table A8. Investment in R&D

Panel regressions of the country-level growth in investment in research and development (R&D) one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1982-2019. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Dependent variable:	1	2	3	4
R&D growth	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0073***	0.0044	0.0005	0.0011
	2.87	1.33	0.16	0.40
Explained sentiment	0.0127	0.0010	0.0029	-0.0026
	1.39	0.18	0.38	-0.42
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	481	490	484	477
R-squared	0.2321	0.2093	0.2080	0.2135

Table A9. Capital intensity

Panel regressions of the country-level capital intensity one, two, three, and four years ahead on orthogonalized and explained sentiment. Capital intensity is defined as the ratio of physical capital to labor. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Capital intensity	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0334***	0.0283***	0.0223**	0.0182*
	3.94	3.12	2.31	1.81
Explained sentiment	0.0245	0.0208	0.0271**	0.0093
	1.54	1.33	2.04	0.39
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6123	0.5947	0.5756	0.5582

Panel B. G7 countries

Dependent variable:	1	2	3	4
Capital intensity	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0191	0.0132	0.0092	0.0074
	1.64	0.96	0.63	0.60
Explained sentiment	0.0508***	0.0449***	0.0433***	0.0446***
	6.90	5.85	4.67	4.20
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.7911	0.7771	0.7579	0.7421

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Capital intensity	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0451***	0.0403***	0.0326**	0.0276*
	4.01	4.02	2.46	1.65
Explained sentiment	-0.0043	-0.0140	0.0017	-0.0538
	-0.12	-0.40	0.04	-0.80
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.5389	0.5221	0.5015	0.4924

Table A10. Future stock returns, sentiment, and local macroeconomic variables

Panel regressions of country-level annual stock returns one year ahead on local sentiment, defined as country-level consumer confidence, and a vector of local macroeconomic variables, which includes changes in real GDP, real consumption, employment, labor share in GDP, inflation. All variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in column (1), the subsample of G7 countries in column (2), and the subsample of non-G7 countries in column (3). All specifications include country and year fixed effects and standard errors are clustered by year. The macroeconomic variables are from the Penn World Table V.10, stock market data is from Kenneth French's and Robert Shiller's websites, and country-level consumer confidence data is from the OECD.

Dependent variable: Stock returns t+1	1 Full	2 G7	3 Non-G7
Sentiment	-0.0153	-0.0223***	-0.0015
	-1.61	-4.27	-0.07
Δ RGDP	0.0080	0.0125	-0.0185
	0.78	0.74	-0.19
Δ Employment	0.0323**	0.0401***	0.0810
	1.99	2.96	0.85
Δ Consumption	-0.0086	-0.0069	-0.1008
	-0.77	-0.39	-1.40
Δ Labor share	-0.0146	-0.0236	-0.0011
	-0.75	-1.12	-0.04
Δ Inflation	0.1025**	0.1754***	0.0890
	2.30	4.32	1.36
Country FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	659	274	385
R-squared	0.0164	0.0715	0.0099

Table A11. Future stock returns: High v. low sentiment breakdown

Panel regressions of country-level annual stock returns one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States) over the period 1975-2019. In Panels A and B, we respectively include the subsample of years in which sentiment takes on above- and below-median values. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10, stock market data is from Kenneth French's and Robert Shiller's websites, and country-level consumer confidence data is from the OECD.

Panel A. High sentiment

Dependent variable:	1	2	3	4
Stock returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0036	-0.0438**	0.0122	-0.0042
	0.15	-2.17	0.74	-0.30
Explained sentiment	0.0129	-0.0118	0.0192	-0.0132
	0.27	-0.34	0.52	-0.28
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	330	323	313	304
R-squared	0.6720	0.6801	0.7233	0.7328

Panel B. Low sentiment

Dependent variable:	1	2	3	4
Stock returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0031	-0.0128	0.0008	0.0004
	0.11	-0.68	0.06	0.02
Explained sentiment	0.0375	-0.0038	0.0379	-0.0160
	1.26	-0.17	1.50	-1.02
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	329	319	312	304
R-squared	0.6997	0.7047	0.6569	0.6553

Table A12. Market efficiency and G7 countries

Panel regressions of country-level alphas on a dummy variable that takes on value one for G7 countries and zero otherwise. Alphas are calculated using a world CAPM in columns (1) and (4), the three Fama-French factors for the United States in columns (2) and (5), and the three Fama-French factors for developed countries in columns (3) and (6). The sample includes seventeen OECD countries, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). In the world CAPM, the market portfolio is defined as an equal-weighted portfolio of returns calculated using all the countries in our sample. We estimate country-level betas through regressions of monthly country-level excess returns, calculated using the three-month treasury bill rate, on global or US risk factors using a three-year rolling window as in Hong and Kacperczyk (2009). We define alphas as a country's excess returns minus the product of betas, defined as annual averages from the monthly estimates, and the global or US risk factors. We express alphas in absolute value in columns (1-3) and as squared values in columns (4-6). The overall sample period is 1975-2019, except for the risk factors for developed countries whose data is available from 1991. Standard errors are block bootstrapped at the country-level with 200 repetitions. Stock market data is from Kenneth French's and Robert Shiller's websites.

	Absolute alphas			**Squared alphas**		
Dependent variable:	1	2	3	4	5	6
	CAPM	3FF USA	3FF global	CAPM	3FF USA	3FF global
G7 dummy	-0.0453***	-0.0767**	-0.0705**	-0.0250***	-0.1010***	-0.1007***
	-2.80	-2.34	-2.13	-2.69	-2.76	-2.60
Observations	601	601	478	601	601	478

Table A13. Bond returns

Panel regressions of country-level 10-year treasury bill rates one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Bond returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0012	-0.0006	-0.0001	0.0002
	-1.21	-0.50	-0.09	0.22
Explained sentiment	0.0009	0.0007	0.0018*	0.0019*
	0.73	0.63	1.69	1.66
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	599	588	577	565
R-squared	0.9213	0.9192	0.9180	0.9186

Panel B. G7 countries

Dependent variable:	1	2	3	4
Bond returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0006	0.0007	0.0005	-0.0001
	0.42	0.43	0.26	-0.04
Explained sentiment	0.0030	0.0019	0.0017	0.0011
	1.46	0.79	0.67	0.48
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	245	242	239	236
R-squared	0.9291	0.9271	0.9270	0.9271

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Bond returns	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0021*	-0.0011	-0.0002	0.0005
	-1.89	-0.77	-0.13	0.41
Explained sentiment	-0.0030	-0.0017	0.0018	0.0033
	-1.17	-0.87	0.88	1.45
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	354	346	338	329
R-squared	0.9279	0.9220	0.9180	0.9189

Table A14. Macroeconomic forecasts

Panel regressions of country-level forecasts of annual growth in domestic demand one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. Final domestic demand is the sum of final consumption, investment, and stock building expenditures by the private and general government sectors in real terms. The forecasts are from the OECD and based on an assessment of the economic climate in individual countries and the world economy, using a combination of model-based analyses and expert judgment. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Domestic demand forecast	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0099***	0.0036**	0.0010	0.0005
	4.13	2.23	0.69	0.29
Explained sentiment	-0.0015	-0.0020	-0.0012	-0.0115
	-0.58	-1.16	-0.67	-1.59
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	629	614	599	584
R-squared	0.4294	0.3548	0.3420	0.3539

Panel B. G7 countries

Dependent variable:	1	2	3	4
Domestic demand forecast	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0042**	-0.0008	-0.0024	-0.0018
	2.39	-0.32	-0.87	-0.77
Explained sentiment	0.0015	-0.0024	-0.0039	-0.0023
	0.89	-1.19	-1.61	-1.60
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	258	253	248	243
R-squared	0.5990	0.5849	0.6178	0.6087

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Domestic demand forecast	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0138***	0.0065***	0.0033***	0.0028
	5.27	5.14	2.78	0.91
Explained sentiment	-0.0056	-0.0045	-0.0010	-0.0304
	-0.96	-0.89	-0.20	-1.55
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	371	361	351	341
R-squared	0.4420	0.3430	0.3222	0.3643

Table A15. Foreign direct investments

Panel regressions of standardized net foreign direct investments (FDIs), defined as the difference between outward and inward FDIs and expressed as a percentage of real GDP, one, two, three, and four years ahead on orthogonalized and explained sentiment. Orthogonalized and explained sentiment are respectively defined as the residuals and fitted values from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sentiment variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD.

Panel A. Full sample

Dependent variable:	1	2	3	4
Net FDIs	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0127	0.0208	0.0130	0.0262
	0.33	0.46	0.28	0.60
Explained sentiment	-0.3412***	-0.3088***	-0.1160	-0.0655
	-4.07	-4.72	-1.52	-1.05
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	638	623	608	593
R-squared	0.3790	0.3816	0.3753	0.3812

Panel B. G7 countries

Dependent variable:	1	2	3	4
Net FDIs	t+1	t+2	t+3	t+4
Orthogonalized sentiment	-0.0517	-0.0625	-0.0674	-0.0347
	-0.65	-0.74	-0.69	-0.34
Explained sentiment	-0.5347***	-0.4526***	-0.2340***	-0.1551***
	-9.04	-7.75	-2.64	-4.80
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	260	255	250	245
R-squared	0.5409	0.5379	0.5260	0.5288

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Net FDIs	t+1	t+2	t+3	t+4
Orthogonalized sentiment	0.0256	0.0537	0.0486	0.0557
	0.51	0.76	0.62	0.77
Explained sentiment	0.1264	0.0105	0.1401	0.0649
	0.81	0.08	0.85	0.45
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	378	368	358	348
R-squared	0.2875	0.2875	0.2885	0.2874

Appendix B. Weather-related sentiment

To further address potential endogeneity concerns, we identify exogenous variation in sentiment by exploiting the well-known positive effect of sunshine on investor mood and behavior (Hirshleifer and Shumway (2003); Cortés et al. (2016); Dong and Tremblay (2022)).[28] Specifically, we expect a decrease in local rainfall in a given year to boost local sentiment. In our setup, this effect should translate into an increase in future productivity.

To test this conjecture, we proceed as follows. We collect weather data from the Global Historical Climatology Network's Global Summary of the Year database released by the National Oceanic and Atmospheric Administration. We pick this data set because it provides coverage for all the countries in our sample for the entire sample period.[29] Following previous literature, we select the weather stations that are closest to the cities where stock exchanges are located (Hirshleifer and Shumway (2003); Dong and Tremblay (2022)).[30] Then we create a dummy variable that takes on the value one if local rainfall has decreased in a given year, and zero otherwise. This specification grants us two advantages. First, it is less sensitive to extreme weather events, which might affect productivity in their own right. Second, it allows us to compare rainfall patterns across countries that exhibit different baseline amounts of precipitation.[31]

In the first stage, we regress our sentiment measure on the rainfall dummy with country and year fixed effects. Consistent with our conjecture, we find that a decrease in annual rainfall in a given country is indeed associated with an increase in sentiment. Although the magnitude is small (0.0892), it is nonetheless statistically significant (t-stat 2.45). We define the fitted values from this regression as "weather-related" sentiment. In Figure B1, we present the time-series plots of country-level consumer sentiment and the rainfall dummy. In years characterized by a decrease in rainfall, represented by grey bars, we observe indeed a few spikes in consumer sentiment in most countries. Those are the spikes that we consider as exogenous and try to identify through weather patterns.

[Figure B1 here]

In the second stage, we re-estimate equation 3 by replacing sentiment with its weather-related breakdown. The results, reported in Table B1, follow a similar empirical pattern to that from our main analysis. In the full sample (Panel A), a one-standard-deviation increase in weather-related sentiment is associated with a positive and highly significant increase in productivity growth up to four years ahead. The estimates are equal to of 1.19% (t-stat 2.67), 0.91% (t-stat 2.11), 1.11% (t-stat 2.32), and 1.08% (t-stat 2.30), for one, two, three, and four years ahead, respectively. In

[28] A measure of weather-related sentiment exhibits substantially better data coverage than competing measures such as sports sentiment (Edmans et al. (2007)) or music sentiment (Edmans et al. (2022)).

[29] Unfortunately, this data set does not provide data on cloud cover, a measure often used in previous research (e.g., Hirshleifer and Shumway (2003); Cortés et al. (2016)). Rainfall is therefore the closest analog to cloud cover for our sample and has also been used and validated in other finance studies (e.g., Dong and Tremblay (2022, 2024).

[30] In so doing, we acknowledge the partial overlap between investor and consumer sentiment and exploit the stock market channel.

[31] We find similar results when comparing rainfall with the average level of rainfall from the previous three years.

the subsample of G7 countries (Panel B), none of the coefficients of weather-related sentiment are significant. By contrast, the estimates are positive and highly significant in the subsample of non-G7 countries (Panel C). A one-standard-deviation increase in weather-related sentiment is associated with an increase in future productivity of 1.12% (t-stat 2.77), 0.86% (t-stat 2.26), 1.01% (t-stat 3.38), and 0.97% (t-stat 3.34) for each of the four years under consideration, respectively.

[Table B1 here]

Although our rainfall dummy is less sensitive to extreme weather events, it may still exert a direct effect on productivity. We identify two potential channels. First, rainfall may affect productivity through agricultural output. However, this alternative explanation is unlikely in our sample because agricultural output plays a minor role in the economies we consider. The average agricultural production reported by the OECD, expressed in thousand tons and scaled by country-level real GDP, is equal to 2.05% in the full sample, 2.15% for G7 countries, and 2.02% for non-G7 countries. Consistent with these considerations, we find that the log-ratio of agricultural output to real GDP exhibits no statistical relation with the rainfall dummy, a dummy for G7 countries, and their interaction term (see Table B2, Panel A).[32]

[Table B2 here]

Second, rainfall may affect productivity through an increase in work absence. To test for this, we consider the country-level measure of missed days at work from the OECD. We run panel regressions of the log-ratio of missed workdays to GDP and the two dummy variables introduced above.[33] Although we find that G7 countries exhibit significantly fewer missed days at work than non-G7 countries, possibly reflecting the superior strength of their economies, rainfall has no effect on work absence either directly or through the G7 dummy, consistent with the good infrastructural systems that characterize the countries in our sample (see Table B2, Panel B). In light of these results, our exclusion restriction seems verified.

Another potential concern is that the instrument we propose may be weak, as our sample has a relatively small time dimension. To address this, we run a battery of weak-instrument tests. Reassuringly, we find that the Wald F statistic from Cragg and Donald (1993) and the rank Wald F statistic from Kleibergen and Paap (2006) are well above the critical values from Stock and Yogo (2005) in each of our specifications, indicating that weather-related sentiment is an adequate instrument in our analysis.[34]

Overall, these results provide support to the validity to our identification of sentiment.

[32]Data coverage starts in 1990 for these tests and only includes six countries, three of which are G7 (Canada, United Kingdom, and United States) and the other three are non-G7 (Australia, New Zealand, and Switzerland).

[33]The sample includes all countries except New Zealand but data coverage only starts in 2010.

[34]In the full sample, the Kleibergen-Paap rank Wald F statistics are 51.5, 53.1, 54.0, and 56.4 for each of the four specifications. All values exceed the Stock-Yogo 10% maximal IV size critical value for these regressions (16.38).

Figure B1. Country-level consumer sentiment and rainfall patterns

Time-series plots of country-level consumer sentiment (S) and a dummy variable (D) that takes on the value one if local rainfall has decreased in a given year, and zero otherwise, for the seventeen countries in our sample (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States). The rainfall dummy is plotted as grey bars. The sample period is 1975-2019. Sentiment data is from the OECD consumer confidence database and weather data is from the Global Historical Climatology Network's Global Summary of the Year database.

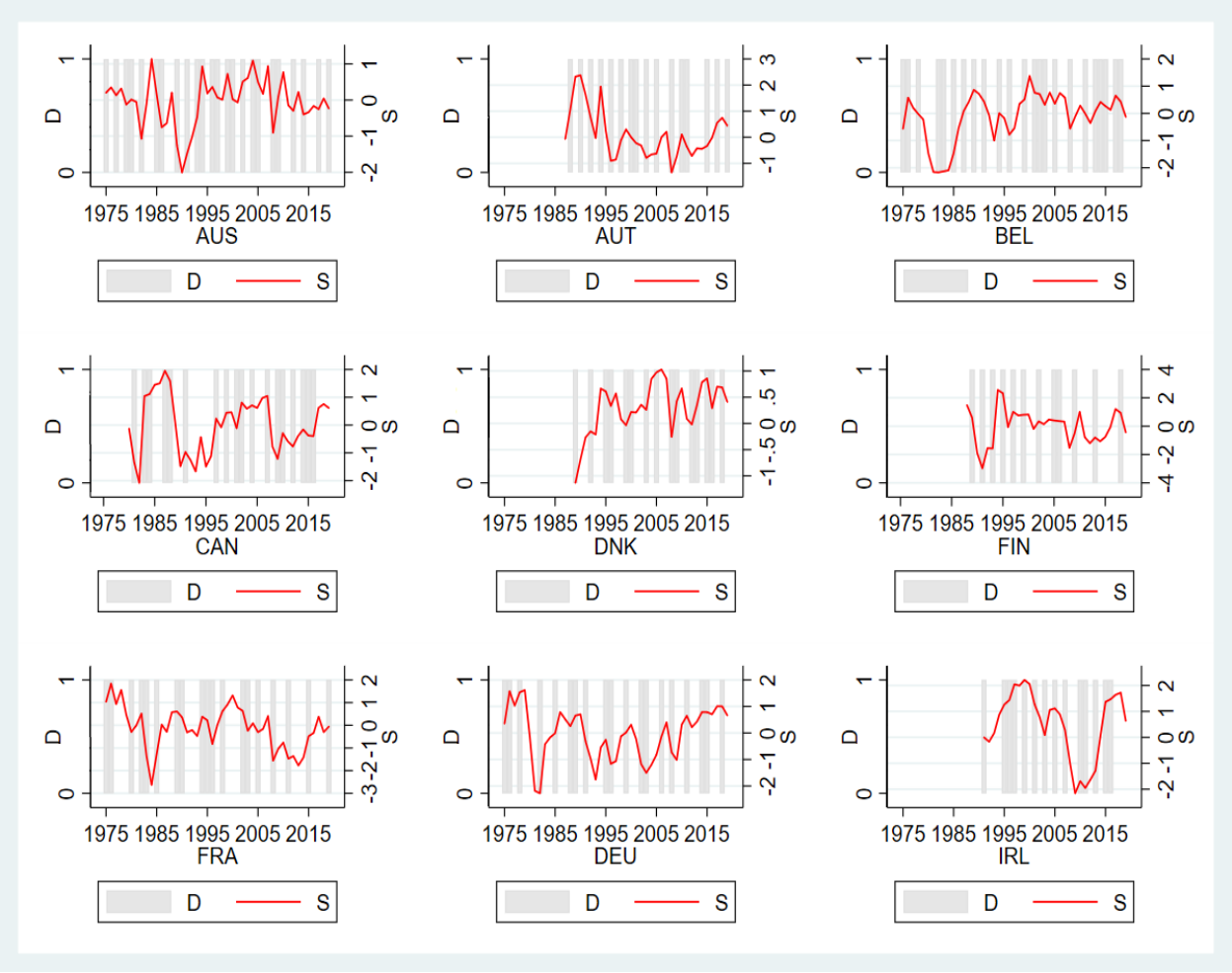

Figure B1. Continued

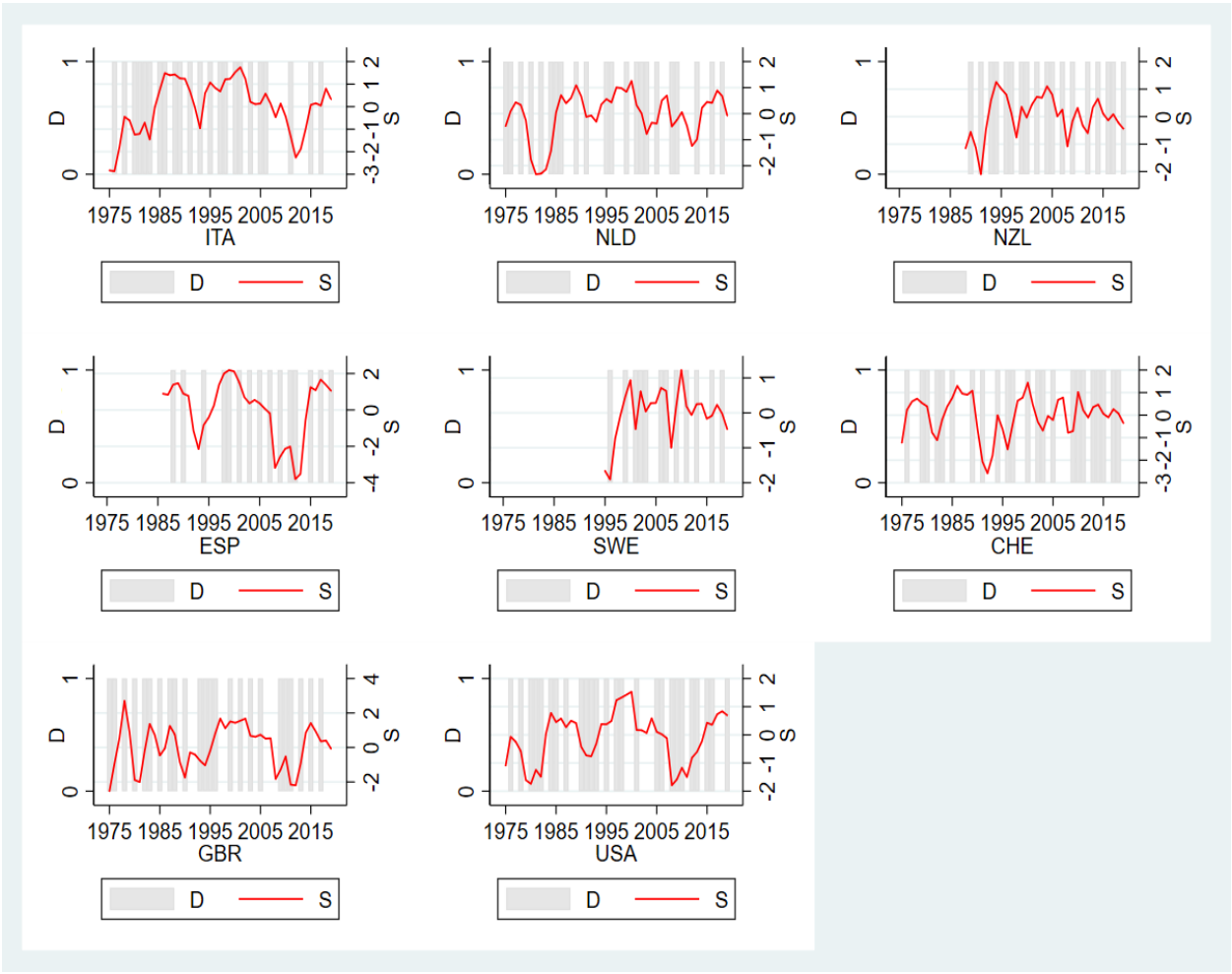

Table B1. Total factor productivity and sentiment: Rainfall decomposition

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on sentiment, defined as the country-level consumer confidence index, a vector of country-level macroeconomic variables, which includes innovations in local real GDP, real consumption, employment, labor share in GDP, and inflation, and the eight principal components of 132 US macroeconomic variables from Ludvigson and Ng (2009) Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. Sentiment is divided into a component explained by country-level annual rainfall and a residual component. Rainfall is defined as a dummy variable that takes on value one if country-level precipitation has decreased in a given year and zero otherwise. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10. Country-level consumer confidence data is from the OECD. Weather data is from the Global Historical Climatology Network's Global Summary of the Year database.

Panel A. Full sample

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment (Weather)	0.0119***	0.0091**	0.0111**	0.0108**
	2.67	2.11	2.32	2.30
Sentiment (Residual)	0.0048	0.0040	0.0031	0.0025
	1.30	1.09	0.83	0.70
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.4307	0.4117	0.4019	0.3857

Panel B. G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment (Weather)	0.0085	0.0064	0.0088	0.0092
	1.29	1.00	1.36	1.34
Sentiment (Residual)	-0.0036	-0.0044	-0.0057	-0.0060
	-0.67	-0.87	-1.15	-1.15
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.4495	0.4365	0.4316	0.4148

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
Sentiment (Weather)	0.0112***	0.0086**	0.0101***	0.0097***
	2.77	2.26	3.38	3.34
Sentiment (Residual)	0.0064	0.0059	0.0052	0.0047
	1.54	1.37	1.20	1.13
Controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.4868	0.4582	0.4493	0.4289

Table B2. Rainfall, agricultural output, and missed days at work

Panel regressions of the country-level log-ratio of agricultural output to real GDP (Panel A) or the log-ratio of missed days at work to real GDP (Panel B) on a dummy variable that takes on the value one if local rainfall has decreased in a given year, and zero otherwise, a dummy variable that takes on value one if a country is a member of the G7 block, and zero otherwise, and an interaction term between the two dummy variables. In Panel A, the sample includes six countries over the period 1990-2019 (Australia, Canada, New Zealand, Switzerland, United Kingdom, and United States). In Panel B, the sample includes sixteen countries over the period 2010-2019 (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland, United Kingdom, and United States) . All specifications include year fixed effects and standard errors clustered by country. Data on agricultural output and missed days at work is from the OECD. Weather data is from the Global Historical Climatology Network's Global Summary of the Year database.

Panel A. Agricultural output

Dependent variable: Log agricultural output to GDP	1	2	3	4
Rainfall dummy	-0.1179		-0.0712	-0.0665
	-0.64		-0.67	-0.79
G7 dummy		1.1271	1.1248	1.1294
		0.80	0.79	0.76
Rainfall dummy × G7 dummy				-0.0087
				-0.04
Year FE	Y	Y	Y	Y
Observations	180	180	180	180
R-squared	0.0207	0.1492	0.1497	0.1497

Panel B. Missed days at work

Dependent variable: Log missed days at work to GDP	1	2	3	4
Rainfall dummy	-0.1273		-0.0956	0.0360
	-0.49		-0.73	0.28
G7 dummy		-2.3829***	-2.3816***	-2.2259***
		-4.01	-4.01	-4.46
Rainfall dummy × G7 dummy				-0.3438
				-1.23
Year FE	Y	Y	Y	Y
Observations	131	131	131	131
R-squared	0.0023	0.6359	0.6369	0.6399

Appendix C. Price-dividend ratio

In this final section, we relate our results to the earlier literature on the price-dividend ratio.

Methodology

As in previous literature, we model future productivity growth as a function of lagged price-dividend ratios (Beaudry and Portier (2006); Colacito and Croce (2011); Bansal et al. (2016); Colacito et al. (2018); Constantinides and Ghosh (2021)):

$$\Delta a_{c,t+h} = \alpha_c + \alpha_t + \beta_a PD_{c,t} + \epsilon^a_{c,t+h}, \tag{C1}$$

where we again measure productivity from one to four years ahead ($h = 1, 2, 3, 4$) and use country and year fixed effects as additional regressors. To incorporate the idea that stock prices partly reflect investor sentiment in financial markets (Hirshleifer (2001); Baker and Wurgler (2006, 2007); Baker et al. (2012)), we propose a decomposition of the country-level price-dividend ratio into a sentiment and a fundamental component:

$$PD_{c,t} = PD^s_{c,t} + PD^f_{c,t}, \tag{C2}$$

which we estimate through a panel regression of the price-dividend ratio on unexplained sentiment:

$$PD_{c,t} = \alpha_c + \alpha_t + \beta_p S^{\perp}_{c,t} + \epsilon^p_{c,t}, \tag{C3}$$

where the sentiment component of the price-dividend ratio is defined as the fitted values from the regression ($PD^s_{c,t} \equiv \widehat{PD}_{c,t}$), whereas the residuals are the fundamental component ($PD^f_{c,t} \equiv PD_{c,t} - \widehat{PD}_{c,t}$), i.e., the part of the price-dividend ratio that reflects economic news.[35]

In Figure C1, we present the time-series plots of country-level price-dividend ratios and orthogonalized sentiment, both standardized by subtracting their mean and dividing by their standard deviation, for each of the seventeen countries in our sample. The two series follow similar empirical patterns for most of the countries, as also attested by their positive correlation coefficient (0.10, p-value < 0.05).[36] Notably, orthogonalized sentiment exhibits spikes in the late 1970s through the mid-1980s as well as in the late 1990s for most countries. These two instances correspond to two known waves of investor optimism documented in previous research (Baker and Wurgler (2006)).

[Figure C1 here]

These results are in line with previous literature showing that consumer sentiment proxies for sentiment in financial markets (Lemmon and Portniaguina (2006)). From a theoretical perspective, the intuition is that the representative agent is simultaneously both a consumer and an investor, which implies an overlap between consumer and investor sentiment. As a result, either measure represents a proxy for the distortion of the marginal investor's beliefs about the future payoffs of

[35]The inclusion of labor and inflation variables to orthogonalize sentiment is particularly important in this respect, because they exhibit a strong relation with aggregate stock prices (Constantinides and Ghosh (2021)).

[36]For explained sentiment, the correlation coefficient is 0.12 (p-value < 0.01).

financial assets (Shefrin (2008)).

The decomposition of the price-dividend ratio allows us to separate out two different types of information embedded in it. The sentiment component represents a signal for short-run economic dynamics (Starr (2012); Benhabib and Spiegel (2019)), whereas the fundamental component represents an economic signal for the long run (Bryzgalova and Julliard (2021); Constantinides and Ghosh (2021); L'Huillier et al. (2022)).

As a result, we estimate a refined version of equation C1 by regressing productivity growth on the sentiment and fundamental components of the price-to-dividend ratio:

$$\Delta a_{c,t+h} = \alpha_c + \alpha_t + \beta_a^s PD_{c,t}^s + \beta_a^f PD_{c,t}^f + \epsilon_{c,t+h}^a, \tag{C4}$$

where $h = 1, 2, 3, 4$.

The residuals from equation C1 represent shocks to the unanticipated component of productivity, whereas the residuals from a regression of the price-dividend ratio onto its lagged value represent shocks to the expected component of productivity (Colacito and Croce (2011); Bansal et al. (2016); Colacito et al. (2018)). These two shocks are referred to as productivity and long-run news shocks, respectively. In our paper, we further decompose long-run news shocks into a fundamental and a sentiment component following equation C2:

$$PD_{c,t}^s = \alpha_c + \alpha_t + \rho_s PD_{c,t-1}^s + \epsilon_{c,t}^s, \tag{C5}$$

$$PD_{c,t}^f = \alpha_c + \alpha_t + \rho_f PD_{c,t-1}^f + \epsilon_{c,t}^f. \tag{C6}$$

The residuals from equation C5 represent a sentiment shock ($\epsilon_{c,t}^s$), defined as a shock to investors' expectations of future productivity unrelated to economic fundamentals. Conversely, the residuals from equation C6 represent an economic news shock ($\epsilon_{c,t}^f$).[37]

In the empirical analysis, we use productivity, long-run news, and sentiment shocks to predict macroeconomic outcomes:

$$g_{c,t+h} = \alpha_c + \alpha_t + \beta_g^a \epsilon_{c,t}^a + \beta_g^f \epsilon_{c,t}^f + \beta_g^s \epsilon_{c,t}^s + u_{c,t+h}, \tag{C7}$$

where $g_{c,t+h}$ represents the growth rate of real GDP, and again $h = 1, 2, 3, 4$.[38]

Model with sentiment

In a preliminary test, we begin to analyze the relation between price-dividend ratios and future productivity by estimating equation C1, i.e., the original test equation from Colacito et al. (2018) that includes the raw price-dividend ratio. The estimates are in Table C1. Consistent with their

[37] In related work, L'Huillier et al. (2022) propose a decomposition of consumer confidence into a component explained by current and past fundamentals and another that includes agents' information (news) on future fundamentals. Our approach differs from theirs in two important ways. First, they focus on economic news shocks whereas we also attempt to identify productivity and sentiment shocks. Second, we use a larger number of macroeconomic variables to include known predictors of aggregate asset prices.

[38] The results that follow are similar when we alternatively identify news and sentiment shocks as changes in the two components of the price-dividend ratio, rather than estimate an autoregressive model.

results, we find that the price-dividend ratio is a positive predictor of future productivity growth among G7 countries up to four years into the future. Conversely, the effect is absent among non-G7 countries at any horizon. These results indicate that the price-dividend ratio indeed contains long-run news over productivity growth, but only among the largest advanced economies.[39]

[Table C1 here]

To look further into these findings, we perform the sentiment decomposition of the price-dividend ratio into a fundamental and a sentiment component from equation C2. Therefore, we estimate equation C4. The results are in Table C2. For G7 countries, we find that the coefficient of the fundamental component of the price-dividend ratio is similar in magnitude and statistical significance to that of the raw price-dividend ratio from Table C1. Specifically, a one-standard-deviation increase in the fundamental component of the price-dividend ratio is associated with an increase in productivity of 4.01% over the subsequent year (t-stat 2.13). On the other hand, the coefficient of the sentiment component is small and insignificant.

[Table C2 here]

In non-G7 countries, the empirical pattern is reversed. The coefficient of the fundamental component of the price-dividend ratio is close to zero in both magnitude and significance, whereas the coefficient of the sentiment component is large, positive, and highly significant. Specifically, a one-standard-deviation increase in the sentiment component of the price-dividend ratio is associated with an increase in productivity of 15.78% over the subsequent year (t-stat 3.87).

The analysis of future productivity at farther horizons reveals another interesting empirical pattern. The estimates become statistically stronger over time for G7 countries. A one-standard-deviation increase in the fundamental component of the price-dividend ratio is followed by an increase in productivity growth of 4.07% two years ahead (t-stat 2.23), 4.14% three years ahead (t-stat 2.35), and 4.08% four years ahead (t-stat 2.31). Conversely, the effect of the sentiment component of the price-dividend ratio becomes progressively weaker for non-G7 countries. The coefficient is 14.21% two years ahead (t-stat 3.20), 13.23% three years ahead (t-stat 2.81), and 11.52% four years ahead (t-stat 2.28).

Overall, these results lend further support to our earlier finding that sentiment is an important catalyst for economic growth in non-G7 countries. The large magnitude of the coefficient is also consistent with the prediction that sentiment-driven economic growth is characterized by a large short-run jump (Barsky and Sims (2012)). Importantly, the effect seems to vanish rather than strengthen over time, which is in line with the volatile nature of sentiment.

Sentiment shocks and future economic growth

Overall, the predictive power of the sentiment component of the price-dividend ratio over future productivity, along with its decreasing magnitude over time, suggests again that sentiment shocks

[39]This is consistent with our earlier results that non-G7 economies exhibit more uncertain fundamentals (see subsection C) and incorporate them less efficiently into market prices (see subsection 1).

in non-G7 economies may directly affect future fundamentals. To test this hypothesis, we estimate equation C7, where we can study the effect of sentiment shocks on future economic growth controlling for economic news and productivity shocks.

The results, reported in Table C3, lend support to our conjecture. Following a one-standard-deviation sentiment shock, one-year-ahead GDP growth increases by 0.41% among G7 countries (t-stat 4.96). The effect is larger among non-G7 countries and equal to 0.68% (t-stat 8.02). At longer horizons, the estimates are not significant and close to zero for G7 countries. For non-G7 countries, the estimates are significant and equal to 0.39% two years ahead (t-stat 3.72), 0.26% three years ahead (t-stat 2.00), and 0.17% four years ahead (t-stat 2.18).

[Table C3 here]

As for the other regressors, we find that productivity shocks are unrelated to future GDP growth. These estimates seem to reflect the presence of strong global comovements across productivity shocks (Gregory and Head (1999); Kose et al. (2008); Colacito et al. (2018)). In keeping with these findings, our analysis shows that country-specific productivity shocks play a relatively minor role compared with global ones which, in our analysis, are absorbed by year fixed effects. On the other hand, long-run news shocks predict higher GDP growth four years ahead among G7 countries, which is consistent with the idea that such shocks capture long-term fundamentals (Colacito et al. (2018)).

Overall, these results are in line with those from our baseline regressions. Importantly, the analysis of the price-dividend ratio further addresses the concern that sentiment might reflect long-run economic news that is uncorrelated with current or future fundamentals. In this setup, this effect is captured by the fundamental component of the price-dividend ratio. Furthermore, we also control for productivity shocks thus showing that our sentiment results do not merely (and spuriously) reflect future productivity news. Finally, another advantage of using our price-dividend ratio decomposition is that the price-dividend ratio is a forward-looking measure. Correspondingly, our estimated shocks have stronger explanatory power over longer horizons than the simple sentiment measure used in Section IV.

Figure C1. Country-level price-dividend ratios and orthogonalized sentiment

Time-series plots of country-level price-dividend ratios (PD) and orthogonalized sentiment (S), both standardized by subtracting their mean and dividing by their standard deviation, for the seventeen countries in our sample (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and United States). Orthogonalized sentiment is defined as the residuals from a regression of raw country-level consumer confidence on changes in real GDP, real consumption, employment, labor share in GDP, inflation, and country and year fixed effects. The sample period is 1975-2019. The macroeconomic variables are from the Penn World Table V.10, the price-to-dividend ratios are from Kenneth French's and Robert Shiller's websites, and sentiment data is from the OECD consumer confidence database.

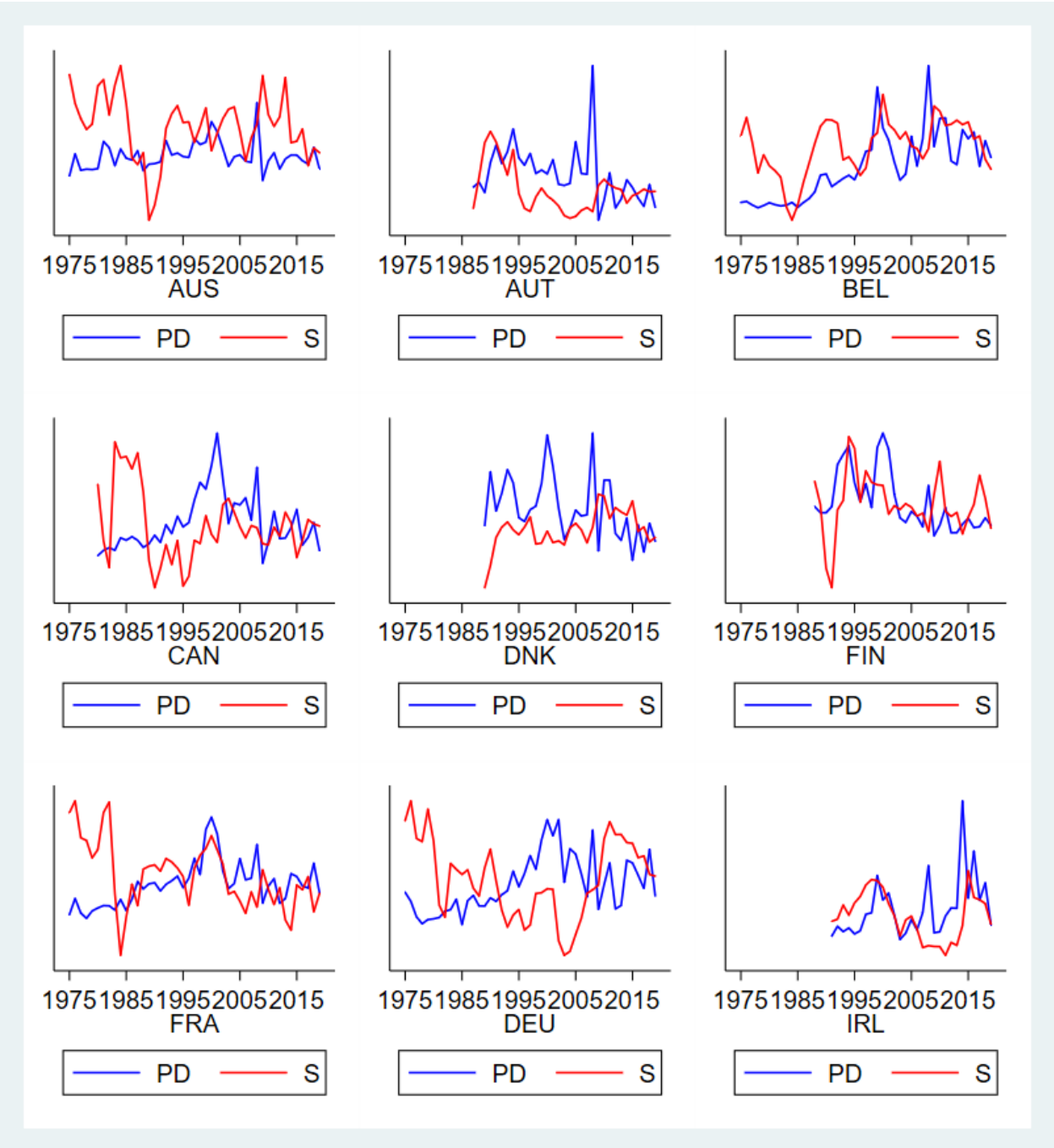

Figure C1. Continued

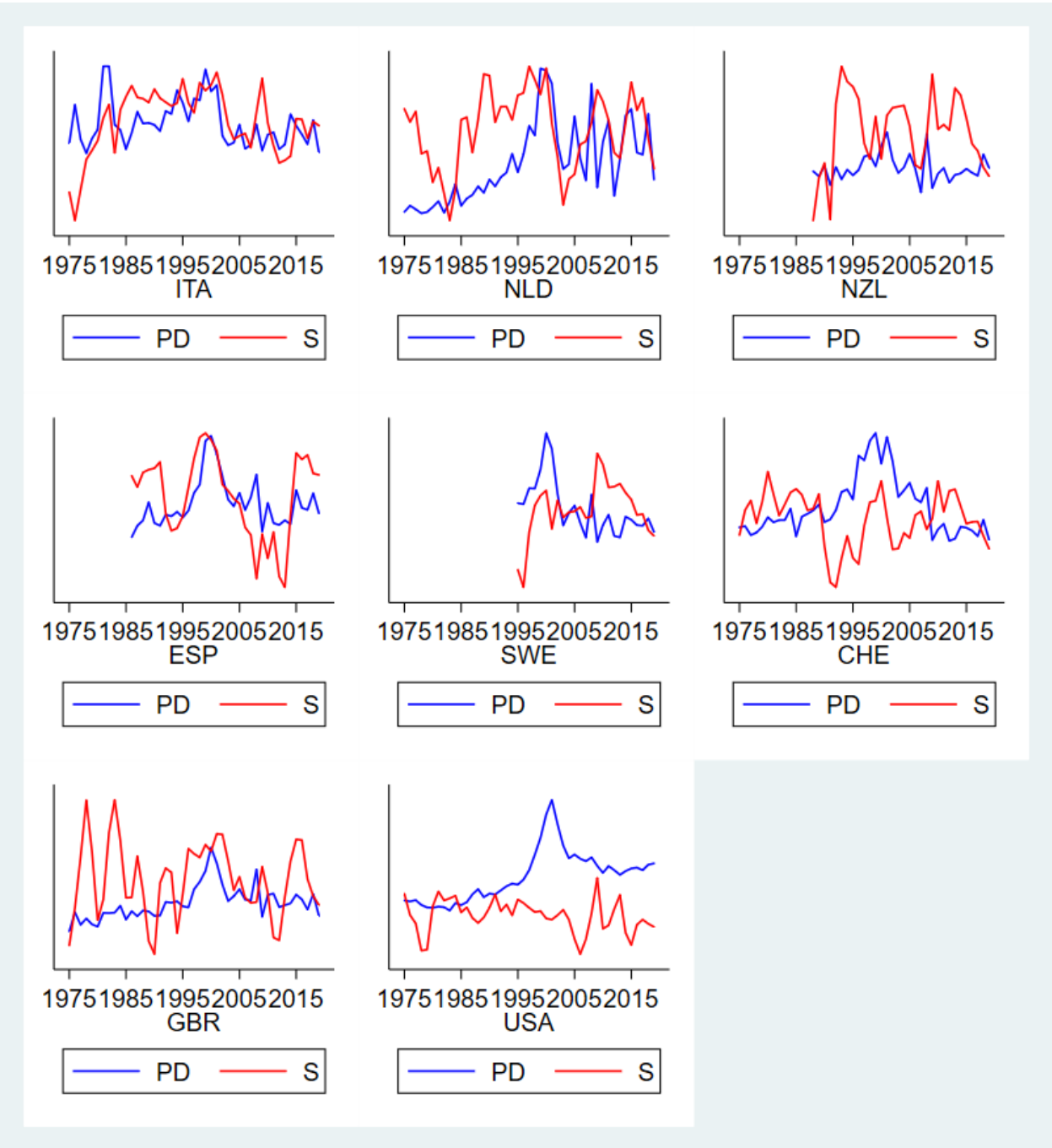

Table C1. Total factor productivity and the price-dividend ratio

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on the price-dividend ratio (PD). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. We consider the raw price-dividend ratio in this analysis and thus estimate equation C1. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects and standard errors are robust to heteroskedasticity. The macroeconomic variables are from the Penn World Table V.10. The price-to-dividend ratios are from Kenneth French's and Robert Shiller's websites.

Panel A. Full sample

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD	0.0107	0.0098	0.0098	0.0099
	1.09	1.06	1.06	1.09
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.7767	0.7745	0.7739	0.7749

Panel B. G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD	0.0519**	0.0528**	0.0539***	0.0531***
	2.33	2.47	2.62	2.61
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.8396	0.8403	0.8418	0.8410

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD	0.0023	0.0006	0.0002	-0.0001
	0.23	0.07	0.02	-0.02
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.7258	0.7223	0.7211	0.7232

Table C2. Total factor productivity and the price-dividend ratio: Sentiment decomposition

Panel regressions of country-level annual total factor productivity growth one, two, three, or four years ahead on the price-dividend ratio (PD). Total factor productivity growth is expressed at constant national prices, calculated using the US as the base country, and accounts for variation in both the share of labor income and capital depreciation across countries and over time. In this analysis, we decompose the price-dividend ratio into a fundamental (F) and a sentiment (S) component and thus estimate equation C4. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10, the price-to-dividend ratios are from Kenneth French's and Robert Shiller's websites, and sentiment data is from the OECD consumer confidence database.

Panel A. Full sample

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD (F)	0.0079	0.0073	0.0073	0.0075
	1.03	1.00	1.01	1.05
PD (S)	0.0825**	0.0667*	0.0507	0.0408
	2.12	1.74	1.24	0.99
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	659	642	625	608
R-squared	0.6210	0.6120	0.6052	0.6018

Panel B. G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD (F)	0.0401**	0.0407**	0.0414**	0.0408**
	2.13	2.23	2.35	2.31
PD (S)	0.0183	0.0039	-0.0225	-0.0300
	0.35	0.08	-0.47	-0.56
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	274	268	262	256
R-squared	0.6768	0.6761	0.6784	0.6763

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Productivity growth	t+1	t+2	t+3	t+4
PD (F)	0.0005	-0.0006	-0.0009	-0.0009
	0.07	-0.10	-0.15	-0.18
PD (S)	0.1578***	0.1421***	0.1323***	0.1152**
	3.87	3.20	2.81	2.28
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	385	374	363	352
R-squared	0.6661	0.6587	0.6552	0.6523

Table C3. Real GDP growth and productivity, news, and sentiment shocks

Panel regressions of the annual growth rate of country-level real GDP one, two, three, and four years ahead on productivity shocks, long-run news shocks, and sentiment shocks from equation C7. Productivity shocks are defined as the residuals from a regression of total factor productivity growth on the price-dividend ratio, decomposed into a sentiment and a fundamental component, and news (sentiment) shocks are defined as the residuals of a regression of the fundamental (sentiment) component of the price-dividend ratio on its first lag. All the explanatory variables are standardized by subtracting their mean and dividing by their standard deviation. The sample includes seventeen OECD countries over the period 1975-2019, of which six are G7 countries (Canada, France, Germany, Italy, United Kingdom, and United States) and eleven are non-G7 countries (Australia, Austria, Belgium, Denmark, Finland, Ireland, Netherlands, New Zealand, Spain, Sweden, and Switzerland). We include the full sample in Panel A, the subsample of G7 countries in Panel B, and the subsample of non-G7 countries in Panel C. All specifications include country and year fixed effects. Standard errors are block bootstrapped at the country-level with 200 repetitions. The macroeconomic variables are from the Penn World Table V.10, the price-to-dividend ratios are from Kenneth French's and Robert Shiller's websites, and sentiment data is from the OECD consumer confidence database.

Panel A. Full sample

Dependent variable:	1	2	3	4
Real GDP growth	t+1	t+2	t+3	t+4
Productivity shock	0.0004	-0.0002	-0.0007	-0.0015
	0.28	-0.08	-0.34	-0.65
PD (F) shock	0.0031	-0.0001	0.0013*	0.0005
	1.33	-0.24	1.82	1.09
PD (S) shock	0.0056***	0.0022**	0.0008	0.0004
	6.88	2.31	0.64	0.64
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	642	625	608	591
R-squared	0.5806	0.5133	0.5146	0.5159

Panel B. G7 countries

Dependent variable:	1	2	3	4
Real GDP growth	t+1	t+2	t+3	t+4
Productivity shock	0.0017	0.0014	0.0012	0.0004
	0.54	0.43	0.37	0.14
PD (F) shock	-0.0001	0.0003	0.0009**	0.0018***
	-0.07	0.26	2.04	2.59
PD (S) shock	0.0041***	0.0009	-0.0014	-0.0011
	4.96	0.87	-1.35	-1.24
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	268	262	256	250
R-squared	0.7314	0.6917	0.6911	0.6860

Panel C. Non-G7 countries

Dependent variable:	1	2	3	4
Real GDP growth	t+1	t+2	t+3	t+4
Productivity shock	0.0003	-0.0019	-0.0028	-0.0044
	0.19	-0.89	-1.18	-1.32
PD (F) shock	0.0036	-0.0005	0.0013	0.0001
	1.28	-0.83	1.43	0.18
PD (S) shock	0.0068***	0.0039***	0.0026**	0.0017**
	8.02	3.72	2.00	2.18
Country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	374	363	352	341
R-squared	0.5646	0.4944	0.4949	0.4923