

- Lustig, N., L. Lopez-Calva, and E. Ortiz-Juarez, 2013, "Deconstructing the Decline in Inequality in Latin America," Policy Research Working Paper, No. 6552. (Washington: World Bank).
- Mejia, L. F., D. C. Escobar, and D. M. Sastre, 2013, "Gasto en Intereses y Pensiones: Cómo se ve Colombia en la Región?", *Reporte de Hacienda, Ministerio de Hacienda y Crédito Público*, Vol. 4, No 2.
- Moller, L. C., 2012, "Fiscal Policy in Colombia: Tapping Its Potential for a More Equitable Society," Policy Research Working Papers, No. 6092 (Washington: World Bank).
- Organization for Economic Cooperation and Development, 2015, "Políticas Prioritarias para un Desarrollo Inclusivo," March.
- Ostry, J., A. Berg, and C. Tsangarides, 2014, "Redistribution, Inequality, and Growth," IMF Staff Discussion Note No. 14/02 (Washington: International Monetary Fund).
- Perry, G., W. F. Maloney, O. S. Arias, P. Fajnzylber, A. D. Mason, and J. Saavedra-Chanduvi, 2007, *Informality: Exit and Exclusion*. (Washington: World Bank).
- Rauniar, G., and R. Kanbur, 2010, "Inclusive Development: Two Papers on Conceptualization, Application, and the ADB Perspective" (Manila: Asian Development Bank).
- Ravallion, M., and S. Chen, 2003, "Measuring Pro-Poor Growth," *Economics Letters*. Vol. 73. pp. 93–99.
- World Bank, 2011, "A Break with History: Fifteen Years of Inequality Reduction in Latin America," (Washington).

THE ROLE OF LABOR FRICTIONS IN COLOMBIA'S RECENT ECONOMIC PERFORMANCE¹

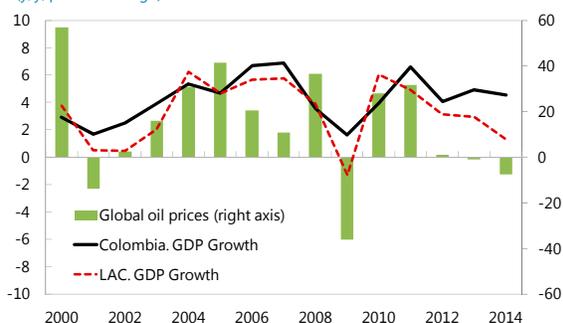
Colombia has sustained strong growth and outpaced its regional peers in recent years and recently implemented an important tax reform to foster labor formality. This paper quantifies the role that improvements in labor market distortions have had in Colombia's recent economic performance; it finds that they have had a significant role in the evolution not only of GDP but also employment and investment.

A. Introduction

1. Colombia's recent economic performance stands out among its peers. Colombia's economic growth has outpaced the region average in most of the years over the last decade; it also been more stable (standard deviation 1.7 for Colombia and 2.3 for the region average), despite being exposed to large swings in oil prices. Further, the 2008–09 crisis affected the region greatly; at the same time, the degree to which countries have closed the gap between their GDP (level) and the one that would have resulted if the pre-crisis (2003–08Q3) growth trend had prevailed, has varied greatly.² Colombia stands out in this dimension as well; its GDP is currently only about 8 percent below the previous trend, which represents the second strongest recovery among the financially integrated countries in the region (LA6)—only marginally weaker than Mexico (7 percent).

Colombia: Strong Economic Performance

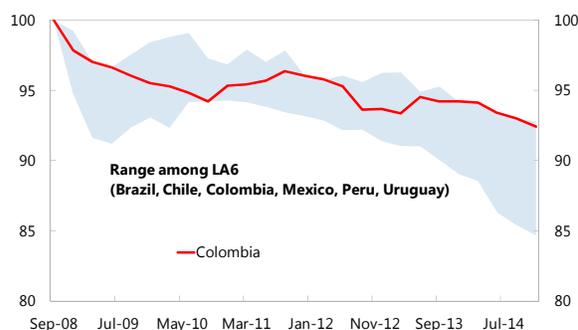
(y/y; percent change)



Source: Fund staff estimates based on WEO.

Colombia has had a Strong Post-Crisis Recovery

(Relative index pre-crisis trend=100; includes Brazil, Chile, Colombia, Mexico, Peru, Uruguay)



Sources: Author's calculations.

¹ Prepared by Daniel Rodríguez-Delgado. Valerie Cerra and seminar participants at the Central Bank of Colombia provided useful comments.

² It is relevant to say at this juncture, that this comparison against the pre-crisis trend is for illustrative purposes only and does not affect the methodology or results of the paper. In particular, it does not intend to argue that absent the crisis, the previous trend would have continued.

2. Employment has been an important growth driver in Colombia during the last decade.

A standard growth accounting decomposition, suggests that employment growth (total hours worked) was the most significant growth contributor during 2000–10, followed by capital accumulation. Total factor productivity, in contrast, remained stagnant during this period. In the most recent years, 2011–14, employment growth's contribution has lagged behind capital accumulation but still contributed with about 1/3 of total GDP growth.

Colombia: Growth Decomposition (percentage points)

	GDP 1/	Capital 2/	Labor 3/	TFP
2000-08	4.1	1.9	1.8	0.4
2009	1.6	0.2	1.3	0.1
2010	3.9	3.1	3.5	-2.7
2011-14	4.9	2.7	1.7	0.6

Sources: Ministry of Finance, Central Bank and Fund staff estimates and projections

1/ Capital share 0.40. Depreciation 6 percent. Adjusts capital for utilization and labor for hours worked

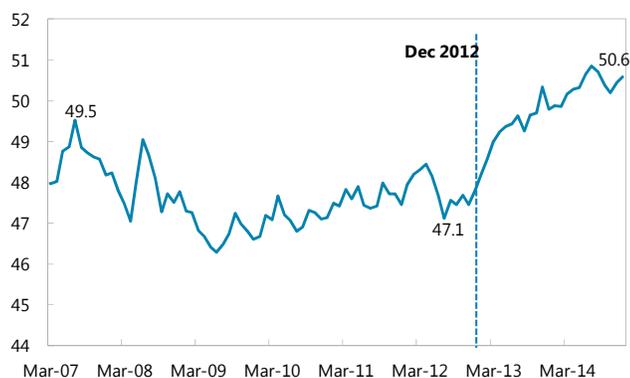
2/ For projections assumes capacity utilization at historical average

3/ For projections assumes hours worked at historical average

3. Colombia implemented an important tax reform in 2012 aimed to reduce the labor tax-burden.

The tax reform's key component was the replacement of some payroll related taxes earmarked for social benefits with a corporate income tax surcharge. By reducing the tax burden to become formal worker, the reform aimed to reduce the widespread informality. The reform became effective in 2013 and although it is early to make a complete assessment of its impact, labor formality has indeed increased since end-2012.

Employment Formality
(Share of total employment; in percent)



Sources: DANE and Fund staff estimates.

4. In this context, this paper uses the Business Cycle Accounting (BCA) methodology to quantify the role that labor market distortions have had in the observed evolution of GDP and other macroeconomic variables.

Intuitively, this methodology asks: by how much one would need to distort a standard growth model so that it is able to replicate the observed data? In this paper we allow for four different types of distortions, each one affecting an equilibrium condition of the

growth model: efficiency (total factor productivity), labor, capital and bond distortions. Distortions are modeled as time-varying shocks and represent the combined effect of structural features such as market imperfections, institutional frameworks, and higher frequency events such as changes in global and local financial conditions, domestic policy decisions, etc (more on this below).

5. This paper builds upon recent applications of the BCA methodology. This paper follows closely Lama (2011), which finds that in episodes of output drop in Latin America during 1990–2006, the labor and efficiency distortions played a dominant role. A similar finding is presented by Cho and Doblas-Madrid (forthcoming) using a larger sample of countries and considering 1980–2006. Further, they find that these two distortions are also key drivers during *recovery* periods. Simonovska and Soderling (2008) present similar results for Chile for the period 1999–2007. In this paper, we apply a similar methodology to the most recent growth experience in Colombia.

6. The main findings are as follows. The model simulations suggest that the contribution of different distortions has been uneven. In particular, changes in labor and efficiency distortions have driven GDP dynamics most closely. In contrast, distortions related to capital accumulation and international borrowing, appear to have played a less important role. Regarding labor distortions, estimation suggests they have eased significantly since late 2008, received an additional boost since end 2012 and have had a quantitatively important role not only in GDP but also in investment and employment.

B. Business Cycle Accounting Methodology

7. As its core, the BCA methodology consists on enriching a standard neoclassical growth model with reduced-form representations of distortions; in this chapter: efficiency, labor, capital and bond/borrowing distortions. The methodology identifies the stochastic process of the distortions most likely to have generated the data. This section follows Lama (2011) who extends Chari et al. (2007)'s methodology to identify frictions that are relevant for explaining economic fluctuations. This is a two-step procedure: (1) estimate the distortions or deviations between the standard neoclassical growth model and the data; (2) evaluate the quantitative relevance of each individual distortion to account for the observed evolution of GDP and other macroeconomic variables.

8. The BCA methodology shares some elements with standard growth decomposition analysis but also has important differences. Similar to traditional growth accounting, the BCA aims to determine the main drivers of the observed dynamics for output, investment, consumption, etc. In contrast with the traditional growth accounting, however, it focuses on identifying which class of distortions induced economic agents to *choose* the dynamics observed in the data. These distortions are modeled as time-varying shocks. While both the growth accounting and the BCA techniques aim to decompose observed dynamics into its subcomponents, there are important differences in how they disentangle the role of “fundamentals”. In short, the BCA aims to incorporate the role of economic agents' decisions, while the growth accounting technique offers a more algebraic decomposition that abstracts from the fact that agents would have chosen different consumption, investment and labor decisions if the fundamentals were different. For example, in

computing the role of efficiency (TFP), the BCA methodology incorporates the fact that investment and employment would have been different if efficiency were to be different; while, the standard growth accounting simply shuts-down productivity growth and assumes investment and employment would be unaffected by such change. Finally, it can be argued that the richer set of questions that the BCA aims to answer is at the expense of requiring additional assumptions than basic growth accounting; for instance, in this paper we assume a standard separable utility function, a stand-in consumer and producer.

9. The setup presented in this paper models distortions as reduced form representations of structural factors. As it is common in the literature, it is useful to think of the modeled distortions as taxes; however, taxation could be just one of many factors causing a wedge between the standard neoclassical growth model and data. Below the paper introduces each type of distortion and briefly mentions some candidate structural factors that could endogenously generate such distortion.

10. As in Lama (2011), the prototype model used in this paper includes a standard representative consumer and firm.

- Stand-in consumers. Consumers maximize expected utility (equation 1) which depends on per capita consumption and per capita labor, subject to the budget constraint, and the law of motion for capital. As it is standard in this type of model, adjustment costs are assumed both for capital (K_t) and debt ($-b_t$) accumulation as in equations 5 and 6 below.

$$\max_{c_t, l_t} E_0 \sum_{t=0}^{\infty} N_t \beta^t U(C_t, l_t) \quad (1)$$

$$(1+n)b_{t+1} + C_t + i_t \leq (1-\tau_{lt})w_t l_t + (1-\tau_{kt})r_t k_t + (1+\tau_{bt})(1+r_t^*)b_t + T_t. \quad (2)$$

$$(1+n)K_{t+1} = (1-\delta)K_t + i_t - \phi(i_t/K_t)K_t. \quad (3)$$

$$(1+r_t^*) = (1+r^*) \left(\frac{b_t}{b^*} \right) \quad (4)$$

- Firms have access to constant returns to scale technology with labor augmenting technological progress and choose capital and labor to maximize profits (equation 7) each period. In this specification, $(1+\gamma)$ is the rate of labor augmenting technical progress—assumed to be constant over time. At is the efficiency distortion.

$$\pi = A_t F(K_t, (1+\gamma)^t l_t) - w_t l_t - r_t k_t \quad (5)$$

11. The key equilibrium conditions determining the measured distortions can be summarized by the following equations:

- Capital/investment: distortions to the inter-temporal allocation of consumption and investment are capture by the term $(1-\tau_{kt})$ as in equation [6]. Models in which the availability of financing to capital investors depend on their net worth (e.g. models with default in which a higher net worth would make default less likely) are relevant candidates to generate this type of friction.

$$U_{ct} = \beta E[U_{ct+1} \{ (1-\tau_{kt+1}) A_{t+1} F_{kt+1} + (1-\delta) \}] \quad (6)$$

- Efficiency (TFP): gap between GDP and the combination of capital and labor. This represents the standard exogenous TFP shock commonly used in the literature. However, it is relevant to consider models that would generate this distortion endogenously. For example, trade frictions could limit firms' exposure to foreign technology and knowledge. Matching/pairing frictions in the labor market could also result in a suboptimal allocation of skills resulting in lower observed TFP. At this moment, it is useful to note that the previous example represents one in which, a labor market-related distortion would manifest itself beyond what in this chapter is labeled as *labor distortion*.

$$A_t = \frac{Y_t}{F_t} \quad (7)$$

- Bond: distortions to the debt accumulation decision. For example, this distortion could reflect risk premium, or the presence of enforcement-related borrowing constraints.

$$U_{ct} = \beta E[U_{ct+1} \{(1 + \tau_{bt+1})(1 + r_{t+1}^*)\}] \quad (8)$$

- Labor: distortions to the intra-temporal allocation of leisure and consumption. In the literature there a few mechanisms which have been shown to generate this type of distortions including those related to taxes (Ohanian, Raffo and Rogerson, 2008) and wage markups created by sticky wages or strong labor unions (Chari, et al., 2007).

$$-\frac{U_{lt}}{U_{ct}} = (1 - \tau_{lt}) A_t F_{lt} \quad (9)$$

Neumeyer and Perri (2005) put forward an alternative mechanism based on working capital requirements. Under this mechanism, the firms total labor costs would also include a financial component so that more restrictive access to credit would represent a worsening of the labor distortions (Lama, 2011). For example, if firms had to borrow at rate R , to cover a fraction p of their wage bill, the equilibrium conditions will include an equation akin to equation 9, where $(1 - \tau_{lt}) = 1/(1 + pR)$. An important remark is in order. As the previous example demonstrates, improvements in labor distortions would not necessarily depend on labor reforms; in fact, this example shows that reforms or policy actions (e.g. monetary policy rate cuts) aimed to improve credit availability among firms could drive what in this paper is measured as labor distortions.

More recent literature, e.g. Cheremukhin and Restrepo-Echavarria (2014), has shown that the degree of efficiency of the matching process between employers and employees can give rise to the labor distortions measured in this paper.

- Shimer (2009) provides an overview of the literature regarding the "labor wedge" which has looked both at a long-term cross-country difference in labor distortions, as well as business cycle fluctuations of labor distortions. This chapter relates more to the latter part of the literature by looking at detrended quarterly data. There it is important magnitude convention regarding the distortions modeled here that is worth emphasizing at this point. In all estimations and simulations presented in this paper, a *higher value of the distortion factor or wedge, $(1 - \tau)$, would represents a situation closer to "first-best"*. Intuitively, and specially for the labor distortion

term, a natural “prior” conjecture would be that the higher the value of the distortion factor, the higher the equilibrium level of GDP and employment.

12. The calibration and estimation of the model are as follows:

- We assume a Cobb-Douglas production function and a utility function of the form:

$$U(c, l) = \log c + \psi \log(1 - l) \quad (10a)$$

$$F(k, l) = Ak^\alpha l^{1-\alpha} \quad (10b)$$

- The capital adjustment cost is defined by

$$\phi\left(\frac{i}{k}\right) = \frac{\alpha}{2} \left(\frac{i}{k} - \delta - \gamma - \eta - \gamma\eta\right)^2 \quad (11)$$

- The stochastic processes is modeled as a VAR (1):

$$Z_t = \left[\log\left(\frac{A_t}{A}\right), \log\left(\frac{1-\tau_{lt}}{1-\tau_{lt}}\right), \log\left(\frac{1-\tau_{kt}}{1-\tau_k}\right), \log\left(\frac{1+\tau_{bt}}{1+\tau_b}\right) \right] \quad (12)$$

$$Z_t = AZ_{t-1} + \varepsilon_t \quad (13)$$

- The shocks are iid and have a standard normal distribution. From this point forward, all variables are expressed in detrended per capita (in fact, per working age population) terms, with the exception of labor/employment.

13. The general identification strategy is to calibrate the parameters of the model related to technology, preferences, and population growth, and estimate the parameters of the stochastic processes with maximum likelihood. The model is log-linearized around its steady state. Some of the parameters are calibrated to match the main features of Colombia’s quarterly data; otherwise we use rely on standard values used in the literature as to improve comparability with other studies. Ψ is calibrated based on the employment to working age population ratio and hours. The discount factor β is calibrated from the Euler equation (8) at steady state. The capital intensity parameter is set at a standard value in the literature (0.40). The rate of technological progress (γ) and population growth are calculated from the data. We use a standard annual depreciation rate of 5 percent and calibrate the capital adjustment cost as in Lama (2011).

C. Results

14. In his section we apply the calibrated and estimated parameters to recover values for the various distortions consistent with the data. We then infer the relative importance of the various distortions to output, employment and investment fluctuations through two counterfactual scenarios.

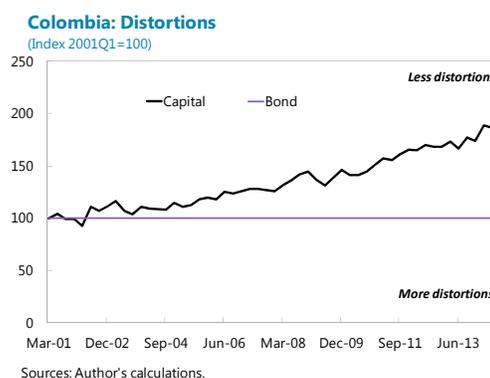
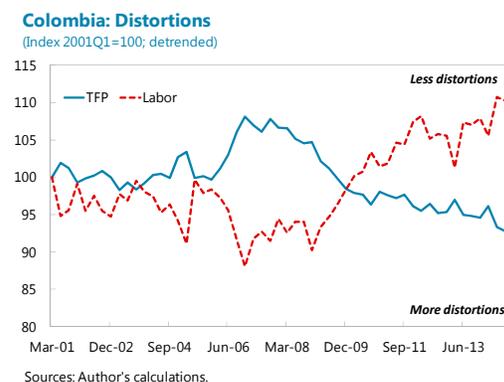
- Introducing each distortion individually.** *The simulations depict the counterfactual level of GDP (investment or employment) in the case that only the specified distortion is as*

estimated, and all others distortions are constant at their steady state level. The goal is to determine which distortion is capable of generating a path for GDP (or investment, or employment) more correlated to the one observed in the data. A model with all distortions at their trend level would generate constant series in which each variable (GDP, investment, labor, and consumption) would be equal to its steady state level.

- b. **Introducing all distortions except labor distortions.** In order to determine the quantitative importance of labor distortions, the paper also computes the amount of GDP (or employment or investment) that would have been lost if labor distortions had remained at their steady state value.

Measured distortions

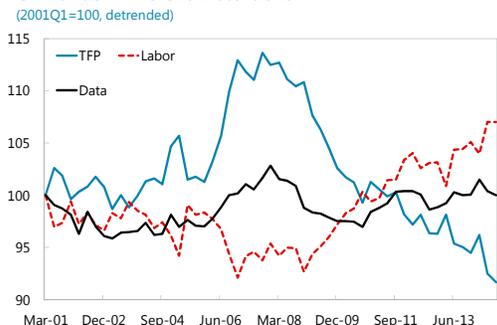
15. The estimation confirms the relatively weak performance of productivity but also some improvement in labor and capital distortions. In particular, efficiency peaked in late 2006 and has declined about 14 percent since then. In contrast, labor distortions have eased by about 20 percent since late 2008, and by about 5 percent since end-2012. At the same time, distortions to the inter-temporal allocation of consumption and investments have improved steadily since 2001.



Explanatory power of each distortions

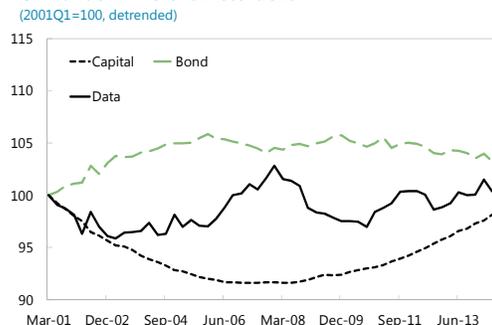
16. Labor and efficiency distortions have been the two most significant drivers of GDP. Counterfactual simulations suggest that no single distortion has been the sole driver of GDP. At the same time, in terms of the correlation between observed data and the counterfactual GDP path with only one distortion at play, efficiency and labor distortions stand as the most important drivers of GDP; such correlations are 0.28 and 0.11 for efficiency and labor, respectively. The correlation using only capital or bond distortions generate a correlation very close to zero.

GDP under Different Distortions
(2001:Q1=100, detrended)



Source: Author's calculations.

GDP under Different Distortions
(2001:Q1=100, detrended)



Source: Author's calculations.

Quantitative importance of labor distortions

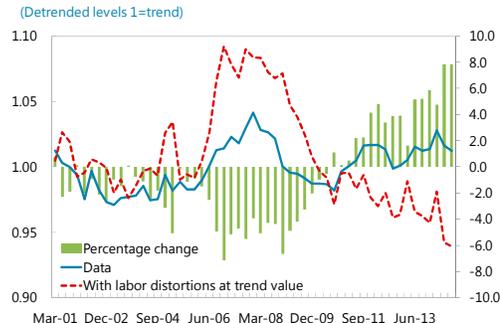
17. The improvement in labor distortions since late 2008 has had important effects.

First, counterfactual simulations suggests that toward end 2014, GDP was about 8 percent higher than the level that would have resulted if labor distortions had remained at their trend value (top chart in accompanying panel). The framework used in this paper also sheds light on how that additional GDP comes about—this is an advantage of this framework vis-à-vis traditional growth accounting. In particular, the simulation suggests that the investment (and by consequence, capital) and employment would have been 8, and 12 percent higher, respectively, than in an equilibrium with labor distortions at trend value. The complementarity between investment and labor distortions is worth emphasizing. For instance, in essence, a key role of the 2012 tax reform was to tilt or bias production’s decision toward labor (or at least formal labor); the simulation suggests that in practice improvements in labor distortions can generate simultaneously a boost in labor and investment.

D. Conclusion

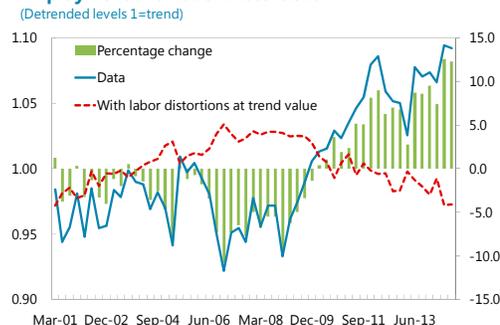
18. The analysis in this chapter confirmed the dominant role of labor and efficiency distortions in Colombia’s recent economic performance, also found in other cross-country

GDP and Labor Distortions
(Detrended levels 1=trend)



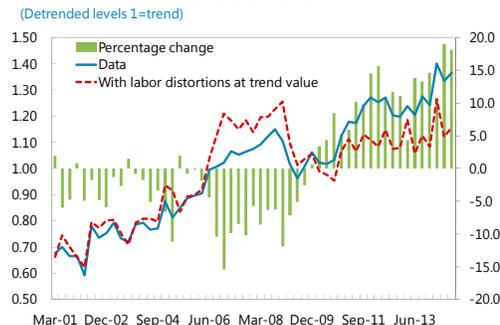
Sources: Haver and Fund staff estimates.

Employment and Labor Distortions
(Detrended levels 1=trend)



Sources: Fund staff estimates.

Investment and Labor Distortions
(Detrended levels 1=trend)



Sources: Fund staff estimates.

studies. This analysis suggests therefore, that to further understand the key factors including the effect of policies, it would be important to look into mechanisms and models that would generate changes in TFP as well as in any deviations from the neoclassical equilibrium condition for the consumption-leisure allocation.

19. The steady improvement in the labor distortions in Colombia since 2008, clearly deserves more analysis as its continued improvement going forward might represent an important offset to dimmer external conditions. As mentioned before, among potential fundamental drivers of labor distortions the literature has highlighted factors related to the financial burden of covering payroll expenses as well as the efficiency of the matching process between employers and employees. As preliminary evidence, the next table, shows a simple regression of the labor distortion identified by the model on commercial (real) lending rates and the level of labor formality in the economy. Regarding the latter, the implied conjecture is that a formal labor market involves a rather more established and, likely, less burdensome matching process. The regression results suggest these two factors have played an important role in the evolution of the labor distortion in Colombia (e.g. R-square>0.5); albeit they also leave a significant component of the measured distortion to be explained by other factors. The fitted values from the regression match well the overall path of the labor distortion except for values around 2012, when the regression generates a worsening but data suggests an improvement. Further, studying in more detail the earlier evolution of labor distortions around the 2002 labor reform could also shed light on specific structural drivers. For instance, despite that the reform allowed more flexibility of labor contracts and foster on-the-job training (apprenticeships) the measured labor distortions do not show a significant improvement. As discussed in IMF (2005), it is possible that the effects of that reform, however, might have taken some time to yield results in full.

Labor Distortions and Fundamentals 1/

Sample: 2007Q1-2014Q3

R-square: 0.533

	Coefficient	P-value	t-Statistic
Real lending rate	-3.7	0.0	-5.2
Labor formality	1.1	0.002	3.4

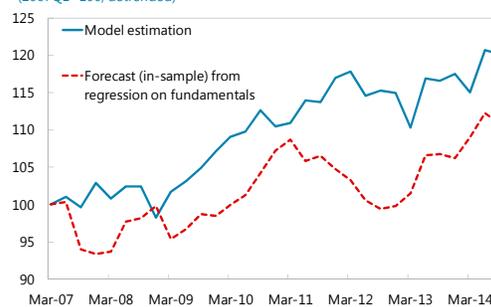
Source: Author's calculations.

1/ Dependent variable, the labor distortion estimated by the model

All variables detrended. Regression applied in log-values.

Labor Distortions and Fundamentals

(2007Q1=100, detrended)



Sources: Author's calculations.

20. Studying the direct impact of policies in the distortions identified in this paper, would be a fruitful agenda. A framework in which fiscal and/or monetary policy are allowed to interact with the basic dynamics presented here would allow the identification of how much of the changes in the distortions can be mapped to agents reacting to different policies. The role of structural reforms should also be explored. For instance, the results in this paper suggest that the ongoing efforts embedded in the national development plan (2014–18) to further improve labor formality as well as the platform for job hiring for the youth and women could have an important yield on reducing labor distortions and therefore on fostering employment and investment and ultimately GDP growth.