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Optimism, pessimism, and short-term fluctuations☆

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ABSTRACT

Economic theory offers several explanations as to why shifting expectations about future economic activity affect current demand. Abstracting from whether changes in expectations originate from swings in beliefs or fundamentals, we test empirically whether optimism and pessimism about the economy trigger short-term fluctuations in private consumption and investment. Under the assumption that cyclical movements in private consumption and investment growth are exogenous to potential output growth forecasts far into the future, our results are consistent with the idea of private economic agents learning about future potential output growth and adjusting their current demand accordingly. We also propose a simple Keynesian model to illustrate that revisions in expected future income can affect short-term equilibria, in line with the results of the empirical analysis.

1. Introduction

The notion that changes in expectations about future economic activity affect current aggregate demand has a long tradition in macroeconomics. The vast literature about the impact of confidence on economic activity includes: (i) the view arguing that "animal spirits" (and "sunspots") eventually lead to busts as they are not supported by fundamentals (Cass and Shell, 1983; Akerlof and Shiller, 2010; De Grauwe and Ji, 2016);[1] (ii) the view for which the same waves of optimism and pessimism associated with "animal spirits" do not necessarily lead to busts, rather they lead to self-fulfilling changes in fundamentals (Acharya et al., 2017; Benhabib et al., 2016), as changes in expectations of some agents trigger the actions of rational agents exhibiting strategic complementarities (Weil, 1989; Cooper and John, 1988); and (iii) a view generally referred to as "news-driven business cycles", which posits that agents become optimistic or pessimistic based on the imperfect (or noisy) information they gather about future developments. If the information is correct the boom lasts, but if it is incorrect or agents are overly optimistic, a bust would occur (Cochrane, 1994; Beaudry and Portier, 2004; 2006; Lorenzoni, 2009; Jaimovich and Rebelo, 2009; Beaudry et al., 2011; Schmitt-Grohé and Uribe, 2012; Blanchard et al., 2013; Forni et al., 2017).[2]

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[1] Drawing on the behavioral economics literature, with "animal spirits" we refer to waves of optimism and pessimism (or more generally beliefs) that enact behaviors which fall outside what is normally understood as rational. This definition is somewhat more general than the original definition of Keynes (1936): "[⋯]a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities".

[2] See Beaudry and Portier (2014) for a review of the literature on "news-driven business cycles" theory and evidence.

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Regardless of whether changes in expectations about future economic conditions are caused by swings in beliefs or fundamentals, there is a broad theoretical consensus that they do affect current business activity. This is because consumers react to changes in their permanent income by smoothing consumption inter-temporally in line with the permanent income hypothesis (Friedman, 1957; Hall, 1978). Current economic booms or busts could then occur without actual technology advances or regresses (Sims, 2009). In other words, they could happen either because revisions in long-term growth are predicated on fundamentals, or just because agents become more or less optimistic about the future. In this sense, Blanchard et al. (2017) argues that persistently low real GDP growth in the United States in the aftermath of the global financial crisis (GFC) can, at least in part, be attributed to systematic downgrades to future potential output growth, giving rise to a strong positive correlation between revisions in potential output growth forecasts and current consumption and investment.

In this paper, we empirically test whether private economic agents expecting higher (lower) future potential output growth decide to consume and invest more (less) today relying on data revisions. Differently from other papers in the literature focusing only on one country, we rely on a panel data set of actual data and forecasts for 89 countries over the 1990–2022 period. Also, we study dynamics and selected nonlinearities of expectation shocks.

This study belongs to a vast literature—largely focused on the United States—that employs a variety of approaches to identify expectation shocks and test their impact on current economic activity. Beaudry and Portier (2006), Beaudry and Lucke (2010), and Beaudry et al. (2011), for example, estimate reduced-form VARs for the United States using stock price innovations orthogonal to total factor productivity (TFP) as a measure of news shocks, and short- and long-run restrictions to allow for a long-run effect on TFP. These papers generally report a large and positive effect of news on economic activity. Matsusaka and Sbordone (1995) also estimate a reduced-form VAR, relying on consumer confidence data as a proxy of expectations and an indicator of economic activity for the United States. They find that expectations Granger-cause future output even after controlling for a set of macroeconomic variables.[3] Chauvet and Guo (2003) estimate a similar VAR (with both consumer confidence data and a business sentiment indicator) allowing for different responses of economic agents depending on the stage of the business cycle. They find that shocks to expectations played a significant role during recession episodes in the United States. Barsky and Sims (2012) use a similar reduced-form VAR and focus on disentangling "news shocks" and "animal spirits shocks". As the effects of these shocks are mostly permanent, they conclude that news shocks account for most of the variation in measured confidence.

The major drawback of the reduced-form VAR is that the estimated coefficients capture only the effect of past shocks on current output. In contrast, Choy et al. (2006) estimate a structural VAR and find that expectation shocks unrelated to fundamentals are not a significant source of output fluctuations. The identification scheme assumes no contemporaneous effects from expectations to macroeconomic variables, based on the fact that forecasts are published at the end of each quarter, which is after consumption and investment decisions are taken. This approach, however, is questionable as economic agents also access information about the economy that is not statistically observed or published. If this information is unbiased, it reflects current macroeconomic variables, regardless of whether the realizations have been announced. Also, given that surveys are conducted during the quarter, expectations can affect macroeconomic variables in the same period. Grisse (2009) estimates a structural VAR using data on business conditions for Germany. Differently from most of the papers in the literature, the identification scheme relies on the heteroskedasticity in the data.[4] His results suggest that expectation shocks about business conditions have a causal effect on industrial production.

Our approach is closer in spirit to the literature that departs from VAR specifications. Oh and Waldman (1990, 2005) rely on revisions of leading economic indicators for the United States and find that announcements of a mistakenly booming economy have a positive effect on economic activity, supporting the self-fulfilling hypothesis. Our empirical strategy follows Blanchard et al. (2017), which use revisions to analyze the role of pessimism about future potential output growth in determining current consumption and investment in the United States. Given that potential output is a structural measure and therefore unlikely to be determined by current fluctuations, they argue that its revisions far into the future have a causal effect on current fluctuations in consumption and investment.[5] They find that there is a strong positive correlation between revisions in potential output growth forecasts and current consumption and investment.

Our results for a large panel of countries are supportive of the notion for which changes in expectations about future income cause short-term fluctuations. Under the assumption that cyclical movements in private consumption growth and private investment growth are exogenous to potential output growth forecast far into the future, our results are consistent with the idea that private economic agents learn about future potential output growth and adjust consumption and investment accordingly over the two years following the shock in expectations. For the average country with a share of private consumption (investment) to GDP of 65 (16) percent, a 0.1 percentage point (pp) upward revision to potential output growth forecast would bring about an acceleration in GDP growth in the range of 0.09–0.14 (0.06–0.11) percent. We also find that despite changes in expectations became more frequent, negatively skewed, and volatile in the aftermath of the GFC, the estimated effects are not different with respect to the period preceding the GFC. Similarly, pessimistic and optimistic expectations do not present a differential impact on private consumption nor private investment, and large changes in expectations generally induce proportional changes in demand.

We complement the analysis with a theoretical model that illustrates the empirical results. In a Keynesian framework, we show

[3] Controlling for macroeconomic variables is generally thought as a way to derive expectation shocks orthogonal to fundamentals.

[4] See Rigobon (2003) for details about the identification through heteroskedasticity.

[5] While this is conceptually valid, effectively isolating exogenous shocks to long-term potential output is a daunting task as analysts may (incorrectly) revise potential output forecasts on the basis of short-term cyclical fluctuations. As noted by Blanchard et al. (2017), however, there is no other clear potential instrument. An alternative—employed in the empirical analysis—is to use potential output forecasts from other sources.

that changes in expected long-term income have short-term effects in the direction of the change in expectations. Concretely, if agents expect long-term output growth to be high (low), short-term consumption, investment, and output in the short-term increase (fall), and unemployment falls (increases). In turn, increases (decreases) in investment today reinforce the expected increase (decrease) in long-term output, giving rise to a self-fulfilling mechanism. Broadly in line with the empirical analysis, we assume that agents rely on forecasters to form their views about the future. In turn, forecasters are prone to herding (*à la* Banerjee (1992)), so that changes in forecasts may either reflect a change in fundamentals or herding in the formation of expectations, in a process that could be loosely assimilated to "animal spirits".

The rest of the paper is organized as follows. Section 2 outlines the empirical strategy. Section 3 examines the statistical properties of the expectations measure and its relationship with private consumption and investment. Section 4 discusses the econometric results, some extensions, and the robustness. Section 5 presents a theoretical model supporting the empirical results. Section 6 concludes.

2. Empirical strategy

2.1. Data

We rely on data from the International Monetary Fundâs (IMF) World Economic Outlook (WEO), released twice a year (in the spring and the fall). The WEO database consists of actual macroeconomic data and forecasts submitted by country teams and vetted by the IMFâs Research Department for both internal and multilateral consistency. The Spring WEO was released in May up through 2001 and in April thereafter; the fall version is typically released in October, and occasionally in September. Starting in 1990, every vintage contains forecasts for the next five years. Given the production lags, forecasts for the spring publication are performed during February or March. Given this timeline, in the Spring WEO data for the previous year are an estimate or forecast for some countries; in contrast, the Fall WEO is based on final information. Thus, we use fall vintages from 1990 to 2016 for 89 countries.

2.2. Empirical model

Our empirical framework is similar to the one employed by Blanchard et al. (2017). Our dependent variable is defined as the deviation of, alternatively, the observed real consumption growth, c, or real investment growth, i, from its previous year growth forecast.[6] Thus, for year t and country j, we calculate such deviations as:

$$D^c_{j,t} = c_{j,t} - \left[\frac{E_{t-1}(C_{j,t})}{E_{t-1}(C_{j,t-1})} - 1\right] = c_{j,t} - E_{t-1}(c_{j,t}) \tag{1}$$

and

$$D^i_{j,t} = i_{j,t} - \left[\frac{E_{t-1}(I_{j,t})}{E_{t-1}(I_{j,t-1})} - 1\right] = i_{j,t} - E_{t-1}(i_{j,t}) \tag{2}$$

where C and I are the levels of real consumption and real investment, respectively. Forecasts for consumption and investment must be as of a time in which the information to prepare the revised forecasts of potential real GDP growth is not available yet. In our case, we will use data of the Fall WEO of year $t-1$.

To construct the expectation measure, we take the forecast available in the Fall WEO of year t of potential real GDP growth, y^*, for year $t+(N-1)$ (with $N = 5$ being the WEO forecast horizon), and denote it by $E_t(y_{j,t+(N-1)})$. Then, we define the forecast revision as its difference with respect to the forecast published in the previous vintage of the Fall WEO (at time $t-1$) for the same year $t+(N-1)$:[7]

$$R^{N-1}_{j,t} = E_t(y_{j,t+(N-1)}) - E_{t-1}(y_{j,t+(N-1)}) \tag{3}$$

Given that every Fall WEO contains forecasts for the next five years, we can generate up to four different variables depending on the forecasting horizon. However, with the objective of isolating structural changes far into the future from cyclical movements, we select the farthest computable revision as our favorite measure.

The specification employed here assumes that there are two moments at which households and corporations adjust their consumption and investment, and these depend on when they receive information about the future state of the economy. In proportion α, they learn about future potential output growth at the time of the Fall WEO publication of year t, hence adjusting consumption and investment over t. In proportion $(1-\alpha)$, they learn about future potential output growth from the information also available to the IMF at the time it produces the forecasts, therefore adjusting their consumption and investment already in $t-1$.

Thus, similar to Blanchard et al. (2017), we specify the following reduced-form equation for private consumption and private

[6] Note that we take the observed value for c and i at time t from the Fall WEO of time $t+1$, to rule out the possibility that the value reported is still an estimate.

[7] Note that to compute the forecast revision, we take the forecast for the second to last year of the forecast horizon $t+(N-1)$ instead of the last year $t+N$ because that is available both for the Fall WEO at time t and at time $t-1$.

investment:

$$D^{c,i}_{j,t} = \beta[(1-\alpha)R^{N-1}_{j,t} + \alpha R^{N-1}_{j,t+1}] + \mu_j + \tau_t + \epsilon_{j,t} \tag{4}$$

where β is an encompassing coefficient on the forecast revision term, μ_j and τ_t are the time- and country-fixed effects, and $\epsilon_{j,t}$ is a vector of residuals. To retrieve the value of α, Eq. (4) can be rearranged as:

$$D^{c,i}_{j,t} = \alpha\beta(R^{N-1}_{j,t+1} - R^{N-1}_{j,t}) + \beta R^{N-1}_{t} + \mu_j + \tau_t + \epsilon_{j,t} \tag{5}$$

where $\alpha = \alpha\beta/\beta$.

The possibility of reverse causality when estimating equation (5) deserves further discussion. As in Blanchard et al. (2017), we argue that unexpected cyclical movements in private consumption growth and private investment growth are unlikely to affect forecasts of potential output growth far into the future. If this true, we can then identify a causal relationship.

There are, however, arguments against this identification strategy. First, statistical methods to compute the potential output could introduce a spurious correlation between the forecast error in private consumption and investment growth and the forecast revision of potential output growth. A review by De Resende (2014) of the estimation methods employed by the IMF to forecast potential output notes:

> "Survey evidence shows that in the Fundâs medium-term forecasting the use of any particular individual forecasting method is much less universal than the use of judgment—understood as a set of information and knowledge, not necessarily quantitative in nature, that desk economists and mission chiefs accumulate about the countries on which they work."

The widespread use of judgment across desk economists should, to some extent, mitigate the concerns about such spurious correlation. Furthermore, as a robustness test, we use estimates of potential output from the OECD's Economic Outlook database, assuming that this breaks further the spurious link with private consumption and investment growth from the IMF's WEO database.

Second, the sharp and large contractions in consumption and investment during the GFC might have led desk economists to revise future potential output, thereby invalidating our identification strategy. To ensure that the results are not dependent on this, we exclude the GFC period from the sample in one of the robustness tests.

Third, if desk economists foresee a context characterized by hysteresis, a negative shock to private consumption and investment affects future potential output through higher unemployment, lower labor force participation, or lower productivity (Blanchard and Summers, 1987; 2017; Blanchard, 2018). Similarly, positive shocks to private consumption and investment can be reflected in higher potential output if reverse hysteresis is at work, leading the inactive population to join the labor force. Under these circumstances, our identification strategy is less adequate and our results should be interpreted as correlations rather than causal effects.

In order to retrieve the dynamics of the effect of a change in expectations about the potential output growth on consumption and investment, we construct impulse response functions employing the local projection method of Jordà (2005). Thus, we estimate h sets of regressions of the form:

$$D^{c,i}_{j,t+h} = \alpha^h\beta^h(R^{N-1}_{j,t+1} - R^{N-1}_{j,t}) + \beta^h R^{N-1}_{j,t} + \mu^h_j + \tau^h_t + \epsilon_{j,t+h} \qquad h = 0, 1, 2, \ldots, s \tag{6}$$

where α^h and β^h describe the response of $D^{c,i}_{j,t+h}$ at horizon h to the shock.

Different from Blanchard et al. (2017) that focus only on the United States, cross-country differences not captured by time- and country-fixed effects may play a role in determining the forecast error of private consumption and private investment growth. Thus, to check the robustness of the results to the inclusion of other covariates, we estimate:

$$D^{c,i}_{j,t} = \alpha\beta(R^{N-1}_{j,t+1} - R^{N-1}_{j,t}) + \beta R^{N-1}_{t} + \delta D^{x}_{j,t} + \psi S_{j,t} + \mu_j + \tau_t + \epsilon_{j,t} \tag{7}$$

where $D^x_{j,t}$ is a vector of control variables $X_{j,t}$ expressed in terms of deviation with respect to their forecast, $S_{j,t}$ is another vector of control variables, and δ and ψ are the relative coefficients.[8]

Some of the control variables may be co-determined with the dependent variables, with each affecting the other, which results in endogeneity. Thus, we estimate Eq. (5) using the System Generalized Method of Moments (S-GMM) estimator, which relies on a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments).[9,10]

3. Stylized facts

Fig. 1 shows the distribution of the revisions in potential output growth forecasts. As shown in the left panel, the frequency

[8] Ideally, all variables should be expressed in terms of deviation with respect to their forecast. However, data availability forces to use the observed value for the variables in vector $S_{j,t}$.

[9] Besides the general assumptions of a Difference GMM estimation—idiosyncratic error serially uncorrelated and past values of the endogenous variables uncorrelated with the current error—the S-GMM estimator requires the additional identifying assumption that the instruments are exogenous to the country-fixed effects.

[10] We employ the asymptotically more efficient two-step S-GMM. The two-step variant presents estimates of the standard errors that tend to be severely downward biased (Arellano and Bond, 1991; Blundell and Bond, 1998). However, we implement the finite-sample correction of the two-step covariance matrix derived by Windmeijer (2005), which produces unbiased standard errors.

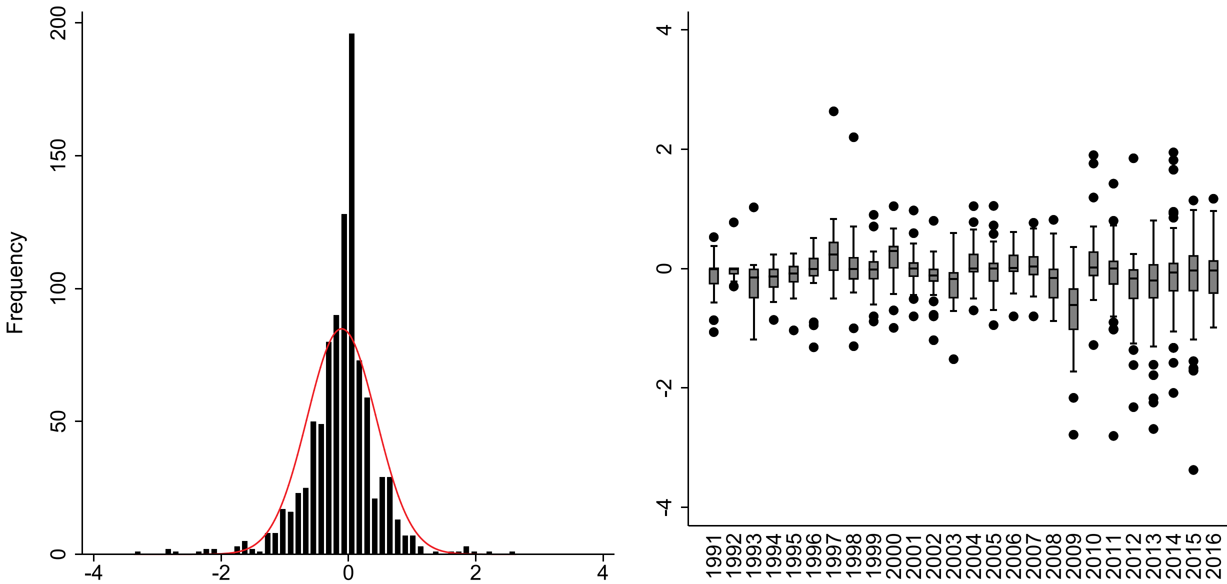

Fig. 1. Revisions inpotential output growth forecasts (Percent).

distribution of the data (black bars) resembles a normal distribution (red line), but with leptokurtic features. The clustering around the mean is related to the high recurrence of small revisions, consistent with the idea that a structural measure of productive capacity should not change often and drastically. Interestingly, the distribution is slightly negative skewed, suggesting that pessimistic expectations were dominating optimistic ones over the sample period.

We now move to analyze how the distribution of revisions in potential output growth forecast changed over time. The right panel of Fig. 1 presents a series of box plots that display some interesting aspects of expectations around the time of the GFC. While the average revision of potential output growth forecasts hovered around zero for the entire time period, in 2008 and 2009 it became negative. Moreover, starting in 2008 expectations became more dispersed, as indicated by the distant ends of the whiskers and more extreme values.

To dig deeper into the differences between the pre- and post-GFC period, we present the frequency distributions and the scatter plots for the periods 1991–2007 and 2008–16 in Fig. 2. The left panel shows that negative revisions became more frequent in the aftermath of the GFC, suggesting that expectations were often revised downward. The right panel confirms this, but also shows that extreme values were both positive and negative, possibly reflecting policy reactions as well as the realization of a structural fall in output.

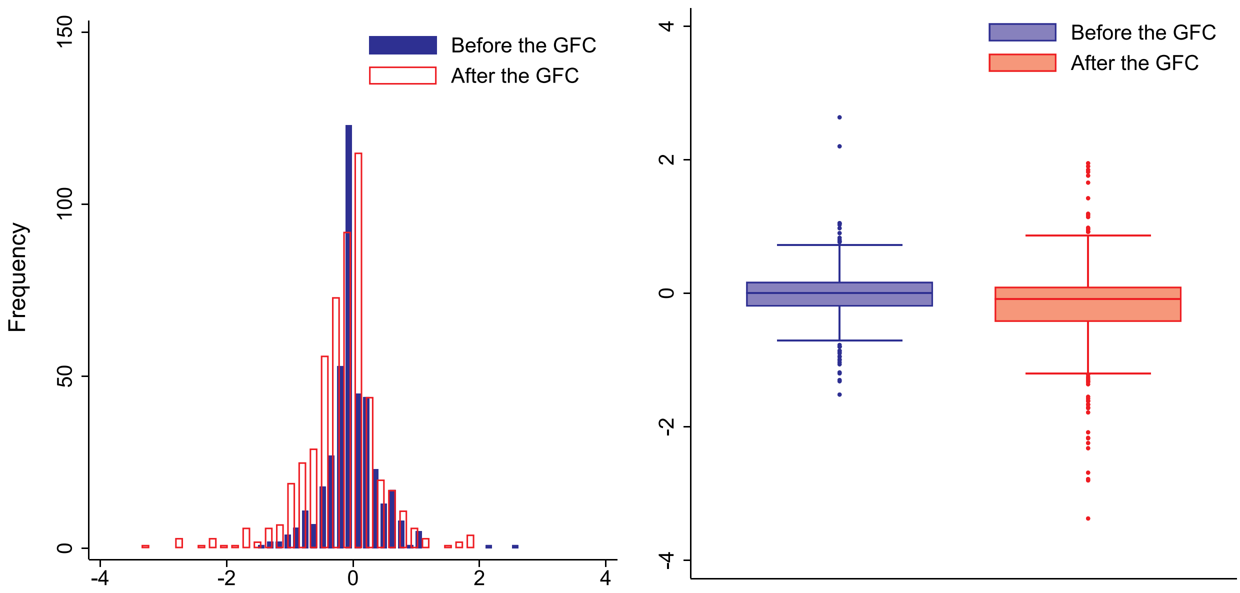

Fig. 2. Revisions in potential output growth forecast before and after the GFC (Percent).

Table 1
Summarystatistics of revisions to potential output growth forecasts (Percent).

	Obs.	Mean	Median	Std. dev.	Skewness	Kurtosis
Full sample	960	−0.11	−0.04	0.54	−0.63	8.44
Income groups						
AE	718	−0.08	−0.02	0.45	−0.27	8.37
EMDE	242	−0.17	−0.08	0.75	−0.61	5.78
Periods						
Before GFC	412	−0.02	0.00	0.42	0.64	8.90
After GFC	548	−0.17	−0.09	0.61	−0.77	7.20
Direction						
Pessimistic	591	−0.37	−0.25	0.45	−2.45	11.68
Optimistic	369	0.33	0.21	0.37	2.46	11.61

Source: Authors' calculations. Notes: The calculations exclude two outliers corresponding to Portugal in 1991 and 1994.

Table 1 presents some summary statistics of the revisions to potential output growth forecasts, which highlight more specifically the heterogeneity across income levels, periods, and direction of the revisions. As already noted in Fig. 1, the average revision across countries is negative (−0.11%), negatively skewed, and with a high concentration of values around the mean. However, Emerging Market and Developing Economies (EMDE), on average, suffered negative revisions of −0.17%, or two times larger than Advanced Economies (AE).[11] Relative to AE, revisions in EMDE were more varied as suggested by the higher standard deviation. Consistent with the panels in Fig. 2, the average revision before the GFC was very close to zero, but it became negative at −0.17% and more volatile starting in 2008. Finally, there is no relevant difference in the average absolute value or volatility between positive and negative revisions. Overall, these stylized facts suggest that it is warranted to empirically test if households and corporations became more sensitive to changes in expectations following the GFC, and whether they are more responsive to pessimistic rather than optimistic expectations.

4. Results

We present here the results of the estimations. We start with a baseline parsimonious model. Then, we extend it to include other independent variables. Finally, we test its robustness.

4.1. Baseline

Similar to Blanchard et al. (2017), we start with a baseline specification for both real private consumption growth and real private investment growth. This includes both the revision of potential output growth forecasts and the difference between its value in $t+1$ and t, which allow to compute how much is learned at the time of the Fall WEO publication and how much at the time the IMF produces its forecasts; country-fixed effects; and time-fixed effects. Table 2 reports the results of OLS estimations for the full sample (columns 1 and 2), AE (columns 3 and 4), and EMDE (columns 5 and 6).

The results show that both the revision of potential output growth forecasts and its time difference are significant across country groups and for both real private consumption and investment growth. The only exception is the coefficient on the time difference in the real private investment growth equation for EMDE, but this is likely due to a reduced number of observations. For the full sample, these factors explain about one fifth of the variation in consumption and investment growth.

In the estimations for the full sample, the coefficient α—denoting how much agents learn about future potential output growth at the time of the Fall WEO publication of year t—is not too far from 0.5, suggesting that households and corporations learn about future potential output growth both at the time of the WEO publication and at the time the IMF produces its forecasts. However, in the results for AE, α is substantially smaller than in the results for EMDE, suggesting that in the former (latter) economic agents learn mostly at the same time of the IMF (Fall WEO publication). This is consistent with the notion for which economic agents are more sophisticated in AE in the sense that they have wider access to information about the future state of the economy and a more refined ability to elaborate it than in EMDE. The coefficient for β ranges between 1.4 and 2.3 in the private consumption specifications, and between 3.9 and 7.2 in the private investment specifications. This implies that a 0.1 pp downward revision in the potential output growth forecast is associated with a 0.14–0.23 (0.39–0.72) percent reduction in private consumption (investment) growth. For the average country with a share of private consumption (investment) to GDP of 65 (16) percent, this would bring about a reduction in GDP growth by 0.09–0.14 (0.06–0.11) percent.

Fig. 3 presents the scatter plots of the weighted average of the revisions to potential output growth forecasts in t and $t+1$ against real private consumption and investment growth forecast error. Specifically, the measure of the horizontal axis is equal to $[(1-\alpha)R_{j,t}^{N-1}+\alpha R_{j,t+1}^{N-1}]$, where α takes the value in columns 1 and 2 of Table 2. The measures on the vertical axis are the ones described in Eq. (1) for the left panel and Eq. (2) for the right panel. Both panels depict a statistically well-defined positive relationship, confirming that more optimistic expectations about future potential output are associated with higher-than-expected

[11] We adopt here the income group classification of the Fall WEO of 2016. See Appendix A for the list of countries in the sample.

Table 2
Baseline estimations .

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error
	Full sample	Full sample	AE	AE	EMDE	EMDE
$R_{t+1}^4 - R_t^4$	0.874***	2.288***	0.769***	2.550***	0.930**	2.178*
	(0.239)	(0.687)	(0.253)	(0.860)	(0.266)	(1.182)
R_t^4	1.872***	5.212***	2.257***	7.234***	1.391**	3.871
	(0.365)	(1.674)	(0.496)	(1.781)	(0.626)	(2.858)
α	0.467***	0.439***	0.341***	0.353***	0.669***	0.563***
	(0.073)	(0.082)	(0.066)	(0.092)	(0.160)	(0.189)
β	1.872***	5.212***	2.257***	7.234***	1.391**	3.871
	(0.365)	(1.674)	(0.496)	(1.781)	(0.626)	(2.858)
Observations	782	566	598	396	184	170
R^2	0.199	0.187	0.332	0.274	0.082	0.124
Countries	89	83	36	33	53	50

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. All estimations include country and time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

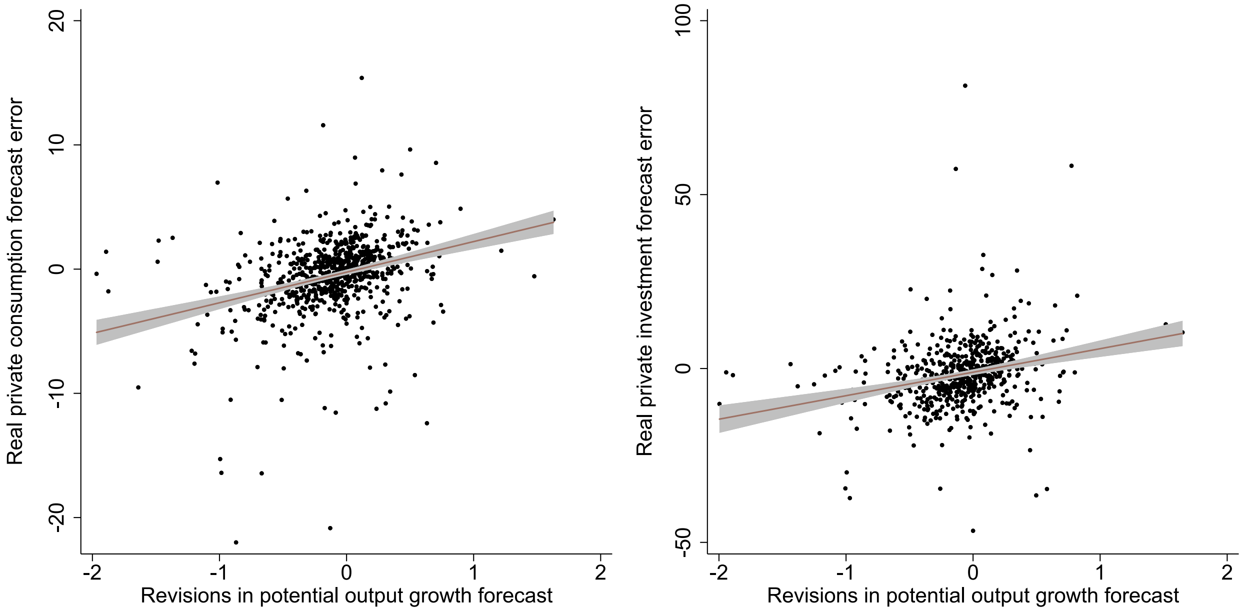

Fig. 3. Revisions in potential output growth forecasts and consumption and investment forecast error (Percent).

levels of consumption and investment by households and corporations.

Fig. 4 shows the impulse response functions derived by applying the local projections method, which allow to appreciate the dynamic effect of better expectations. The black line displays the β coefficient, which in period $t = 0$ is the same of the one reported in Table 2. Similarly, the red dot displays the α coefficient, only when it turns out significant. The dashed red lines define the band of possible values of the α coefficient. In the case of real private consumption growth (first row of panels), the positive effect of an improvement in expectations phases out after two years for the full sample and AE, while it only lasts one year for EMDE. This also holds for the impact on private investment growth (second row of panels), with the exception of EMDE, for which the effect is not significant. The red dots provide information regarding the learning of economic agents over time. As expected, these red dots tend to approach one over time, consistent with the idea that as the time goes by, economic agents are increasingly informed.

4.2. Extensions

One can think of a series of factors that could shape nonlinearities in the relationship between expectations and consumption and investment. As we discussed in Section 3, the GFC came with a great deal of uncertainty that may have changed the sensibility of economic agents to an improvement or a worsening of expectations. Similarly, households and corporations may adjust

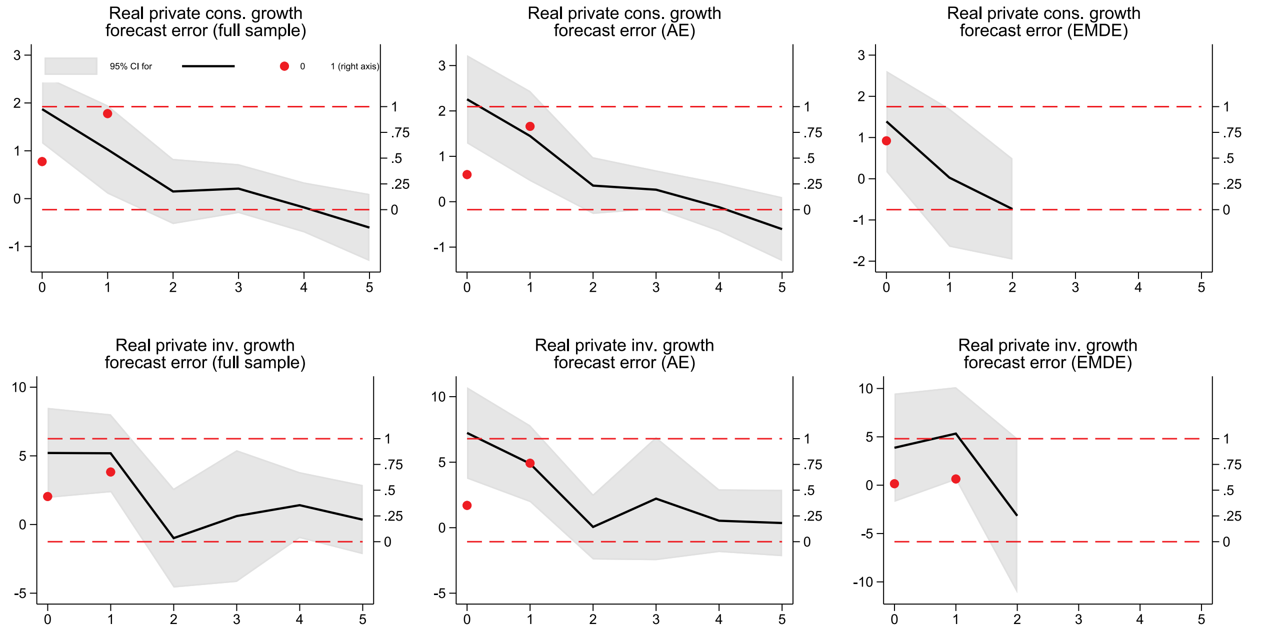

Fig. 4. Responses to a one pp upward revision in the potential output growth forecast (Percent).

asymmetrically to worse and better expectations. Lastly, large revisions in expectations may produce non-proportional effects on consumption and investment.

Table 3 tests for these possible nonlinearities by adding interaction terms to the specification to be estimated. In columns 1 and 2, we interact our variables of interest with a dummy that takes value one after the GFC to test for differential effects since then. In columns 3 and 4, we add an interacting dummy that takes value one when revisions to potential output growth forecasts are negative, hence testing if economic agents react differently to pessimistic expectations with respect to positive ones. Finally, in columns 5 and 6, we add the expectations terms squared to proxy large revisions. For every column, we calculate α and β with and without interaction terms.

The results suggest that that the effects of forecast revision of long-term potential output growth are generally linear. The results in column 5 for real private consumption growth, however, show a positive and marginally significant coefficient for the time difference term of the revision of output growth forecast. This suggests that in presence of large revisions to potential output growth forecast, private economic agents increase their consumption more than proportionally. It also implies that agents rely on information available before the WEO Fall publication to a higher degree, as shown by a larger α coefficient. The magnitude of the effect, however, is small.

We now move to check how results would change when adding control variables. The selection of the variables relies on consumption theory as well as data availability.[12] In what follows, we provide a rationale for the inclusion of each variable and discuss its expected effect. D_t^x in Eq. (5) includes terms of trade, real public consumption growth (or real public investment growth), real short-term interest rate, and inflation. A terms of trade improvement has a direct effect on income and, if such increase in income is temporary (permanent), both the permanent-income hypothesis and the life-cycle hypothesis (LCH) predict that it should be saved (consumed). At the same time, since imported goods cover a larger share than exported goods in the composition of consumption, higher terms of trade reduce the consumption deflator, negatively affecting real consumption. In sum, the overall effect of terms of trade is ambiguous.

With respect to public consumption (and more generally fiscal policy), the Ricardian-equivalence hypothesis predicts that any increase should be fully offset by lower private consumption (Barro, 1974; Seater, 1993). While a full offset is empirically unlikely, to the extent that public and private consumption are substitutes, some offsetting should occur. In the unlikely case in which these turn out to be complements in consumer utility, a positive effect can be observed (Lopez et al., 2000).

Real interest rates are used here to capture the effects of monetary policy or more broadly credit conditions. If the consumer is a net creditor, substitution and human-wealth effects of a higher rate of return on consumption are negative, while the income effect is positive. If the consumer is a net debtor, the income effect turns negative. All in all, the combined net effect is ambiguous. Higher inflation lowers consumption as it makes current prices of consumer goods higher relative to past prices. At the same time, to the extent that current inflation proxies macroeconomic instability, it would lead to precautionary saving reducing consumption. Also, if higher current inflation signals increases in expected future inflation, this lowers the ex-ante real interest rate, inducing intertemporal substitution, income, and human-wealth effects that, on balance, imply an overall ambiguous effect on consumption.

[12] For a review of consumption theories and determinants see Grigoli et al. (2018).

Table 3
Interactions.

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error
$R_{t+1}^4 - R_t^4$	1.102***	3.116***	0.710**	2.484*	0.868***	2.358***
	(0.393)	(1.072)	(0.342)	(1.341)	(0.229)	(0.705)
R_t^4	2.498***	8.546***	1.167**	3.375	1.817***	5.252***
	(0.724)	(2.329)	(0.526)	(3.382)	(0.356)	(1.855)
$D^{afterGFC}*(R_{t+1}^4 - R_t^4)$	−0.324	−1.139				
	(0.485)	(1.324)				
$D^{afterGFC}*R_t^4$	−0.873	−4.569				
	(0.843)	(3.055)				
$D^{afterGFC}$	−0.130	4.251				
	(0.526)	(2.697)				
$D^{pessimism}*(R_{t+1}^4 - R_t^4)$			0.234	−0.221		
			(0.433)	(1.616)		
$D^{pessimism}*(R_t^4)$			1.134	3.053		
			(0.775)	(3.564)		
$D^{pessimism}$			0.042	−0.205		
			(0.249)	(0.861)		
$(R_{t+1}^4 - R_t^4)^2$					0.186*	−0.577
					(0.101)	(0.478)
$(R_t^4)^2$					−0.238	0.286
					(0.227)	(0.410)
α w/o interaction	0.441***	0.365***	0.608**	0.736	0.478***	0.449***
	(0.069)	(0.091)	(0.302)	(0.600)	(0.067)	(0.093)
β w/o interaction	2.498***	8.546***	1.167**	3.375	1.817***	5.252***
	(0.724)	(2.329)	(0.526)	(3.382)	(0.356)	(1.855)
α w/ interaction					0.580***	
					(0.091)	
β w/ interaction						
Observations	782	566	782	566	782	566
R^2	0.202	0.197	0.203	0.193	0.205	0.195
Countries	89	83	89	83	89	83

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. α w/ interaction and β w/ interaction are reported only if the coefficients with interactions present a statistical difference with respect to the coefficients without interactions. All estimations include country and time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

S_t in Eq. (5) in includes some demographics variables, such as old-age dependency ratio and the share of urban population. The LCH predicts a hump-shaped pattern of saving along the life cycle. Thus, an increase in the old-age dependency ratio should bring about an increase in consumption. Regarding the share of urban population, theory suggests that the âæcity lightsâg are associated with consumption opportunities for city dwellers compared to the rural population. Also, farmers are likely to face larger income uncertainty and less insurance and credit opportunities than urban dwellers, leading to lower consumption in rural areas. However, farmers are generally poorer than city dwellers, therefore a move of urban population towards rural areas should be associated with higher consumption. Hence, urbanization affects consumption ambiguously. Given that demographic variables are not subject to large unforeseen changes, the lack of forecast to construct a measure of the forecast error (and the use of the observed value instead) should not affect the results.

Table 4 presents the results of the S-GMM estimations including the control variables. Column 1 and 2 include the inflation forecast error, as well as the lagged dependent variable. Columns 3 and 4 add the terms of trade forecast error. In columns 5 and 6 we include the public counterpart of real consumption growth and real investment growth, respectively. Columns 7 and 8 include the forecast error for the short-term real interest rate. Finally, columns 9 and 10 include the old-age dependency ratio and the share of urban population. All control variables, except the demographic ones and terms of trade forecast error, are treated as endogenous.

The results suggest that our baseline results are generally robust to the inclusion of the control variables. In the results for the forecast error of real private consumption growth, the lag of the dependent variable turns out positive and significant, suggesting some persistence. Also, inflation forecast error turns out negative and significant. Finally, the results for real private investment growth indicate that a terms of trade improvement is reflected in higher investment. Notably, neither the variables proxying changes in fiscal policy or credit conditions turn out significant, possibly because these changes were already incorporated in agents' consumption and investment decisions or because of the delays in affecting macroeconomic variables.[13] The coefficient α, when significant, is about 0.3 (ranges between 0.4 and 0.5) for real private consumption (investment) growth, consistent with the baseline

[13] In order to have a significant effect, we would need to observe deviations in private consumption and investment growth rates with respect to their forecasted growth rates in the last three months of the year, i.e. after the Fall WEO publication.

Table 4
Controls.

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error	(7) Dep: real PC growth forecast error	(8) Dep: real PI growth forecast error	(9) Dep: real PC growth forecast error	(10) Dep: real PI growth forecast error
$R^4_{t+1} - R^4_t$	0.490	2.336***	0.506*	2.311***	0.459	2.154***	0.742**	3.220***	0.763**	3.255***
	(0.335)	(0.696)	(0.304)	(0.674)	(0.316)	(0.663)	(0.325)	(0.935)	(0.316)	(0.957)
R^4_t	1.749***	5.665***	1.903***	5.596***	1.834***	5.026***	2.225***	7.108***	2.245***	7.111***
	(0.611)	(1.399)	(0.565)	(1.356)	(0.598)	(1.437)	(0.564)	(1.641)	(0.557)	(1.638)
Lag of real PC forecast error	0.199**		0.195**		0.220***		0.258***		0.255***	
	(0.081)		(0.077)		(0.078)		(0.078)		(0.076)	
Inflation forecast error	−0.432***	0.106	−0.466***	0.172	−0.459***	0.140	−0.281*	0.733	−0.283*	0.748
	(0.157)	(0.285)	(0.090)	(0.292)	(0.081)	(0.269)	(0.155)	(0.499)	(0.156)	(0.494)
Lag of real PI forecast error		−0.024		−0.049		−0.061		0.086		0.088
		(0.104)		(0.098)		(0.114)		(0.116)		(0.120)
Terms of trade forecast error			0.010	0.129**	0.009	0.122*	−0.007	0.300*	−0.006	0.297**
			(0.012)	(0.062)	(0.012)	(0.065)	(0.017)	(0.157)	(0.017)	(0.151)
Real public cons. growth forecast error					0.000		0.000		0.000	
					(0.000)		(0.000)		(0.000)	
Real public inv. growth forecast error						0.050		0.022		0.028
						(0.061)		(0.045)		(0.046)
Real short-term interest forecast error							0.263	0.434	0.258	0.446
							(0.174)	(0.530)	(0.176)	(0.533)
Old-age dependency ratio									−0.000	−0.059
									(0.016)	(0.095)
Share of urban population									0.005	0.014
									(0.010)	(0.048)
α	0.280**	0.412***	0.266***	0.413***	0.250**	0.429***	0.333***	0.453***	0.340***	0.458***
	(0.112)	(0.412)	(0.099)	(0.072)	(0.109)	(0.084)	(0.088)	(0.091)	(0.084)	(0.093)
β	1.749***	5.665***	1.903***	5.596***	1.834***	5.026***	2.225***	7.108***	2.245***	7.111***
	(0.611)	(1.399)	(0.565)	(1.356)	(0.598)	(1.437)	(0.564)	(1.641)	(0.557)	(1.638)
Lags/instruments	1-1/9	1–5/25	1-1/10	1–5/26	1-1/12	1–5/32	1-1/14	1–5/38	1-1/16	1–5/40
p-value AR(2)	0.056	0.107	0.070	0.232	0.082	0.327	0.082	0.448	0.080	0.434
p-value Hansen *J*-test	0.365	0.257	0.684	0.184	0.775	0.236	0.981	0.135	0.978	0.143
Observations	759	526	704	440	686	438	584	325	584	325
Countries	89	83	83	78	80	78	53	50	53	50

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. All estimations include time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

specification. β is always significant, and ranges between 1.7 and 2.2 (5 and 7.1) for real private consumption (investment) growth. These magnitudes are very similar to the ones of the baseline estimations. The coefficients indeed imply that a 0.1 pp downward revision in the potential output growth forecast is associated with a 0.17–0.22 (0.5–0.71) percent reduction in private consumption (investment) growth. For the average country with a share of private consumption (investment) to GDP of 65 (16) percent, this would bring about a reduction in GDP growth by 0.11–0.14 (0.08–0.11) percent.[14]

4.3. Robustness

To ensure that the positive effect of expectations on aggregate demand is not unique to the timing of the revision of the potential output growth forecast, the WEO dataset, or the use of a specific estimator, we perform a battery of robustness tests. Table 5 presents the results of the baseline specification using varying lags of the revisions to potential output growth forecast in columns 1–8, and constructing the expectation variables with OECD data in columns 9 and 10.[15]

The results turn out generally robust. Constructing the revision to potential output growth forecasts comparing the latest available year in each vintage, or for one, two, and three years ahead instead of four, does not affect the results. When we use OECD data, the number of countries drops to 34 and 32 in the case of private consumption and private investment, respectively. Nevertheless, the β coefficients turn out significant and comparable in terms of magnitude to the ones of the baseline specification. The α coefficient in the regression for real private investment growth is also significant and similar in size to the one in the baseline specification, but turns out insignificant in the specification for real private consumption growth. The portion of variation in the dependent variables explained by expectations is much higher in the regressions using OECD data (between 38 and 45%), likely because of relatively higher homogeneity of the countries in the sample. The results generated employing OECD data provide a supporting piece of evidence towards our identification strategy, as discussed in Section 2.

If unexpected large and sharp contractions in private consumption and investment, such as the ones observed during the GFC, lead desk economists to revise future potential output, our identification strategy would be invalid. To rule out this possibility, we exclude the period of the GFC (i.e., 2008–09) from the sample. The results in Table 6 suggest that excluding the GFC does not affect our findings.

Table 7 presents the results for the baseline specification using a different set of estimators. We start with a plain pooled OLS estimator (columns 1 and 2). Then, we allow for heterogeneous variance and auto-correlation in the residuals by employing the Feasible Generalized Least Squares (FGLS) estimator with time-fixed effect (columns 3 and 4). We also correct for cross-sectional dependence with a Panel Corrected Standard Error (PCSE) estimator with time-fixed effect (columns 5 and 6). To address endogeneity, we employ the 2-Stage Least Squares (2SLS) estimator with time and country-fixed effects, where we instrument the endogenous variables with their own lags (columns 7 and 8), and the S-GMM with country- and time-fixed effects (columns 9 and 10).

The results suggest that the positive impact of the revisions in potential output growth forecast is robust across alternative estimation techniques. Interestingly, not only the significance of the effect is pervasive, but also the sizes of the α and β coefficients are strikingly similar across estimators, corroborating the baseline results.

5. Illustrating the results with a “Keynesian” model

5.1. Rationale and setup

We now propose a simple Keynesian-type model that delivers results similar to those in the empirical analysis. The model shows that under certain circumstances, changes in expected growth can affect current economic outcomes, and through that, future economic activity in the direction of the changes in expectations. As our purpose is mainly illustrative, we make assumptions that deliver a model with standard Keynesian features (as, e.g., in Mankiw (1987) and Benigno (2015)). As in Weil (1989), our model suggests that “a general belief in material progress (or decline) may be sufficient [⋯] to generate economic growth (or contraction)”.

The model assigns a key role to money hoarding, as hoarded money subtracts from aggregate demand, thereby decreasing the marginal propensity to spend (MPS). This is not in any way original. For instance, at the beginning of the XVIII century John Law argued that economic slumps occur when “[⋯]subjects hoard up those signs of transmission as a real treasure, being induced to it by some motive of fear or distrust”.[16] In the same vein, Keynes (1936) questioned the validity of Says law—that supply creates its own

[14] One should note that while at 5% significance level the identification assumptions are valid, at 10% significance level the test for second-order autocorrelation in the residuals rejects the null of no autocorrelation in some specifications for real private consumption growth, and the Hansen *J*-test for over-identifying restrictions rejects the null of instruments validity in some specifications for real private investment growth. Reassuringly, the results are broadly the same when the assumptions are valid. The results are also very similar if we estimate these specifications with OLS.

[15] We rely on the December edition of the OECD Economic Outlook database as its release coincides most closely with the Fall WEO. Data is available from 1996 to 2016, but forecasts of potential output growth are available only for the following two years. This leaves us with only one option of constructing the revision of potential output growth forecast for the following year.

[16] Law appears to have referred to the self-fulling nature of negative expectations about future output: “I always call blind [⋯] because it stops a circulation that puts a State to a loss, and which is more likely than anything else to bring that poverty which they fear, both upon others and to themselves. Moreover, in the early XIX century Thomas Joplin (a merchant and economic pamphleteer) argued that: “[A] demand for money in ordinary times, and a demand for it in periods of panic [⋯] are diametrically different. The one demand is for money to put into circulation; the other for money to be taken out of it”. Both references are from Martin (2015).

Table 5
Robustness Checks.

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error	(7) Dep: real PC growth forecast error	(8) Dep: real PI growth forecast error	(9) Dep: real PC growth forecast error	(10) Dep: real PI growth forecast error
$R^5_{t+1} - R^4_t$	0.659**	2.470***								
	(0.272)	(0.812)								
R^4_t	1.420***	5.452***								
	(0.455)	(1.865)								
$R^3_{t+1} - R^3_t$			0.808***	2.199***						
			(0.229)	(0.606)						
R^3_t			2.026***	6.091***						
			(0.299)	(1.388)						
$R^2_{t+1} - R^2_t$					1.042***	2.320***				
					(0.259)	(0.740)				
R^2_t					2.147***	6.635***				
					(0.312)	(1.471)				
$R^1_{t+1} - R^1_t$							0.979***	2.687***		
							(0.178)	(0.789)		
R^1_t							1.927***	6.048***		
							(0.335)	(1.157)		
$R^1_{t+1} - R^1_t$ (OECD data)									0.286	3.261***
									(0.195)	(0.900)
R^1_t (OECD data)									1.653***	7.356***
									(0.280)	(1.217)
α	0.464***	0.453***	0.399***	0.361***	0.485***	0.350***	0.508***	0.444***	0.173	0.443***
	(0.103)	(0.082)	(0.082)	(0.069)	(0.077)	(0.073)	(0.073)	(0.083)	(0.195)	(0.079)
β	1.420***	5.452***	2.026***	6.091***	2.147***	6.635***	1.927***	6.048***	1.653***	7.356***
	(0.455)	(1.865)	(0.299)	(1.388)	(0.312)	(1.471)	(0.335)	(1.157)	(0.280)	(1.217)
Observations	782	566	782	566	782	566	782	566	484	262
R^2	0.171	0.185	0.218	0.206	0.238	0.228	0.269	0.234	0.449	0.376
Countries	89	83	89	83	89	83	89	83	34	32

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. All estimations include country and time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

Table 6
Excluding the Global Financial Crisis.

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error
	Full sample	Full sample	AE	AE	EMDE	EMDE
$R^4_{t+1} - R^4_t$	0.941***	2.288***	0.895***	2.550***	0.930**	2.178*
	(0.245)	(0.687)	(0.279)	(0.860)	(0.452)	(1.182)
R^4_t	1.870***	5.212***	2.323***	7.234***	1.391**	3.871
	(0.370)	(1.674)	(0.522)	(1.781)	(0.626)	(2.858)
α	0.503***	0.438***	0.385***	0.352***	0.668***	0.562***
	(0.073)	(0.082)	(0.064)	(0.092)	(0.160)	(0.190)
β	1.870***	5.212***	2.323***	7.234***	1.391**	3.871
	(0.370)	(1.674)	(0.522)	(1.781)	(0.626)	(2.858)
Observations	721	566	537	396	184	170
R^2	0.158	0.187	0.292	0.274	0.082	0.124
Countries	89	83	36	33	53	50

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. All estimations include country and time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

demand—in a monetary economy, because people can hoard money instead of purchasing goods. Indeed, the treatment of money as something that circulates in normal conditions and that is hoarded for a precautionary motive when economic prospects deteriorate has a strong Keynesian flavor, but has been somewhat neglected in recent literature (Martin, 2015). Money hoarding by many "uncoordinated" agents, together with a nominal rigidity, are the channels that deliver our Keynesian results. The fact that agents rely

Table 7
Alternative estimators.

	(1) Dep: real PC growth forecast error	(2) Dep: real PI growth forecast error	(3) Dep: real PC growth forecast error	(4) Dep: real PI growth forecast error	(5) Dep: real PC growth forecast error	(6) Dep: real PI growth forecast error	(7) Dep: real PC growth forecast error	(8) Dep: real PI growth forecast error	(9) Dep: real PC growth forecast error	(10) Dep: real PI growth forecast error
	Pooled OLS	Pooled OLS	FGLS	FGLS	PCSE	PCSE	2SLS	2SLS	S-GMM	S-GMM
$R_{t+1}^4 - R_t^4$	0.955***	3.174***	0.456***	2.547***	0.805***	3.053***	0.707***	1.960**	0.887**	2.672***
	(0.264)	(0.900)	(0.143)	(0.510)	(0.273)	(0.884)	(0.253)	(0.876)	(0.388)	(0.856)
R_t^4	2.354***	6.746***	1.623***	5.567***	1.873***	6.173***	1.872***	4.689***	2.222***	5.895***
	(0.381)	(1.142)	(0.209)	(0.736)	(0.364)	(1.297)	(0.330)	(1.433)	(0.654)	(1.802)
Lag of real PC forecast error									0.195***	
									(0.075)	
Lag of real PI forecast error										-0.012
										(0.131)
α	0.406***	0.470***	0.281***	0.457***	0.430***	0.494***	0.378***	0.418***	0.399***	0.453***
	(0.083)	(0.110)	(0.066)	(0.058)	(0.111)	(0.089)	(0.097)	(0.128)	(0.084)	(0.073)
β	2.354***	6.746***	1.623***	5.567***	1.873***	6.173***	1.872***	4.689***	2.222***	5.895***
	(0.381)	(1.142)	(0.209)	(0.736)	(0.364)	(1.297)	(0.330)	(1.433)	(0.654)	(1.802)
Lags/instruments									1-1/9	1–7/25
p-value AR(2)									0.053	0.118
p-value Hansen J-test									0.622	0.121
Observations	782	566	774	557	782	566	644	416	759	526
Countries	89	83	81	74	89	83	60	56	89	83

Source: Authors' calculations. Notes: PC and PI denote private consumption and private investment, respectively. Pooled OLS estimations include the constant. FGLS, PCSE, 2SLS estimations include country- and time-fixed effects, S-GMM estimations include time-fixed effects. ***, **, and * next to a number indicate statistical significance at 1, 5, and 10%, respectively.

on forecasters to assess economic prospects, and that forecasters pay attention to both their own private signals and that of others (which can be wrong) opens the door for pessimistic or optimistic equilibria, in line with Banerjee (1992).

Our model describes a monetary economy in which fiat money plays the role of unit of account, has fixed nominal value, and is accepted as a mean of payment for goods and factor services. Thus, money can be hoarded as a hedge against uncertain future conditions. While we specify why money is hoarded, money used in transactions is assumed to "circulate", and to pay for factors of production or goods.[17] We assume that the economy is closed (i.e., there are no transactions with the rest of the world), and that it is populated by a few economic forecasters, and many workers and entrepreneurs. Perfect competition is prevalent in goods and factor markets, and thus, neither individual workers nor entrepreneurs can affect market outcomes. There are three periods: period $t = 0$, in which economic forecasters receive signals of different quality in sequence and make forecasts; period $t = 1$ (interchangeably referred to as short term); and period $t = 2$ (or long term). Relying on the forecast produced in $t = 0$, workers and entrepreneurs undertake economic transactions in $t = 1$ and $t = 2$.

Both workers and entrepreneurs have identical utility functions over present and future consumption. Workers supply a constant amount of labor and receive a wage for their services. In $t = 1$, they decide how to allocate their income between consumption and money hoarding, while in $t = 2$ they use labor income plus hoarded money balances to consume.[18] Entrepreneurs maximize profits in the short term, demanding labor and taking the initial capital stock as given. They allocate short-term profits among consumption, investment, and money hoarding. Investment in $t = 1$ determines the capital stock in $t = 2$. In the long term, entrepreneursâ consumption is financed by the real rents on capital plus the real value of money hoarded in $t = 1$. We introduce nominal rigidities by assuming that nominal wages are fixed in the short term. This is the only nominal rigidity in the model—other prices are fully flexible both in the short term and in the long term.[19]

There exist two states of the world in $t = 2$, good and bad. In the bad state of the world (which occurs with probability $0 < \pi^S < 1$), total factor productivity (TFP) growth rate is lower than in the good state of the world. Thus, the real return to capital in $t = 2$ depends on the stochastic TFP. Workers and entrepreneurs do not have private information about π^S, and thus rely on the

[17] The importance of money as something that circulates is also highlighted in the post-Keynesian tradition (Godley and Lavoie (2007)).

[18] The (realistic) assumption of heterogeneous budget constraints for workers and entrepreneurs tightens the link between economic uncertainty and both money hoarding and investment. The link is looser if the representative agent is both worker and entrepreneur.

[19] This is similar to the way Sargent (1987) introduces a nominal rigidity in his version of the Keynesian model. The literature introduces short-term nominal frictions from imperfect competition in the goods market (Mankiw, 1987; Benigno, 2015) or from both imperfect competition in the goods and labor markets (Blanchard and Kiyotaki, 1987).

consensus forecast produced in $t = 0$ by the forecasters. This ensures the modelâs internal consistency.[20]

Given a consensus forecast on the probability about the bad state of the world (π, which can be higher or lower than π^S), the representative consumer maximizes utility:

$$lnc_1^j + \beta E(lnc_2^j) \tag{8}$$

where $j = W, F$ denotes either workers (W) or entrepreneurs (F), c_1^j represents short-term consumption and c_2^j long-term consumption, $0 < \beta \leq 1$ is the subjective time preference, and E is the expectation operator. Workers maximize utility subject to non-negativity constraints for consumption and money hoarding, and the following budget constraints:

$$P_1 c_1^W \leq W_1 L_1^d - M_1^{W,h}, \quad P_2^i c_2^{W,i} \leq W_2^i L_2 + M_1^{W,h} \tag{9}$$

where $i = L, H$ denotes either the bad state of the world (L) or the good state of the world (H), P_t represents the price level, W_t denotes nominal wages, L_t^d is labor demand, and $M_1^{j,h}$ is money hoarding. Workers' income in $t = 1$ depends on the sticky nominal wage W_1, and on labor demand, which in the short-term may be lower than the fixed labor supply ($L_1^d \leq \overline{L} > 0$). Entrepreneurs maximize their utility function subject to non-negativity constraints for consumption, capital, and money hoarding, and the following budget constraints:

$$P_1 c_1^F \leq \Pi_1 - M_1^{F,h} - P_1 K_2, \quad P_2^i c_2^{F,i} \leq R_2^i K_2 + M_1^{F,h} \tag{10}$$

where Π_1 denotes nominal short-term profits, and R_2 and K_2 represent the (stochastic) nominal return of investment, and real investment, respectively. The profit maximization problem in $t = 1$ takes the initial capital stock as given:

$$\Pi_1 \equiv P_1 \sigma y_1 - W_1 L_1^d \tag{11}$$

where $0 < \sigma \leq 1$ is the MPS.[21] This problem is subject to the following constraints:

$$y_1 \leq A_1 K_1^\alpha L_1^{d,1-\alpha}, \quad \Pi_1 \geq 0 \tag{12}$$

where y_1 denotes short-term output, $K_1 = \overline{K} > 0$ is the initial (exogenous) capital stock, $A_1 > 0$ is the exogenous neutral TFP in the short term, and $0 < \alpha < 0$ is a production function parameter. Importantly, short-term profit maximization takes the aggregate MPS as given, which is defined as:

$$\sigma(\cdot) \equiv \frac{P_1 y_1 - M_1^h}{P_1 y_1} = 1 - \frac{M_1^h / P_1}{y_1} \tag{13}$$

In expression 13, $M_1^h = M_1^{F,h} + M_1^{W,h}$. The rationale to include the MPS in the short-term profit maximization is that entrepreneurs know that in an interior equilibrium (i.e., given a sufficiently high π), money is hoarded. The counterpart of money hoarding is unsold production, which materializes in the accumulation of inventories. Monetary profits in $t = 1$ are determined by effective demand. Given that unsold production is costly, entrepreneurs anticipate the MPS's value, which is determined by expectations about π^S. Put differently, entrepreneursâ monetary costs are linked to total output, but receive monetary income only for sales, which is always below output in an interior equilibrium.

In the long term, profit maximization features all factors of production as variable:

$$\Pi_2^i \equiv P_2^i y_2^i - W_2^i L_2^{i,d} - R_2^i K_2^{i,d} \tag{14}$$

and is subject to the following constraint:

$$y_2^i \leq A_2^i K_2^{i,d^\alpha} L_2^{i,d^{1-\alpha}} \tag{15}$$

where $0 < A_2^L < A_2^H$. The level of prices in the short term results from a quantitative theory of money-type equation. The stock of money in $t = 1$, $M_1 = \overline{M} > 0$ is exogenous, but money circulating in the economy is endogenous. Accordingly, the value for P_1 results from the interaction between $\overline{M}$, endogenous (aggregate) money hoarding, and y_1:

$$\overline{M} - M_1^h = P_1 y_1 \tag{16}$$

In the long term, the monetary authority conducts any operations necessary to ensure that inflation is aligned to a given target, φ, and monetary policy is assumed to be fully credible. Given these assumptions, the long-term price level is given by $P_2^i = P_1(1 + \varphi)$. The short-term price level combined with the sticky nominal wage determines real wages in $t = 1$. If π is high enough, aggregate money hoarding results in a lower P_1 (as money is taken out of circulation), a higher real wage, and unemployment.

In an interior equilibrium (i.e., for each π), workers pick positive values for c_1^W, $c_2^{W,i}$, and $M_1^{W,h}$; entrepreneurs (as consumers) pick positive values for c_1^F, $c_2^{F,i}$, $M_1^{F,h}$, and K_2; and entrepreneurs (as profit maximizers) pick y_1, L_1^d, y_2^i, $K_2^{i,d}$, and $L_2^{i,d}$. Monetary policy and

[20] In practice, agents receive a variety of data about economic activity, which they use to infer whether the information reflects structural or cyclical components. This is not in the model, as our objective is limited to highlight, in line with Blanchard et al. (2017), that more optimistic forecasts (no matter whether justified by fundamentals or not) can affect current consumption, investment, and both short and long-term output, in the direction of the changes in expectations.

[21] Note that in the short term there should be two measures of profits. One is that described in Eq. (11), while the other includes unsold inventories. We refrain from discussing how unsold inventories should be valued and just value them at market prices.

money hoarding determine P_1 and P_2^i; in $t = 2$, market clearing (i.e., $L_2^{i,d} = \overline{L} > 0$ and $K_2^{i,d} = K_2$) determines values for R_2^i and W_2^i, while in $t = 1$, $W_1 = \overline{W} > 0$, $K_1 = \overline{K} > 0$, and $L_1^d \leq \overline{L}$. Total goods' supply in $t = 2$ is given by y_2^i plus inventories accumulated in $t = 1$. The budget constraints for workers and entrepreneurs and the first order conditions (FOCs) close the model.

The workers' FOC suggest that they hoard money ($M_1^{W,h}$) to equalize the short-term marginal utility of consumption with the expected long-term (discounted) marginal utility of consumption multiplied by the real return on money. Intuitively, a higher π increases $M_1^{W,h}$ to support $c_2^{W,L}$:

$$\frac{1}{c_1^W} = \frac{\beta}{1+\varphi}\left[\pi\frac{1}{c_2^{W,L}} + (1-\pi)\frac{1}{c_2^{W,H}}\right] \tag{17}$$

In $t = 1$, entrepreneurs (as consumers) pick a portfolio including both money and physical capital. Needless to say, the value of π, and the workers' actions given π affect their decisions (what applies symmetrically for workers). $M_1^{F,h}$ is determined by a FOC similar to Eq. (17). In turn, K_2 equalizes the short-term marginal utility of consumption to the expected long-term (discounted) marginal utility of consumption multiplied by the expected real return on capital:

$$\frac{1}{c_1^F} = \beta\left[\pi\frac{R_2^L}{c_2^{F,L}P_2^L} + (1-\pi)\frac{R_2^H}{c_2^{F,H}P_2^H}\right] \tag{18}$$

Increases in π reduce K_2 both because of the lower expected return on capital, but also because lower effective demand in $t = 1$ reduces y_1. The optimal portfolio composition between money and capital also equalizes the marginal rate of substitution of consumption among different states of the world in $t = 2$ to the odds ratio times the difference in expected real returns of different assets:

$$\pi\frac{1}{c_2^{F,L}}\left(\frac{P_1}{P_2^L} - \frac{R_2^L}{P_2^L}\right) + (1-\pi)\frac{1}{c_2^{F,H}}\left(\frac{P_1}{P_2^H} - \frac{R_2^H}{P_2^H}\right) = 0 \tag{19}$$

The profit maximizing level of output in the short term is given by:

$$y_1 = A_1K_1^\alpha\left[\frac{P_1}{W_1}(1-\alpha)(c_1+K_2)\right]^{1-\alpha} \tag{20}$$

Eq. (20) shows that output in $t = 1$ depends (through the MPS) on effective demand, giving the model a key Keynesian feature. Labor demand in $t = 1$ is determined by technology (Eq. (12)). The FOCs for profit maximization in $t = 2$ require the equalization of the value marginal product for each input with the respective input price, which determine $K_2^{i,d}$ and $L_2^{i,d}$ for $i = L, H$. Market clearing determines real wages and capital returns in $t = 2$.

5.2. Expectations about long-term output

The model assumes that workers and entrepreneurs rely on the consensus forecast produced by N economic forecasters in $t = 0$. This assumption is somewhat artificial, but provides a straightforward connection to the empirical analysis. Forecasts are produced according to the game of incomplete information in Banerjee (1992).[22]

In $t = 0$, the (structural or fundamental) probability of the bad of the state of the world, π^S, is unknown, but falls within $0 < \underline{\pi} \leq \pi^S \leq \overline{\pi} < 1$. A share ($0 < \theta < 1$) of the forecasters receive a signal, while the rest does not. Those who receive a signal learn the correct value of π^S with probability $0 < \psi < 1$, and otherwise receive a wrong signal. The probability distribution among signals is uniform, and since the range above is continuous, the probability of any given signal within the range is zero. If a forecaster guesses the correct probability of the bad state of the world, she receives compensation $\xi > 0$; in all other cases, she receives an equal, strictly positive, but lower compensation than if she was right. The aggregate cost of compensating the forecasters, Γ, is in the range $0 < \Gamma \leq \xi N$. To simplify the model, it is assumed that ξN is negligible with respect to the size of the economy, and that the cost to compensate the forecasters is distributed proportionally among the population in a lump-sum fashion in $t = 2$. These assumptions ensure that the impact of forecastersâ activity is limited to establishing π. Forecasters make forecasts in sequence, and the turn of each forecaster to make her forecast is randomly assigned. A forecaster learns her type at the moment in which her turn comes, which is when she is able to observe the forecasts made before her turn. The structure of the game and Bayesian rationality are common knowledge.[23]

[22] There are different ways in which the signal about future productivity can enter the problem of the individual agents. Separating economic forecasting from other economic activities simplifies the setup considerably.

[23] Banerjee (1992) makes three additional assumptions that allow a given forecaster to decide between two options that are equally attractive. First, the decision maker has no signal and everyone else before has chosen $(\underline{\pi} + \overline{\pi})/2$, she also chooses $(\underline{\pi} + \overline{\pi})/2$; second, when forecasters are indifferent between following their own signal, and someone elseâs, they follow their own; and third, when the forecaster is indifferent between following more than one of the previous forecasts, she chooses the forecast entailing the highest probability. Each forecaster chooses a strategy in the form of a decision rule that defines what forecast to choose given her type, the timing of her decision, and the history of forecasts until the moment she needs to made a forecast herself. Given the tie-breaker assumptions described above, this game has a unique Bayesian Nash equilibrium. In other words, the structure of this game is identical to that in Banerjee (1992), with the exception that the motivation and the value chosen in the first tie-break assumption change. The reason for changing the first-tie break value assumption is to ensure that if forecasters receive no signal, they produce a forecast about π^S that is in the center of the range. This does not affect the solution and conclusions of the game.

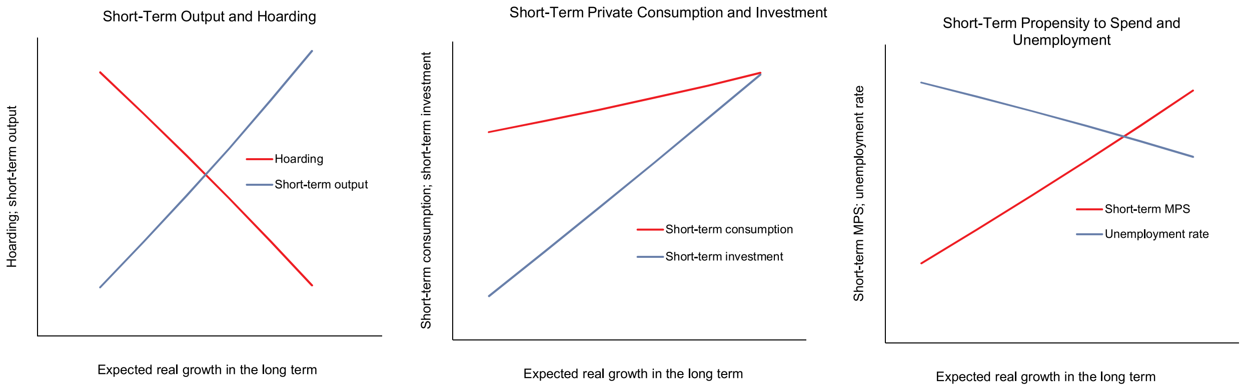

Fig. 5. Expected long-term growth and short-term economic performance.

This setup allows for multiple equilibria depending on the ordering and signals that forecasters receive, many of them being the result of herding around wrong values of π^S. The consensus forecast may thus potentially reflect herding, resulting from the way in which individual information is aggregated. Although there are many other ways in which the model could have accounted for uncertainty about the actual probability of the bad state of the world and the formation of expectations, the mechanisms featured here account for problems with aggregation of information and herding that appear common in the way agents form aggregate expectations about the future.

This setup also allows for a simple classification of optimistic and pessimistic equilibria. An optimistic equilibrium in our context is understood as that in which the consensus probability of the bad state of the world is lower than the actual (or fundamental) probability. A more optimistic forecast results in a higher level of short-term income, consumption, and investment. In addition, the latter provides a sort of self-fulfilling feature in our model, as higher short-term investment will produce higher future output in all states of the world.

Fig. 5 shows the sensitivity of the model's key endogenous variables to changes in expectations about long-term growth. Concretely, if expectations about future growth deteriorate (i.e., people expect an increased probability of the bad state of the world), then aggregate money hoarding increases, the MPS and effective demand (both aggregate consumption and investment) fall, and short-term unemployment increases. Conversely, improved expected future economic prospects result in lower money hoarding; higher MPS, effective demand, and output; and lower unemployment. In other words, a change in the consensus forecast has an effect on short-term economic variables in the direction of the forecast change, no matter whether the change in the forecast reflects "animal spirits" or an actual change in the probability of the bad state of the world. Lower expected future productivity decreases investment (reinforcing the negative effect on long-term output), and results in a decline in current output, further decreasing permanent income.[24]

6. Conclusions

Changes in expectations about future economic activity have been often proposed as an avenue to explain short-term fluctuations in aggregate demand. Regardless of whether the perturbations are due to swings in beliefs (including rational but wrong) or fundamentals, they may put in motion mechanisms that move the economy onto a new (better or worse) equilibrium. In this paper, we empirically test the hypothesis for which expectations about future economic prospects (turning more optimistic or pessimistic) have a role in determining short-term fluctuations in private consumption and investment. Relying on a dataset of actual data and forecasts for 89 countries over the 1990–2022 period, we find supportive evidence for this hypothesis.

Under the assumption that cyclical movements in private consumption growth and private investment growth are exogenous to potential output growth forecast far into the future, our results are consistent with the idea private economic agents learn about the future potential output growth of the economy and adjust their consumption and investment levels accordingly over the two years following the shock in expectations. Specifically, 0.1 pp upward revision in the potential output growth forecast is associated with a 0.14–0.23 (0.39–0.72) percent increase in private consumption (investment) growth. For the average country with a share of private consumption (investment) to GDP of 65 (16) percent, this would bring about an acceleration in GDP growth by 0.09–0.14 (0.06–0.11) percent. We also find that the estimated effects are generally linear and robust to different specifications and estimators. Despite changes in expectations became more frequent, negatively skewed, and volatile in the aftermath of the GFC, the estimated impact is not statistically different with respect to the period preceding the GFC. Similarly, pessimistic and optimistic expectations do not present a differential impact on private consumption nor private investment, and large changes in expectations generally induce proportional changes in demand.

As a way to interpret the empirical results, we propose a Keynesian model. In this framework, changes in expected long-term

[24] The simulation results underlying Fig. 5 and the sensitivity analysis of the impact on endogenous variables of changes in the model's parameters, exogenous variables, and predetermined variables are available upon request.

income have self-fulling effects in the direction of the change in expectations. Concretely, if agents expect long-term output growth to be high (low), short-term consumption, investment, and output increase (fall) in the short term, and unemployment falls (increases), corroborating the empirical findings.

Our results have some policy implications. If changes in expectations about future economic conditions cause short-term fluctuations in aggregate demand, economic policy could aim at curbing such fluctuations when these place the economy in an inferior equilibrium or generate undesired instability. While both policymakers and economic agents are subject to the same (or similar) restrictions in accessing information about future economic activity, credible commitments remain a valuable tool. To the extent that institutions are credible, a commitment to policy intervention to stabilize undesired fluctuations could act on the expectation formation mechanisms by deterring economic agents from moving the economy to an inferior equilibrium.

Appendix A. Country groups

Advanced economies: Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States.

Emerging market and developing economies: Algeria, Antigua and Barbuda, Armenia, Bahamas, Barbados, Belize, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Dominica, Dominican Republic, Egypt, El Salvador, Georgia, Grenada, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Jamaica, Kazakhstan, Kenya, Lebanon, Malaysia, Mauritius, Mexico, Moldova, Montserrat, Nicaragua, Pakistan, Panama, Peru, Philippines, Poland, Romania, Russia, South Africa, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Swaziland, Thailand, Togo, Turkey, Ukraine, Uruguay.

Appendix B. Data

Table B.1 lists all variables used in the empirical analysis, along with the source and scales.

Table B.1
Data sources.

Variable	Source	Scale
Real private consumption growth forecast error	IMF World Economic Outlook	Percent
Real private investment growth forecast error	IMF World Economic Outlook	Percent
Revision in potential growth forecast	IMF World Economic Outlook and OECD Economic Outlook	Percent
General government debt	IMF World Economic Outlook	Percent of GDP
Inflation forecast error	IMF World Economic Outlook	Percent
Terms of trade forecast error	IMF World Economic Outlook	Percent
Real public consumption growth forecast error	IMF World Economic Outlook	Percent
Real public investment growth forecast error	IMF World Economic Outlook	Percent
Real short-term interest rate forecast error	IMF International Financial Statistics and Haver	Percent
Old-age dependency ratio	World Bank World Development Indicators	Percent of working-age population
Share of urban population	World Bank World Development Indicators	Percent of population

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