Investor Sentiment and Employment*

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Abstract

We find that investor sentiment should affect a firm's employment policy in a world with moral hazard and noise traders. Consistent with the model's predictions, we show that higher US sentiment leads to: (1) higher employment growth worldwide; (2) lower labor productivity, as it hardly affects real value added growth; (3) higher (lower) real wage growth in countries with high (low) human capital; (4) greater labor instability during financial crises, especially in industries that are more dependent on external finance. The results suggest that sentiment has real effects and also lend support to the view that finance has a 'dark side'.

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1. Introduction

It is well known that financial development is positively correlated with a country's economic growth (King and Levine, 1993; Beck, Levine and Loayza, 2000a, 2000b; Demirgüç-Kunt and Levine, 2001). In particular, the services the financial sector provides are an essential catalyst of value added growth (Rajan and Zingales, 1998) and employment growth (Pagano and Pica, 2012), especially for the industries that are most dependent on external finance. An important question that remains unanswered, however, is whether investor sentiment plays a role in this picture. In fact, recent research shows that sentiment affects firms' capital structure (Baker and Wurgler, 2000) and stock prices (Baker and Wurgler, 2006, 2007), but it is not clear whether it also has an impact on economic growth. In this paper, we try to shed some light on this issue both theoretically and empirically.

To this purpose, we analyze the stock issue of a firm in a world with asymmetric information and two categories of investors, i.e. arbitrageurs and noise traders. We find that when the firm seeks equity financing, investor sentiment should affect a firm's employment policy. Consistent with the model's predictions, we show that higher investor sentiment in the US leads to: (1) higher employment growth worldwide; (2) lower labor productivity, as it hardly affects real value added growth; (3) higher (lower) real wage growth in countries with high (low) human capital; (4) greater labor instability during financial crises, especially in industries that are more dependent on external finance. All the results are both statistically and economically significant.

The main intuition behind the story is as follows. Following high investor sentiment, firms issue more equity (Baker and Wurgler, 2000, 2002) and increase their investments (Chirinko and Schaller, 2001; Baker, Stein and Wurgler, 2003; Polk and Sapienza, 2009). Since part of the operations of US firms takes place outside the national boundaries, foreign countries also experience higher investments from the US and thereby higher employment growth. This additional hiring, however, is inefficient as it is generated by sentiment-driven capital, not by an improvement in the economic outlook or production technology. The main innovation of this paper therefore lies in the fact that this is, to the best of our knowledge, the first study that looks into the causal effects of investor sentiment on employment. In fact, previous literature finds

correlation between these two measures but does not establish causality (McLean and Zhao, 2014).

The model we propose is a refined version of Pagano and Pica (2012). A manager/entrepreneur needs to fund a risky project through equity financing. The project has a binary outcome and can either thrive or default. The manager then launches an IPO and caters to a population of investors made up of arbitrageurs and noise traders. The difference between these two groups is that the former know the exact probability of default of the project, which allows them to correctly estimate the expected final cash flow from the stock. The latter instead are affected by sentiment and estimate the probability of default with a bias, which can be either positive or negative.

Neither arbitrageurs nor noise traders however can verify the firm's cash flow, which creates a moral hazard issue. In particular, the manager can extract private benefits by appropriating a proportion of the firm's cash flow. This proportion is in turn a decreasing function of the level of development of the financial system (Pagano and Pica, 2012), which encompasses features such as monitoring ability and legal protection of investors. Upon receiving the funding the manager hires new employees, starts production, extracts private benefits, pays the employees[1] and leaves the rest to shareholders.

Investors face transaction costs as in Hong and Sraer (2013). Therefore, optimal demand for the stock is an inverse function of the severity of transaction costs and a direct function of the difference between the subjective valuation of the firm's final cash flow and the current stock price. This implies that the equilibrium price of the stock is a weighted average of all individual valuations, where the weights area the relative sizes of the arbitrageur and noise trader populations. The effect of sentiment on the stock price then depends on the size of the noise trader cohort as well as the size of noise traders' bias in their estimate of their final cash flow.

Note that in this framework the labor market equilibrium also depends on investor sentiment. In fact, optimal labor demand is a function of the firm's technology, the project's probability of default and the amount of funding the firm is able to raise on the stock market. Then, when noise traders are affected by positive (negative) sentiment, the firm hires more (less) workers than it should and ends up with an inefficient level of employment. We call this

[1] As insiders, employees can observe cash flows.

phenomenon sentiment-driven over-hiring or under-hiring. Analogously, the equilibrium wage in the labor market will be higher (lower) following positive (negative) investor sentiment.

Next, we extend the analysis to a framework with two types of industry and *n* countries. Within each country, industries can hire either high-skill or low-skill workers and therefore have either high or low productivity respectively. We assume workers face high switching costs (such as e.g. training) to move across the two industries, so the two labor markets are essentially separate with two different market clearing wages. In particular, the high productivity industry pays a wage premium, due to the higher cost of entry, and relies more on external finance, as it is more capital intensive and the manager's resources are limited.

The *n* countries differ in their level of financial development. If country *i* is more financially developed than country *j*, then it has a higher level of employment and pays higher wages in both the high and the low productivity industry. Therefore, workers in country *j* are cheaper. This implies that firms from the more financially developed countries have an incentive to hire workers in the countries with lower financial development. In particular, other things being equal, it is optimal for the former to pick employees where the type of labor they seek is in greater net supply.

Since the proportion of high-skilled workers over total workforce depends on the country's level of human capital, it is optimal for countries with high financial development to hire high-skilled (low-skilled) workers in countries with lower financial development *and* a high (low) level of human capital. This mechanism suggests that sentiment-driven labor demand should affect employment levels in all countries to some extent. The effect on wage growth instead is ambiguous. In particular, as long as firms take wages in foreign countries as given, in periods of high sentiment wage growth will increase (decrease) in countries with high (low) levels of human capital. Therefore, we should observe cross-sectional effects.

Finally, the model also predicts that the effect of investor sentiment on employment should be stronger in countries with higher financial development and especially for industries with higher dependence on external finance. As in the one-industry case, the key aspect is that sentiment-driven labor demand should lead to a lower level of labor productivity in the country. In fact, if the hiring of new workers is not justified by economic conditions and/or technological progress, then labor should become less efficient.

In order to test the main predictions from the model, we study the effects of US investor sentiment on labor markets worldwide. The reason we choose the US as our reference country is that it represents the largest and one of most financially developed economies and its firms typically carry out a nontrivial part of their operations abroad. Also, the US is virtually the only country for which a widely accepted measure of investor sentiment is available (Baker and Wurgler, 2006, 2007; Baker, Wurgler and Yuan, 2012).

To analyze the labor market, we consider a large panel of non-US countries from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database) that spans the period 1970-2003[2]. We only consider countries for which at least 10 observations are available, for a total of 113 countries. The dataset provides annual country-sector statistics on the growth in employment, real wages and real value added.

We choose to measure investor sentiment through Baker and Wurgler's (2006) index. The major caveat of this measure is that it is rather broad: it does not reveal which part of US sentiment-driven capital is invested within the US or abroad, let alone the country or industry breakdown. If anything, however, the noise it entails should inflate standard errors and thus work against us. In contrast, this measure has two major advantages: (1) it is purged of US business cycle indicators and (2) it is unlikely to suffer from reverse causality.

Our empirical methodology follows Rajan and Zingales (1998), but also includes a time dimension as in Pagano and Pica (2012). Our battery of controls includes country, sector and year fixed effects; a country's level of financial development; an industry's need for external finance; the lagged share of real value added, employment and real wages of any given country-industry. Standard errors are robust and clustered by country.

Consistent with the model predictions, we find that a one standard deviation increase in US investor sentiment in a given year is followed by a 3.29% increase in employment growth worldwide (t-stat 3.93). The effect is more pronounced for developing countries (4.05%, t-stat 2.79) than for developed countries (2.69%, t-stat 4.94). This is consistent with the model's prediction that following high sentiment, countries with higher financial development have an incentive to hire workers in countries with lower financial development. However, this increase

[2] Following Pagano and Pica (2012) we consider the 2006 release, as the following ones have more missing observations.

in employment coincides with a general decrease in labor productivity (-2.46%, t-stat -2.69), which is especially strong for OECD countries (-2.96%, t-stat -6.47).

In order to test the effect of sentiment on wages we break down the sample according to the level of human capital, defined as the average number of years of schooling in the population over 25 as of 1970 from the Barro-Lee files on the National Bureau of Economic Research web site. However, since human capital is likely to be endogenously related to economic growth, we use a country's legal origin as a proxy. In particular, following La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998) we consider four legal systems: British, French, German and Scandinavian. Then we calculate the average level of human capital for each of these systems and find that the subsample of countries with a French legal system has the lowest score (5.07 years of schooling), whereas countries with a Scandinavian legal system score the highest (9.86 years). Interestingly, we find that in the former subsample the effect of US investor sentiment on real wage growth is negative (-3.56%, t-stat -2.94). On the contrary, in the latter subsample the effect is positive (1.07%, t-stat 2.87). This is consistent with the model's cross-sectional predictions.

Rajan and Zingales (1998) point out that since financial markets and institutions help firms overcome asymmetric information issues, financial development should help industries relying on external finance grow disproportionately faster. Consistent with this conjecture, they find that real value added growth of externally dependent industries is significantly higher in financially developed countries. Pagano and Pica (2012) find a similar effect on employment growth.

In our analysis we manage to replicate both results. The annual rate of growth of value added and employment are respectively 5.17% (t-stat 2.57) and 3.26% (t-stat 2.11) higher in industries with greater need for external finance located in countries with higher financial development. However, we also find that the employment effect is much stronger if we condition the analysis on the previous year's level of US investor sentiment. In particular, it increases by a further 2.23% (t-stat 2.18), i.e. it is almost 70% larger.

Pagano and Pica (2012) find that the very same industries that benefit more from financial development are also the ones that are hit the hardest by financial crises, and call this feature the 'dark side of finance'. We look into whether investor sentiment somehow exacerbates this aspect. To this purpose, we consider the list of banking crises from Laeven and Valencia (2010). We find that following higher US investor sentiment in the previous year, a country-level

banking crisis in the following year prompts a 1.61% (t-stat -1.76) *larger* drop in employment growth in externally dependent industries. We also find a particularly strong effect on real value added growth (-5.81%, t-stat -2.33), and consequently a negative effect on labor productivity as well (-3.96%, t-stat -1.77). The evidence is mildly consistent with the idea that finance has a dark side.

The rest of the paper is organized as follows. Section 2 briefly reviews the relevant literature we refer to. Section 3 introduces the model. Section 4 shows the empirical results. Section 5 concludes.

2. Literature review

We refer to two main strands of research. The first one is the vast empirical literature that tries to shed light on the causal link between finance and growth. Many studies have tackled this question using country-level data. King and Levine (1993a, 1993b) analyze the impact of lagged financial development on a country's rate of economic growth, where the former is defined as the size of the financial sector at the beginning of the sample period. Demirgüç-Kunt and Maksimovic (1996) find that the proportion of firms whose rate of growth exceeds the one prompted by self-financing is positively related to stock market turnover and to a measure of law enforcement. Levine and Zervos (1998) find that measures of market liquidity are positively correlated with growth, capital accumulation and productivity, whereas more traditional measures of development such as stock market capitalization are not as robustly related. Beck, Levine and Loayza (2000a) use legal origin as an instrument for financial development and find that the size of the financial sector is positively and robustly related to the rate of growth of per capita GDP and total factor productivity.

Other papers have addressed the causality issue using natural experiments, such as changes in financial market regulation. Jayaratne and Strahan (1996) find that the liberalization of the banking sector in different states in the US has had a positive influence on the state's growth. Dehejia and Lleras-Muney (2007) analyze changes in state-level banking regulation between 1900 and 1940 and document similar and robust results. This methodology however could be harder to apply to different countries or different questions.

Another line of research has used industry-level data to establish causality. In their seminal paper, Rajan and Zingales (1998) find that industries typically dependent on external finance for growth develop disproportionately faster in countries with high financial development. The intuition comes from the fact that financial markets and institutions help firms overcome asymmetric information problems, thus lowering the cost of capital. This test has two main advantages. First, it looks into a specific mechanism by which finance affects growth, which is a necessary ingredient in the analysis of causality. Second, it introduces the possibility to correct for fixed country (and industry) effects.

Pagano and Pica (2012) use the same methodology as in Rajan and Zingales (1998) to extend their analysis to labor markets. Consistent with their model's predictions, they find that standard measures of financial development are associated with greater employment growth in externally dependent industries, although only in non-OECD countries. The finding suggests that financial development matters only up to some threshold, as the most developed countries seem to be not affected. On the other hand, they do not find any effect on labor productivity and real wage growth. Interestingly, the authors also find that finance has a 'dark side', in that employment growth slows down significantly more during financial crises in externally dependent industries located in financially developed countries. In essence, sensitivity to financial development has both an upside and a downside.

The second strand of research our paper is related to studies the relationship between firm decisions and investor sentiment. The extant literature shows that sentiment affects firm investment decisions in at least three ways. First, Morck, Shleifer and Vishny (1990) point out that managers may infer information from share prices. A price inflated with sentiment could therefore cause managers to infer high expected cash flow or low discount rates, both of which would stimulate more investment. Second, Polk and Sapienza (2009) contend that firm managers can increase short-term firm value through catering to investor beliefs. Consistent with this idea, they find that periods of high investor sentiment (defined as firm-level mispricing) prompt more investment, controlling for investment opportunities and financial slack. Third, Baker, Stein and Wurgler (2003) find that stock prices have a stronger impact on the investment of "equity-dependent" firms, i.e. firms that need external equity to finance marginal investments. In particular, such firms may forego investment if their securities are undervalued and even modify their capital structure accordingly (Baker and Wurgler, 2002). Hence investment and external

finance should both be increasing in sentiment. This finding seems to hold outside the US as well, as Chirinko and Schaller (2001) find that the 1980s stock market boom in Japan led to high levels of investment.

However, none of the above papers look into the implications of sentiment-driven investment on labor. Only recently McLean and Zhao (2014) try to fill this gap. They find that both investment and employment are less sensitive to Tobin's q and more sensitive to cash flow during recessions and low investor sentiment periods. Their innovation lies in the fact that they (1) use sentiment as a state variable and (2) let sentiment and fundamental variables interact with each other. Also, they incorporate the insights of Lamont and Stein (2006), Shiller (2001) and Samuelson (1998) and consider an aggregate measure of sentiment rather than resort to some form of firm-level mispricing, as opposed to Baker, Stein and Wurgler (2003) and Polk and Sapienza (2009). However their analysis of the labor market is only marginal as it is limited to the effects on employment growth and does not acknowledge many potentially relevant firm characteristics (e.g. book-to-market ratio). Moreover, it does not test whether sentiment has any direct explanatory power on labor.

In this paper we try to extend these studies. Since greater speculative demand implies higher prices and lower cost of capital, we expect investor sentiment to play an important role in the labor market. In order to derive some theoretical guidance, we introduce a modified version of Pagano and Pica's (2012) model to study the effect of sentiment on employment growth, real wage growth and labor productivity, in a setting with industries with either low or high productivity and countries with different levels financial development. In fact, we combine the two above strands of literature. Consistent with the model predictions we find that when US investor sentiment is high, there is a boost in employment growth worldwide, an increase (decrease) in real wage growth in countries with high (low) human capital but a decrease in labor productivity. This is consistent with the idea that firms 'over-hire' (under-hire) in times of positive (negative) sentiment and low (high) cost of capital. We also find mild evidence consistent with the idea that finance has a dark side. In fact, the effect of financial crises on externally dependent industries is stronger following periods of high sentiment.

3. The model

This section first introduces the model with one industry and one country, then presents the extension to two industries and *n* countries.

3.1 One-industry one-country model

The representative risk-neutral manager-entrepreneur has wealth *I* and launches an IPO to fund a new project[3]. The project is risky and can fail with probability π. The key ingredient of the model is that workers can observe the firm's cash flow, but shareholders cannot. This creates a moral hazard problem. In particular, the manager can appropriate a fraction $1-\lambda$ of the firm's operating profits. Therefore, λ can be thought of as a measure of financial development, such as e.g. monitoring ability or investor protection.

The timing is as follows. Upon receiving external money *F*, the firm hires workers *L*. Then the firm produces $\tilde{y}$, the manager gets private benefit $\tilde{B}$, workers get *wL* and shareholders receive the remainder. In particular, firm's revenues are generated by a Cobb-Douglas production function:

$$\tilde{y} = \tilde{\theta} K^{1-\alpha} L^{\alpha} \tag{1}$$

where $\tilde{\theta}$ is firm profitability and *K* is the firm's capital, given by the sum of the manager's wealth *I* plus the amount of equity funding *F* he can get and *L* is the labor demand of the firm. Profitability is stochastic and is distributed as:

$$\tilde{\theta} = \begin{cases} \theta & 1-\pi \\ 0 & \pi \end{cases} \tag{2}$$

such that expected revenues are equal to:

[3] Note that the arguments that follow would hold for SEOs as well. However, we use the IPO setting for ease of exposition.

$$E(\tilde{y}) = (1-\pi)\theta K^{1-\alpha} L^{\alpha} \equiv \bar{\theta} K^{1-\alpha} L^{\alpha} \tag{3}$$

The manager maximizes his expected private benefits:

$$\max_{L} \; E(\tilde{B}) = (1-\lambda)[E(\tilde{y}) - wL] \tag{4}$$

subject to the participation constraint $E(\tilde{B}) \geq I$, in which *w* represent workers' wage in a perfectly competitive labor market. The first-order condition yields:

$$L^{*} = \left(\frac{\alpha}{w} \bar{\theta} \right)^{\frac{1}{1-\alpha}} K \tag{5}$$

which in turn implies the following private benefit:

$$E(\tilde{B}^{*}) = (1-\lambda)\phi K \tag{6}$$

where:

$$\phi = (1-\alpha) \left[\left(\frac{\alpha}{w} \right)^{\frac{\alpha}{1-\alpha}} \bar{\theta}^{\frac{1}{1-\alpha}} \right] K \tag{7}$$

represents the profit per dollar invested. The complement to (6) then represents pledgeable income, i.e. cash flow to external financiers.

Investors are risk-neutral and can be either arbitrageurs (type A) or noise traders (type B), where the latter estimate the firm's probability of default with a bias ($\hat{\pi} \neq \pi$). Investor *i* solves:

$$\max_{n_i} \; n_i(\bar{v}_i - p_0) - \frac{1}{2} \frac{n_i^2}{\gamma} \tag{8}$$

where *n* is the amount of wealth invested in the stock, γ captures transaction costs and $\bar{v}_i$ is her subjective evaluation of the stock:

$$\bar{v}_i = \begin{cases} \bar{v} & i = A \\ \bar{v}s_0 & i = B \end{cases} \tag{9}$$

where $s_0 \neq 1$ represents noise trader sentiment and is defined as:

$$s_0 = \frac{\bar{v}_B}{\bar{v}} \equiv \left(\frac{1-\hat{\pi}}{1-\pi}\right)^{\frac{1}{1-\alpha}} \tag{10}$$

The first-order condition yields the optimal demand for the stock:

$$n_i^* = \gamma\left(\bar{v}_i - p_0\right) \tag{11}$$

Let the sum of all individual demands be n_A^* and n_B^* for arbitrageurs and noise traders respectively. Given stock supply *q*, the equilibrium price is:

$$p_0^* = \frac{n_A^* + n_B^* s_0}{n_A^* + n_B^*}\bar{v} - \frac{q}{\gamma}\frac{1}{n_A^* + n_B^*} \tag{12}$$

or following from (6):

$$p_0^* = \left(S_0 \lambda \phi\right)K - \frac{q}{\gamma}\frac{1}{n_A^* + n_B^*} \tag{13}$$

where:

$$S_0 = \frac{n_A^* + n_B^* s_0}{n_A^* + n_B^*} \tag{14}$$

Therefore, any bias in the noise trader estimates will have a stronger impact on prices if noise traders represent a greater fraction of total stock demand.

The firm's optimal level of capital is then:

$$K^* = \left(I - \frac{q}{\gamma} \frac{1}{n_A^* + n_B^*} \right) (1 - \lambda \phi S_0)^{-1} \tag{15}$$

and the optimal level of employment is:

$$L^* = \left(\frac{\alpha}{w} \bar{\theta} \right)^{\frac{1}{1-\alpha}} \left(I - \frac{q}{\gamma} \frac{1}{n_A^* + n_B^*} \right) (1 - \lambda \phi S_0)^{-1} \tag{16}$$

Note that (16) is made up of two pieces. One is set by the manager and incorporates the true probability of default of the project. The other instead depends on the stock market and is therefore affected by sentiment. In equilibrium, sentiment increases both employment and wages as follows:

$$\frac{dL^*}{dS_0} \frac{S_0}{L^*} = \frac{\lambda \phi S_0}{1 - \lambda \phi S_0 + \frac{1 - (1-\alpha)\lambda \phi S_0}{(1-\alpha)\varepsilon}} > 0 \tag{17}$$

$$\frac{dw^*}{dS_0} \frac{S_0}{w^*} = \frac{\lambda \phi S_0}{(1 - \lambda \phi S_0)\varepsilon + \frac{1 - (1-\alpha)\lambda \phi S_0}{(1-\alpha)}} > 0 \tag{18}$$

as long as the elasticity of labor supply (ε) is finite[4]. In particular, for each sentiment-driven euro received, a fraction $1-\lambda$ is kept by the manager and the rest is used to hire new workers. However, if sentiment is positive (negative), this leads to over-hiring (under-hiring). In fact, the demand for the firm's product does not change with sentiment[5]. Therefore, following high sentiment firms should experience a decrease in efficiency, i.e. lower labor productivity.

3.2 Two-industry *n*-country model

Now consider a world with *n* countries and two industries. The two industries are characterized by high and low productivity respectively. In particular, the high (low) productivity industry hires high-skill (low-skill) workers. Workers cannot move freely across industries because employment in a given industry requires specific and irreversible investments in human capital. Therefore, this friction to inter-industry job reallocation creates a wage differential in equilibrium. In particular, the high-productivity industry pays higher wages:

$$\frac{dw^*}{d\theta}\frac{\theta}{w^*} = \frac{1}{(1-\lambda\phi S_0)(1-\alpha)\varepsilon + 1-(1-\alpha)\lambda\phi S_0} > 0 \tag{19}$$

and also relies more on external finance:

$$\frac{dK^*}{d\theta}\frac{\theta}{K^*} = \frac{\lambda\phi S_0}{1-\lambda\phi S_0}\frac{1}{1-\alpha}\left(1-\frac{\alpha}{1-\alpha}\frac{dw^*}{d\theta}\frac{\theta}{w^*}\right) > 0 \tag{20}$$

for a given level of the manager's wealth. On the other hand the *n* countries differ in their level of financial development λ. In particular, if country *i* is more financially developed than country *j* (i.e. $\lambda_i > \lambda_j$) then it has a higher level of employment:

[4] As in Pagano and Pica (2012), we do not model labor supply. Rather, we consider a generic upward-sloping function.
[5] Assuming the firm is a price taker in a perfectly competitive market.

$$\frac{dL^*}{d\lambda}\frac{\lambda}{L^*} = \frac{\lambda\phi S_0}{1-\lambda\phi S_0 + \dfrac{1-(1-\alpha)\lambda\phi S_0}{(1-\alpha)\varepsilon}} > 0 \tag{21}$$

and pays higher wages:

$$\frac{dw^*}{d\lambda}\frac{\lambda}{w^*} = \frac{\lambda\phi S_0}{(1-\lambda\phi S_0)\varepsilon + \dfrac{1-(1-\alpha)\lambda\phi S_0}{(1-\alpha)}} > 0 \tag{22}$$

Therefore, workers in countries with lower financial development are cheaper. In particular, other things being equal, it is optimal for the firm to hire employees in less developed countries where the type of labor they seek (high or low skill) is in greater net supply. Since country *j*'s proportion of high-skilled workers over total workforce (η_j) depends on the level of human capital in that country, then it is optimal to hire high-skill (low-skill) labor in high (low) human capital countries.

This strategy implies two different patterns of wage growth in country *j* depending on η_j. Consider the average wage in country *j* at time *t*:

$$w_t = \frac{w_H L_t(\theta_H) + w_L L_t(\theta_L)}{L_t(\theta_H) + L_t(\theta_L)} \equiv w_L + \eta_t(w_H - w_L) \tag{23}$$

where w_H and w_L are the equilibrium wages in the high and low productivity industry respectively. Now consider an increase in labor demand from country *i* at time $t + \Delta$. If the hiring firm is a price taker in the local labor market, wage growth between *t* and $t + \Delta$ is:

$$\frac{w_{t+\Delta} - w_t}{w_t} = \frac{\eta_{t+\Delta} - \eta_t}{\eta_t + \dfrac{w_L}{w_H - w_L}} \tag{24}$$

which means its sign depends on $\eta_{t+\Delta} - \eta_t$, i.e. on the change in the proportion of high-skill labor over total workforce. This implies that countries with high (low) human capital should experience positive (negative) wage growth following greater sentiment-driven labor demand. Therefore, investor sentiment should have cross-sectional effects on wage growth.

3.3 Model predictions

The main predictions from the model can be summed up as follows. An increase in investor sentiment should lead to:

1) higher employment growth worldwide, especially in countries with higher financial development (λ) and/or higher external dependence (*K*);
2) lower labor productivity, due to a sub-optimal level of employment;
3) higher (lower) wage growth in countries with high (low) human capital.

Next, we take these predictions to the data.

4. Empirical analysis

4.1 Data and methods

Our empirical analysis studies the effects of US investor sentiment on labor markets worldwide. The reason we choose the US as our reference country is that it represents one of most financially developed economies and its firms typically carry out a nontrivial part of their operations abroad. Also, the US is virtually the only country for which a widely accepted measure of investor sentiment is available (Baker and Wurgler, 2006, 2007; Baker, Wurgler and Yuan, 2012).

In order to analyze the effect of US sentiment on non-US labor markets, we consider a large panel of countries from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database) that spans the period 1970-2003. Following Pagano and Pica (2012) we consider the 2006 release, as the following ones have more missing observations. We only consider countries for which at least 10 observations are available, for a

total of 113 countries[6]. The dataset provides annual country-level statistics on the growth in employment, real wages and real value added.

Ideally, in order to capture the exact level of US sentiment-driven capital in a given country-industry we should observe the difference between the following two variables: (1) the *optimal* investment of US firms in that country-industry according and (2) the *actual* investment. The caveat of this approach however is that actual investments are usually aggregated at the country level with no sector breakdown, which would bring about a measurement error problem. Also, it is hard to produce a sensible estimate of the optimal investment in the first place, since country-sector specific economic conditions are typically not available for most countries.

In light of this, we choose to measure investor sentiment through Baker and Wurgler's (2006) index as our second-best. The major caveat of this measure is that it is rather broad: it does not reveal which part of US sentiment-driven capital is invested within the US or abroad, let alone the country or industry breakdown. If anything, however, the noise it entails should inflate standard errors and thus work against us. In contrast, this measure has two major advantages: (1) it is purged of US business cycle indicators and (2) it is unlikely to suffer from reverse causality.

In fact, the reverse causality story would be that US investor sentiment may rise in anticipation of improving world economic conditions. However, the index is orthogonalized to US economic indicators. Since the US economy is integrated with the rest of the world, it appears unlikely that the index might reflect the future state of the economy in foreign countries. Furthermore, we find that sentiment predicts a worldwide decrease in the efficiency of labor – lower labor productivity. This feature also appears to be an unlikely driver of US investor sentiment.

Following Rajan and Zingales (1998) and Pagano and Pica (2012), our baseline specification is:

[6] The countries we consider are: Algeria, Argentina, Australia, Austria, Bahamas, Bangladesh, Barbados, Belgium, Benin, Bolivia, Botswana, Bulgaria, Burkina-Faso, Burundi, Cameroon, Canada, Central African Republic, Chile, China, Colombia, Congo, Costa Rica, Cote d'Ivoire, Cuba, Cyprus, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Ethiopia and Eritrea, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Guatemala, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Kuwait, Latvia, Libyan Arab Jamahiriya, Luxembourg, Madagascar, Malawi, Malaysia, Malta, Mauritius, Mexico, Morocco, Myanmar, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Romania, Russia, Rwanda, Senegal, Seychelles, Singapore, Slovenia, Somalia, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, United Kingdom, United Republic of Tanzania, Uruguay, Venezuela, Yugoslavia, Zambia, Zimbabwe.

$$y_{cit} = \beta_0 + \beta_1 S_{t-1} + \beta_2 share_{cit-1} + \beta_3 FD_c + \beta_4 ED_i + \beta_5 (FD_c \times ED_i) + \\ + \beta_6 (S_{t-1} \times FD_c) + \beta_7 (S_{t-1} \times ED_i) + \beta_8 (S_{t-1} \times FD_c \times ED_i) + \\ + \mu_c + \mu_i + \mu_t + \varepsilon_{cit} \quad (25)$$

where y_{cit} represents the following four dependent variables in country *c*, sector *i* at time *t*: employment growth; real value added growth; labor productivity, defined as the difference between real value added growth and employment growth; and real wages growth. The other variables are as follows: $share_{cit-1}$ denotes the industry's share of y_{cit} in the manufacturing sector in the previous year; S_{t-1} is Baker and Wurgler's (2006) index of investor sentiment, orthogonalized to business cycle indicators and lagged one year. FD_c is financial development of country c, defined as stock market capitalization over GDP (1980-95 average); ED_i is external dependence of firms in sector *i*, defined as in Rajan and Zingales (1998) as the reliance on external finance of US listed firms in the Compustat database; μ_c, μ_i and μ_t are country, sector and year fixed effects respectively. Standard errors are clustered by country.

Finally we look into the idea that finance has a 'dark side', i.e. the firms that benefit most from financial development in good times are also the ones that are hit the hardest in bad times (Pagano and Pica, 2012). To this purpose we perform the same empirical test that they propose, but we also add interaction terms with sentiment. Therefore, our regression equation is:

$$y_{cit} = \beta_0 + \beta_1 S_{t-1} + \beta_2 share_{cit-1} + \beta_3 (FD_c \times ED_i) + \beta_4 (crisis_{ct} \times ED_i) + \\ + \beta_5 (crisis_{ct} \times FD_c \times ED_i) + \beta_6 (S_{t-1} \times FD_c \times ED_i) + \beta_7 (S_{t-1} \times ED_i \times crisis_{ct}) + \\ + \mu_c + \mu_i + \mu_t + \varepsilon_{cit} \quad (26)$$

where 'crisis' represents a banking crisis in country *c* at time *t* from Laeven and Valencia (2010).

4.2 Results

Table 1 presents some sample statistics. The sample size includes more than sixty thousand observations, of which almost two thirds are for non-OECD countries. The average annual employment growth in the full sample is 2.05%. However, there is a sharp difference between OECD countries and non-OECD countries. The former exhibit near-zero growth (-0.15%)

whereas the latter has strong positive growth (3.19%). Average real value added growth is 3.80% in the full sample and is fairly stable across both OECD and non-OECD countries (2.98% vs. 4.20%). Labor productivity is 1.76% overall, but it is much higher for OECD countries (3.25%) than it is for non-OECD countries (1.00%). Average wage growth is 1.37% for the full sample, but again it is much stronger for OECD countries (3.10%) than for non-OECD countries (0.50%). Interestingly, non-OECD countries exhibit a higher standard deviation and a wider range across all four measures considered.

Tables 2 and 3 present the regression output for our baseline specification. Table 2 shows that employment growth seems indeed to be affected by sentiment. A 1 standard deviation increase in sentiment in a given year is followed by an increase in employment growth worldwide by 3.29% (t-stat 3.93). The effect is more pronounced for developing countries (4.05%, t-stat 2.79) than for developed countries (2.69%, t-stat 4.94). This is consistent with the model's prediction that following high sentiment, countries with higher financial development have an incentive to hire workers in countries with lower financial development. Interestingly, however, sentiment does not affect much real value added growth. The coefficient for the full sample is positive but not significant (1.15%, t-stat 1.46). In particular, it is near-zero for OECD countries (-0.29%, t-stat -0.47) but positive and significant for non-OECD countries (2.27%, t-stat 2.03). Therefore, it seems that the economies of developing countries are stimulated by US investor sentiment.

Table 3 shows that labor productivity is negatively affected by sentiment. In fact, a 1% standard deviation increase in US investor sentiment is followed by a decrease in labor productivity by 2.46% (t-stat -2.69). The effect is quite similar across OECD countries (-2.96%, t-stat -6.47) and non-OECD countries (-2.20%, t-stat -1.29), except that the latter is not significant. Finally, the effect of sentiment on real wage growth is negative overall. A 1% standard deviation increase in sentiment is followed by a decrease in wage growth by 2.91% (t-stat -3.36) and the effect is similar across OECD countries (-2.94%, -3.71) and non-OECD countries (-3.22%, t-stat -2.02).

However, the model suggests that sentiment might have cross-sectional effects on real wage growth. In particular, the effect should be positive (negative) for countries with high (low) levels of human capital. Following Rajan and Zingales (1998) we define human capital as average years of schooling in population over 25 as of 1970 from the Barro-Lee files on the National

Bureau of Economic Research web site. However, since its relationship with our measures of growth might be endogenous, we use the country's legal system origin as a proxy. In particular, we classify countries in French, British, German and Scandinavian legal system as in La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998). Table 3 reports some sample statistics. The majority of countries in the sample have a French legal system (49%), followed by the British (28%), German (6%) and Scandinavian (6%) systems. The mean level of human capital goes from 5.07 for the French legal system all the way up to 9.86 for the Scandinavian one, with the UK (5.62) and Germany (7.41) in between. Interestingly, the correlation between human capital and legal system is large and negative for the French legal system (-0.30, p-value 0.1%) but large and positive for the Scandinavian legal system (0.47, p-value 0.1%). Therefore, we pick them as our two extremes on the human capital scale.

In light of this, we re-estimate our baseline regression by breaking down the sample into four subsamples, one for each legal system. The effect of sentiment on employment growth (Panel A) is rather similar all throughout. Real value added growth is largely unaffected by sentiment (Panel B), except (marginally) for the British legal system (2.62%, t-stat 1.77). The effect on labor productivity (Panel C) is mixed. Sentiment prompts a decrease in labor productivity all throughout, but the drop is significant only for the French (-2.44%, t-stat -2.16) and the German (-2.18%, t-stat -2.65) legal systems. Finally, Panel D unveils a cross-sectional pattern in the effect of sentiment on real wage growth. The effect of sentiment on real wage growth is negative e in the subsample of countries with the lowest level of human capital (-3.56%, t-stat -2.94), but positive in the subsample of countries that ranks highest on the human capital scale (1.07%, t-stat 2.87). This is consistent with the model's predictions.

Rajan and Zingales (1998) find that financial development helps industries that rely more on external finance grow disproportionately faster than other industries. Pagano and Pica (2012) document that this finding applies not only to real value added growth, but also to employment growth – even though only for non-OECD countries. The model we propose suggests that in the presence of sentiment this measure should have an even stronger effect. To test this conjecture, we introduce a triple interaction term between a country's level of financial development, an industry's need for external finance and lagged US investor sentiment in our baseline specifications from Tables 2 and 3. We find that employment growth is 3.26% higher (t-stat 2.11) for externally dependent industries in financially developed countries, but the effect

increases by another 2.23% (t-stat 2.18) when conditioning on sentiment. A breakdown in OECD vs. non-OECD countries shows that the result is essentially driven by the latter (2.42%, t-stat 1.95), as the coefficient become insignificant for OECD countries (1.45%, t-stat 1.55). On the other hand, the triple interaction term seems to have no effect on the other dependent variables we consider. Overall, these results are consistent with Pagano and Pica's (2012) findings.

Finally we test the conjecture that finance has a 'dark side' and that sentiment amplifies this effect. To this purpose we estimate equation (26). The results are in Table 6. We find that conditional on sentiment in the previous year, the impact of financial crises on externally dependent industries is stronger. In particular, we document that employment growth drops by 1.61% (t-stat -1.76), real value added by 5.81% (t-stat -2.33) and labor productivity by 3.96% (t-stat -1.77). Real wages growth instead is hardly affected (-0.37%, t-stat -0.46). The effects are therefore mildly consistent with the conjecture that finance has as dark side. In particular, this side is even darker in the presence of sentiment.

5. Conclusion

We find that in a world with moral hazard and noise traders, investor sentiment should affect a firm's employment policy. Consistent with the model's predictions, we show that higher US sentiment leads to higher employment growth worldwide. However, the increase in employment is not justified by economic fundamentals. In fact, firms hire a suboptimal number of employees, which leads to a general decrease in labor productivity. The effect of sentiment on wage growth is mixed. In fact, following high sentiment wage growth goes up (down) in countries with high (low) human capital. The intuition is that firms will hire workers in countries where the particular type of work they are looking for (high or low skill) is in greater net supply, which then creates a cross-sectional pattern. Finally, we document that sentiment exacerbates the effect of financial crises on labor, especially for firms that rely more on external finance. This is consistent with the idea that finance has a 'dark side', i.e. the firms that benefit the most from financial development are also the ones that are hit the hardest during financial crises. Our findings suggest that sentiment amplifies this effect.

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Tables

Table 1
Sample statistics

Sample statistics for employment growth (Panel A), real value added growth (Panel B), labor productivity (Panel C) and real wage growth (Panel D) from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database). The dataset includes three-digit industries for 113 countries for the period 1970-2003.

Panel A. Employment growth

	Observations	Mean	Std. Dev.	Min	Max
Full sample	61626	0.0205	0.2594	-5.3122	6.5796
OECD	20970	-0.0015	0.1338	-3.2355	2.2907
Non-OECD	40656	0.0319	0.3040	-5.3122	6.5796

Panel B. Real value added growth

	Observations	Mean	Std. Dev.	Min	Max
Full sample	64105	0.0380	0.4128	-22.8624	8.1424
OECD	21145	0.0298	0.2364	-4.0404	3.8498
Non-OECD	42960	0.0420	0.4761	-22.8625	8.1424

Panel C. Labor productivity

	Observations	Mean	Std. Dev.	Min	Max
Full sample	61626	0.0176	0.3289	-7.7062	5.3125
OECD	20970	0.0325	0.2070	-4.2949	3.8942
Non-OECD	40656	0.0100	0.3764	-7.7062	5.3125

Panel D. Real wage growth

	Observations	Mean	Std. Dev.	Min	Max
Full sample	59417	0.0137	0.2723	-14.9357	4.8288
OECD	20061	0.0310	0.1508	-1.8079	3.2429
Non-OECD	39356	0.0050	0.3164	-14.9357	4.8288

Table 2
Investor sentiment and growth

Panel regression of employment growth (columns 1-3) and real value added growth (columns 4-6) on lagged U.S. investor sentiment (S), defined as Baker and Wurgler's (2006) index orthogonalized to U.S. business cycle indicators. The dataset includes three-digit industries for 113 countries for the period 1970-2003 from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database). The main controls are: country, sector and year fixed effects; financial development (FD), defined as stock market capitalization over GDP (1980-95 average); external dependence (ED), defined as in Rajan and Zingales (1998) as the reliance on external finance of US listed firms in the Compustat database; the interaction between the two (FD x ED); the industry's share of the dependent variable in the manufacturing sector in the previous year. Standard errors are clustered by country. Columns (1) and (4) report the results for the full sample. Columns (2) and (5) report the results for the subsample of OECD countries. Columns (3) and (6) report the results for the subsample of non-OECD countries.

	Employment Growth			Real Value Added Growth		
	(1) Full	(2) OECD	(3) Non-OECD	(4) Full	(5) OECD	(6) Non-OECD
Share (-1)	-0.2335***	-0.1025***	-0.3247***	-0.5452***	-0.3876***	-0.6708***
	(-4.34)	(-2.79)	(-4.37)	(-6.40)	(-3.93)	(-5.63)
FD x ED	0.0326**	0.0100	0.0395**	0.0517**	-0.0085	0.0672***
	(2.11)	(0.81)	(1.97)	(2.57)	(-0.48)	(2.59)
S (-1)	0.0329***	0.0269***	0.0405***	0.0115	-0.0029	0.0227**
	(3.93)	(4.94)	(2.79)	(1.46)	(-0.47)	(2.03)
S (-1) x FD x ED	0.0223**	0.0145	0.0242*	0.0245	0.0288*	0.0242
	(2.18)	(1.55)	(1.95)	(1.55)	(1.89)	(1.25)
Controls	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	43293	18758	24535	44856	18900	25956

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 3
Investor sentiment, financial development and external dependence

Panel regression of labor productivity (columns 1-3), defined as the difference between real value added growth and employment growth, and real wage growth (columns 4-6) on lagged U.S. investor sentiment (S), defined as Baker and Wurgler's (2006) index orthogonalized to U.S. business cycle indicators. The dataset includes three-digit industries for 113 countries for the period 1970-2003 from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database). The main controls are: country, sector and year fixed effects; financial development (FD), defined as stock market capitalization over GDP (1980-95 average); external dependence (ED), defined as in Rajan and Zingales (1998) as the reliance on external finance of US listed firms in the Compustat database; the interaction between the two (FD x ED); the industry's share of the dependent variable in the manufacturing sector in the previous year. Standard errors are clustered by country. Columns (1) and (4) report the results for the full sample. Columns (2) and (5) report the results for the subsample of OECD countries. Columns (3) and (6) report the results for the subsample of non-OECD countries.

	Labor Productivity			Real Wage Growth		
	(1) Full	(2) OECD	(3) Non-OECD	(4) Full	(5) OECD	(6) Non-OECD
Share (-1)	-0.3923***	-0.3098***	-0.4647***	-0.0981***	-0.0878***	-0.1072***
	(-5.19)	(-4.59)	(-4.47)	(-8.77)	(-7.40)	(-7.55)
FD x ED	0.0196**	-0.0154*	0.0296***	0.0015	-0.0168**	0.0057
	(2.38)	(-1.68)	(2.97)	(0.21)	(-2.09)	(0.61)
S (-1)	-0.0246***	-0.0296***	-0.0220	-0.0291***	-0.0294***	-0.0322**
	(-2.69)	(-6.47)	(-1.29)	(-3.36)	(-3.71)	(-2.02)
S (-1) x FD x ED	0.0059	0.0145	0.0040	0.0062	0.0030	0.0071
	(0.62)	(0.90)	(0.38)	(1.18)	(0.63)	(1.15)
Controls	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	42033	18199	23834	43293	18758	24535

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4
Legal system and human capital

Classification of the countries in our sample according to the origin of their legal system. The breakdown is in French, British, German and Scandinavian legal systems as in La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998). For each legal system, the columns report the relative frequency ("Mean"); the mean level of human capital ("Mean HC"), defined as the average number of years of schooling in the population over 25 as of 1970 from the Barro-Lee files on the National Bureau of Economic Research web site; the correlation between legal system origin and level of human capital ("Correlation HC"). The data are annual and the sample period is from 1970 to 2003.

Legal System	Mean	Mean HC	Correlation HC
French	0.49	5.07	-0.30***
British	0.28	5.62	-0.11***
German	0.06	7.41	0.18***
Scandinavian	0.06	9.86	0.47***

* p<0.10, ** p<0.05, *** p<0.01

Table 5
Investor sentiment and growth: legal system breakdown

Panel regression of employment growth, real value added growth, labor productivity and real wages growth on lagged U.S. investor sentiment, defined as Baker and Wurgler's (2006) index orthogonalized to U.S. business cycle indicators. The dataset includes three-digit industries for 113 countries for the period 1970-2003 from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database). The sample is broken down into a different subsample for each legal system: French (FR), British (UK), German (GE) and Scandinavian (SC). Data on the origin of the legal system are from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998). The main controls are: country, sector and year fixed effects; financial development (FD), defined as stock market capitalization over GDP (1980-95 average); external dependence (ED), defined as in Rajan and Zingales (1998) as the reliance on external finance of US listed firms in the Compustat database; the interaction between the two (FD x ED); the industry's share of the dependent variable in the manufacturing sector in the previous year. Standard errors are clustered by country. The last two columns split the sample into OECD and non-OECD countries.

	FR	**UK**	**GE**	**SC**
Panel A: Employment Growth				
Investor Sentiment (-1)	0.0277**	0.0333***	0.0279***	0.0199**
	(2.46)	(4.43)	(3.24)	(2.12)
Panel B: Real Value Added Growth				
Investor Sentiment (-1)	0.0121	0.0262*	0.0053	0.0126
	(1.15)	(1.77)	(0.46)	(1.41)
Panel C: Labor Productivity				
Investor Sentiment (-1)	-0.0244**	-0.0077	-0.0218***	-0.0073
	(-2.16)	(-0.44)	(-2.65)	(-1.58)
Panel D: Real Wages Growth				
Investor Sentiment (-1)	-0.0356***	-0.0021	-0.0207	0.0107***
	(-2.94)	(-0.15)	(-1.42)	(2.87)

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 6
Investor sentiment, financial development and external dependence during crises

Panel regression of employment growth (column 1), real value added growth (column 2), labor productivity (column 3) and real wages growth (column 4). The regressors are: the industry's share of the dependent variable in the manufacturing sector in the previous year; financial development (FD), defined as stock market capitalization over GDP (1980-95 average); external dependence (ED), defined as in Rajan and Zingales (1998) as the reliance on external finance of US listed firms in the Compustat database; lagged U.S. investor sentiment (S), defined as Baker and Wurgler's (2006) index orthogonalized to U.S. business cycle indicators; a banking crisis dummy from Laeven and Valencia (2010); country, sector and year fixed effects. The dataset includes three-digit industries for 113 countries for the period 1970-2003 from UNIDO INDSTAT (United Nations Industrial Development Organization, Industrial Statistics Database). Standard errors are clustered by country.

	(1) Employment Growth	(2) Real Value Added Growth	(2) Labor Productivity	(2) Real Wages Growth
Share (-1)	-0.2336***	-0.5459***	-0.3929***	-0.0981***
	(-4.34)	(-6.41)	(-5.20)	(-8.77)
FD x ED	0.0349**	0.0556***	0.0210**	0.0021
	(2.13)	(2.69)	(2.54)	(0.28)
ED x crisis	0.0131	0.0493	0.0310	0.0072
	(0.69)	(0.89)	(0.76)	(0.73)
FD x ED x crisis	-0.0722	-0.1060	-0.0315	-0.0117
	(-1.21)	(-0.93)	(-0.40)	(-0.54)
S (-1)	-0.0067	-0.0068	-0.0030	-0.0031
	(-1.56)	(-1.26)	(-0.80)	(-1.48)
S (-1) x FD x ED	0.0239**	0.0245	0.0052	0.0068
	(2.27)	(1.52)	(0.60)	(1.34)
S (-1) x ED x crisis	-0.0161*	-0.0581**	-0.0396*	-0.0037
	(-1.76)	(-2.33)	(-1.77)	(-0.46)
Country FE	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
N	43293	44856	43293	42033

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01