KOÇ UNIVERSITY-TÜSİAD ECONOMIC RESEARCH FORUM
WORKING PAPER SERIES

LABOR SHARE FLUCTUATIONS IN EMERGING MARKETS: THE ROLE OF THE COST OF BORROWING

Serdar Kabaca

Working Paper 1122
September 2011

KOÇ UNIVERSITY-TÜSİAD ECONOMIC RESEARCH FORUM
Rumelifeneri Yolu 34450 Sarıyer/Istanbul

Labor Share Fluctuations in Emerging Markets: The Role of the Cost of Borrowing

Serdar Kabaca*

Department of Economics, University of British Columbia (UBC)

October, 2010†

Abstract This paper contributes to the literature by documenting labor income share fluctuations in emerging economies and proposing an explanation for them. We show that emerging markets differ from developed markets in terms of changes in the labor share over the business cycle. Labor share is more volatile in emerging markets and is pro-cyclical with output, especially in countries facing counter-cyclical interest rates. On the contrary, labor share in developed markets is more stable and slightly counter-cyclical with output. A frictionless RBC model cannot account for these facts. We introduce working capital into an RBC model, which generates liquidity need for labor payments. The main result is that the behavior of the cost of borrowing along with working capital mechanisms can predict the right sign of the comovement between labor share and output, and can partly be responsible for the volatility of labor share. We also show that imperfect financial markets in the form of credit restrictions not only amplify the results for the variability of labor share but also help better explain some of the striking business cycle regularities in emerging markets such as strongly pro-cyclical investment and counter-cyclical net exports.

Keywords: *labor income share, emerging markets, working capital, credit constraints*
JEL Classification: *E25, F41, E44*

*E-mail: serdarka@interchange.ubc.ca Website: http://grad.econ.ubc.ca/serdarka Mailing Address: Department of Economics, University of British Columbia, 997-1873 East Mall Vancouver, BC, Canada V6T 1Z1. I am grateful to Michael B. Devereux, Henry E. Siu and Viktoria Hnatkovska for supervising my work and for helpful discussions. I also thank Yaniv Yedid-Levi and participants at the UBC Macro Lunch, CEA 2010, CEF 2010 and SSEM-EuroConference 2010.

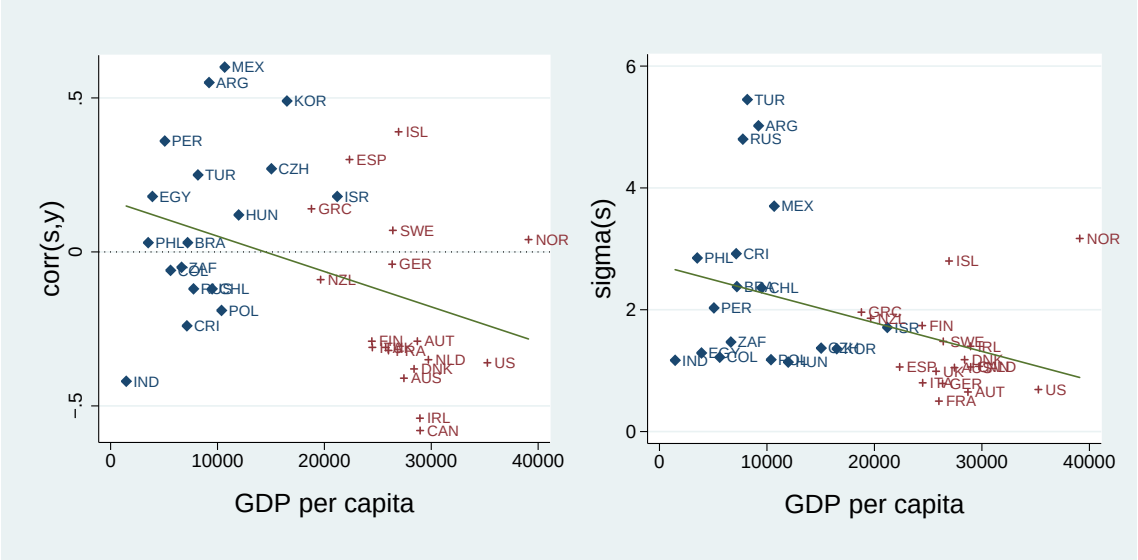
†An earlier version of this paper was titled as "The Volatility of Labor Income Share in Emerging Markets" and presented in the Canadian Economic Association Conference 2010, Conference on Computing in Economics and Finance 2010, and EuroConference 2010.

1 Introduction

One of the stylized facts of growth is that factor income shares are stable over time. This fact justifies many economic models using constant income shares. Recently, researchers have been more interested in explaining short-run fluctuations and cyclical movements of labor (income) share. However, the literature has focused on developed markets, mostly on the US and is silent on labor share fluctuations in emerging markets. In this paper we document the volatility and the cyclicality of labor share in emerging markets and show that there is a close relationship between labor share and the interest rate that these countries face in international markets. We then build a model where wages have to be financed through working capital loans and show that the variation in the cost of borrowing can account for the movements of the labor share over the cycle. The premise of the paper is that financing matters to labor share and that emerging markets serve us a good natural experiment due to the financial problems and the different features of the interest rate that they face.

Figure-1 illustrates the characteristics of labor share fluctuations in both emerging and developed markets. Labor share tends to be procyclical with output on average in emerging markets whereas it is slightly countercyclical in developed markets. In addition, labor share is much more volatile in low income countries. However, there is a large variation across countries in terms of characteristics of labor share fluctuations.[1] India, for instance, having the lowest income per capita in our sample does not show a procyclical labor share whereas Korea has a strongly procyclical labor share although it is one of the richest emerging economies. Figure-2, on the other hand, gives us a more clear picture. It shows that labor share is procyclical with output especially in the countries with countercyclical interest rates, i.e., a decrease in the cost of borrowing during booms tends to increase labor share. The more countercyclical interest rates are, the more procyclical labor share is. Moreover, the countries that face more volatile interest rate tend to have more volatile labor share, as well. We also show below that negative slope coefficients in Figure-1 disappear when we take fluctuations in the interest rate into account. Finally, these results are robust to adjustments of the labor share that controls for self-employment and the informal sector.

[1] Gollin (2002) shows that after adjustments the variation of the *level* of labor share across countries does not depend on income level. Here, we show that the *volatility* of labor share does not necessarily depend on either.



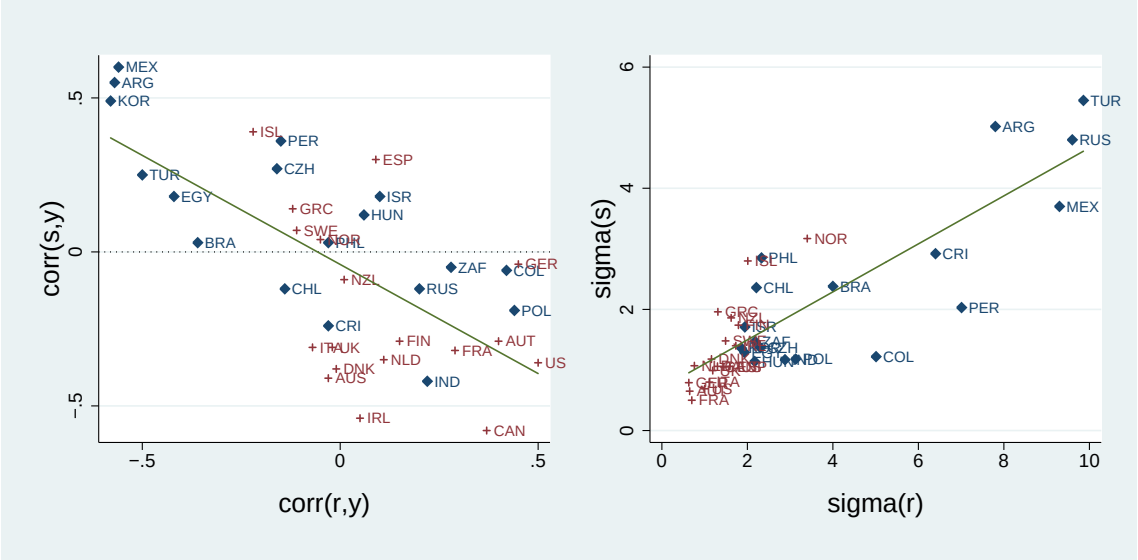
Note: corr(s,y) and sigma(s) denote the correlation of labor share with output and the standard deviation of labor share, respectively. The variables are detrended and logged. Labor share is annual and covers the period after 1980 for most countries. GDP per capita (PPP adjusted in US dollars) in 2000 is taken for the income level. See the Appendix for data sources.

Figure 1: Labor Share Fluctuations across Income Level

Another striking fact is that labor share is significantly more volatile and cyclical in emerging markets in periods with large capital flows i.e 1980s-1990s compared to the 1970s and 2000s. For example, the Mexican labor share did not seem to change significantly in 2009 when GDP dropped by 6.5% in the global crisis. However, labor share fell by almost seven percentage points in 1995 when GDP dropped by 6.8% during the financial turmoil in Mexico. Not surprisingly, the interest rate on internationally traded Mexican bonds did not change significantly in the recent recession but Mexico experienced a large increase in the cost of borrowing as well as other credit constraints in 1995. Motivated by these observations from across and within country analyses, this paper concentrates on a financial story rather than a pure development story to understand the dynamics of labor share in different country groups and different periods, and develop a model in which the variation in borrowing opportunities generates movements in the labor share through working capital mechanisms to finance labor costs.

We present a model in which labor share moves over the cycle even with a Cobb-Douglas production function when firms have to borrow in order to pay workers in advance before the production takes place and sales are cashed out.[2] Even if the firm uses its own resources instead of borrowing, labor decisions would still

[2]The use of medium or long-run post-dated checks and illiquid assets as the return to goods sold will increase the liquidity burden on wage bill, as well, not only because of the time lag between



Note: corr(s,y) and sigma(s) denote the correlation of labor share with output and the standard deviation of labor share, respectively. The variables are detrended and logged. Labor share is annual and covers the period after 1980 for most countries. r denotes real annualized interest rates in those countries. See the Appendix for data sources.

Figure 2: Labor Share vs. Interest Rate Fluctuations

be affected as it creates an opportunity cost in a world with a positive return on bonds. The liquidity need to finance the wage bill makes labor demand sensitive to interest rate changes. The duration between the time when labor income is paid and the time when the goods market clears will create an extra cost on the wage bill, namely interest payments to the rest of the world. During a recession, the share of output that goes to the rest of the world increases due to the higher interest rate which lowers the labor share of output. The introduction of limits on the borrowing capacity generates an effective interest rate that is more responsive than the observed one and leads to larger responses in the labor share.

In the quantitative analysis section, we calibrate the model to Mexico and show that working capital mechanisms can generate the right comovement of the labor share with output and explain part of the volatility in the labor share. In addition to this effect, results are amplified when agents are credit constrained. The presence of the binding leverage constraint not only amplifies the response of labor share but also improves the performance of the model with respect to the other business cycle regularities in emerging markets, particularly highly procyclical investment and countercyclical net exports with output.

wages are paid and sales are cashed out but also because of uncertainty in drawing checks which might be high during recessions.

Our paper is related to the literature that previously studies the different behavior of interest rate that emerging markets face. As opposed to slightly procyclical interest rates in developed markets, the countercyclical interest rates are mostly explained by the country-risk premium (see Arellano (2008)). Neumeyer and Perri (2005), and Uribe and Yue (2006) also show that countercyclical interest rates due to default risk can be a propagation mechanism to generate business cycle fluctuations in this group of countries but they do not focus on the implications on labor income. Recently, Li studies that these models along with income effect on labor supply can explain a significant part of the wage volatility. Here, we firstly show that these models with working capital requirement have implications also on labor share. Secondly, we show that under the shock processes calibrated consistently with data, the perfect credit used in above models are not enough to match fluctuations in these countries. This is why we emphasize the imperfect credit along with working capital requirements.

Interest rates are, indeed, not the only cost of borrowing developing countries face. Credit frictions are also costly for these lower income countries (see Section-2 for a literature survey). In terms of the macroeconomic implications of credit frictions, there are numerous studies in the literature following Kiyotaki and Moore (1997) and Bernanke et al. (1999).[3] Although these studies highlight the importance of credit frictions in developed markets, one would expect a significant impact of these frictions in developing countries as well especially when their relatively low level of financial development is considered.[4] This paper stands on the same line with this literature and claims that these models when working capital is introduced have important implications on the short-run dynamics of labor share thanks to volatile cost of borrowing -either the observed one in the market or the effective one through imperfect credit.[5]

We also study the model performance in a developed market, Canada, and conclude that the proposed model implies more or less stable labor share that is slightly countercyclical with output. This is because interest rates in developed markets

[3]See Kocherlakota (2000), Aiyagari and Gertler (1999), Devereux and Yetman (2009), Jermann and Quadrini (2006) for the use of financial constraints.

[4]Calvo (1998) and Caballero and Krishnamurthy (2001) are seminal papers studying the effects of financial frictions on output drops in emerging markets. Recently, Mendoza (2010) points out that the real cost of borrowing can be amplified in sudden stops through credit frictions.

[5]By saying imperfect credit, we not only consider credit rationing in the financial system but also mean leverage cycles explained by various types of asymmetric informational frictions in the emerging market asset as in Fostel and Geanakoplos (2008).

display a slight positive correlation with output perhaps as a result of an increase in marginal product of capital to a positive productivity shock (see Kydland and Prescott, 1982) and/or the dominance of monetary authorities that might have an impact on real variables in the short-run (see King and Watson, 1996).

Labor share movements in developed markets have already been addressed in the literature. Ríos-Rull and Santaeulalia-Llopis (2009) show that when we allow labor share to have a dynamic response, it displays an overshooting property as a response to a positive productivity shock. Thus, labor share falls down on impact, then starts to increase, and after a couple of quarters it passes beyond the steady-state level and stays above the mean for a long time.[6] These findings show that there are some mechanisms or frictions that prevent labor share from initially responding as it does in the medium run. Bentolila and Saint-Paul (1998) empirically show that adjustment costs on labor and union wage bargaining have a significant effect on the movements of the labor share.[7] Ríos-Rull and Choi (2009) emphasize the effect of non-competitive wages and search frictions on labor share dynamics in a developed market, the US.[8] Following these papers, when the model implications of a developed and a developing country are compared, we also include an adjustment cost to the model to investigate how much sluggishness in labor market contributes to the cyclicality of labor share. The result is that working capital channel is the dominant factor explaining labor share fluctuations in emerging markets through volatile interest rates whereas other factors producing less responsive wage bill explain the movements in the labor share more in developed markets.

2 Labor Share and Interest Rate

2.1 The Measure of Labor Share

Labor share is computed using total compensation of employees from GDP income accounts. In income approach, gross value added GDP is the sum of labor compensation, capital income (corporate profits, interest income, rental income and

[6]Using Mexican quarterly data, we also find evidence on overshooting property in labor share. However, in this paper, we are interested in the immediate response of labor share in emerging markets which is procyclical.

[7]See also Bentolila and Bertola (1990) that use firing costs to explain countercyclical labor share in European countries.

[8]Boldrin and Horvath (1995) and Gomme and Greenwood (1995) use contracting model in which wage deviates from marginal product of labor. This mechanism also makes total wage bill less responsive to output and generate countercyclical labor share.

depreciation), mixed income of self-employed (unincorporated income) and indirect taxes less subsidies. Most countries officially announce total compensation of employees, indirect taxes and the rest as operating surplus. Therefore, we measure labor share as in the following:

$$\text{Labor Share} = \frac{\text{Labor Compensation}}{\text{GDP-net indirect taxes}} \tag{1}$$

Since we are interested in the incomes earned by the factors of production, we exclude government income from gross value-added. By doing this, we assume that net indirect taxes goes both to capital and labor income. Although this is the standard measure used in macroeconomics, it is criticized by Gollin (2002) because it does not include labor income from self-employment which constitute a significant part of total employment in developing countries.[9]

On the other hand, ignoring self-employment in labor cost will be misleading in terms of the cyclical component of labor share only if self-employment is cyclical with output over the cycle. Below, we show that self-employment does not have any systematic comovement with output eventhough total employment is highly procyclical. Nevertheless, we do corrections on labor share using approaches following Gollin (2002). For countries that announce mixed income in their income accounts, we exclude mixed income from GDP and look at the labor share in incorporate sector. For other countries, we use self-employment ratios from labor surveys to correct total labor compensation when possible.

2.2 Data

We choose countries that report income accounts compiled with 1993 System of National Accounts. Income accounts data come from OECD and UN.[10] The data is annual and we take the countries that have at least 10 annual observations in order to have an idea on the cyclical comovement of labor share with output. This leaves us with 18 emerging markets. Emerging economies taken here cover most of the countries defined as emerging market in institutions providing investment

[9]The ratio of self-employment goes up to 30% in many low-income countries.

[10]OECD has longer labor compensation data for some developed countries, Mexico, and Turkey. We check that data in OECD is consistent with data reported to UN such that results are not changing much. Therefore, we choose longer dataset in OECD to do within country analysis for these countries as well.

analysis.[11] In addition to emerging markets, 18 developed markets are included in the sample for comparison. These countries are listed in Appendix. Data for most emerging countries start at 1980s. Therefore, we take labor share data for developed countries after 1980 for consistency, as well. For self-employment correction, we use self-employment ratios either from OECD or ILO statistics. The details on data sources can be found in Appendix.

As for real interest rates, Uribe and Yue (2006) has dataset on quarterly interest rates (annualized) for emerging markets. They construct interest rates for each country using their corresponding JP-Morgan EMBI+ spread over US T-bills. Since these bonds are dollar denominated, real yields are calculated using current and three preceding periods US annual inflation from US-GDP deflator.[12] One drawback of using these interest rates is the limited coverage especially at the annual level. For most countries, EMBI data starts at 1994Q1 or 1999Q3 which gives us a very small number observations at annual level. Another drawback is that these are the cost of borrowing in US dollars. Firms which have local currency denominated assets in their balance sheet would face an extra cost, namely exchange rate. In addition, a varying intermediary cost (to access to international credit market) over the cycle might make financing more difficult, too. In order to have a longer and a more representative interest rate data, we use domestic interest rates as well. Thanks to small open economy assumption, domestic rates should follow world interest rates each country faces. Indeed the patterns are similar except (see Figure-4) that domestic rates tend to have a high volatility. Domestic rates are coming from IFS and representing the cost of financing short-term needs of private sector.[13] GDP deflator is used to get the real interest rate. For developed economies, interest rates come from OECD financial indicators. These are domestic short-term (treasury bill) interest rates on bonds that are denominated in local currency. As in the case of emerging markets, these rates are assumed to be representative cost of borrowing that an agent face in these economies.

[11] We also include Costa Rica given its relatively high per capita income and long time series data although it is not listed as emerging market in FTSE or MSCI lists.

[12] Using future inflation as expected inflation is not changing the results very much since inflation is more or less stable in US over this period.

[13] Either lending or treasury bill rates are used depending on availability. If non of them is available, money market or deposit rates are used. We checked that all types of interest rate series move together within a country.

2.3 Observations

We document the statistics of annual labor share fluctuations in Tables 3 and 4 for emerging and developed markets, respectively.[14] P-values can be found in parenthesis for correlation coefficients. These statistics show that labor share, on average, is twice more volatile in emerging markets compared to developed markets. More importantly, comovements of labor share with output differ in emerging markets compared with developed ones. The correlation between the cyclical component of labor share and output tends to be procyclical (0.10) in emerging markets whereas it is negative (-0.19) in developed markets. Since there is variation among countries in each group, we apply a sample mean test where the null hypothesis is that there is no difference in these correlations across different country groups. T-statistics from the mean test is 3.08 which falls in the region of rejection for the significance level of 1%. This indicates that labor share fluctuations are, indeed, statistically different in emerging economies than in developed ones.

Furthermore, it can be seen in Table 3 that average procyclical labor share is mostly driven by countries with countercyclical interest rates. In addition, Figure 2 and 3 (with domestic real rates and EMBI rates, respectively) support the claim that procyclicality in labor share becomes more apparent as the country faces countercyclical interest rates. In statistical analysis, we take Argentina, Brazil, Czech Republic, Egypt, Korea, Mexico, Peru and Turkey as countries having countercyclical cost of borrowing.[15] Then, the average correlation of labor share with output goes up to 0.34 which shows a stronger procyclical labor share in those countries than the average in emerging markets. Other countries in emerging group do not have significantly different movements in labor share than in developed markets.[16]

There is variation in terms of the dynamics of labor share among developed economies, as well. The developed countries that tends to face countercyclical interest rates such as Greece, Iceland and Sweden also tends to have procyclical labor share. In addition, we check that, in recent crisis, there are three countries in which labor share significantly drops: Iceland, Ireland and Spain. Not surprisingly, these

[14] We also check the quarterly labor share fluctuations on which we have data for only Brazil, Korea, Mexico and Turkey. The results are very similar to annual fluctuations. The author can provide these results upon request.

[15] When EMBI rates are considered, interest rates still show countercyclicality with output in these countries.

[16] T-stat and p-value from a sample-mean test between emerging economies that do not face significantly countercyclical interest rates and developed economies are 1.36 and 0.19, respectively.

are the countries facing higher risk premium in 2009. Therefore, we claim that there is a strong relationship between the dynamics of labor share and the risk component in the cost of borrowing independent of development level.

The results from within country analysis also support this relationship between labor share and the cost of borrowing. Figure 3 shows that in Mexico, where data on labor share goes back to 1970s, the volatility and procyclicality of labor share is so much apparent especially in 1980s and 1990s. This period is accompanied with highly unstable financial environment and highly volatile capital flows in and out of the country. The comovement of labor share and output disappears when the economy stabilizes after 2001 so does the relationship between interest rates and output. In addition, we do not observe procyclical labor share in 1970s when there is less financial liberalization. The results are similar in Korea except that we do observe procyclicality in labor share in 1970s, as well but we verified that Korean interest rates are still countercyclical with output in 1970s, too.

Lastly, we want to discuss labor share movements in the recent crisis in emerging economies. National income accounts for these countries are not readily available yet. However, total labor compensation index in manufacturing in Mexico has some clues on Mexican labor share in the recent crisis. This index shows a 8.5% drop in total compensation in manufacturing and GDP drops by 7% in 2009 in Mexico. This implies no significant change in labor share especially when it is considered that manufacturing sector is highly responsive to changes in GDP. Not surprisingly, Mexico did not face severe difficulties in borrowing so that bid yields on US-dollar-denominated Mexican bonds do not show a significant upward movement in recent crisis, nor does real domestic rates.[17] On the other hand, the same compensation index dropped by approximately 20% in the crisis year of 1995 when GDP dropped by 6.5%, and the country was experiencing difficulties to finance its expenses either because of high cost of borrowing or the quantity restrictions on loans. Therefore, these observations from both across and within country analyses motivated us to explore the effects of financing labor cost on the share of income going to labor.

Self-employment Adjustments:

In this section, we discuss how sensitive the observations in Table 1 are to corrections with self-employment. We apply two adjustment methods to take into account the

[17]Financial Times reports that bid yields on US-dollar-denominated Mexican bonds are around 5-6% in January-2008. It remained unchanged during the 2008-2009 crisis whereas they increased to 20% from 10% levels in 1995.

labor income of self-employed people. The first method is to take just incorporated businesses when computing labor share. This requires a deduction in value added GDP by an amount equal to self-employed income (mixed income):

$$\text{Adj-1}: \qquad \text{Labor Share} = \frac{\text{Labor Compensation}}{\text{Value Added GDP - Mixed Income}}$$

Above adjustment assumes that labor share is same across incorporated and unincorporated (self-employed) enterprises and can be applied only to countries that report mixed income in their national accounts. For those that do not report it, we compute a proxy for labor income of a self-employed person and then adjust the overall economy labor share using self-employment data for those countries:

$$\text{Adj-2}: \quad \text{Labor Share} = \frac{\text{Labor Comp.} + \text{Labor Income per Self-Emp.} \times \text{Self-Emp}}{\text{Value Added GDP}}$$

Labor compensation per employee calculated by total labor compensation divided by the number of employees can potentially be a proxy the labor income of a self-employed person as in Gollin (2002). However, the assumption that the labor cost of a self-employed is equal to the labor compensation per employee might not be valid for some countries. This method, indeed, lifts the level of labor share up to a very high fraction of income in countries where self-employment ratio is high.[18] Korean labor share, for example, rises to 80-90% levels after this correction. We then checked household surveys in Korea and Turkey, and verified that self-employed people earn less than wage-earners. This includes possible capital income from their jobs as well. The reason is perhaps because a big part of self-employment is coming from rural areas or because there are differences in terms of skills across average workers and self-employed people. Another explanation might be that self-employment heavily relies on informal sector where the administrative cost of labor such as labor income tax and social security payments do not show up. Therefore, we assume that the labor income of a self-employed is half of the labor cost of an employee in Korea and Turkey.[19] For other countries, we continue to assume equal labor cost across wage earners and own-account workers. Hence, the differences between baseline labor share and the adjusted one should be considered as upper limit for these countries.

[18]Korea and Turkey have the highest self-employment ratio in our sample. Half of employed people are working on their own account. The average is around 30% in developing group whereas 12% in developed economies.

[19]Household surveys tell us that total *gross* income of self-employed person is around 60-65% of average wage level.

The results for adjusted labor share are listed in Table 3. There are only minor changes after self-employment corrections. Adjusted labor share still shows a high volatility. In terms of the cyclical comovement of labor share with output, changes are so small that adjustment does not alter the sign of correlation between labor share and output. This shows that the high procyclicality of labor share in countries such as Argentina, Korea and Mexico is not a measurement error from a calculation that ignores self-employment.

The reason why self-employment is not a concern here is because this part of employment does not show a significant countercyclical movements with output. Table 5 shows the correlations of cyclical components of self-employment and total employment with output. Although self-employment is less correlated with output compared with total employment, this is not enough to reverse the results on overall labor share. In addition, the information on mixed income tells us that the contribution of self-employment to GDP is only around 10-15% although self-employment constitute around 30% of total employment.

Discussion on Sectoral Shifts and Informal Sector

Another driving force in change of labor share might be shifts across sectors over the cycle. Moreover, government expenditure can also amplify these shifts by investing on labor intensive sectors and indeed government expenditure is procyclical in these countries. In an empirical work, Kabaca (2010) shows that the change in labor share is mostly coming from within sectoral changes when the countries with procyclical labor share are analyzed. We also check if the overall economy labor share is driven by cyclical government spending or not. However, business sector labor share excluding public sectors such as health, education and public administration is still volatile and procyclical and these sectors are driving 70-80% of GDP in most of the countries.

Another important issue for low-income countries is the high ratios of informal employment. On the other hand, labor compensation estimates mostly rely on labor cost in the formal sector. Similar to the concern with self-employment, the exclusion of labor compensation in the informal sector might be misleading in the results of labor share cyclicality if the total labor compensation depends more on informal sector in recessions. If that were true, then we should observe more procyclical labor share because of this measurement problem especially in countries with high ratios of informality. However, we do not see that type of link between informality and

procyclicality in developing countries. India, for example, as a country having one of highest informality in our sample does not have procyclical labor share whereas Korea having less informality shows a procyclical labor share.[20] In addition, the contribution of informal sector to GDP is small (official estimate from Mexico suggests that it is around 12% although the informal sector employment is 30% of total employment) and is not showing countercyclicality with output.[21]

2.4 Interest Rates and Financial Environment

The variation in interest rates emerging markets face in international markets is widely discussed in the macro literature. Neumeyer and Perri (2005) and Uribe and Yue (2006) document the countercyclical behavior of interest rates for a number of emerging markets. Here, we show that domestic real rates (Table 3) also support this behavior. As in previous studies, Argentina, Brazil, Korea, Mexico and Turkey exhibit highly countercyclical interest rates whereas Philippines and South Africa have a cost of borrowing that mildly responds to output changes. The countercyclical movement of interest rate is mostly explained by default risk variation over the cycle. Arellano (2008) derives high probabilities of default in equilibrium during a recession when there is less incentive for repayment in incomplete markets. This,in turn, leads to higher interest rates and consequently causes more output contractions (see Neumeyer and Perri (2005) and Uribe and Yue (2006)).

During financial distress, borrowing becomes not only more costly but also more limited to agents that will engage risky investment activities. Thus, agent-principal problem might be even more apparent during recessions. Stiglitz and Weiss (1981) explains credit rationing as an equilibrium phenomena in an environment where agents differ in terms of their risk and financial markets are monopolistically competitive. Indeed, macroeconomic implications of financial frictions are heavily touched in the literature. Examples in developed market literature include Kiyotaki and Moore (1997), Bernanke et al. (1999), Aiyagari and Gertler (1999) and Holmstrom and Tirole (1997) which address the high cost of recessions when the agents are credit constrained.

In emerging markets, these frictions are still important especially when their level of financial development is considered. In an empirical study, Arteta and Hale (2008)

[20] See Kabaca (2010) for empirical details on this.
[21] See Garcia-Verdu (2007).

finds that crisis are accompanied with a sharp decrease in foreign credit when firm-specific and country-specific characteristics are controlled and that credit remains at low levels for a couple of quarters and only recovers after macro fundamentals recover. In theoretical perspective, the effects of financial frictions on large output drops in emerging markets have been emphasized by Aghion et al. (2001), Caballero and Krishnamurthy (2001) and Calvo (1998). Moreover, Mendoza and Smith (2006) and Mendoza (2010) stress the importance of financial frictions on the crashes of asset prices in emerging markets.

Empirical studies on the leverage ratio (measured as debt liabilities over market value of equity, or total credit as a percentage of output) also have some clues on large credit booms and sharp declines. Gourinchas et al. (2001) and Mendoza and Terrones (2008) show that credit expansions play a significant role for output expansions in emerging countries. In fact, private credit to GDP ratio displays a positive movement with output in these countries. We show below that perfect credit markets with highly volatile and countercyclical interest rates are having hard time to explain these large credit expansions and procyclical leverage ratios. Previous studies deliver some explanations on volatile credit such as poor monitoring on banks' lending activities,[22] bailout guarantees aggravating moral hazard issues,[23] and directing credits to risky projects, and imperfection in credit markets serving as a financial accelerator.[24] Considering these possible explanations on credit expansions ans empirical evidence on credit restrictions, we take a simple reduced form of leverage constraint to explore the effects of imperfect credit markets on financing labor.

3 Model

The model is in the class of small open economy models with an internationally traded single good. Asset markets are incomplete in the sense that there is only a single internationally traded one-period bond which pays the buyer a predetermined interest. Agents face shocks to interest rate on bonds and productivity level. These shocks follow exogenous processes, details of which are described below. The only difference from a standard RBC model is that wage payments has to be paid in-advance and the country is credit constrained.

[22] See Lorenzoni (2008) that points out the need for financial supervision as a second-best option.
[23] see Ranciere et al. (2008) and Schneider and Tornell (2004)
[24] See Gourinchas et al. (2001) for a summary of these explanations.

3.1 Optimization Problem

Let us consider an economy with infinitely-lived self-employed representative household.[25] The agent derives utility from consumption c_t and leisure $1 - l_t$ where the total time that he devotes to labor and leisure is normalized to one. His preferences are described as in the following:

$$\sum_{t=0}^{\infty} \beta^t E_t u(c_t - N(l_t)) \tag{2}$$

where $0 < \beta < 1$ is the discount factor, $u(.)$ is twice-continuously-differentiable and concave period utility function, and $N(.)$ expresses the disutility of labor which is twice-continuously-differentiable and convex function. This utility representation is known as GHH preferences after Greenwood et al. (1988). These preferences eliminate wealth effect and makes labor supply decisions independent of consumption. Neumeyer and Perri (2005) shows that standard Cobb-Douglass utility function generates large wealth effects if interest rates are volatile and countercyclical, and results in an acyclical employment which is counterfactual. An alternative to this form would be to use standard preferences with asset market segmentation to lessen the effect of interest rates on labor supply decisions. However, we choose this specific form due to its simplicity to deal with wealth effect.

The agent maximizes the life-time expected utility and choose the optimal sequences of consumption, labor, investment and bond holdings subject to budget and leverage constraints:

$$\begin{aligned} c_t + x_t + b_t + \kappa(b_t) &\leq y_t - \theta(R_t - 1)w_t l_t + R_{t-1} b_{t-1} && (3) \\ b_t - \theta R_t w_t l_t &\geq -\psi_t y_t && (4) \end{aligned}$$

Income, in this economy, is generated by producing a single traded good, y_t, using a constant-returns-to-scale technology which has capital k_t and labor l_t as the factors of production. The technology in the production function, $y_t = A_t F(k_t, l_t)$, is subject to TFP shocks. The agent chooses investment level x_t, in order to accumulate capital by taking into account that capital depreciates at a rate, δ. Capital accumulation

[25] This is similar to the yeoman-farmer model in which the farmer uses his own labor to produce the good and is widely used in monetary literature (see Ball and Romer (1990) and Mankiw (1985)). The alternative is to use a decentralized representation which has household and firms as separate agents but we choose this type of modeling since it allows us to impose a constraint on the whole nationwide debt including both household debt and working capital loans (see Mendoza (2010)).

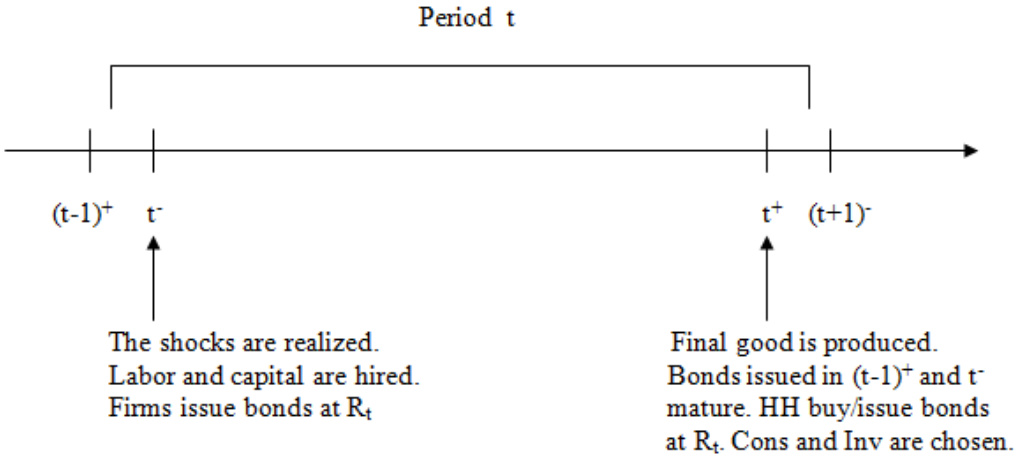


Figure 3: Timing Line

follow the law of motion, $x_t = k_{t+1} - (1-\delta)k_t + \Phi(k_{t+1}, k_t)$ where $\Phi(k_{t+1}, k_t)$ is a quadratic convex capital adjustment cost to mitigate the excessive volatility of investment that might arise in the small open economy models. The agent can also trade an international one-period bond b_t in the market that has a gross return R_t. A quadratic convex cost function, $\kappa(b_t)$, is introduced into the model as in Schmitt-Grohé and Uribe (2003) to ensure a stationary path for bond holdings.[26]

The model has a wage bill financing, that is, a fraction θ of wage bill has to be paid in-advance before the production takes place. This can be rationalized either by the fact that workers want to consume in the beginning of the period but cannot access the financial markets or by having a production line where firms use installments or post-dated checks so that sales are cashed out in later periods. In the model, these working capital loans are borrowed in the beginning of the period from international markets at the same rate on the bond, R_t, after the shock is realized and generate interest payments in the end of the period to the rest of the world (see Figure-3 for a representation of the timing line). That is why income net of these payments are entered in the right-hand-side the budget constraint. Labor market is competitive, therefore, the wage is taken as given by the representative agent and equals to the marginal disutility of labor, $w_t = \partial N(\bar{l}_t)/\partial \bar{l}_t$ where $\bar{l}_t$ is the market average. This is similar to the optimal labor supply in a decentralized competitive equilibrium

[26]This cost is zero in imperfect credit since non-stationarity does not exist in this case and it is so small in perfect credit case that it does not affect the long-run business cycle implications of the model.

set-up.

The economy also faces an external leverage constraint (4). The net foreign asset is constrained by a fraction of output, $-\psi_t$. In other words, net debt including working capital loans has to be smaller than a ψ_t fraction of output. This fraction has a stochastic component and is varying over time. Ludvigson (1999) finds that forecastable (ex-ante) credit growth has a significant influence on consumption that is independent of variation in predictable income growth and that introducing a stochastic upper limit on the debt-to-output ratio improves the correlation between consumption and income growth in the US. The high correlation between (detrended) consumption and income appears in emerging markets, as well.[27] In our exercise with perfect credit markets, we show below that the model with working capital cannot account for highly volatile (and highly cyclical) consumption and countercyclical net exports even in the presence of countercyclical interest rates whereas a stochastic leverage constraint can improve these results.[28]

Another issue is the frequency of binding situations which is difficult to pin down from data. Stiglitz and Weiss (1981) shows that financial imperfection as in the form of quantity restrictions can be an opt imal equilibrium outcome when there are asymmetric informational costs in the environment. We assume the existence of these costs at every state creating unsatisfied borrowers which implies a permanently binding constraint. Considering the low levels of financial development in emerging markets, these kind of constraints are more likely to bind. And in this paper, we narrow our scope to see how the presence of binding constraints interact with working capital rather than trying to explore how often these constraints bind. Since the constraint is binding, ψ_t represents the leverage ratio of the economy as the net debt over GDP. Motivated by interest rates being an important driving force in emerging markets, the leverage ratio moves over the cycle in the following:

$$\widehat{\psi}_t = -\eta \widehat{R}_t \tag{5}$$

where $\eta > 0$. As mentioned above, since financial imperfection can be derived endogenously through asymmetric cost channels, interest rates would not be a bad

[27] see Aguiar and Gopinath (2007) for the documentation of business cycle regularities in emerging markets.

[28] Sarquis (2008) and Guajardo (2004) also explore the effects of these types of credit shocks in emerging markets' business cycles. The difference here is that we introduce working capital channel in order to explore the effect of changes in the effective cost of borrowing on labor market variables.

choice explaining the behavior of restriction on credit.[29] That is, monopolistically competitive banks will not only charge high interest rates but also impose tighter restrictions on credit when the asymmetric cost is higher. This specification implies a one-to-one relation between interest rates and leverage ratio in the model since the constraint is always binding. Indeed domestic credit-to-gdp ratio for non-financial firms provided by banking system shows us a high correlation of -0.60 with interest rates in Mexico.

3.2 Competitive Equilibrium and Labor Share

A competitive equilibrium for this economy consists of sequences of optimal allocations $\{c_t, l_t, k_{t+1}, b_t, x_t\}$ and wages $\{w_t\}$ such that

1. the representative agent solves the maximization problem subject to budget and collateral constraints in (2), taking as given wages, interest rate and initial states k_0 and b_0,
2. wage equals to marginal disutility of labor $w_t = \partial N(\bar{l}_t)/\partial \bar{l}_t$, and
3. labor decisions satisfy $\bar{l}_t = l_t$

The system of equations from optimization problem look similar to the ones from a standard SOE-RBC model except the effect of working capital on optimal labor decision and of credit constraint on bond holding, capital accumulation and labor equations. The key equation determining labor share is the first order condition for hours worked:

$$u_2(c_t, l_t) + \lambda_t[A_t F_2(k_t, l_t) - \theta(R_t - 1)w_t] + \mu_t[\psi_t A_t F_2(k_t, l_t) - \theta R_t w_t] = 0 \qquad (6)$$

where λ_t and μ_t are the Lagrange multipliers on budget and borrowing constraints at period t, respectively. $\frac{\mu_t}{\lambda_t}$ can be seen as a shadow price of credit constraint in marginal units of consumption. Equation (4) represents the labor demand in this economy. Using the wage rate formula described above and the relationship $\frac{\partial N(l_t)}{\partial l_t} = -\frac{u_2(c_t,l_t)}{u_1(c_t,l_t)}$, we can rewrite equation (4) as:

[29] Recently, Sarquis (2008) uses similar type of specification for the stochastic limitation on the borrowing constraint.

$$w_t = \frac{1 + \frac{\mu_t}{\lambda_t}\psi_t}{1 + \theta(R_t - 1) + \frac{\mu_t}{\lambda_t}\theta R_t} A_t F_2(k_t, l_t) \tag{7}$$

Now, let us consider the effects of working capital and credit constraint on labor share. In order to see the contribution of each friction, we firstly suppose that the upper limit on borrowing is infinitely high, i.e., the agent is not credit-constrained implying that $\mu_t = 0$ for every t. Assuming the production function is in Cobb-Douglass form, labor share would be:

$$s_t = \frac{w_t l_t}{y_t} = \frac{1 - \alpha}{1 + \theta(R_t - 1)} \qquad \textbf{(perfect credit)} \tag{8}$$

where s_t is the labor share at period t and α is the capital exponent in the production function. Equation (6) tells us that labor share would still be moving even when the credit market is frictionless since wages deviate from marginal product of labor.[30] An increase (decrease) in interest rates drives the wages to a lower (higher) level than the marginal product of labor which shrinks (increases) the labor share of income and increases (decreases) the share of the interest payments in output.

When the credit constraint is introduced, the effect of this mechanism is amplified:

$$s_t = \frac{w_t l_t}{y_t} = \frac{(1 - \alpha)(1 + \frac{\mu_t}{\lambda_t}\psi_t)}{1 + \theta(R_t - 1) + \frac{\mu_t}{\lambda_t}\theta R_t} \qquad \textbf{(imperfect credit)} \tag{9}$$

If the increase in R_t is accompanied with credit rationing implying that $\frac{\mu_t}{\lambda_t}$ and R_t are positively correlated, an increase in R_t will further increase the effective interest rate and influence the labor share more adversely. Intiutively, the demand for labor is lowered not only because of the higher cost of borrowing but also the higher credit restrictions imposed by lenders. Note that since labor decisions affect output which tightens or loosens the credit constraint, $\frac{\mu_t}{\lambda_t}\psi_t$ appears in the nominator. However, because $\frac{\mu_t}{\lambda_t}$ and ψ_t are moving in different directions over the cycle, the impact is mostly driven by the denominator.

[30] In a decentralized set-up, a similar implication can be derived from firm maximization as in the following:

$$\max_{k_t, l_t} \qquad F(A_t, k_t, l_t) - r_t^k k_t - (1 + \theta(R_t - 1))w_t l_t$$

This maximization problem produces the same labor share as in the equation (6) when Cobb-Douglass production function is taken.

4 Calibration

The model is calibrated to Mexico quarterly. The sample period is 1987Q1-2008Q4.

4.1 Shocks

Solow residuals are used as the measure of productivity. We calculate Solow residuals using Mexican GDP from OECD. $lnA_t = ln(y_t) - \alpha ln(k_t) - (1-\alpha)ln(l_t)$. Capital exponent is set to match average labor share (see below). Employment series come from Neumeyer and Perri (2005) and we extend it to 2008Q4 using series at ILO. In order to find total labor input used in production, we calculate total hours by the given employment series and hours worked in manufacturing from OECD for Mexico. Capital stock series are constructed using investment perpetual method. Particularly, we set depreciation rate, $\delta = 0.02$ and use the balanced growth path equation, $\frac{(\delta+\gamma)k}{y} = \frac{i}{y}$. Assuming, there is a constant growth rate on the path for the first ten quarters, we find the approximate initial capital stock. Then, we extend the capital stock data using investment series from OECD. Detrended Solow residuals suggest an AR(1) coefficient of 0.70 and standard deviation of 1.44% of shocks to TFP. These results imply less persistent and volatile shocks as it is the case in emerging markets.

For interest rates, we take "average cost of borrowing" series reported by IFS over the sample period.[31] GDP deflator is used to deflate the interest rate. Since we are not interested in modeling inflation, we assume that agents perfectly foresee inflation, and thus use future inflation in calculation of real interest rates.[32] The previous literature commonly used JP-Morgan EMBI+ spreads for emerging markets but we think that domestic interest rates might be a better representative cost of borrowing for domestic agents. In fact, interest rates using EMBI+ spreads have a very small volatility in terms of quarterly yields. For example, in Mexico, average real interest rate from EMBI+ is 2.2% and have standard deviation of 0.55% at

[31] We take the first two-years observations out of the sample since it represents abnormal changes from -20% to 100% of real return. We are doing this in order for results not to be driven by these variations.

[32] Note that using different types of expected inflation such as an average of past inflation rates still suggest a very volatile interest rates but we think that using current or past inflation in an environment with highly volatile inflation might be fallacious. The behavior of domestic interest rates is consistent with Kaminsky et al. (2004). They show that domestic interest rates are volatile and counter-cyclical in most of the developing countries.

the quarterly frequency. On the other hand domestic interest rates are almost four times more volatile. There might be several reasons for this. First of all, domestic firms, instead of issuing bonds internationally, most of the time access international financing through domestic banks and/or government in these economies. Risk on these institutions and on typical agents in domestic market might differ substantially or intermediation costs might be volatile on domestic agents.[33] Firms that are doing international lending might differ from firms doing domestic lending in terms of their riskiness as well. Moreover, Kaminsky et al. (2004) shows that monetary policies are pro-cyclical with output in emerging markets. These policies (such as increasing nominal interest rates to prevent capital outflows) might have an impact on real interest rate as well. Thirdly, EMBI rates are the returns on US-dollar denominated assets. Domestic firms having asset position mostly in local currency should also take variation in exchange rate into consideration in order to prevent the problems arising from currency mismatch. Because we want to keep the simplicity of the model, we take the effect of these channels exogenous to agents and use domestic interest rates.[34] The average of annualized real interest rate is 5.33% and the standard deviation of detrended annualized interest rate is 8.13% which suggest 2.04% at quarterly yields. AR(1) of these detrended interest rates suggests 0.65 as correlation coefficient and 1.65% as standard deviation of shocks to interest rate.

Since there are two shocks in the model, correlation between them has to be checked to see if they have feedback from each other. Indeed, Uribe and Yue (2006) shows that country spread shocks emerging markets face are not independent to domestic situation. The correlation between detrended TFP and interest rate is -0.44. We apply a VAR estimation to get a better idea how shocks to these variables are correlated. Below is the VAR estimation results with variance-covariance matrix for the shocks. Covariance matrix suggests a correlation of -0.40 between two shocks.

$$\begin{array}{l} \widehat{A}_t = 0.64\widehat{A}_{t-1} + (-0.12)\widehat{R}_{t-1} + \epsilon_t^a \\ \widehat{R}_t = 0.05\widehat{A}_{t-1} + 0.60\widehat{R}_{t-1} + \epsilon_t^r \end{array} \qquad \Sigma_{\epsilon_t \epsilon_t'} = \begin{pmatrix} 0.014^2 & -0.000093 \\ -0.000093 & 0.017^2 \end{pmatrix}$$

[33]The idea here is that banks might charge typical agents a higher intermediation cost during recessions, i.e they choose to lend government since firms are riskier. However the risk gap between government and firms becomes smaller during booms and they charge a lower intermediation cost which creates an even higher volatility in interest rates.

[34]Note that endogenizing domestic interest rates using one of the possible channels mentioned above will not change the impact of working capital on labor share since the mechanism generates a reduced form of labor share -equation (6)- that has only interest rate as the time-varying component.

As of stochastic leverage ratio, we set η in equation (3) to be 1.5 so that the standard deviation of ψ_t matches the standard deviation of domestic credit-to-gdp ratio over the sample period.

4.2 Other Model Parameters

Bond holdings cost function and capital adjustment cost functions are quadratic functions: $\kappa(.) = \frac{\kappa}{2} y_t(\frac{b_t}{y_t} - \overline{b})^2$ and $\Phi(.) = \frac{\phi}{2} k_t(\frac{k_{t+1}-k_t}{k_t})^2$ respectively where $\overline{b}$ is steady-state level of bond holdings-to- GDP ratio, and κ and ϕ are the parameters that determine the size of the costs. κ is set very low so that it does not affect short-run dynamics over the cycle very much but gives us a stationary bond holdings. We set ϕ is to match investment volatility in Mexico over the period taken and $\overline{b}$ to match the steady-state net foreign assets in this economy, $b_t - \theta R_t w_t l_t$. Steady-state net foreign asset to GDP ratio, -0.42 is coming from Lane and Milesi-Ferretti (2007) data set for Mexico. We set $\theta = 1$ or $\theta = 0.66$ implying that there is around either 3 months or 2 months difference between the times when labor and capital incomes are earned generating liquidity need for financing labor income.[35] When self-employment and possible differences in up-front wage payments across sectors are considered, we think that it is reasonable to set a working capital lower than one as a robustness check.

The functional form for the utility function is the following:

$$u(c_t, l_t) = \frac{1}{1-\sigma}[c_t - \xi l_t^{\upsilon}]^{1-\sigma} \tag{10}$$

Intertemporal elasticity of substitution is set to 0.2 implying $\sigma = 5$ in (??) following Neumeyer and Perri (2005). Using the optimal labor supply equation at the steady state, labor weight parameter ξ in the utility function is set to match $\overline{l} = 0.32$ which is the fraction of hours worked in the total non-sleeping hours. OECD manufacturing total hours worked is used in the calculation of the steady state value of hours, $\overline{l}$. In the model, υ determines the elasticity of labor, $\frac{1}{\upsilon - 1}$. The empirical evidence on this parameter is mostly coming from developed markets and the values used in the literature are in the range [0.5,1]. Considering their lower income and wealth we assume that agents in emerging markets stand closer to lower bound of this range

[35] Unfortunately, there is not a good estimate for this parameter. Calibration results using loans data might not be reliable either since the agents might finance wage bill using their own savings. As mentioned above this would still create an opportunity cost in a modified model where firms borrow from households to finance wage bill in addition to investment.

and set the value of υ to 2.75 showing an elasticity of labor, 0.57 which implies a standard deviation of hours closer to data. Although this parameter is not crucial for the results on labor share fluctuations, it changes how the movements in the wage bill are split between the labor input and hourly wages.

Using the average interest rate level and depreciation rate, we extract the values for discount factor and steady-state shadow price of credit constraint simultaneously from optimal bond holding and capital equations at steady state. Calculations result in $\beta = 0.98$ and $\frac{\overline{\mu}}{\lambda} = 0.01$. Capital exponent is set to 0.43 to match average labor share in Mexico, i.e., α is coming from $\frac{1-\alpha}{1+\overline{r}} = 0.57$. The labor share using National Account data is very small (around 0.33) since it is suffering from measurement problem such as informal employment and self-employment labor income. Labor compensation data from National Account is mostly coming from formal sector. The data on the contribution of informal sector to Mexican GDP from 1993-2004 is available. Informal sector contributes 13% of value added GDP on average. Assuming the labor share is the same in both sectors[36], we recalculated the labor share by removing the informal sector from GDP and then adjusting labor compensation data using self-employment ratio which is approximately 0.33 in Mexico.

5 Results

Table 6 contains the implications of different versions of the model along with the second moments from data.[37] The data moments represent quarterly variations after taking logs (except net export-GDP ratio and net interest rate) and HP-filtering using 1600 as the smoothing parameter.[38] We use quarterly labor share data in manufacturing as a proxy of overall labor share fluctuations in the economy. We check that, at the annual level, series from both manufacturing and total economy is highly correlated to each other (0.86) and have large standard deviation of 4.5 and 3.5 in the manufacturing and overall economy, respectively. The second column lists the moments from the standard SOE-RBC model for comparison and the remaining columns document the results of the model described above in both cases of perfect and imperfect credit markets for different values of working capital parameter.

[36]Note that one can imagine a higher labor share for informal sector. However, since its contribution is smaller in value, having a higher labor share in this sector would not change the results very much.

[37]See the appendix for data sources in detail.

[38]We apply ARIMA-X12 from Census Bureau to deseasonalize data if we observe significant seasonal effects.

To begin with, the results from the standard RBC model can not explain any dynamics in labor share simply because Cobb-Douglass production implies a constant labor share in a competitive environment where wage is equal to marginal product of labor. Consequently, it cannot account for the volatility in labor market variables. As mentioned earlier, real wages are more volatile than output in emerging markets but even with relatively inelastic labor supply, RBC is having hard time to explain highly volatile wages. The standard model is also doing a poor job in explaining highly volatile consumption and net exports-GDP ratio since agents tend to smooth their consumption using credit markets.

We now continue with the results from the model with working capital. The introduction of working capital without any limits on borrowing (columns 3 and 5) can generate variations in labor share. Because interest rates are countercyclical, working capital requirement tends to produce a larger response in labor demand than in RBC model. As a consequence, it can be seen that wages and hours become more volatile in these models. Having more volatile wage bill results in a procyclical labor share consistent wit data. Although the model is doing a good job in predicting the movements of labor share with output, the volatility depends heavily on working capital parameter, θ. A smaller value for this parameter lowers the volatility of labor share.

The models with perfect credit can explain neither of the strong countercyclicality in net exports-GDP nor the strong procyclicality in investment although the cost of borrowing is volatile and moving negatively with output.[39] This is because under relatively less persistent shocks, investment is less cyclical with current output and the smoothing behavior is still dominant. Consequently, net exports become procyclical (or acyclical) in the perfect credit market. On the other hand, when leverage constraint is introduced (columns 5 and 6), smoothing behavior disappears and the credit cycles, because of imperfection in capital markets, generate second moments closer to data. As a result, net exports become more volatile and strongly countercyclical with output consistent with data.

Imperfect credit market along with working capital also contributes to the volatility of labor share thanks to a fraction of wage bill in the nationwide debt. Now, even

[39] Assuming a higher parameter for elasticity of intertemporal substitution and/or making shocks more persistent decreases the correlation between net-exports and output only to -0.15 which leaves still significant comovement unexplained. See Li (2010) and Mendoza (2010).

with a lower working capital parameter (column 6), the model can explain a significant part of volatility. Considering some industries where working capital might be of less importance, borrowing limit gives us more flexibility to set a lower working capital than it is used in the literature.

The models mentioned here implies a very procyclical wages. On the other hand, wages are mot strongly cyclical (0.45) in data. This smaller cyclicality is a well-known fact in developed markets as well, where wages are even acyclical.[40] Wage rigidities through contracting models (see Gomme and Greenwood (1995)) and the change of skill composition of labor (see Bils (1985)) over the cycle can possibly make aggregate wages less cyclical. However, introducing these features into the model will increase the importance of working capital and the cost of borrowing since they tend to decrease the volatility of wages and make labor share countercyclical whereas working capital implies a procyclical one.

6 Implications on Developed Economies

In this section, we want to show the performance of the model in a developed market, and calibrate it to Canada. Then we compare and contrast the results with the implications for Mexico. We, here, take the model with imperfect credit market and a working capital requirement of 0.66 as the baseline model.

As mentioned earlier, the literature suggests mechanisms for countercyclicality of labor share in developed markets through less responsive wage bill to output changes. High unionization (especially in Europe), firing and search costs and optimal labor contracts for workers' insurance imply sluggishness either on wages or on the quantity of labor.[41] Based on these explanations, for a representation of labor market rigidities, we also include an adjustment cost on labor to understand how they interact with working capital and contribute to the variability of labor share. These rigidities or regulations in labor market can be expected in emerging markets, as well.[42] Therefore, by having adjustment costs on labor, we also want to see if they

[40] See Ríos-Rull and Choi (2009) and Li (2010) for the recent wage-output correlations in US and other developed markets.

[41] There are also other axplanations on the countercyclicality of labor share in developed markets. See Hansen and Prescott (2005) which introduces occasionally binding capacity constraints implying procyclical capital share, and consequently countercyclical labor share with output.

[42] Heckman et al. (2000) for example, show that protection on employment is in high levels in Latin American countries. Moreover, OECD protection index also indicates that Mexico and Turkey have much more protection on labor than the average among OECD countries.

undo the results of baseline model in emerging economies explained in the previous section.

We assume a convex labor adjustment cost as in the following: $\Omega(l_t, l_{t-1}) = \phi_l l_{t-1}(\frac{l_t - l_{t-1}}{l_{t-1}})^2$. This cost has a significant effect on autocorrelation of hours. Therefore, ϕ_l parameter is set to match the autocorrelation of hours in data which is 0.69 and 0.66 in Mexico and Canada, respectively. For other parameters in calibration of Canadian economy, we follow similar approaches we do for Mexico except that we assume a higher labor elasticity (unit elasticity as in literature) and a lower η representing a higher level of financial development (or better financial supervision).

The results can be seen in Table 7. The baseline model, when it is calibrated to Canada, can generate a countercyclical labor share since interest rates are slightly procyclical in Canada. As a response to positive productivity shock, higher interest rate mitigates the response of labor demand and wage bill to output producing a countercyclical labor share. However, since interest rates are not showing a high variability, the model can only explain a very small part of volatility in labor share in Canada.

On the other hand, the modified version of the model with the adjustment cost on labor can explain more variation in labor share. Sluggish labor makes wage bill less responsive to output and contributes to the cyclicality and volatility of labor share as the previous work in literature suggests. Therefore, working capital and labor market rigidities are working in the same direction in explaining the movements of labor share in developed markets. Since the interest rates are not volatile in developed markets, the effect of working capital is minimal. However, emerging markets serve us a good natural experiment with their different behavior of interest rates. In the emerging model economy, introducing labor market rigidities cannot offset the effect of working capital on labor share because interest rates are much more volatile. Without working capital, labor share turns to be negatively correlated with output which is counterfactual. This suggests that working capital is the dominant factor in determining the movements of labor share.

7 Conclusion

In this paper, we show that emerging markets tend to have a more volatile and procyclical labor share as opposed to a relatively stable and countercyclical one in developed markets. Procyclicality increases as the country faces stronger countercyclical interest rates. We, then, explore the effect of financing labor and show that working capital can be a good mechanism generating fluctuations in labor share consistent with data. The liquidity need for labor payments imposes a burden on the cost of labor and leads to a more (less) responsive wage bill when interest rates are countercyclical (procyclical) with output. Since interest rates in different country groups move in opposite directions over the cycle, the effect of cost of borrowing is different across these groups implying a procyclical labor share in emerging markets and a countercyclical one in developed markets. Introducing other financial problems that emerging economies encounter such as credit frictions amplifies the results by making the effective interest rate more volatile than the observed one. Binding leverage constraint not only contributes to the variability in labor share but also improves the model performance in terms of other business cycle regularities in these economies such as highly volatile consumption, strongly countercyclical net exports and procyclical investment.

Following the literature on labor share in developed economies, we also include adjustment cost on labor as a representation of the slower adjustment in labor market. Without working capital, these models tend to produce counterfactual labor share fluctuations in emerging markets by making wage bill less responsive to output. On the other hand, they can contribute to labor share fluctuations in developed markets. In short, financing labor income plays an important role on labor share movements in an environment where the cost of borrowing varies associated with unstable financial markets. On the other hand, labor market rigidities generating less responsive wage bill such as costs on labor adjustment (hiring and firing costs), wage bargaining and/or contracting are more likely to dominate working capital channels in countries where financial markets are stable. We leave as a future research to better understand the interaction between labor market specific rigidities and financing wage payments.

References

Aghion, P., Bacchetta, P., and Banerjee, A. (2001). Currency crises and monetary policy in an economy with credit constraints. *European economic review*, 45(7):1121–1150.

Aguiar, M. and Gopinath, G. (2007). Emerging market business cycles: The cycle is the trend. *Journal of Political Economy*, 115(1):69–102.

Aiyagari, S. and Gertler, M. (1999). Overreaction of Asset Prices in General Equilibrium. *Review of Economic Dynamics*, 2(1):3–35.

Arellano, C. (2008). Default risk and income fluctuations in emerging economies. *American Economic Review*, 98(3):690–712.

Arteta, C. and Hale, G. (2008). Sovereign debt crises and credit to the private sector. *Journal of International Economics*, 74(1):53–69.

Ball, L. and Romer, D. (1990). Real rigidities and the non-neutrality of money. *The Review of Economic Studies*, 57(2):183–203.

Bentolila, S. and Bertola, G. (1990). Firing costs and labour demand: how bad is eurosclerosis? *The Review of Economic Studies*, 57(3):381–402.

Bentolila, S. and Saint-Paul, G. (1998). Explaining Movements in the Labour Share. *CEPR Discussion Papers*.

Bernanke, B., Gertler, M., and Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of macroeconomics*, 1:1341–1393.

Bils, M. (1985). Real wages over the business cycle: evidence from panel data. *The Journal of Political Economy*, 93(4):666–689.

Boldrin, M. and Horvath, M. (1995). Labor contracts and business cycles. *Journal of Political Economy*, 103(5):972–1004.

Caballero, R. and Krishnamurthy, A. (2001). International and domestic collateral constraints in a model of emerging market crises* 1. *Journal of Monetary Economics*, 48(3):513–548.

Calvo, G. (1998). Capital flows and capital-market crises: the simple economics of sudden stops. *Journal of applied Economics*, 1(1):35–54.

Devereux, M. and Yetman, J. (2009). Leverage Constraints and the International Transmission of Shocks. *NBER Working Papers*.

Fostel, A. and Geanakoplos, J. (2008). Leverage cycles and the anxious economy. *The American Economic Review*, 98(4):1211–1244.

Garcia-Verdu, R. (2007). The Informal Sector: What Is It, Why Do We Care, and How Do We Measure It. *nimeo*.

Gollin, D. (2002). Getting income shares right. *Journal of Political Economy*, 110(2):458–474.

Gomme, P. and Greenwood, J. (1995). On the cyclical allocation of risk. *Journal of Economic Dynamics and Control*, 19(1-2):91–124.

Gourinchas, P., Valdes, R., Landerretche, O., Talvi, E., and Banerjee, A. (2001). Lending Booms: Latin America and the World [with Comments]. *Economia*, 1(2):47–99.

Greenwood, J., Hercowitz, Z., and Huffman, G. (1988). Investment, capacity utilization, and the real business cycle. *The American Economic Review*, 78(3):402–417.

Guajardo, J. (2004). Financial Frictions and Business Cycles in Developing Countries. *Econometric Society 2004 Latin American Meetings*.

Hansen, G. and Prescott, E. (2005). Capacity constraints, asymmetries, and the business cycle. *Review of Economic Dynamics*, 8(4):850–865.

Heckman, J., Pagés-Serra, C., Edwards, A., and Guidotti, P. (2000). The cost of job security regulation: Evidence from latin american labor markets [with comments]. *Economia*, 1(1):109–154.

Holmstrom, B. and Tirole, J. (1997). Financial Intermediation, Loanable Funds, and The Real Sector*. *Quarterly Journal of Economics*, 112(3):663–691.

Jermann, U. and Quadrini, V. (2006). Financial innovations and macroeconomic volatility. *NBER Working Paper*.

Kabaca, S. (2010). The Empirics of Labor Share Fluctuations in Emerging Markets. *working paper*.

Kaminsky, G., Reinhart, C., and Végh, C. (2004). When it rains, it pours: procyclical capital flows and macroeconomic policies. *NBER Macroeconomics Annual*, pages 11–53.

King, R. G. and Watson, M. W. (1996). Money, prices, interest rates and the business cycle. *The Review of Economics and Statistics*, 78(1):35–53.

Kiyotaki, N. and Moore, J. (1997). Credit cycles. *Journal of political economy*, 105(2):211–248.

Kocherlakota, N. (2000). Creating business cycles through credit constraints. *Federal Reserve Bank of Minneapolis Quarterly Review*, 24(3):2–10.

Kydland, F. E. and Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica*, 50(6):1345–1370.

Lane, P. and Milesi-Ferretti, G. (2007). The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970–2004. *Journal of International Economics*, 73(2):223–250.

Li, N. (2010). Cyclical Wage Movements in Emerging Markets Compared to Developed Economies: The Role of Interest Rates. *Working paper*.

Lorenzoni, G. (2008). Inefficient credit booms. *Review of Economic Studies*, 75(3):809–833.

Ludvigson, S. (1999). Consumption and credit: a model of time-varying liquidity constraints. *Review of Economics and Statistics*, 81(3):434–447.

Mankiw, N. (1985). Small menu costs and large business cycles: a macroeconomic model of monopoly. *The Quarterly Journal of Economics*, 100(2):529–537.

Mendoza, E. (2010). Endogenous Sudden Stops in a Business Cycle Model with Collateral Constraints: A Fisherian Deflation of Tobin's Q. *forthcoming in American Economic Review*.

Mendoza, E. and Smith, K. (2006). Quantitative implications of a debt-deflation theory of Sudden Stops and asset prices. *Journal of International Economics*, 70(1):82–114.

Mendoza, E. and Terrones, M. (2008). An anatomy of credit booms: evidence from macro aggregates and micro data. *NBER Working Paper*.

Neumeyer, P. A. and Perri, F. (2005). Business cycles in emerging economies: the role of interest rates. *Journal of Monetary Economics*, 52(2):345 – 380.

Ranciere, R., Tornell, A., and Westermann, F. (2008). Systemic Crises and Growth*. *Quarterly Journal of Economics*, 123(1):359–406.

Ríos-Rull, J. and Choi, S. (2009). Understanding the Dynamics of Labor Share: The Role of Non-competitive Factor Prices . *working paper*.

Ríos-Rull, J. and Santaeulalia-Llopis, R. (2009). Redistributive Shocks and Productivity Shocks. *forthcoming in Journal of Monetary Economics*.

Sarquis, S. (2008). Interest Rate and Business Cycles in a Credit Constrained Small Open Economy. *Cycles, Contagion and Crises*, page 238.

Schmitt-Grohé, S. and Uribe, M. (2003). Closing small open economy models. *Journal of International Economics*, 61(1):163–185.

Schneider, M. and Tornell, A. (2004). Balance sheet effects, bailout guarantees and financial crises. *Review of Economic Studies*, 71(3):883–913.

Stiglitz, J. and Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, 71(3):393–410.

Uribe, M. and Yue, V. Z. (2006). Country spreads and emerging countries: Who drives whom? *Journal of International Economics*, 69(1):6 – 36.

Appendix: Data Sources

	Period	Compensation & GDP (VA)	Interest Rates (IFS)
Emerging Markets			
Argentina	1993-2007	UN	lending rate (IFS)
Brazil	1992-2007	UN	T-bill rate (IFS)
Chile	1981-2007	UN	lending rate (IFS)
Columbia	1992-2007	UN	lending rate (IFS)
Costa Rica	1982-2007	UN	lending rate (IFS)
Czech Rep.	1992-2008	OECD	lending rate (IFS)
Egypt	1996-2006	UN	lending rate (IFS)
Hungary	1995-2008	OECD	lending rate (IFS)
India	1981-2002	UN	lending rate (IFS)
Israel	1995-2007	UN	lending rate (IFS)
Korea	1981-2008	OECD	corporate bond rate (IFS)
Mexico	1981-2008	OECD	ave cost of borr. (IFS)
Peru	1986-2006	UN	lending rate (IFS)
Philippines	1992-2007	UN	T-bill rate (IFS)
Poland	1991-2008	OECD	T-bill rate (OECD)
Russia	1995-2008	UN	lending rate (IFS)
South Afr.	1981-2008	UN	T-bill rate (IFS)
Turkey	1987-2006	UN	money market (IFS)
Developed Markets			
Australia	1981-2008	OECD	T-bill rate (OECD)
Austria	1990-2008	OECD	T-bill rate (OECD)
Canada	1981-2008	OECD	T-bill rate (OECD)
Denmark	1987-2008	OECD	T-bill rate (OECD)
Finland	1987-2008	OECD	T-bill rate (OECD)
France	1981-2008	OECD	T-bill rate (OECD)
Germany	1981-2008	OECD	T-bill rate (OECD)
Greece	1981-2008	OECD	T-bill rate (IFS)
Iceland	1988-2008	OECD	T-bill rate (OECD)
Ireland	1984-2008	OECD	T-bill rate (OECD)
Italy	1981-2008	OECD	T-bill rate (OECD)
Netherlands	1986-2008	OECD	T-bill rate (OECD)
New Zealand	1981-2008	OECD	T-bill rate (OECD)
Norway	1981-2008	OECD	T-bill rate (OECD)
Spain	1981-2008	OECD	T-bill rate (OECD)
Sweden	1982-2008	OECD	T-bill rate (OECD)
United Kingdom	1981-2008	OECD	T-bill rate (OECD)
United States	1981-2008	OECD	T-bill rate (OECD)

Note: Compensation is the compensation of employees in GDP-national accounts from income approach.

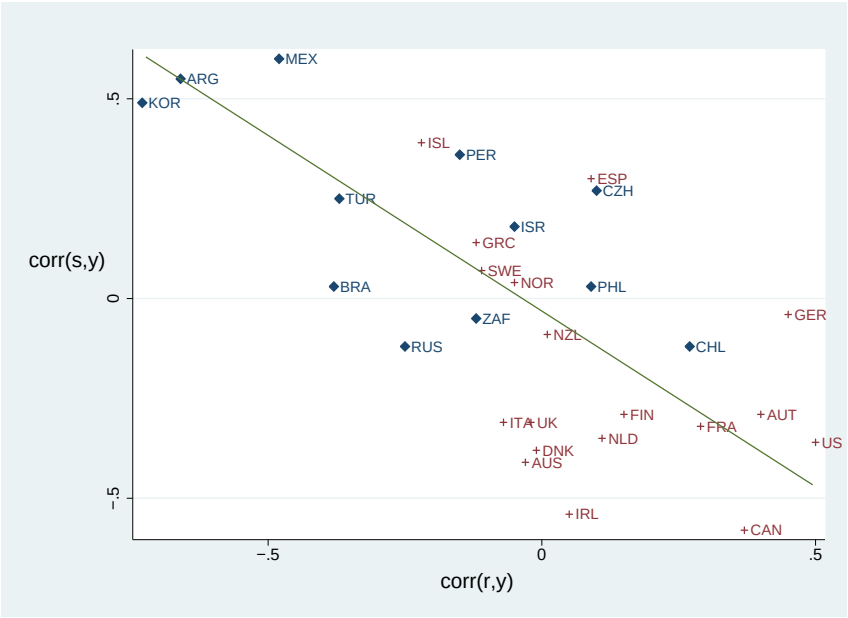
GDP deflator

The data source is either OECD or IFS. For each country, interest rates and GDP deflators are coming from the same source.

EMBI rates

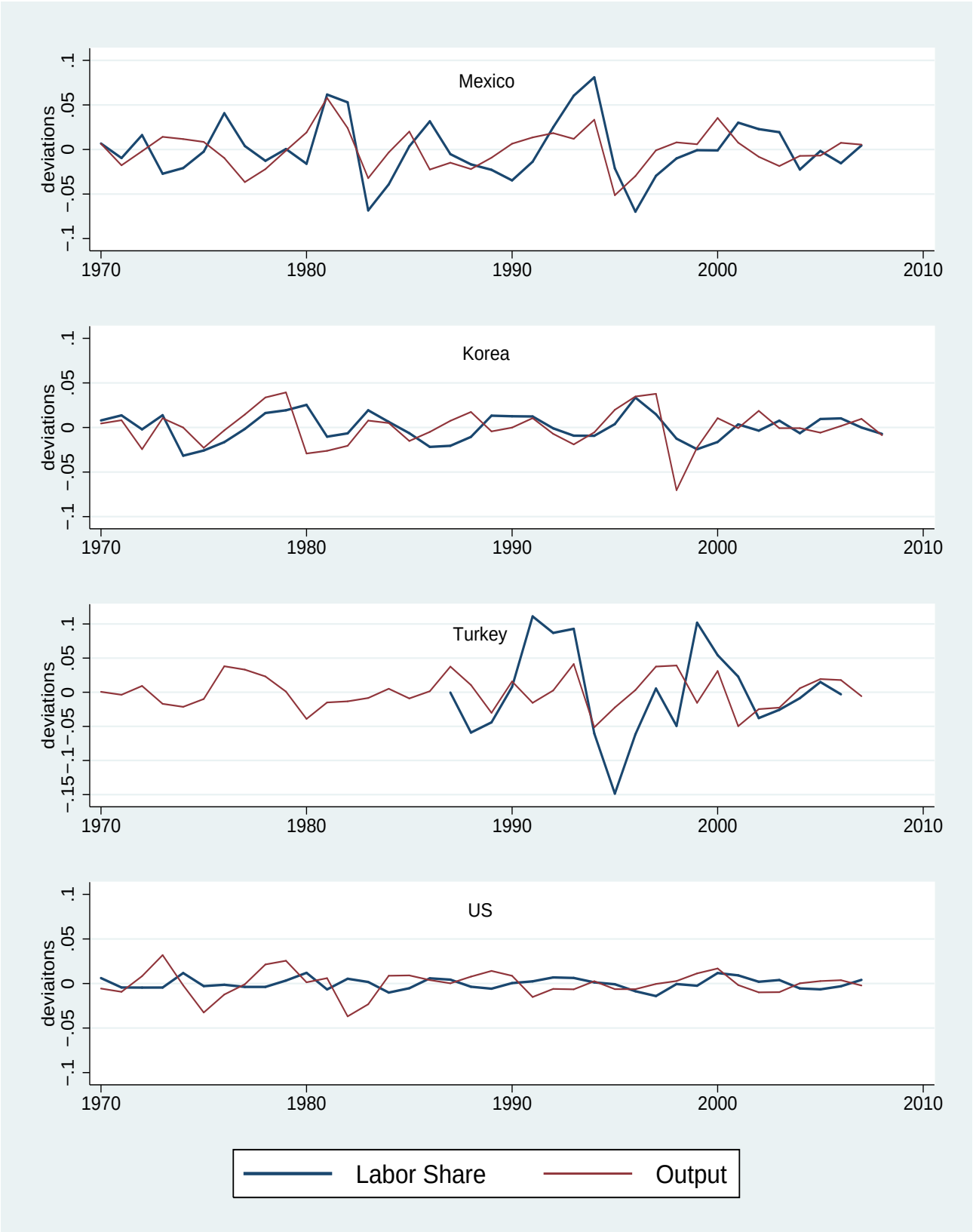
The data on EMBI spreads for emerging economies come from Uribe and Yue (2006) dataset.

Figure 4: Correlation of Labor Share and EMBI interest rates with Output



Note: corr(s,y) and corr(r,y) denote the correlation of labor share with output and of interest rate with output, respectively. Interest rate data covers 1994Q1-2005Q1 for most countries and constructed using EMBI spread data from Uribe and Yue (2006) except Argentina. Interest rate data for Argentina (1983Q1-2005Q1) comes from Neumeyer and Perri (2005) until 2001Q2, we then extend the data using EMBI rates from Uribe and Yue (2006).

Figure 5: Labor Share Fluctuations in Mexico, Korea, Turkey and US



Note: The variables are de-trended using HP-filter. Y-axis shows percentage deviations from the levels.

Table 1: Volatility and Correlations in Emerging Markets

	σ(s)	ρ(s,y)	σ(r)	ρ(r,y)	ρ(r,s)
Argentina	5.02	0.56	7.8	-0.57	-0.57
		(0.03)		(0.03)	(0.03)
Brazil	2.38	0.03	4.08	-0.36	-0.08
		(0.92)		(0.22)	(0.39)
Chile	2.36	-0.12	4.67	-0.02	0.19
		(0.54)		(0.89)	(0.32)
Colombia	1.22	-0.06	5.21	0.42	-0.25
		(0.88)		(0.02)	(0.36)
Costa Rica	2.92	-0.22	4.53	-0.03	-0.05
		(0.26)		(0.88)	(0.82)
Czech Rep.	1.37	0.27	2.30	-0.16	0.03
		(0.30)		(0.55)	(0.92)
Egypt	1.29	0.18	1.93	-0.40	-0.60
		(0.58)		(0.27)	(0.02)
Hungary	1.14	0.12	2.17	0.06	-0.11
		(0.67)		(0.83)	(0.71)
India	1.17	-0.44	2.89	0.22	-0.52
		(0.04)		(0.33)	(0.01)
Israel	1.71	0.17	1.94	0.10	-0.31
		(0.57)		(0.74)	(0.31)
Korea	1.36	0.45	1.83	-0.57	-0.20
		(0.02)		(0.01)	(0.31)
Mexico	3.72	0.60	9.10	-0.56	-0.66
		(0.0)		(0.0)	(0.0)
Peru	2.30	0.36	7.01	-0.16	0.02
		(0.07)		(0.52)	(0.92)
Philippines	2.10	0.02	2.33	-0.03	-0.09
		(0.95)		(0.92)	(0.74)
Poland	1.97	-0.19	3.45	0.44	-0.35
		(0.46)		(0.08)	(0.17)
Russia	4.8	-0.12	3.22	0.20	-0.70
		(0.68)		(0.49)	(0.02)
South Africa	1.47	-0.06	2.18	0.16	0.11
		(0.76)		(0.41)	(0.59)
Turkey	6.40	0.25	9.66	-0.49	-0.24
		(0.30)		(0.02)	(0.31)
Mean	**2.48**	**0.10**	**4.27**	**-0.10**	**-0.24**
Mean*	**2.98**	**0.34**	**5.49**	**-0.41**	**-0.29**

Note: P-values are in parenthesis. σ ρ denote standard deviation and correlation. Mean* represents the average for countercyclical facing countercyclical interest rates. Interest rates are net annual domestic rates from IFS. See the data appendix for sources.

Table 2: Volatility and Correlations in Developed Markets

	σ(s)	ρ(s,y)	σ(r)	ρ(r,y)	ρ(r,s)
Australia	1.05	-0.41	1.45	-0.03	0.62
		(0.02)		(0.50)	(0.0)
Austria	0.65	-0.29	0.65	0.40	-0.06
		(0.08)		(0.08)	(0.80)
Canada	1.06	-0.58	1.30	0.37	-0.22
		(0.0)		(0.06)	(0.26)
Denmark	1.18	-0.38	1.16	-0.03	-0.05
		(0.05)		(0.0)	(0.81)
Finland	1.74	-0.29	1.79	0.15	0.32
		(0.13)		(0.49)	(0.14)
France	0.50	-0.32	0.70	0.29	0.13
		(0.09)		(0.13)	(0.50)
Germany	0.79	-0.04	0.63	0.45	0.09
		(0.88)		(0.01)	(0.64)
Greece	1.96	0.14	1.31	-0.12	-0.23
		(0.49)		(0.54)	(0.64)
Iceland	2.8	0.39	2.01	-0.22	-0.03
		(0.03)		(0.0)	(0.89)
Ireland	1.4	-0.54	1.73	0.05	-0.06
		(0.01)		(0.87)	(0.75)
Italy	0.8	-0.31	1.11	-0.07	0.23
		(0.10)		(0.72)	(0.25)
Netherlands	1.07	-0.35	0.76	0.11	-0.01
		(0.10)		(0.63)	(0.97)
New Zealand	1.86	-0.09	1.62	0.01	0.53
		(0.65)		(0.95)	(0.01)
Norway	3.17	0.04	3.4	-0.05	-0.44
		(0.82)		(0.81)	(0.02)
Spain	1.06	0.30	1.59	0.09	0.34
		(0.13)		(0.63)	(0.08)
Sweden	1.48	0.07	1.49	-0.12	0.21
		(0.70)		(0.56)	(0.30)
UK	0.99	-0.31	1.19	-0.02	0.25
		(0.10)		(0.83)	(0.18)
US	0.69	-0.36	1.00	0.50	-0.42
		(0.05)		(0.01)	(0.03)
Mean	**1.34**	**-0.19**	**1.38**	**0.10**	**0.07**

Note: P-values are shown in parenthesis. σ and ρ denote standard deviation and correlation, respectively. Interest rates are the annual average of short-term interest rates on local denominated T-bills over the period taken for labor share. See the data appendix for details.

Table 3: Adjustments for Self-employment

	Lab. Share		Adj-1		Adj-2	
	σ(s)	ρ(s,y)	σ(s)	ρ(s,y)	σ(s)	ρ(s,y)
Argentina	5.02	0.56	5.60	0.54		
		(0.03)		(0.04)		
Brazil	2.38	0.03	2.88	0.20		
		(0.92)		(0.43)		
Chile	2.36	-0.12			2.18	-0.44
		(0.54)				(0.13)
Colombia	1.22	-0.06	1.15	-0.10		
		(0.88)		(0.67)		
Costa Rica	2.92	-0.22			2.59	-0.46
		(0.26)				(0.03)
Czech Republic	1.37	0.27			1.42	0.17
		(0.30)				(0.33)
Egypt	1.29	0.18	1.35	0.18		
		(0.58)		(0.59)		
Hungary	1.14	0.12			1.51	-0.02
		(0.67)				(0.95)
Korea	1.36	0.44			1.45	0.32
		(0.02)				(0.05)
Mexico	3.72	0.60			3.34	0.58
		(0.0)				(0.0)
Turkey	6.40	0.25			6.22	0.15
		(0.30)				(0.62)
Mean	**2.65**	**0.18**				
Mean (Adj.)	**2.46**	**0.10**				

Note: Adj-1 calculates labor share as the ratio of labor compensation of incorporate sector over value added excluding unincorporate sector. Adj-2 assumes that labor income per self-employed is equal to compensation of average worker and recalculates labor share as the multiplication of compensation per employees and total employment. Adj-3 assumes that labor income of self-employed is half of average compensation per worker and does the calculation as in adj-2.

Table 4: Cyclical Variation in Self-Employment and Total Employment

	Brazil	Korea	Mexico	Turkey
$\rho(se, y)$	0.23	-0.28	0.30	-0.29
$\rho(l, y)$	0.50	0.78	0.75	0.35

Note: $\rho(x, y)$ is the correlation between two variables. se denotes self-employment whereas l denotes total employment. The data covers the period after 1990.

Table 5: Parameters

Name	**Symbol**	**Value**	
		Mexico	**Canada**
Discount factor	β	0.98	0.99
Utility curvature	σ	5	5
Labor curvature	υ	2.75	2.0
Labor weight	ξ	varies	varies
Capital exponent	α	0.43	0.40
Depreciation rate	δ	0.02	0.02
Wage bill paid in advance	θ	1 or 0.66	
Bond holding cost	κ	0.001	0.001
Capital adjustment cost	ϕ	varies	varies
Induced leverage	η	1.5	0.75
Net Foreign Debt / GDP	$\overline{\psi}$	-0.42	-0.25

Shock process:

Mexico	
$\widehat{A}_t = 0.64\widehat{A}_{t-1} + (-0.12)\widehat{R}_{t-1} + \epsilon_t^a$ $\widehat{R}_t = 0.05\widehat{A}_{t-1} + 0.60\widehat{R}_{t-1} + \epsilon_t^r$	$\Sigma_{\epsilon_t\epsilon_t'} = \begin{pmatrix} 0.014^2 & -0.000093 \\ -0.000093 & 0.017^2 \end{pmatrix}$
Canada	
$\widehat{A}_t = 0.58\widehat{A}_{t-1} + 0.17\widehat{R}_{t-1} + \epsilon_t^a$ $\widehat{R}_t = 0.12\widehat{A}_{t-1} + 0.70\widehat{R}_{t-1} + \epsilon_t^r$	$\Sigma_{\epsilon_t\epsilon_t'} = \begin{pmatrix} 0.007^2 & 0.0000038 \\ 0.0000038 & 0.0025^2 \end{pmatrix}$

Table 6: Model Implications for Mexico

			θ=1		θ=0.66	
	Data	**RBC**	**Perfect Credit**	**Imperfect Credit**	**Perfect Credit**	**Imperfect Credit**
Standard Deviation						
Output	2.19	2.10	2.35	2.47	2.26	2.42
Labor share	**3.58**	**0.0**	**2.01**	**3.06**	**1.34**	**2.43**
Interest Rate	2.01	2.01	2.01	2.01	2.01	2.01
Net exports	2.25	0.81	2.27	2.25	2.26	2.21
Standard Deviation (Relative)						
Wage	1.82	0.63	0.99	1.26	0.85	1.14
Hours	0.64	0.37	0.56	0.72	0.49	0.65
Consumption	1.35	0.58	0.67	1.05	0.62	1.25
Investment	3.45	3.45	3.45	3.45	3.45	3.45
Correlation with Output						
Labor Share	**0.44**	**0.0**	**0.41**	**0.66**	**0.40**	**0.66**
Interest Rate	-0.45	-0.36	-0.51	-0.57	-0.47	-0.52
Wage	0.41	1.0	0.91	0.90	0.94	0.92
Hours	0.64	1.0	0.91	0.90	0.94	0.92
Consumption	0.89	0.79	0.82	0.90	0.83	0.89
Investment	0.94	0.31	0.35	0.87	0.33	0.85
Net Exports	-0.65	0.39	0.32	-0.47	0.36	-0.51
Lab. Share and R	-0.48	0.0	-1.0	-0.96	-1.0	-0.93

Note: Data period is 1987Q1-2008Q1. All variables are in logs (except net interest rate and net export) and HP-filtered. Quarterly labor share and wages are coming from manufacturing but labor shares in manufacturing has a very strong correlation with labor share in overall activity at annual level. Investment adjustment cost parameter is set to match investment volatility. Net export is defined exports minus imports over output. The last line represents the correlation between labor share and interest rates.

Table 7: Model Implications for Mexico and Canada: What dominates Where?

	Mexico			Canada		
	Data	**Baseline**	**Sluggish Labor**	**Data**	**Baseline**	**Sluggish Labor**
Standard Deviation						
Output	2.19	2.43	2.28	1.30	1.02	0.92
Labor share	**3.58**	**2.35**	**1.67**	**1.05**	**0.19**	**0.31**
Interest Rate	2.01	2.01	2.01	0.40	0.40	0.40
Net Exports	2.25	2.25	2.25	0.88	0.21	0.27
Standard Deviation (Relative)						
Wage	1.82	1.10	1.01	0.64	0.49	0.40
Hours	0.64	0.65	0.55	0.65	0.49	0.40
Consumption	1.35	1.30	1.22	0.72	0.44	0.37
Investment	3.45	3.45	3.45	2.55	2.55	2.55
Correlation with Output						
Labor Share	**0.42**	**0.66**	**0.53**	**-0.62**	**-0.19**	**-0.73**
Interest Rate	-0.45	-0.52	-0.49	0.33	0.25	0.25
Wage	0.41	0.92	0.92	-0.20	0.99	0.95
Hours	0.64	0.92	0.92	0.81	0.99	0.95
Consumption	0.89	0.88	0.83	0.69	0.99	0.95
Investment	0.94	0.84	0.72	0.72	0.96	0.95
Net Exports	-0.65	-0.50	-0.30	0.07	0.55	0.68
Labor Share and R	-0.48	-0.93	-0.89	-0.15	-0.94	-0.12

Note: Baseline model is the one with imperfect credit and $\theta = 0.66$. Third and sixth columns add adjustment cost on labor to baseline model. For other details see table-6.