Accounting for Business Cycles: A Cross-Country Comparative Analysis

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Question

- What factors drive business cycle fluctuations for a relative large cross-section of countries?
- We are curious about the answer of this question because of both theoretical and practical reasons:
  - Practically, we want to identify the business cycle fluctuations and their sources
  - Doing this might help us giving some policy recommendations.
  - On the theoretical side, we want to understand the economic mechanism which leads to these cycles.

Contribution

- Use annual data from 1960 to 2014 for 21 emerging markets and 22 developed economies.
- Conduct a business cycle accounting exercise for each of these 43 economies.
- Characterize business cycles in different countries and country groups.

BCA Procedure

- To study the business cycles, we largely borrow from the Business Cycle Accounting (BCA) framework developed by Chari, Kehoe, and McGrattan (2007a) by introducing time-varying wedges, each representing different types of distortions or shocks, to an otherwise standard one-sector neo-classical growth model.
  - Efficiency wedge
  - Labor wedge
  - Investment wedge
  - Government Spending wedge
  - Trade Account wedge

BCA Procedure

- Efficiency wedge stands for the total factor productivity and input-financing frictions.
- Credit frictions, capital or consumption taxes lead to the investment wedge.
- Labor wedge captures labor market frictions such as unionization or sticky wages and monetary shocks.
- Government spending wedge captures shocks to government spending.
- Finally, trade shocks and frictions are represented by the trade account wedge.

BCA Literature

- This method of identifying the frictions in the economy using the BCA framework drew increasing attention lately, in spite of some criticisms against it. (See Christiano and Davis (2006) and Chari et al. (2007b) for a discussion about this.)
- Examples:
  - Kobayashi and Inaba (2006) for the Japanese economy
  - Lama (2005) for Argentina, Brazil and Mexico.
  - Cavalcanti (2004) for Portugal
  - Gao (2007) for China
  - Kersting (2008) for UK
  - Simanovska and Soderling (2009) for Chile
  - Cicek and Elgin (2011) for Turkey and many others

The Model

Households maximize:

$$\sum_{t=0}^{\infty}\sum_{s^t}\beta^t\pi_t(s^t)U(c_t(s^t),1-l_t(s^t))N_t$$

subject to the budget constraint,

$$C_t(s^t)+(1+\tau_{x_t}(s^t))X_t(s^t)=r_t(s^t)K_t(s^{t-1})+(1-\tau_{l_t}(s^t))w_t(s^t)L_t(s^t)+T_t(s^t)$$

the law of motion of capital,

$$\frac{N_{t+1}}{N_t}k_{t+1}(s^t)-(1-\delta)k_t(s^{t-1})=x_t(s^t)$$

and the non-negativity constraint,

$$c_t(s^t),l_t(s^t),x_t(s^t)\geq 0$$

The Model

On the production side:

$$Y_t(s^t) = A_t(s^t)F(K_t(s^{t-1}), Z_t L_t(s^t)),$$

where $Z_t = (1+\gamma)^t$. Therefore, the representative Firms maximizes the following profit function:

$$A_t(s^t)F(K_t(s^{t-1}), Z_t L_t(s^t)) - r_t(s^t)K_t(s^{t-1}) - w_t(s^t)L_t(s^t).$$

The Model

Finally,

$$N_t k_t(s^{t-1}) = K_t(s^{t-1})$$

$$N_t l_t(s^t) = L_t(s^t)$$

and the aggregate resource constraint

$$N_t(c_t(s^t) + x_t(s^t)) + G_t + TR_t = (C_t(s^t) + X_t(s^t)) + G_t + TR_t = Y_t(s^t)$$

where working-age population grows at a constant rate, i.e. $\frac{N_{t+1}}{N_t} = 1 + g_n$.

The Model

For practical purposes of our analysis, we assume the following functional forms for the utility and production functions

$$U(C_t, L_t) = ln(C_t) + \psi ln(1 - L_t)$$

$$F(K_t, Z_t L_t) = K_t^{\alpha}(Z_t L_t)^{1-\alpha}$$

The Model

Some manipulation of the first order conditions yield the following equations for de-trended variables

$$\frac{\psi \hat{c}_t}{1 - l_t} = (1 - \tau_{l_t})(1 - \alpha)\frac{\hat{y}_t}{l_t} \tag{1}$$

$$\frac{1 + \tau_{x_t}}{\hat{c}_t} = \hat{\beta} E_t \frac{1}{\hat{c}_{t+1}}(\theta \frac{\hat{y}_t}{\hat{k}_{t+1}} + (1 - \delta)(1 + \tau_{x_{t+1}})) \tag{2}$$

These two equations, together with

$$\hat{c}_t + \hat{g}_t + \hat{tr}_t + (1 + g_n)(1 + g_z)\hat{k}_{t+1} - (1 - \delta)\hat{k}_t = \hat{y}_t \tag{3}$$

$$\hat{y}_t = \hat{k}_t^{\alpha}(z_t l_t)^{1-\alpha} \tag{4}$$

completely characterize the competitive equilibrium.

Data

- Annual wedge series for each country in each year
- Contribution of each wedge to output for each country in each year

Data

- **Emerging Markets:** Argentina, Brazil, Chile, Colombia, Costa Rica, Hong Kong, Hungary, India, Israel, Jordan, S. Korea, Mexico, Peru, Philippines, Poland, Russia, Singapore South Africa, Taiwan, Turkey, Venezuela
- **Developed Economies:** Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Data

- Table 1 (see next slide) presents the standard business cycle facts of 43 countries, categorized separately for emerging markets and developed economies.
- Here, we observe that output, consumption, investment, government spending, hours worked and employment are all more volatile in EM.

Business Cycle Facts: Data

				Corr. w. Output				
Output	Std. Dev.	Rel. Vol..	Autocorr.	-2	-1	0	1	2
Emerg. Econ.	0.025	1.00	0.24	-0.27	0.24	1.00	0.24	-0.27
Adv. Econ.	0.015	1.00	0.24	-0.28	0.24	1.00	0.24	-0.28
Consumption								
Emerg. Econ.	0.027	1.06	0.24	-0.19	0.24	0.74	0.18	-0.21
Adv. Econ.	0.013	0.81	0.28	-0.07	0.24	0.67	0.21	-0.22
Investment								
Emerg. Econ.	0.095	3.91	0.13	-0.19	0.18	0.71	0.14	-0.20
Adv. Econ.	0.059	3.94	0.18	-0.29	0.20	0.85	0.18	-0.20
Gov. Sp.								
Emerg. Econ.	0.043	1.76	0.11	-0.04	0.10	0.30	0.15	-0.10
Adv. Econ.	0.020	1.39	0.02	0.12	0.09	-0.03	-0.07	-0.08
Hours								
Emerg. Econ.	0.015	0.66	0.18	-0.06	0.10	0.20	0.08	-0.05
Adv. Econ.	0.012	0.82	0.32	0.01	0.41	0.56	0.03	-0.25
Employment								
Emerg. Econ.	0.009	0.35	0.24	-0.02	0.05	0.06	0.04	0.01
Adv. Econ.	0.008	0.51	0.21	0.14	0.31	0.23	-0.11	-0.21

All series are first logged and detrended using the HP filter.

Wedges

- Next, in Table 2, the same facts are presented for the model-generated wedges. Similarly, all the wedges are more volatile in emerging markets.
- Moreover, we also observe that the all the wedges are more volatile than output both in DC and EM.
- However, except for the efficiency wedge, the relative volatility of wedges to output is smaller in EM than in the DC.
- When we examine the correlations of the wedges with output, efficiency wedge is strongly procyclical both in EM and DC. Investment wedge is also somewhat procyclical both in EM and DC. Labor wedge is generally acyclical both in EM and DC. Government wedge is somewhat procyclical in EM and acyclical in DC.

Business Cycle Facts: Wedges

				Corr. w. Output				
Efficiency Wedge	Std. Dev.	Rel. Vol..	Autocorr.	-2	-1	0	1	2
Emerg. Econ.	0.027	1.08	0.14	-0.24	0.16	0.82	0.17	-0.23
Adv. Econ.	0.016	1.07	0.14	-0.39	-0.05	0.77	0.29	-0.11
Labor Wedge								
Emerg. Econ.	0.03	1.20	0.07	0.00	0.03	-0.09	0.02	0.01
Adv. Econ.	0.02	1.33	0.18	0.20	0.28	0.05	-0.02	-0.14
Investment Wedge								
Emerg. Econ.	0.034	1.36	0.09	-0.01	0.13	0.21	-0.01	-0.11
Adv. Econ.	0.032	2.13	0.07	-0.07	0.15	0.23	-0.08	-0.11
Government Wedge								
Emerg. Econ.	0.045	1.80	0.10	0.03	0.11	0.24	0.09	-0.13
Adv. Econ.	0.029	1.93	0.02	0.12	0.05	-0.07	-0.06	-0.08
				Correlation of X with Y at lag				
Emerg. Econ.				-2	-1	0	1	2
Efficiency, labor.				0.09	-0.01	-0.41	0.02	0.08
Efficiency, Investment				-0.09	0.00	0.14	0.10	-0.01
Efficiency, Government				-0.12	0.12	0.27	0.09	-0.02
Labor, Investment				0.00	-0.06	-0.18	0.02	0.05
Labor, Government				-0.08	-0.08	-0.02	0.02	0.07
Investment, Government				-0.10	0.05	0.13	0.05	-0.01
Advanced. Econ.				-2	-1	0	1	2
Efficiency, labor				-0.06	-0.10	-0.35	0.16	0.27
Efficiency, Investment				-0.09	-0.16	0.15	0.13	-0.03
Efficiency, Government				-0.02	0.01	-0.03	-0.02	0.04
Labor, Investment				0.11	0.12	-0.30	-0.06	-0.00
Labor, Government				-0.05	-0.01	-0.02	0.09	0.05
Investment, Government				-0.08	-0.05	0.08	0.07	0.13

All series are first logged and detrended using the HP filter.

Output Components

- Table 3 illustrates the business cycle statistics of the output series generated by the model using a specific varying wedge.
- Accordingly, both for emerging markets and advanced economies, the model generated output using time-varying efficiency wedge is the best one among output series generated by different wedges.

Business Cycle Facts: Output Components

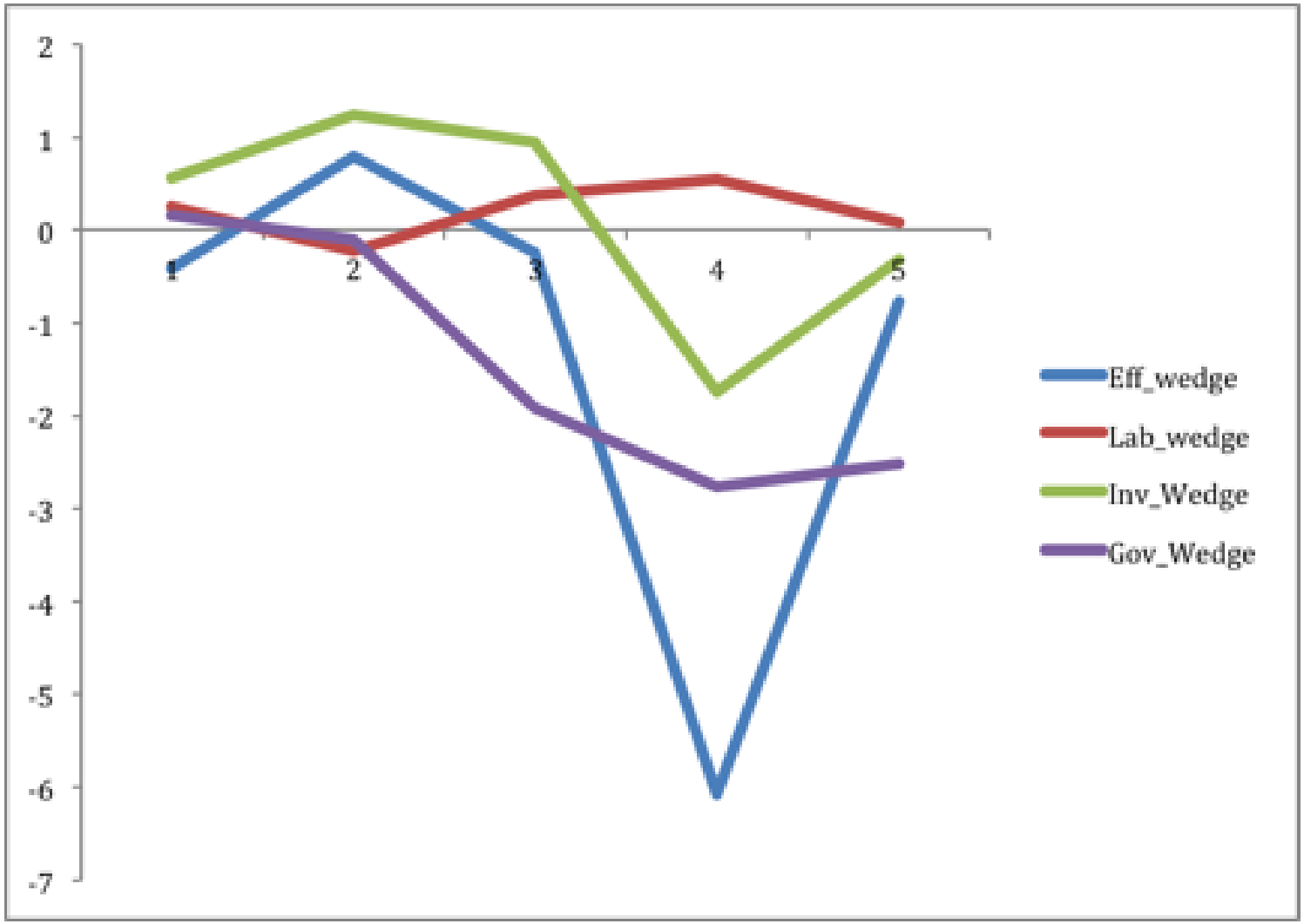
			Corr. w. Output				
Efficiency Wedge	Rel. Vol.	Autocorr.	-2	-1	0	1	2
Emerg. Econ.	1.64	0.14	-0.26	0.14	0.84	0.19	-0.22
Adv. Econ.	1.32	0.13	-0.39	-0.02	0.85	0.29	-0.13
Labor Wedge							
Emerg. Econ.	2.38	0.06	0.12	-0.10	-0.45	-0.02	0.16
Adv. Econ.	1.66	0.07	0.25	0.12	-0.31	-0.09	-0.03
Investment Wedge							
Emerg. Econ.	2.13	0.08	-0.09	0.09	0.30	0.05	-0.10
Adv. Econ.	1.51	0.07	-0.10	0.09	0.25	-0.03	-0.07
Government Wedge							
Emerg. Econ.	0.13	0.09	-0.06	0.10	0.31	0.10	-0.13
Adv. Econ.	0.10	0.06	-0.02	0.05	0.17	0.01	-0.09
			Correlation of X with Y at lag				
Emerg. Econ.			-2	-1	0	1	2
Efficiency, labor.			0.19	-0.01	-0.53	-0.11	0.11
Efficiency, Investment			-0.08	0.02	0.20	0.08	-0.06
Efficiency, Government			-0.12	0.12	0.28	0.08	-0.04
Labor, Investment			0.22	-0.07	-0.73	-0.05	0.25
Labor, Government			0.12	-0.09	-0.39	0-0.02	0.11
Investment, Government			-0.11	0.03	0.21	0.03	-0.06
Advanced. Econ.			-2	-1	0	1	2
Efficiency, labor			0.08	-0.01	-0.45	-0.03	0.20
Efficiency, Investment			-0.10	-0.17	0.14	0.15	-0.01
Efficiency, Government			-0.04	-0.00	0.07	0.01	-0.00
Labor, Investment			0.25	0.05	-0.77	-0.12	0.17
Labor, Government			0.08	0.06	-0.13	0.02	-0.04
Investment, Government			-0.09	-0.05	0.16	0.04	0.05

All series are first logged and detrended using the HP filter.

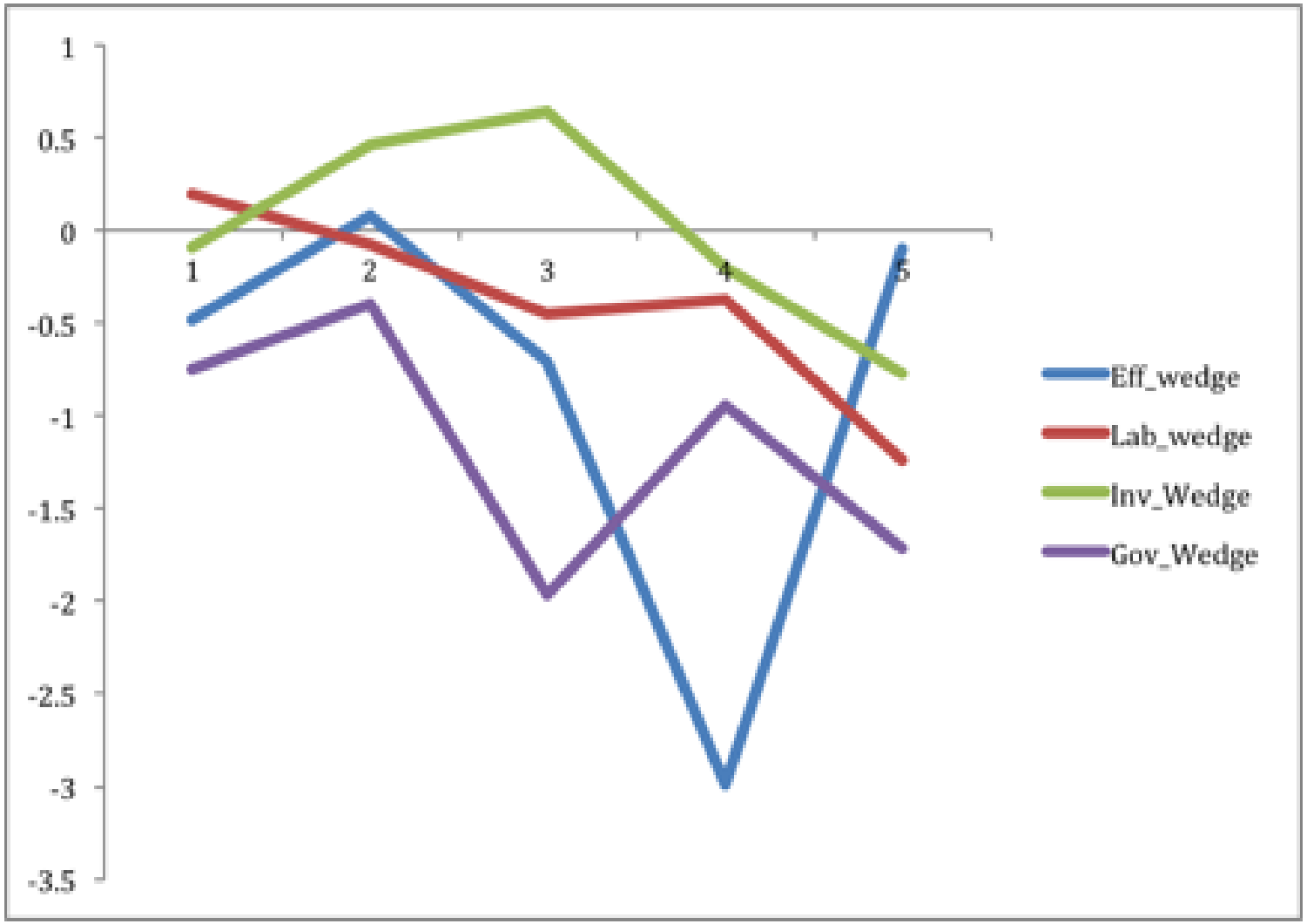
Table: Behavior of Wedges Through Recessions

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-0.42	-2.66	1.71	0.25	-1.76	1.98	0.2	-1.98	1.79	-0.45	-3.04	2.56
-1	0.17	-1.59	1.94	-0.1	-1.71	2.17	0.71	-1.44	2.51	-0.29	-3.31	2.26
0	-0.48	-1.8	1.32	-0.21	-2.06	1.65	0.69	-1.05	2.86	-1.96	-4	0.64
1	-4.17	-6.47	-2.14	-0.02	-1.94	2.55	-1.03	-4.14	1.42	-1.89	-4.93	2.02
2	0.35	-1.14	2.08	-1.13	-3.08	0.65	0.54	-2.18	2.8	-2.53	-4.76	-0.01
EM	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-0.42	-3.84	3.1	0.25	-2.5	3.87	0.56	-2.83	2.85	0.16	-3.22	3.73
-1	0.79	-1.13	2.73	-0.23	-2.17	3.51	1.24	-1.58	3.39	-0.1	-3.64	2.28
0	-0.25	-2.55	2.05	0.37	-2.42	2.94	0.94	-1.46	3.31	-1.91	-4.83	1.48
1	-6.08	-9.2	-3.76	0.54	-1.8	3.24	-1.74	-5.13	1.42	-2.77	-7.16	-0.19
2	-0.78	-5.07	2.36	0.08	-2.73	2.03	-0.33	-3.46	3.15	-2.52	-5.89	-0.11
DC	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-0.48	-2.49	1.47	0.2	-1.25	1.43	-0.09	-1.8	1.27	-0.75	-2.92	1.93
-1	0.08	-1.69	1.53	-0.07	-1.62	1.76	0.46	-1.24	2.39	-0.4	-3.31	2.23
0	-0.71	-1.65	0.99	-0.45	-1.98	1.29	0.64	-1.05	2.56	-1.97	-3.41	0.36
1	-2.99	-4.77	-1.74	-0.37	-2.07	1.92	-0.2	-3.06	1.28	-0.95	-3.56	2.31
2	-0.1	-1.8	1.52	-1.24	-2.87	0.31	-0.77	-3.18	1.5	-1.72	-4.39	0.44

Wedges through Recessions in Emerging Markets



Wedges through Recessions in Developed Economies



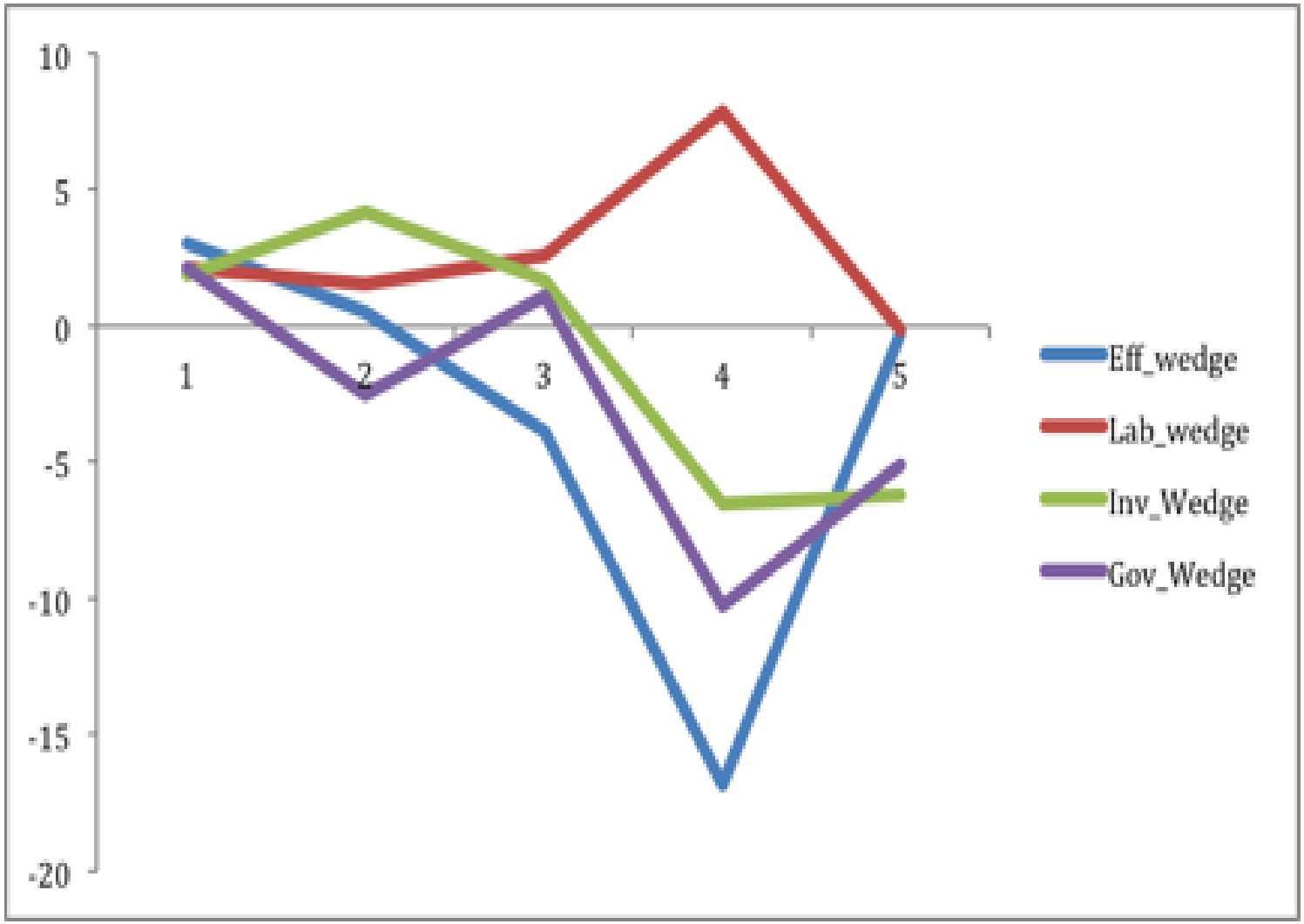
Wedges through Recessions

- It appears that the efficiency wedge declines most among wedges both in DC and EM, followed by government and investment wedges.
- Labor wedge does not decline significantly in recessions. (declines somewhat in DC 1 year after recession)
- Investment wedge declines significantly in the first period of recession in EM.
- Government wedge declines significantly in the first and second periods of recessions in EM and somewhat in DC.

Table: Wedges through Depression

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	3.06	-0.78	4.88	2.09	-0.72	4.13	1.88	-2.9	3.28	2.14	-0.75	3.52
-1	0.53	-2.59	3.61	1.51	0.16	4.07	4.21	2.49	4.73	-2.52	-5.9	-2.47
0	-3.84	-5.19	-0.77	2.59	-2.04	4.81	1.67	3.31	11.67	1.11	-8.05	4.72
1	-16.84	-17.46	-13.76	7.86	-2.52	15.2	-6.52	-10.52	-0.87	-10.25	-12.39	-4.75
2	-0.22	-5.92	0.34	-0.15	-2.16	1.34	-6.17	-7.91	-3.56	-5.09	-10.9	0.48

Wedges through Depression



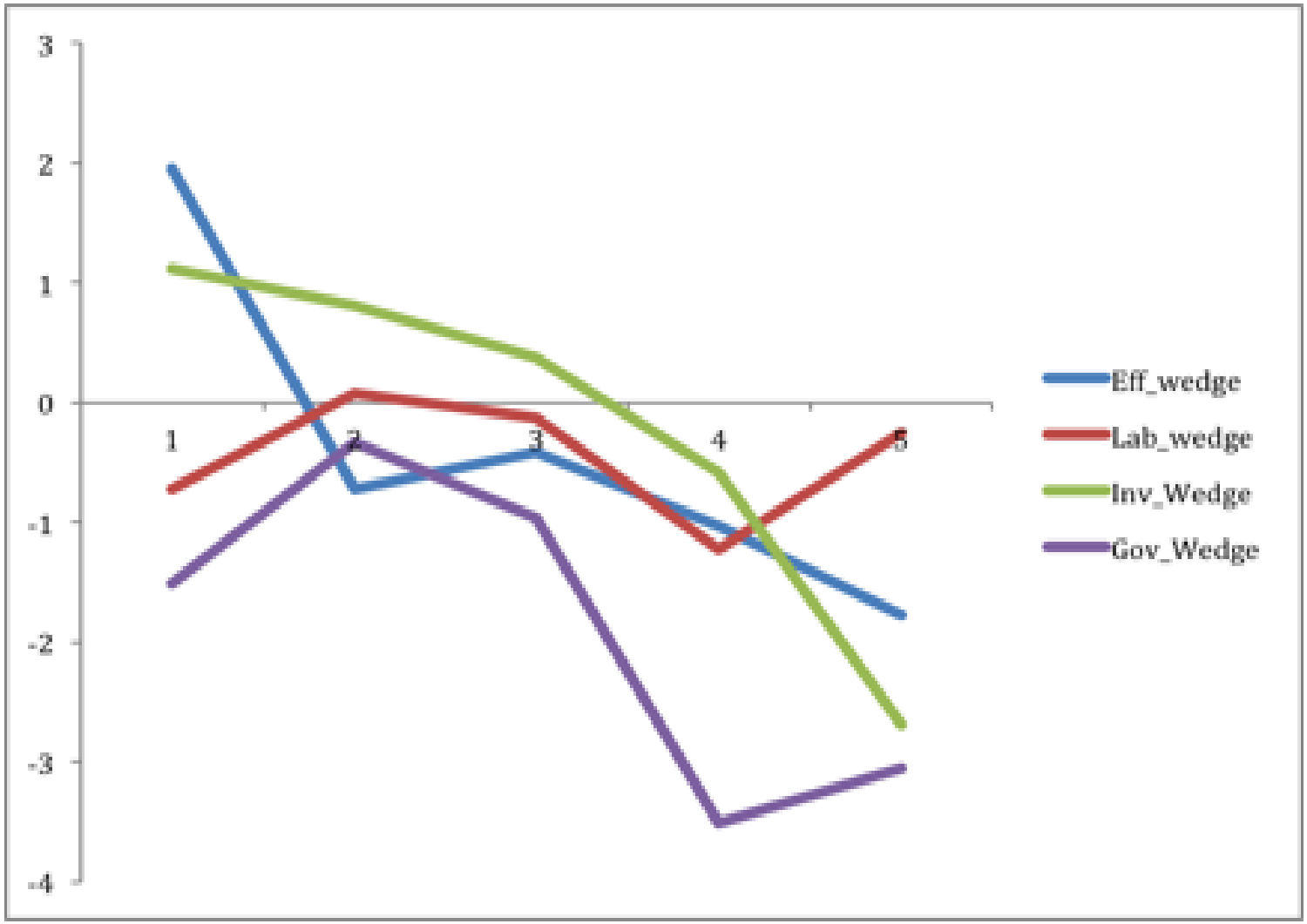
Wedges through Depressions

- In depressions, efficiency wedge declines sharply.
- On the other hand, labor wedge increases sharply.
- Investment and government wedge also decline but not as sharply as the efficiency wedge.

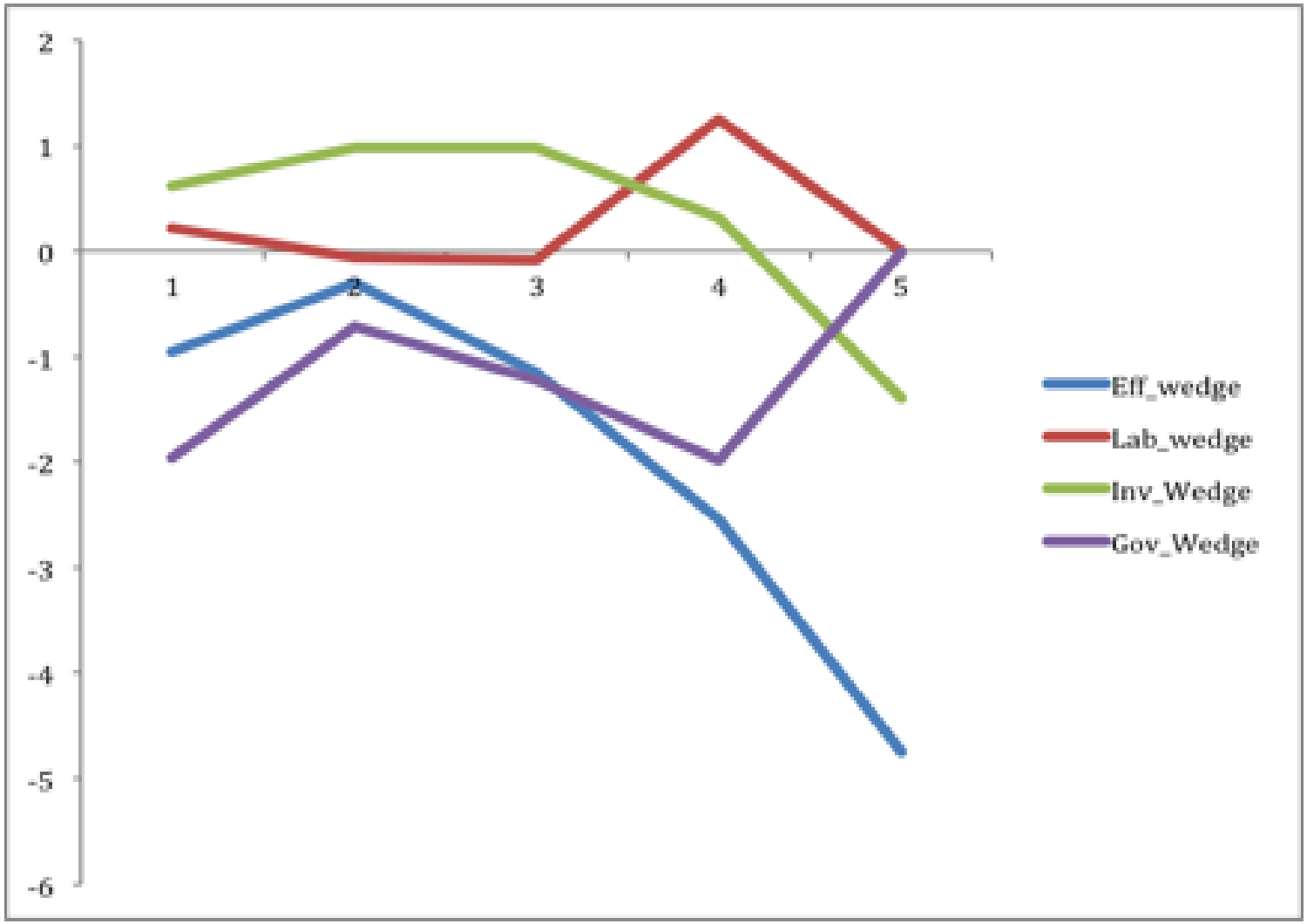
Table: Behavior of Wedges through Banking Crises

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	0.29	-1.95	2.7	-0.12	1.8	1.05	0.69	-0.31	2.76	-1.55	-3.53	1.62
-1	-0.47	-2.74	1.5	0.05	-1.78	1.77	0.9	-1.16	2.77	-0.54	-2.66	1.63
0	-1	-2.03	1.15	-0.12	-1.61	1.92	0.92	-1	2.4	-0.97	-4.02	3.38
1	-1.15	-4.17	0.33	-0.53	-2.19	2.45	-0.22	-2.76	1.28	-2.26	-5.63	-0.88
2	-3.56	-5.98	0.31	-0.1	-2.1	1.55	-2.32	-6.15	0.83	-2.26	-5.02	1.13
EM	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	1.95	-1.13	3.51	-0.72	-2.17	1.05	1.11	-0.31	2.9	-1.52	-3.15	2.14
-1	-0.72	-4.2	2.03	0.08	-1.95	2.88	0.8	-1.76	3.34	-0.34	-5.05	2.96
0	-0.41	-5.01	1.48	-0.12	-2.55	4.73	0.37	-2.35	2.72	-0.97	-6.71	2.28
1	-1.03	-5.8	0.95	-1.23	-3.29	3.01	-0.59	-3.46	1.48	-3.52	-7.17	-1.12
2	-1.78	-6.74	1.46	-0.25	-2.95	4.14	-2.69	-7.07	1.36	-3.06	-6.47	0.02
DC	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-0.95	-1.95	1.02	0.22	-0.95	0.89	0.62	-0.08	1.61	-1.96	-4.28	1.37
-1	-0.3	-1.65	1.47	-0.06	-1.66	1.08	0.98	-0.92	1.34	-0.71	-2.4	0.73
0	-1.15	-1.66	0.96	-0.08	-1.37	1.31	0.98	-0.47	2.4	-1.22	-3.05	3.51
1	-2.54	-3.85	-0.7	1.25	-1.51	2.45	0.32	-1.52	1.28	-1.98	-4.58	0.06
2	-4.75	-5.54	-3.09	0	-1.25	1.38	-1.39	-4.06	0.51	-0.01	-2.94	2.48

Wedges through Banking Crises in Emerging Markets



Wedges through Banking Crises in Developed Economies



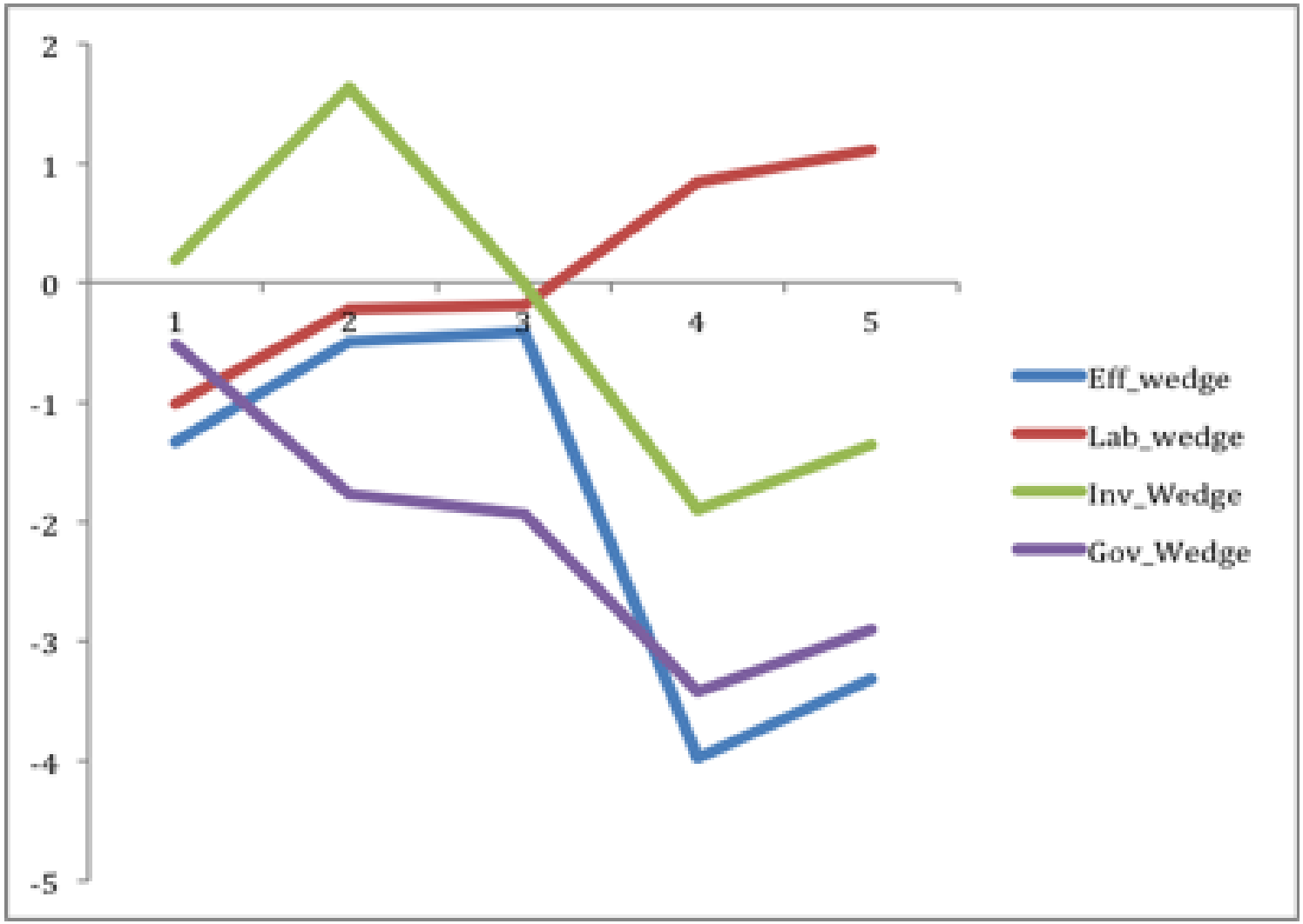
Wedges through Banking Crises

- Efficiency wedge declines sharply in DC, less so in EM.
- Labor wedge declines in EM Labor wedge increases in DC
- Government wedge declines sharply in EM and somewhat in DC

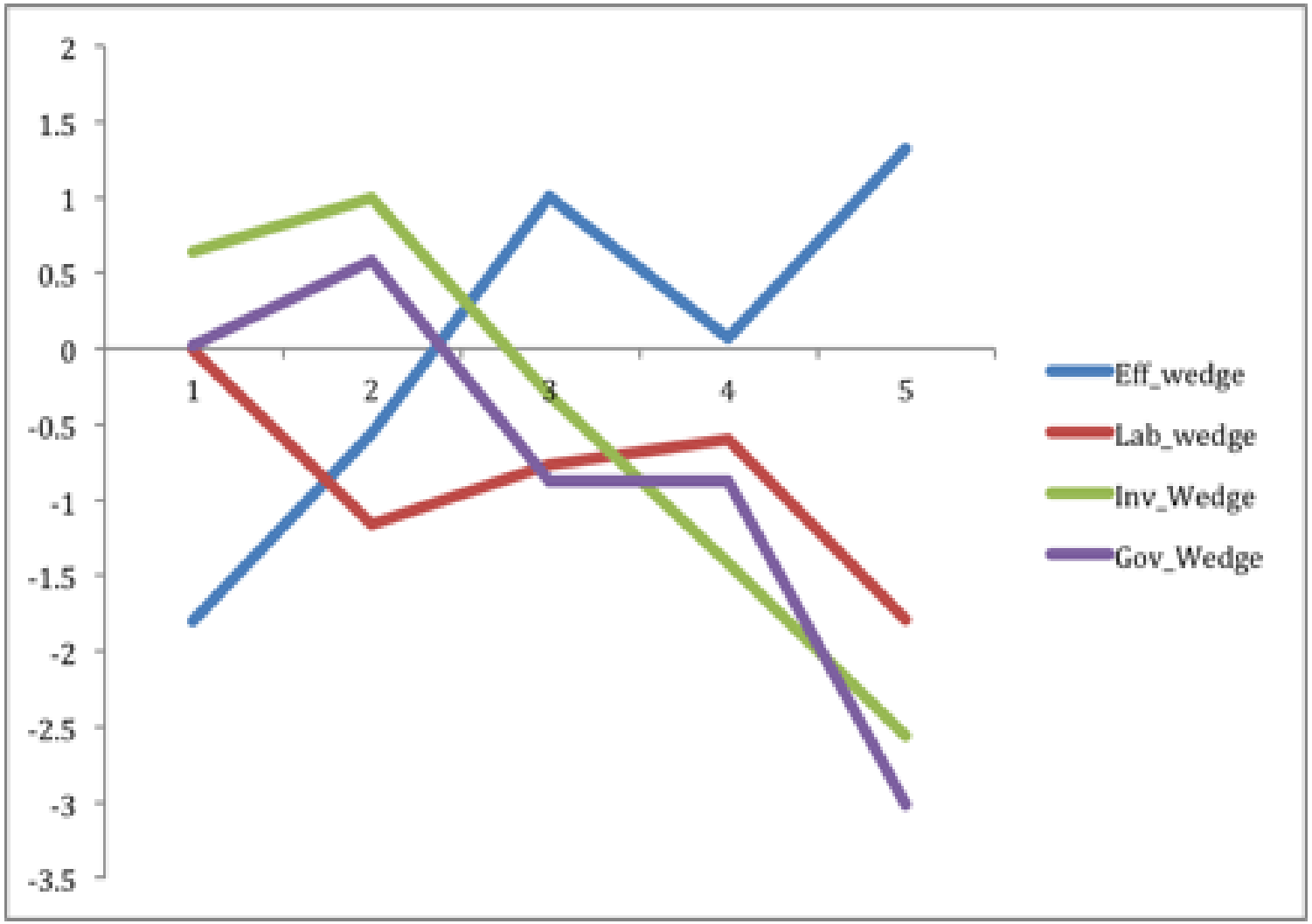
Table: Wedges through Currency Crises

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-1.33	-3.46	1.71	-0.59	-3.03	2.02	0.24	-2.12	2.59	-0.43	-4.46	2.33
-1	-0.53	-3.94	2.41	-0.71	-1.9	2.93	1.58	-0.96	3.8	-0.62	-6.53	3.03
0	0.25	-2.34	2.44	-0.23	-3.1	2.14	-0.07	-2.76	2.88	-1.89	-5.57	1.53
1	-2.42	-6.9	0.53	0.6	-2.99	3.51	-1.76	-4.24	0.93	-3.15	-6.94	1.05
2	-2.15	-6.58	1.42	0.66	-2.17	3.12	-1.36	-4.63	0.98	-2.9	-7.37	0.47
EM	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-1.33	-3.64	1.88	-1.01	-4.1	2.06	0.19	-2.61	1.88	-0.51	-5.91	2.5
-1	-0.49	-3.74	2.46	-0.21	-1.75	3.86	1.63	-0.88	3.34	-1.76	-6.76	1.94
0	-0.41	-3.8	2.44	-0.18	-2.9	3.75	-0.01	-3.1	2.88	-1.93	-5.57	2.13
1	-3.98	-8.46	-0.15	0.85	-2.99	3.51	-1.9	-4.69	0.93	-3.42	-6.94	-0.19
2	-3.32	-6.96	0.03	1.12	-1.47	3.51	-1.36	-4.79	1.42	-2.9	-7.8	1.13
DC	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-1.8	-2.9	1.55	-0.01	-1.16	1.43	0.65	-1.51	3.08	0.02	-2.98	2.17
-1	-0.56	-5.08	2.36	-1.16	-1.93	1.78	1	-1.61	5.56	0.58	-1.22	4.93
0	1	-1.35	3.14	-0.77	-5.67	1.9	-0.3	-2.71	2.93	-0.88	-12.73	0.82
1	0.07	-2.42	3.39	-0.6	-4.4	3.73	-1.41	-4.07	3.14	-0.88	-7.41	1.67
2	1.32	-2.14	2.18	-1.79	-5.12	0.83	-2.56	-4.63	0.4	-3.01	-4.13	0.47

Wedges through Currency Crises in Emerging Markets



Wedges through Currency Crises in Developed Economies



Wedges through Currency Crises

- Efficiency wedge declines significantly in EM but not in DC..
- Labor wedge declines in DC but not in EM.
- Investment wedge declines significantly both in EM and DC.
- Government wedge declines much more in EM than in DC in the first year of recession, but the opposite is true in the following year.

Table: Wedges through Debt Default

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	1.25	-3.68	3.83	-1.62	-4.16	0.81	-1.4	-3.03	1.07	-0.19	-1.91	5.4
-1	-1.36	-5.26	1.33	-1.27	-2.02	2.51	-0.68	-2.86	3.04	-3.66	-9.51	-0.78
0	-3.67	-5.58	-2.66	3.75	0.45	5.82	-0.14	-6.14	4.1	-2.14	-4.61	2.28
1	-6.19	-7.95	-4.67	0.99	-4.42	3.96	-2.92	-6.36	-0.24	-7.17	-9.61	-3.52
2	-4.46	-6.78	0.68	-0.2	-3.14	3.28	-6.37	-12.88	-0.82	-9.23	-12.82	-3.11

Wedges through Debt Defaults

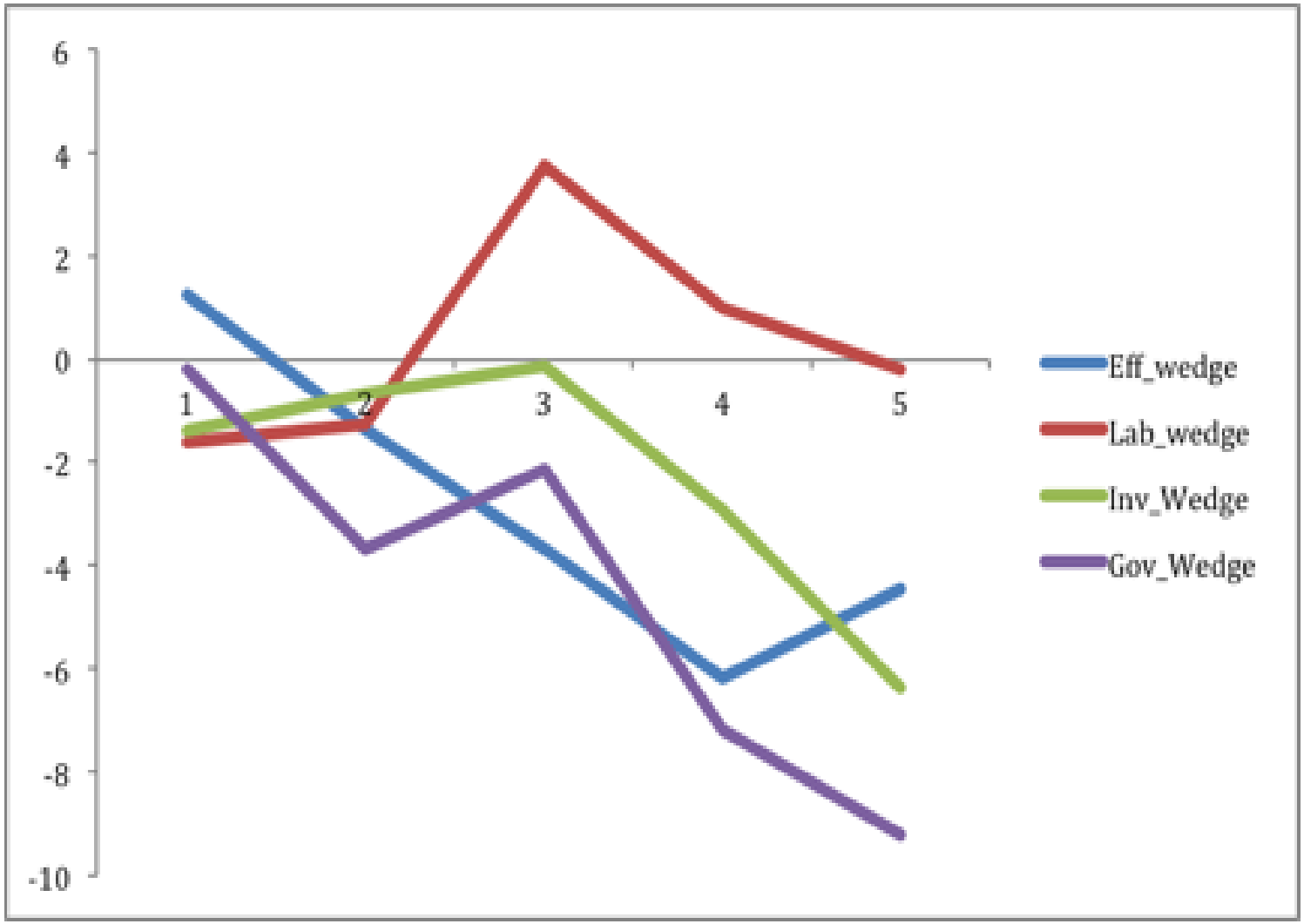
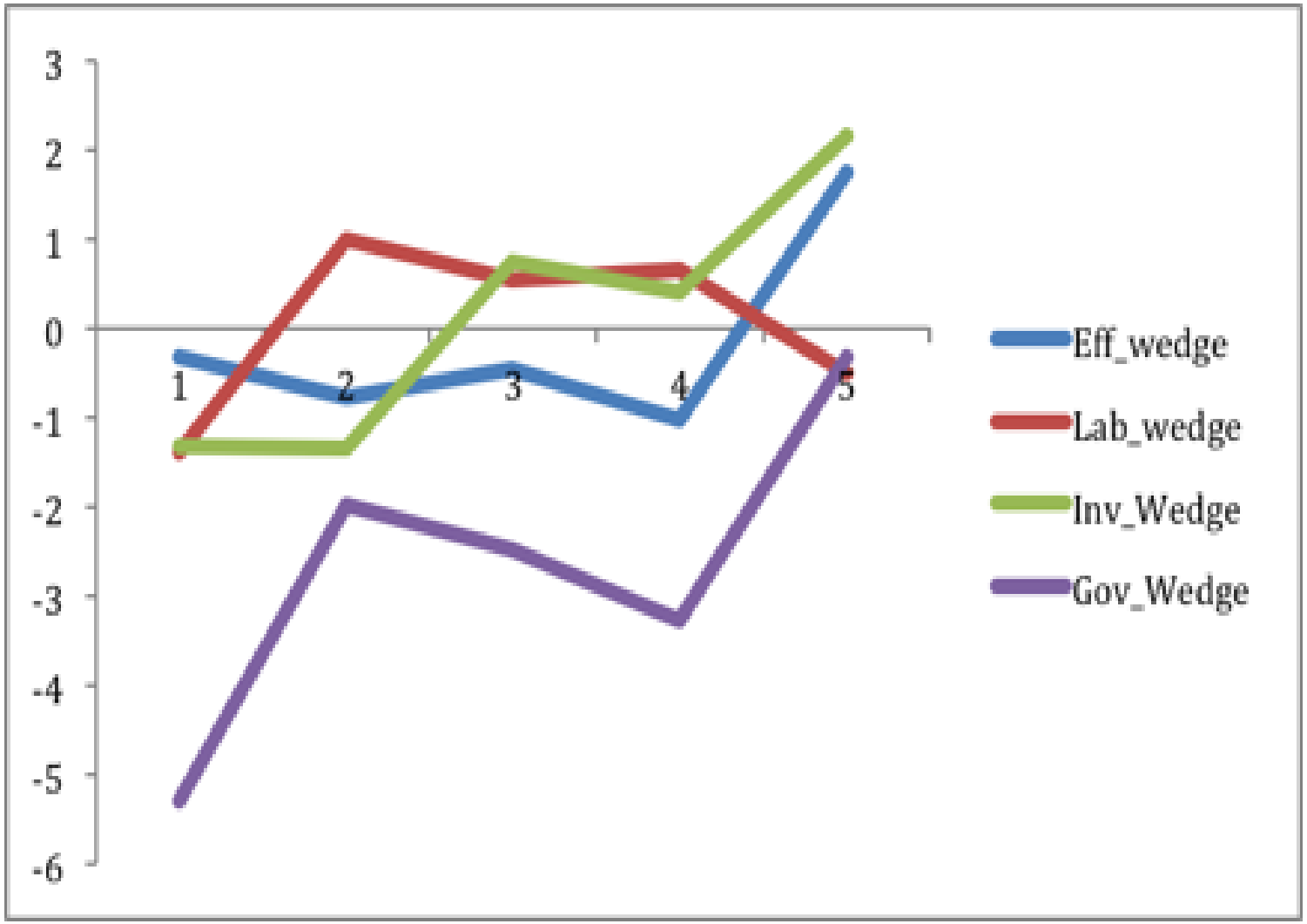


Table: Wedges through Debt Reconstruction

	Eff_			Lab_			Inv_			Gov_		
All	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**	**Median**	**Lower**	**Upper**
-2	-0.32	-3.64	1.4	-1.4	-4.11	1.97	-1.34	-8.21	2.55	-5.29	-10.11	-1.19
-1	-0.77	-4.35	1.91	0.99	-1.91	2.41	-1.36	-3.69	1.67	-1.98	-8.34	0.22
0	-0.45	-4.45	5.18	0.54	-2.93	4.06	0.74	-2.45	3.63	-2.47	-7.16	3.48
1	-1.03	-2.65	0.35	0.66	-2.01	6.45	0.4	-3.39	3.39	-3.26	-6.92	0.29
2	1.76	-1.18	2.48	-0.52	-1.43	2.83	2.15	-3.79	4.01	-0.31	-2.73	6.13

Wedges through Debt Reconstruction



Wedges through Defaults and Reconstructions

- During default periods, efficiency, government and investment wedges decline sharply. However, the labor wedge does not decline and even exhibits a small increase.
- During debt reconstruction, it appears that government wedge and efficiency wedge both decline. (not as much as in debt default though) The other wedges do not.

RMSE	Eff. Wedge	Lab Wedge	Inv. Wedge	Gov. Wedge
Argentina	2.39	7.77	3.75	2.74
Australia	1.28	3.76	2.23	1.43
Austria	0.79	1.3	1.21	1.01
Belgium	0.7	2.13	1.37	1.09
Brazil	1.08	3.29	2.35	2.46
Canada	0.95	1.81	1.35	1.26
Chile	2.74	7.25	5.07	3.13
Colombia	1.51	7.34	6.66	1.52
Costa Rica	1.18	4.74	3.97	1.81
Denmark	0.92	2.63	1.05	1.36
Finland	1.23	2.4	2.83	2.17
France	0.59	1.4	0.81	0.97
Germany	0.69	1.41	1.55	1.4
Greece	1.18	2.61	2.68	1.88
Hong Kong	2.23	7.88	4.68	1.41
Hungary	4.92	5.24	2.61	1.9
Iceland	1.92	6.66	3.99	3.34
India	1.19	2.67	2.19	1.79
Ireland	1.34	2.88	2.15	2.19
Israel	0.75	3.07	2.2	2.01
Italy	0.68	1.71	1.11	1.26
Japan	0.48	1.94	1.47	1.37
Jordan	3.53	7.37	9.52	3.16
Korea	1.83	7.86	6.07	2.07
Mexico	1.68	7.92	2.80	2.75
Netherlands	1.21	1.93	1.55	1.22
New Zealand	2.51	5.64	2.3	1.81
Norway	0.89	9.05	6.68	1.01
Peru	3.98	16.98	10.66	3.5
Philippines	1.84	6.07	4.94	1.79
Poland	3.18	6.02	3.29	2.17
Portugal	2.1	4.76	4.09	2.6
Russia	2.21	7.97	3.7	2.78
Singapore	2.39	11.26	9.23	2.44
South Africa	1.77	4.44	2.44	1.43
Spain	2.57	9.18	7.48	2.64
Sweden	0.89	4.37	2.07	1.37
Switzerland	0.86	1.61	1.89	1.44
Taiwan	1.21	5.47	8.66	1.75
Turkey	1.9	4.31	3.17	2.64
UK	0.92	2.06	1.37	1.37
USA	0.81	6.31	6.32	1.29
Venezuela	2.46	6.97	3.72	3.92

Wedges through Defaults and Reconstructions

- The RMSE value of the output series constructed using a time-varying government wedge is the one closest to the data for Hong Kong, Hungary, Jordan, New Zealand, Peru, Phillipines, Poland, and South Africa.
- For all other countries, efficiency wedge is the best

RMSE of Different Wedges

RMSE

	Eff.	Lab.	Inv.	Gov.	Eff.	Lab.	Inv.	Gov.
Dummy	-1.09*	-2.51*	-2.34*	-0.72*				
	(0.26)	(1.03)	(0.80)	(0.20)				
GDP cap.					-0.06*	-0.07	0-0.08	-0.04*
					(0.01)	(0.08)	(0.06)	(0.01)
R-squared	0.31	0.13	0.17	0.23	0.26	0.03	0.07	0.25
Observations	43	43	43	43	43	43	43	43
F-Test	0.00	0.02	0.01	0.00	0.00	0.00	0.14	0.00

Here we regress RMSE of different output series (generated by the model with only one specific variable wedge) on GDP per-capita or developed economy dummy. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but its coefficient is not reported. Dummy takes the value of 1 for 22 developed economies in our sample and 0 for 21 emerging markets.

Volatility of (de-trended) GDP and Volatility of (de-trended) Wedges

	GDP Vol				**Wedge Vol**			
	Eff.	Lab.	Inv.	Gov.	Eff.	Lab.	Inv.	Gov.
Vol. of Wedge	0.72*	0.49*	0.15	0.22*				
	(0.12)	(0.10)	(0.09)	(0.05)				
Dummy					-0.01*	-0.01*	-0.01	-0.02*
					(0.002)	(0.003)	(0.007)	(0.005)
R-squared	0.73	0.50	0.19	0.28	0.35	0.29	0.05	0.22
Observations	43	43	43	43	43	43	43	43
F-Test	0.00	0.00	0.12	0.00	0.00	0.00	0.16	0.00

In the first four columns we regress standard deviation of detrended GDP on the standard deviation of detrended wedge. In the last four columns we regress the standard deviation of detrended wedge on developed economy dummy. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported. Dummy takes the value of 1 for 22 developed economies in our sample and 0 for 21 emerging markets.

Panel Data Estimations

Gr. Eff. Wedge							
	(1)	(2)	(3)	(4.	(5)	(6)	(7)
Banking	-0.01*						
	(0.005)						
Currency Cris.		-0.03*					
		(0.005)					
Debt Restruct.			0.007				
			(0.008)				
Debt Default				-0.05*			
				(0.009)			
Depression					-0.15*		
					(0.01)		
Recession						-0.04*	
						(0.002)	
Recovery							0.01*
							(0.002)
R-squared	0.19	0.20	0.17	0.20	0.24	0.32	0.19
Observations	2022	2022	2022	2022	2022	2022	1981

Here we regress growth of the efficiency wedge on different economic episode dummies in a panel data setting. All panel regressions include a country fixed effect and year dummies. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Panel Data Estimations

Gr. Lab. Wedge							
	(1)	(2)	(3)	(4.	(5)	(6)	(7)
Banking	0.004						
	(0.007)						
Currency Cris.		0.00w					
		(0.007)					
Debt Restruct.			0.01				
			(0.01)				
Debt Default				0.01			
				(0.01)			
Depression					0.06*		
					(0.02)		
Recession						-0.002	
						(0.003)	
Recovery							-0.009**
							(0.004)
R-squared	0.05	0.05	0.05	0.05	0.06	0.05	0.05
Observations	2065	2065	2065	2065	2065	2065	2024

Here we regress growth of the labor wedge on different economic episode dummies in a panel data settingAll panel regressions include a country fixed effect and year dummies. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Panel Data Estimations

Gr. Inv. Wedge							
	(1)	(2)	(3)	(4.	(5)	(6)	(7)
Banking	-0.0003						
	(0.008)						
Currency Cris.		-0.01					
		(0.008)					
Debt Restruct.			0.007				
			(0.01)				
Debt Default				0.03**			
				(0.02)			
Depression					0.03		
					(0.02)		
Recession						-0.01*	
						(0.004)	
Recovery							-0.001
							(0.005)
R-squared	0.07	0.07	0.07	0.07	0.07	0.07	0.06
Observations	2065	2065	2065	2065	2065	2065	2024

Here we regress growth of the investment wedge on different economic episode dummies in a panel data settingAll panel regressions include country fixed effects and year dummies. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Panel Data Estimations

Gr. Gov. Wedge							
	(1)	(2)	(3)	(4.	(5)	(6)	(7)
Banking	-0.006						
	(0.009)						
Currency Cris.		-0.01					
		(0.009)					
Debt Restruct.			-0.01				
			(0.02)				
Debt Default				-0.06*			
				(0.02)			
Depression					-0.09*		
					(0.02)		
Recession						-0.02*	
						(0.004)	
Recovery							-0.02*
							(0.05)
R-squared	0.08	0.09	0.08	0.09	0.09	0.09	0.09
Observations	2065	2065	2065	2065	2065	2065	2024

Here we regress growth of the government wedge on different economic episode dummies in a panel data settingAll panel regressions include a country fixed effect and year dummies. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Conclusion

- Our business cycle accounting exercise suggests that efficiency wedge is the most important among the four wedges considered for most countries.
- Significant differences in the evolution as well as effects of the wedges in different episodes.