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Abstract

Government expenditures are procyclical in emerging markets and countercyclical in developed economies. We show this pattern is driven by differences in social transfers: transfers are more countercyclical and make up a larger portion of spending in developed economies. We use a small open economy model to study how much these differences in fiscal policies can account for differences in business cycle characteristics of emerging economies, particularly excess volatility of private consumption. We find that ignoring disparate fiscal policy results in an overestimation of the persistence of technology shocks in emerging markets relative to developed by 52%. We study how this conclusion depends on differences in the extent and sources of inequality across countries.

JEL Codes: E21, E32, E62, F41
Keywords: fiscal policy, emerging markets, trasnfers, inequality

1 Introduction

We study the role disparate fiscal policies play in generating the business cycle anomalies of emerging markets. Prior literature has documented that emerging markets experience business cycles differently than developed economies. Consumption is more volatile relative to output, real exchange rates depreciate during downturns, and the trade balance is strongly counter-cyclical.[1]

A parallel literature has documented that the business cycle response of fiscal policy in emerging markets is also distinctive.[2] Total expenditures are procyclical in emerging markets versus countercyclical in developed economies. This contrast is important because fiscal procyclicality tends to amplify rather than mitigate underlying forces driving business cycles. In this paper, we delve further into fiscal data and find this pattern holds for only one key component of government expenditure: social transfers. Social transfers are acyclical in emerging economies and countercyclical (correlation with GDP is -0.64) in developed economies. This is important because social transfers are the largest expenditure category in each country group. They comprise 36% of expenditures (12.3% of GDP) in developed economies compared to 23% of expenditures (5.4% of GDP) in emerging economies. The large differences in transfers trounce the minor differences in other categories such as Goods Expenses, Fixed Capital, and Employee Compensation. Therefore, understanding the impact of transfers is key for understanding the impact of overall fiscal policy on business cycle outcomes.

We bridge these literatures by developing a small open economy business cycle model with a role for government expenditure explicitly modeled as social transfers. The base of our model is the workhorse small open economy model of Mendoza 1990. We generate emerging market business cycle characteristics using a theory of trend shocks provided by Aguiar and Gopinath. To the base model, we add heterogeneous households and a government. Households differ in both their labor productivity and access to financial markets. The government provides social transfers to poor households according to an exogenous process replicating the level, standard deviation, and correlation with GDP of social benefits observed

[1] Key works in this field include: Mendoza (1995), Neumeyer and Perri (2005), Uribe and Yue (2006), and Aguiar and Gopinath (2007).

[2] See Alesina et al. (2008), Riascos and Vegh (2003), Talvi and Vegh (2005)

in the data. Social transfers are supported by taxes on rich households. Taxes are chosen endogenously with the objective to smooth the tax burden overtime.[3] Fiscal deficits are covered by issuing bonds at the global interest rate and surpluses may be invested in the same international market.[4]

We find that differences in fiscal policy go a long way in accounting for the contrasting business cycle characteristics of emerging and developed economies. When we estimate the model with realistic social transfers observed in the data, we find trend shocks account for 48% of the variation in TFP in emerging markets and 29% in developed. Re-estimating the model with social transfers set to zero implies trend shocks account for 48% and 7% of the variation of TFP in emerging and developed countries, respectively. We conclude that ignoring redistribution provided by fiscal policy leads to a substantial overestimation in the differences in the underlying TFP processes between emerging and developed economies. This is an important result not only for understanding the risks nations face along the path of economic growth, but also for understanding the stabilizing role of fiscal policy.

Emerging markets also feature higher income and wealth inequality than developed economies above what can be accounted for by differences in social transfers. We explore how the extent of inequality affects the macroeconomic impacts of social redistribution through the channels of our model. First, we consider wealth inequality. We assume rich agents own the capital stock and poor agents are hand-to-mouth consumers with no means of saving. We find the smaller the share of rich agents in the economy, the smaller is the impact of social benefits on cyclical properties of consumption and trade balance. Second, we consider income inequality. We assume rich agents have higher efficiency units of labor than poor agents resulting in a higher wage per unit of time worked. We find the larger the relative labor income of rich agents, the larger is the effect of social transfers on cyclical properties of consumption and trade balance. Thus, our results suggest the source of income inequality matters for business cycles.

[3]This assumption is motivated by the classical arguments of Barro (Barro (1979)), but may also be interpreted as minimizing political and/or administrative costs necessary to change fiscal policy at high frequency.

[4]Sovereign default is obviously an important issue for emerging markets. However, the question we ask in this paper does not require the explicit modeling of default. Instead, we can consider a partial equilibrium interest rate on government bonds that depends on the current debt to GDP ratio. This captures the relevant difference in constraints to tax smoothing in emerging and developed countries.

1.1 Literature

Business cycles in emerging markets are different than in developed economies. Consumption is more volatile than output and trade balance is strongly counter-cyclical. These two facts are puzzling for the standard business cycle model of a small open economy. Numerous suggested fluctuations in emerging markets were driven by fundamentally different sources than in developed countries. Aguiar and Gopinath (2007) proposed productivity process in emerging markets was different - emerging markets faced a more volatile shocks to growth rate rather than level of productivity. Neumeyer and Perri (2005) and Uribe and Yue (2006) emphasized the role of interest rate fluctuations and financial frictions. A number of follow-up studies focused their efforts in evaluating the relative importance of the two sources of fluctuations[5], implicitly emphasizing the substantial difference between emerging and developed economies. We show the differences between the two groups of countries may have been over-estimated, once we take into account the behavior of fiscal policy, particularly social transfers.

Ours is not the first paper to consider the role of fiscal policy in generating anomalies of emerging markets business cycles. Gavin and Perotti (1997) first document the pattern of procyclical fiscal policy in Latin America. Their work is followed by broader studies on expenditures (Kaminsky et al. (2005)) and taxes (Ilzetzki and Végh (2008)) reinforcing their findings. Two complementary theoretical literatures are related to these empirical findings: one seeking to understand the implication of fiscal policy in open economy business cycles and one seeking to understand the fundamental cause of why these fiscal policies differ. Our paper belongs to the first literature.[6] The study of fiscal policy in open economy models was included in early works. Backus et al. (1992) show that an increase in government spending causes a real exchange rate depreciation in the open economy neoclassical model. This response has been shown to be counterfactual. For example, Ravn et al. (2007) document that increases in government expenditure on goods deteriorates the trade balance and depreciates the real exchange rate. They provide a theory of deep habits where an increase in

[5] A non-exhausting list includes Chang and Fernández (2013), Garcia-Cicco et al. (2010), Rothert (2012).

[6] The second literature has provided theories related to limited access to international credit markets (Cuadra et al. (2010),Riascos and Vegh (2003)) and political economy motives (Talvi and Vegh (2005), Alesina et al. (2008)).

government spending leads firms to lower domestic markups relative to foreign providing a real exchange rate depreciation matching the data.

Our contribution to the quantitative theory literature is to explore how the composition of government expenditures, not just the level, may reconcile outcomes in the neoclassical open economy model with empirical observations. As such we depart from the standard modelling assumptions as government expenditures as a sunk expense, or equivalently as separable in the utility function of households. We also add agents who are heterogenous in wealth and income into the analysis. These departures relate our paper to a third, emerging literature on the calculation of government spending multipliers in models with heterogenous agents. Most related is Brinca et al. (2014). They document a positive correlation between fiscal multipliers and wealth inequality. They show a heterogenous agent neoclassical model of incomplete markets can replicate this fact when government spending is modeled as social security and appropriately calibrated. Ferriere and Navarro (2014) study the impact tax progressivity on multipliers, but model expenditures as "thrown into the ocean". Our work is also distinct in considering an open economy setting.

Our empirical analysis of the IMF's Government Finance Survey is an independent contribution apart from our quantitative theory exercises. Changes in the survey overtime and differences in reporting conventions across countries require significant cleaning of the dataset to provide consistent measures of government expenditure at the categorical level. We devise a detailed methodology to achieve this. We then merge the dataset with key variables from other Macroeconomic datasets and compute a variety of statistics useful for studying issues in growth, international macroeconomics, and political economy.

2 Empirical Regularities on the Composition of Fiscal Policy

Government Finance Statistics Dataset [7] Our main dataset for fiscal variables is the Government Finance Statistics Dataset (GFS) maintained by the International Monetary Fund (IMF). The data collection began in 1972 with further guidelines established in 1986 intended to harmonize reporting of fiscal measures across countries. These guidelines have subsequently been updated twice: once in 2001 and again in 2014. These changes have little impact on our analysis with the exception of the expansion in the inclusion of nonmonetary transactions. Most countries switched from cash accounting to accrual in the mid-1990s' early 2000's.

We use annual data. Higher frequency- monthly and quarterly data- are limited to a smaller group of mostly developed countries.

Reported transactions are delineated by sub-sectors of the total Public Sector. Starting from finest to coarsest, the sector-level reporting concepts we consider are:

1. Budgetary Central Government: a single unit encompassing financial activities of the judiciary, legislature, ministries, president, and government agencies. It is funded by the main operating budget of the nation, generally approved by the legislature. Items not included in the budgetary central government statistics include extra-budgetary units and transactions;[8] and social security funds.

2. Central Government: the central government includes all transactions not operated through a public corporation (ex: central bank and other financial institutions) that are implemented at the national level (ie: not state or local governments). These statistics may or may not include social security, depending on the country reporting. Social security refers to social insurance schemes operated by a budget of assets and liabilities separate from the general fund.

3. General Government: the sum of central, state, and local financial activities plus social security. This does not include financial corporations.

[7] Information for this section comes from the 2014 GFS manual.

[8] For example, units with revenue streams outside of the central budget, external grants received, etc.

Striation in the reporting of statistics by government level differs greatly across countries and over time. This is a major difficulty in our analysis.

The transactions we analyze fall into the categories of revenues and expenses affecting net worth. The specific breakdown is as follows.

- Revenue: transactions that increase *net* worth. These do not include transactions that simply affect the composition of assets and liabilities in the balance sheet such as the payments of loans or sale of financial assets.

    1. Tax Revenue: compulsory, unrequited accounts receivable by the government. Does not include, fines, penalties, and most social security contributions (as these are requited). Taxe revenue can be further disaggregated into: (a) taxes on income, profits and capital gains; (b) payroll taxes; (c) property taxes; (d) taxes on goods and services; (e) taxes on international trades and transactions.
    2. Social Contributions: revenue of social insurance schemes. May be voluntary or compulsory.
    3. Grants: transfers relievable that are not taxes, social contributions, or subsidies. May come from domestic or international organizations and units.
    4. Other: revenues not fitting in the aforementioned categories. Include: (a) property income, (b) sales of goods and services, (c) fines, etc.

- Expense: transactions that decrease *net* worth. These do not include transactions that simply affect the composition of assets and liabilities in the balance sheet.

    1. Compensation of Employees: renumeration payable, both cash and in-kind, to employees of the government unit. Includes contractors.
    2. Use of Goods and Services: "value of goods and services used for the production of market and nonmarket goods and services". Includes consumption of fixed capital and goods purchased by the government for direct distribution. Consumption of fixed capital is also reported separately.
    3. Interest: interest fees on liabilities generated by both financial and non-financial services consumed by the government. Includes intra-government liabilities for disaggregated units.

Table 1: List of countries

Emerging	Developed
Brazil	Australia
Israel	Austria
Malaysia	Belgium
South Korea	Canada
Peru	Denmark
Slovakia	Finland
South Africa	Netherlands
Thailand	New Zealand
Argentina	Norway
	Portugal
	Spain
	Sweden
	Switzerland

4. Subsidies: unrequited transfers to enterprises based on production activities. *Includes implicit subsidies of central banks.*
5. Social Benefits: current transfers receivable by household related to social risks. These include: sickness, unemployment, retirement, housing, and education.
6. Other: transfers not otherwise classified, non-interest property expense, premiums and fees on nonlife insurance schemes.

We consider an alternative measure of expenditure categorized by function: "social protection". These expenditures are provided to individual persons and include (a) sickness and disability; (b) old age and survivors; (c) family and children; (d) unemployment; (e) housing; (f) social exclusion not otherwise classified.

Sample The time period spans 1990-2012. We place small open economies into two groups: (1) Emerging and (2) Developed, based on the classification of Aguiar and Gopinath, subject to data availability for the variables of our interest. The resulting sample is presented in Table 1.

Table 2: Macro Statistics

Variable	Emerging	Developed
std(y)	0.38	0.208
std(c)/std(y)	1.27	0.85
nx/gdp	-0.016	0.013
corr(nx,gdp)	-0.37	0.12

Constructing Consistent Measures of Revenues and Expenditures. Constructing consistent measures of revenues and expenditures at the categorical level is non-trivial. The first hurdle is that different countries implement fiscal policy through different government bodies. For example, Brazil reports almost all social benefits are provided at the central government level while subnational governments provide three-quarters of social benefits in Denmark. This is a potential problem because the data are incomplete: some countries only report spending at certain levels.[9] The second hurdle is that some countries switch from reporting cash to non-cash payments or switch the level at which they report payments: general, central, of budgetary general. We handle each of these issues on a case-by-case basis. In many cases the time-series remains smooth despite changes in the reported accounting scheme. If these changes occur in the two years after the GFS survey is updated (1995-6, 2001-2) we use the two series as one consistent series. In cases where we observe general government spending in ten or more years, we use this category as is. In cases where we only observe central government spending in ten or more years, we continue to use the time series if it is more than 85% of total government spending in the years where general government spending is observed as well. Countries included in Aguiar and Gopinath (2007) that do not meet either of these criteria are dropped (Mexico, Uruguay, etc.). We repeat this process for each component of expenditures and revenues and their cash and non-cash reports.

Table 3 shows the following stylized facts about average expenses and revenues across the country groups. Developed countries have higher mean total expenses and total revenues over the sample. The difference in total expenses is driven almost entirely by the difference in Social Benefits. Developed countries mean spending on social benefits is twice that of emerging economies. Social benefits are also the largest expenditure category in each country

[9]The main issue is the exclusion of local governments for the emerging economies.

Table 3: Composition of Government Spending

Average Share of GDP		
Variable	Emerging	Developed
Total Expenses	23.3	34.0
Compensation of Employees	5.05	4.86
Fixed Capital	1.2	1.0
Goods Expenses	4.03	3.19
*Social Protection**	6.2	12.3
Social Benefits	5.42	12.30
Subsidies & Transfers	1.06	1.45
Interest	3.3	2.8
Other Expense	1.28	1.36
Total Revenue	23.2	33.6
Social contributions	3.16	8.11
Taxes	16.88	21.93
Grants	0.33	0.53
Other Revenue	3.2	4.0
Gini	47.5	29.5

*Social Protection is calculated by a different accounting method categorizing expenditure by function.

Table 4: Cyclical Properties of Fiscal Policy

Variable	Emerging	Developed
std(G expend)	0.086	0.049
corr(G expend, gdp)	-0.37	-0.54
std(G rev)	0.056	0.038
corr(G rev, gdp)	0.22	0.12
std(Social Benefits)	0.56	0.67
corr(Social Benefits, gdp)	-0.024	-0.638
std(Goods Exp)	0.543	0.288
corr(Goods Exp, gdp)	-0.10	-0.26

group. Social contributions are 2.5 times higher in the developed group. Taxes are also five percentage points higher (as percent of GDP). The final line show the Gini coefficient on wealth in each country, taken as the median over the sample period. It is clear that inequality is also much higher in emerging markets.

We now examine the volatility of expenditures and revenues as well as their comovement with GDP. Table 4 shows overall expenditures are more volatile and less counter-cyclical in emerging markets. Similarly, government revenues are more procyclical and volatile as well. Social Benefits are strongly countercyclical in developed countries and acyclical in emerging markets. Compare this to goods expenditures, a category often focused on in the literature: they are counter-cyclical in both groups of economies.[10]

Finally, we study the relationship between inequality and our variables of interest. We find countries with higher inequality have higher volatility of consumption relative to GDP and more procyclical net exports. More unequal societies also have more procyclical government expenditures, whereas government revenues show no relationship to inequality. Interestingly enough, these results do not hold for a broader sample including large open economies. The lower half of the table displays statistics for countries with a data quality rating in the Penn World Tables of a "C" or better. We weight all countries equally. We now find inequality is correlated with lower volatility of consumption. This may be related to the

[10]The sample includes recessionary years following 2007 to 2012. We are investigating whether the fiscal response during this time is driving these results.

Table 5: Relationship to Inequality

Variable	Pooled A&G Sample
corr(Gini , std(c)/std(y))	0.214
corr(Gini , corr(NX,y))	0.233
corr(Gini, std(y))	0.52
corr(Gini, corr(G expend, GDP)	0.38
corr(Gini, corr(G rev, GDP))	-0.002
Variable	PWT data quality better than "C"
corr(Gini , std(c)/std(y))	-0.25
corr(Gini , corr(NX,y))	-0.027
corr(Gini, std(y))	-0.013
corr(Gini, corr(G expend, GDP)	-0.20
corr(Gini, corr(G rev, GDP))	-0.025
corr(Gini, corr(Social Ben, GDP)	-0.355

fact that it also is correlated countercyclical expenditures and social benefits. This is rather unsurprising as our data quality requirement trims the sample to mostly large, developed economies.

3 Model

In order to analyze the impact of inequality, and redistributive policies on business cycle properties we build on workhorse real business cycle model of a small open, emerging economy (Mendoza (1991), Aguiar and Gopinath (2007) and Neumeyer and Perri (2005)). We introduce inequality by considering two types of households: (R)ich and (P)oor. There is a mass N^R of rich households, and a mass N^P of poor households. The difference between the two is twofold. First, rich households have higher efficiency of labor input: efficiency of the unit of labor of a poor household is 1, efficiency of the unit of labor of a rich household is $\gamma > 1$. Second, only rich households can own physical capital.

3.1 Production

Aggregate production function is Cobb-Douglas with identical specification as in Aguiar and Gopinath (2007):

$$Y_t = e^{z_t} K_t^{\alpha} (\Gamma_t L_t)^{1-\alpha},$$

where z_t is a temporary component of the log of total factor productivity (TFP), and Γ_t is the trend component of the TFP. The inputs K_t, and L_t are aggregate capital stock and aggregate labor respectively. The stochastic processes governing productivity are as follows:

$$\begin{aligned} z_t &= \rho_z z_{t-1} + \epsilon_t^z \\ \Gamma_t &= \Gamma_{t-1} e^{g_t} \\ g_t &= (1-\rho_g)\mu_g + \rho_g g_{t-1} + \epsilon_t^g \end{aligned}$$

Aggregate capital stock is the sum of all the physical capital owned by rich households. Aggregate labor input is the sum of effective labor inputs of the rich and the poor households:

$$\begin{aligned} K_t &= N^R \cdot k_t \\ L_t &= N^R \cdot \gamma \ell_t^R + N^P \ell_t^P \end{aligned}$$

where k_t is capital stock per rich household, ℓ^R and ℓ^P is labor supply per rich and poor household, respectively.

3.2 Households

The Rich A typical rich household solves the following utility maximization problem:

$$\max \sum_t \beta^t \frac{\left[c_t^R - \chi \Gamma_{t-1} \frac{\ell_t^{R\,1+\nu}}{1+\nu}\right]^{1-\sigma}}{1-\sigma}$$

subject to:

$$c_t^R + x_t \leq w_t^R (1-\tau_t^R)\ell_t^R + r_t k_{t-1} + R_{t-1} a_{t-1} - a_t - \frac{\kappa}{2}\left(a_t - \bar{a}\right)^2$$

$$k_t = (1-\delta)k_{t-1} + x_t - \frac{\phi}{2}\left(\frac{k_t}{k_{t-1}} - e^{\mu_g}\right)^2 k_{t-1}$$

where the last term on the RHS of the budget constraint is a portfolio adjustment introduced to ensure stationarity of the law of motion for assets in the linearized economy.

The Poor There is a mass N^P of poor households. A typical poor household solves the following utility maximization problem:

$$\max \sum_t \beta^t \frac{\left[c_t^P - \chi \Gamma_{t-1} \frac{\ell_t^{P\,1+\nu}}{1+\nu}\right]^{1-\sigma}}{1-\sigma}$$

subject to:

$$c_t^P \leq w_t^P \ell_t^P + b_t$$

where b_t is the net social transfer from the government.

Government The government's only expenditure is social benefits b_t. We treat them as an exogenous stochastic process, possibly correlated with other exogenous variables in the model. Given the stochastic process for the social benefits $\{b_t\}$, the government's objective is to minimize time variation in taxes, subject to the inter-temporal budget constraint. The government solves the following problem:

$$\min \sum_t \beta^t \frac{1}{2} TAX_t^2$$

subject to:

$$TAX_t = N^R \cdot \tau_t^R \ell_t^R w_t^R$$
$$N^P \cdot b_t + R_{t-1} D_{t-1} = TAX_t + D_t - \frac{1}{2}\kappa \left(D_t - \bar{D} \cdot \Gamma_{t-1}\right)^2$$
$$\log(b_t) = (1-\rho_s)\bar{b} + \rho_s \log b_{t-1} + \epsilon_t^b$$

The first constraint specifies the source of tax of revenues is labor tax imposed on rich households. The second constraint is the government inter-temporal budget constraint. The government has to finance exogenously given social transfers $N^P \cdot b_t$ and repay outstanding debt. The two sources of revenue to cover this expenditure are tax revenues TAX_t and newly issued debt D_t. The last term on the RHS is a quadratic adjustment cost introduced to ensure stationarity of the law of motion for government debt in the linearized economy. Finally, the last equation specifies the stochastic process for social transfers.

3.3 Cyclicality of fiscal policy

Cyclicality of fiscal policy is introduced exogenously by specifying a joint stochastic process for the vector of shocks: $[\epsilon_t^z, \epsilon_t^g, \epsilon_t^{sb}]$. The stochastic process takes the following form:

$$\begin{pmatrix} \epsilon_t^z \\ \epsilon_t^g \\ \epsilon_t^{sb} \end{pmatrix} \sim N(0, \Sigma)$$

where the variance co-variance matrix Σ is given by:

$$\Sigma = \begin{pmatrix} \sigma_z^2 & 0 & \sigma_{z,sb} \\ 0 & \sigma_g^2 & \sigma_{g,sb} \\ \sigma_{z,sb} & \sigma_{g,sb} & \sigma_{sb}^2 \end{pmatrix}$$

The cyclicality of social transfers will be driven by two parameters: $\sigma_{z,sb}$, and $\sigma_{g,sb}$.

3.4 Solution method

We solve the model with local methods by linearizing the equilibrium conditions around the non-stochastic steady-state. We use Dynare for this step. Equilibrium conditions are described in the appendix.

4 Results

We focus on the impact of the cyclicality of social transfers on differences in business cycle properties between developed and emerging economies. Our benchmark parameter values are presented in Table 6. Most of the parameter values are quite standard. Elasticity of labor supply $\nu = 0.6$ is the same as in Neumeyer and Perri (2005). Adjustment cost on investment $\phi = 3.0$ was calibrated so that a model with only transitory productivity shocks has relative volatility of investment of 3. In the subsequent versions of the paper, the estimation of this parameter will be a part of the quantitative analysis. Persistence parameters ρ_z, ρ_g, and ρ_b were all set to 0.9. This way, in our quantitative analysis we only focus on standard deviations of the three shocks and the correlation between shocks to social transfers and shocks to productivity.

Table 6: Benchmark parameter values

Technology		Preferences	
α	0.33	β	0.98
δ	0.04	σ	2.00
ϕ	3.00	ν	0.60
μ_g	0.006	χ	1.50
Persistence of shocks		**Inequality**	
ρ_z	0.9	NR	0.50
ρ_g	0.9	γ	1.00
ρ_b	0.9		

4.1 Quantitative implications of social transfers

In our main exercise we study how the inclusion (or exclusion) of social transfers affects our estimates of parameters that govern the process for total factor productivity. In particular, we look at the estimate of the random walk component of TFP. The random walk component

Table 7: Results

	Model w/o transfers			**Model w/ transfers**		
	Emerging	Developed	Difference	Emerging	Developed	Difference
σ_z	0.145	0.091	0.054	0.145	0.085	0.060
σ_g	0.093	0.017	0.076	0.093	0.036	0.057
$\frac{\sigma_z^2}{1-\rho_z^2}$	0.763	0.479	0.284	0.763	0.447	0.316
$\frac{\sigma_g^2}{1-\rho_g^2}$	0.489	0.089	0.400	0.489	0.189	0.300
σ_b	N/A	N/A	N/A	0.550	0.650	-0.100
$corr(\epsilon_z, \epsilon_b)$	N/A	N/A	N/A	-0.020	-0.530	0.510
Random walk						
component of TFP	48%	7%	41%	48%	29%	19%

of TFP is calculated using the formula (14) in Aguiar and Gopinath (2007):

$$RW = \frac{(1-\alpha)^2\sigma_g^2/(1-\rho_g^2)}{[2/(1+\rho_z)]\sigma_z^2 + [(1-\alpha)^2\sigma_g^2/(1-\rho_g^2)]}$$

We first consider a restricted model with $\sigma_b = 0$. In this restricted model we estimate two parameters—σ_z, and σ_g—by matching two empirical moments—standard deviation of GDP, and the relative standard deviation of consumption. Then, we drop the restriction that $\sigma_b = 0$, and we also allow for $\sigma_{z,b} \neq 0$, and for $\sigma_{g,b} \neq 0$ (for simplicity we only impose restriction that $\sigma_{g,b} = \sigma_{z,b}$, i.e. transfers respond identically to transitory and permanent productivity shocks). In that estimation we use additional two moments—standard deviation of social benefits, and correlation between GDP and social benefits. In each case we focus on the difference between emerging and developed in the importance of the random walk component of TFP. Our results are summarized in Table 7.

In the model without social transfers about 48% of the TFP variance in emerging markets is accounted for by trend shocks. In developed countries this number is only 7%. For comparison, Chang and Fernández (2013) estimate the random walk component in emerging markets to be 28%, Rothert (2012) estimates it to be 61%, while Aguiar and Gopinath (2007) estimates it to be 96%[11].

[11]We only provide these numbers for reference, without drawing any conclusions. Our model features

When we include social transfers and estimate their cyclical behavior to mimic the one in the data, the difference between emerging and developed countries shrinks dramatically. Since transfers are largely acyclical in emerging economies, our estimates of σ_z and σ_g for this group remains essentially the same. However, the strong counter-cyclicality and high volatility of social transfers in developed countries has a big impact on our estimates of the productivity process in that group. We now estimate that as much as 29% of the TFP variance in developed countries is accounted for by trend shocks. This is only 19 percentage points difference from emerging markets, comparing to 41 percentage points difference if we do not take into account the cyclical behavior of social benefits.

4.2 Does the inequality matter?

We explore the impact of inequality by changing two parameters: the fraction of population that owns capital ($N^R = 0.35$), and the relative labor productivity of capital owners ($\gamma = 1.5$). In each case we estimate the model without and with social transfers, and see how the inclusion of transfers affects the difference between emerging and developed countries. Our preliminary results suggest the, given the cyclicality of transfers, the impact of inequality is not very large.

Table 8: Random walk component of TFP - the role of inequality

	Model w/o transfers			**Model w/ transfers**		
	Emerging	Developed	Difference	Emerging	Developed	Difference
Benchmark	48%	7%	41%	48%	29%	19%
$N^R = 0.35$	45%	7%	38%	44%	23%	21%
$\gamma = 1.5$	42%	4%	38%	42%	29%	13%

When changes in inequality come from changes in relative labor productivity, the im-

heterogenous households, where only the rich own capital stock, and only the rich are allowed to borrow or lend. Naturally, our benchmark estimates will differ.

pact of social transfers on qualitative features of business cycles is stronger. For developed countries, taking into account social benefits, increases the estimate of the random walk component by 25 percentage points (comparing to the increase by 22 percentage points with $\gamma = 1$). When changes in inequality come from changes in capital ownership, the result is opposite. For developed countries, taking into account social benefits, increases the estimate of the random walk component by 16 percentage points (comparing to the increase by 22 percentage points with $NR = 0.5$).

5 Conclusions

We studied the role disparate fiscal policies play in generating the business cycle anomalies of emerging markets. We first documented substantial differences in the business cycle properties of various components of fiscal policy in developed and emerging economies. In particular, we showed the key difference between the two groups of countries is in the cyclical behavior of social transfers.

We then studied how these differences affect our conclusions about differences in the sources of business cycle fluctuations in emerging vs. developed countries. We considered a workhorse, real business cycle model of a small open economy with heterogenous households, in order to account for differences in inequality and to study redistributive policies. Accounting for social transfers drastically reduces the estimated differences between emerging and developed economies. Ignoring cyclicality of social transfers leads us to believe the random walk component of total factor productivity in emerging economies is 7 times more important than in developed countries. Taking that cyclicality into account, reduces that ratio to 2.

Overall, our results indicate the fundamental differences between emerging and developed countries may be exaggerated if one does not take into account differences in the behavior of fiscal policy.

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Appendices

A Equilibrium conditions

Since our model features a stochastic trend, we need to make the model stationary. We do so, by dividing all the variables containing the trend by Γ_{t-1}. The resulting equilibrium conditions are as follows.

Production function:

$$y_t = e^{z_t}(N^R \cdot k_{t-1})^{\alpha} \left[e^{g_t} L_t\right]^{1-\alpha}$$

where $L_t = \left(N^R \gamma \cdot \ell_t^P + N^P \cdot \ell_t^P\right)$.

Capital law of motion:

$$e^{g_t} k_t = (1-\delta)k_{t-1} + x_t - \frac{\phi}{2}\left(e^{g_t}\frac{k_t}{k_{t-1}} - e^{\mu_g}\right)^2 k_{t-1}$$

Resource constraint:

$$N^P c_t^P + N^R c_t^T + N^R x_t + NX_t = y_t$$

Consumption leisure trade-off:

$$-U_{\ell,t}/U_{c,t} = w_t^i, \qquad i = R, P$$

where

$$\begin{aligned} w_t^P &= (1-\alpha)Y_t/L_t \\ w_t^R &= \gamma w_t^P \end{aligned}$$

Government budget constraint:

$$N^P \cdot b_t + R_{t-1} d_{t-1} = TAX_t + e^{g_t} d_t - \frac{1}{2}\kappa\left(d_t - \bar{d}\right)^2$$

Poor household's budget constraint:

$$c_t^P = e_t^P \ell_t^P + b_t$$

Trade balance:

$$NX_t = N^R \left[R^* a_{t-1} - e^{g_t} a_t + \frac{\kappa}{2} \left(a_t - \bar{a} \right)^2 \right] + R^* d_{t-1} - e^{g_t} d_t + \frac{\kappa}{2} \left(d_t - \bar{d} \right)^2$$

Government's inter-temporal Euler condition:

$$TAX_t(1 - \kappa(d_t - \bar{d})) = (e^{g_t})^{-\sigma} R^* \beta E_t TAX_{t+1}$$

Rich household's inter-temporal Euler condition for capital:

$$U_{c,t} \left[1 + \phi \left(e^{g_t} k_t / k_{t-1} - e^{\mu_g} \right) \right] = (e^{g_t})^{-\sigma} R^* \beta E_t U_{c,t+1} \cdot \left[1 - \delta + \alpha \frac{y_{t+1}}{k_t} + \frac{\phi}{2} \left(\left(e^{g_t} \frac{k_{t+1}}{k_t} \right)^2 - e^{2\mu_g} \right) \right]$$

Rich household's inter-temporal Euler condition for asset holdings:

$$U_{c,t}(1 - \kappa(a_t - \bar{a})) = (e^{g_t})^{-\sigma} R^* \beta E_t U_{c,t+1}$$

The rich household's budget constraint automatically holds by Walras' law.

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