



## Employment Miracles

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# Employment Miracles



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**World Bank, Office of the Chief Economist  
Middle East and Northern Africa Region**

**“Labor Markets Through the Lens of the Great Recession”  
Jacques Polak Annual Research Conference, IMF, Washington DC**

# Introduction

- **How can policymakers engineer enduring reductions in unemployment?**
- The jury is out – despite a rich literature on
  - the determinants of unemployment (eg. Blanchard and Wolfers 2005, Nickell 1995, 1997)
  - labor market institutions and their impact on economic performance (eg. Bentolila and Bertola 1990, Nickell and Layard 1999)
    - The interaction between shocks and institutions in shaping LM outcomes
- Our approach: look at the incidence, and subsequently, the determinants of **employment miracles**; large and sustained decreases in unemployment.
  - Large events could isolate key factors that are obscured in time series studies because of noise or asymmetries.
  - Large and sustained events could be different
  - This is what many countries want

# Preview of Results

- Miracles happen.
- Miracles coincide with acceleration of GDP growth, trade surge, higher investment and lower government spending.
- Sound regulation, property rights and contract enforcement offer double dividend:
  - Unemployment is lower on average.
  - In periods of high unemployment, more likely to have miracle.
- Non results also important. Little evidence labor regulations are binding constraints.

# Outline of Presentation

- Defining Miracles
- Incidence
- Initial Conditions
  - Macro
  - Regulations
  - Governance
- Evolution of Key Explanatory Variables
- Predicting Miracles
  - Baseline Model
  - Robustness
- Which Policies Matter Most? Bayesian Model Averaging
- Conclusion

## What is an Employment Miracle?

### A Large and Sustained Reduction in Unemployment

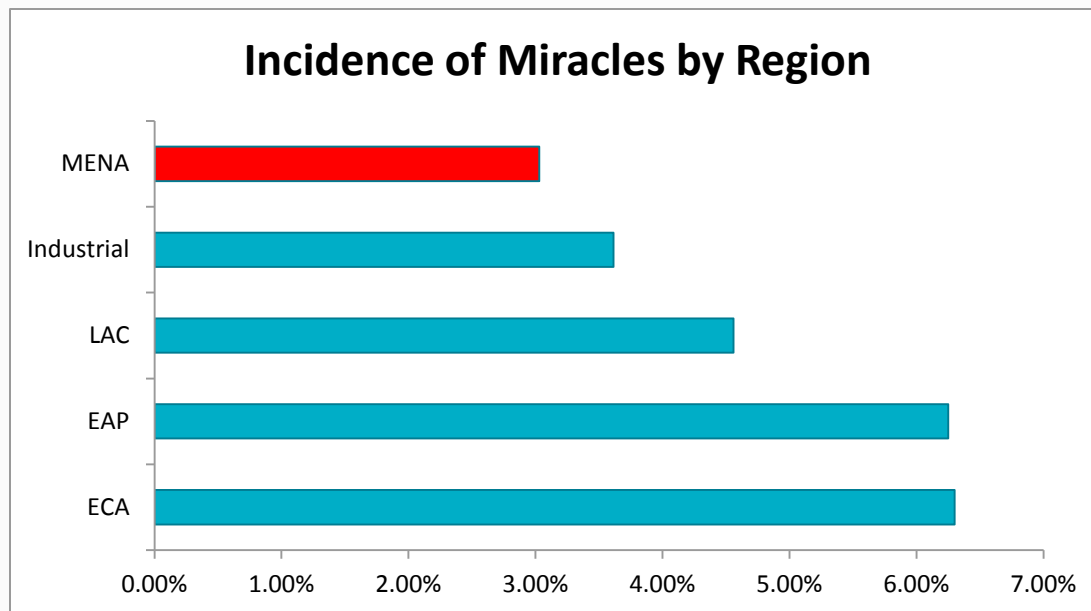
A decline in unemployment starting at period  $t$  counts as an unemployment spell if

1. Unemployment declines **at least 3 percentage points over a 4 year period**
2. The decline in unemployment over this 4 year period is **at least 25% of total initial unemployment**
3. The drop in unemployment **must remain below the critical unemployment reduction thresholds for at least another 3 years**
4. Unemployment **strictly declines in the first year of the miracle**
5. An unemployment miracle did not commence in the previous 7 years; employment miracles **do not overlap**.

# Incidence of Miracles (1/2)

## Miracles are prevalent – but not in MENA

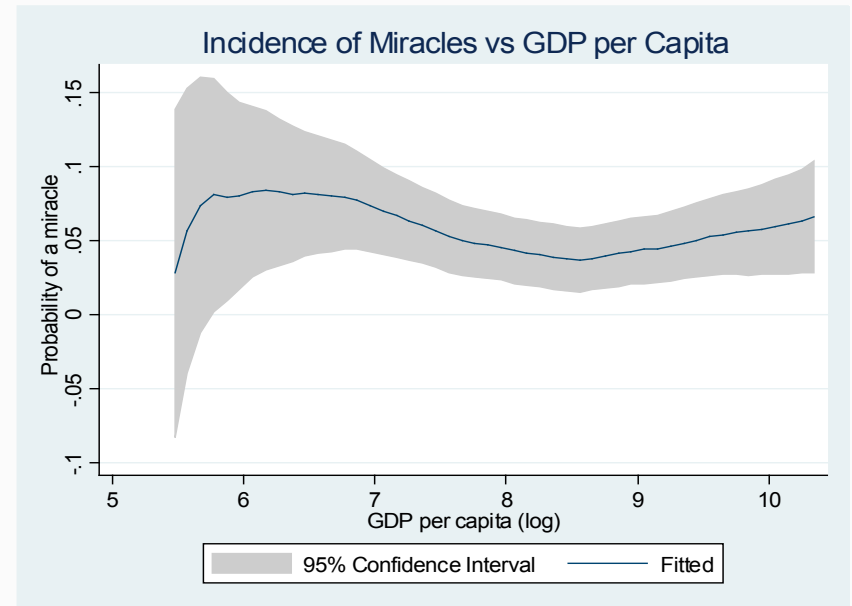
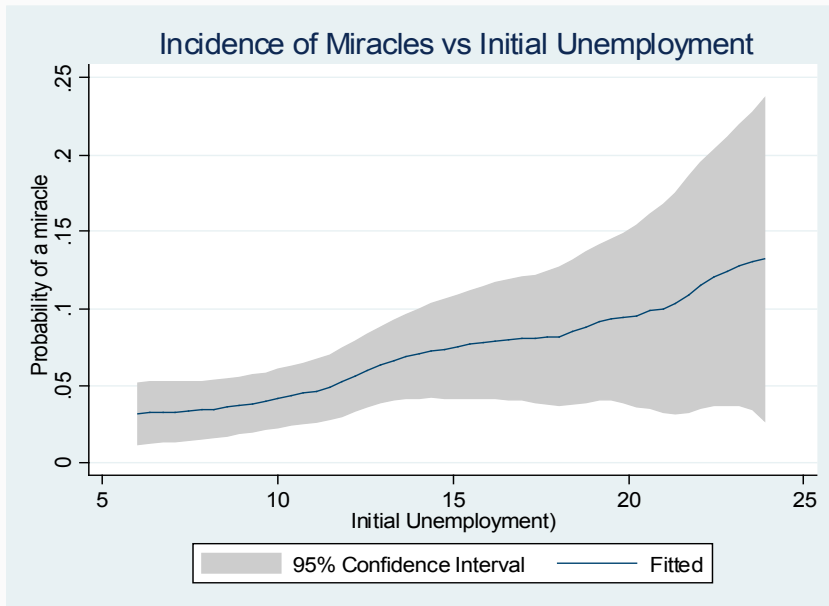
- 43 miracles in total (Data: WDI, 1980-2008)
  - Approximately 1 in 20 countries embark on a miracle each year
  - Data do not cover low-income countries



# Incidence (2/2)

*Likelihood of miracles rises with initial unemployment*

*But does not vary strongly with the level of development*





# Initial Conditions (1/3)

Similar initial conditions, save for initial unemployment

<i>Descriptive Statistics</i>	<i>Onset of Miracle</i>			<i>No Takeoff</i>		
	<b>Mean</b>	<b>SD</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>
<b><i>Initial Unemployment</i></b>						
Unemployment	<b>14.69</b>	5.75	42	<b>11.67</b>	4.99	672
<b><i>GDP</i></b>						
GDP per capital (log)	8.25	1.19	41	8.38	1.10	668
GDP per capita growth	0.78	4.81	42	1.27	4.01	670
<b><i>Trade</i></b>						
Exports	38.66	17.09	40	35.33	19.22	665
Imports	37.75	16.35	40	38.27	20.15	665
FDI	2.67	2.42	41	2.14	5.60	644
<b><i>Core Macro</i></b>						
Investment	19.14	5.30	40	20.45	4.42	654
Government spending	17.21	4.60	42	16.85	5.77	658
Inflation	0.12	0.15	39	0.20	0.47	636
<b><i>Crisis</i></b>						
Crisis	0.14	0.36	35	0.12	0.33	478
<b><i>Democracy and Conflict</i></b>						
Polity Score	6.08	5.63	40	6.95	5.01	600
War	0.13	0.33	40	0.07	0.25	600
<b><i>Overall Regulatory Quality</i></b>						
Economic freedom	6.35	1.08	41	6.21	1.08	605
Ease of Doing Business -Rank	56.90	44.51	40	68.75	47.17	654
Regulation (WGI)	0.62	0.63	42	0.57	0.57	662

# Initial Conditions (2/3)

## Minimal Regulatory Differences, save for Business Regulations

<i>Descriptive Statistics</i>	<i>Onset of Miracle</i>			<i>No Takeoff</i>		
	Mean	SD	N	Mean	SD	N
<b><i>Dimensions of Economic Freedom</i></b>						
Government Size	5.55	1.40	41	5.55	1.63	602
Legal System	6.15	2.26	40	6.20	2.00	592
Money	7.07	2.16	41	6.75	2.44	611
Free Trade	6.89	1.36	41	6.68	1.27	605
Regulation	6.17	1.01	40	5.90	1.12	598
<b><i>Labor Regulation</i></b>						
Rigidity of Employment DB	27.80	19.09	40	29.47	19.52	654
MW Stringency	0.34	0.20	29	0.40	0.19	415
Unemployment Benefits GRR	0.30	0.28	36	0.25	0.22	482
Severance Pay	1.14	1.69	36	0.96	1.33	489
Advance Notice	2.67	1.87	36	2.35	1.71	489
<b><i>Financial Openness</i></b>						
Financial Openness	0.64	0.29	36	0.63	0.25	495
Domestic Credit to the Private Sector	46.00	1.18	41	47.20	4.79	632
<b><i>Trade Regulation</i></b>						
Time to Export - log(Days) DB	2.85	0.64	40	2.98	0.57	640
Time to Import - log(Days) DB	2.77	0.58	40	2.87	0.51	640
<b><i>Business Regulations</i></b>						
Starting a Business - log(Days) DB	3.43	0.80	38	3.57	0.92	596
Closing a Business - log(Days) DB	1.11	0.35	39	1.24	0.43	633
Time to Enforce a Contract DB log(Days) DB	<b>6.20</b>	0.52	40	<b>6.41</b>	0.45	640

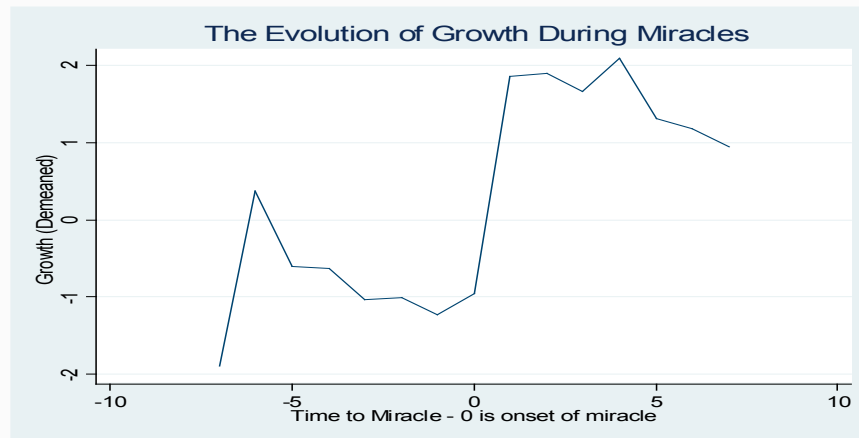
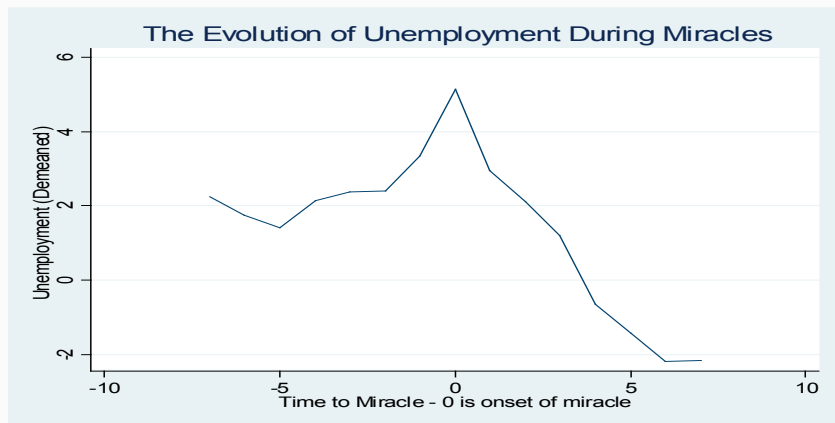
# Initial Conditions (3/3)

## No Significant Differences in Governance

<i>Descriptive Statistics</i>	<i>Onset of Miracle</i>			<i>No Takeoff</i>		
	<b>Mean</b>	<b>SD</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>
<b><i>Governance (WGI)</i></b>						
Rule of Law	0.49	0.98	42	0.47	0.87	664
Voice	0.53	0.81	42	0.54	0.73	664
Political Stability	0.29	0.91	42	0.18	0.86	664
Government Effectiveness	0.64	1.04	42	0.53	0.97	664
Control of Corruption	0.62	1.07	42	0.48	0.98	662

**Overall, differences in Initial Conditions are remarkably small**

# Evolution of Key Explanatory Variables (1/3)



## Main Findings

**-Macroeconomic conditions improve**

**-Growth accelerates**

- Government spending and inflation abate, trade surges, investment rises

**-Regulations improve**

**-Incidence of crises abates**

## Evolution of Key Explanatory Variables (2/3)

$$Y_{it} = \beta_B \text{Beginning} + \beta_E \text{End} + u_i + \varepsilon_{it}$$

Evolution of Key Explanatory Variables: FE Regressions						
<i>Dependent variable</i>	<i>Level</i>			<i>Demeaned</i>		
<i>Variable</i>	<i>Beginning</i> <i>(t=1,2,3,4)/se</i>	<i>End</i> <i>(t=5,6,7)/se</i>	<i>N</i>	<i>Beginning</i> <i>(t=1,2,3,4)/se</i>	<i>End</i> <i>(t=5,6,7)/se</i>	<i>N</i>
Unemployment	-1.902*** (0.309)	-5.350*** (0.333)	381	-2.113*** (0.306)	-5.188*** (0.330)	381
GDP per capita (log)	0.189*** (0.031)	0.506*** (0.034)	385	0.052** (0.021)	0.194*** (0.023)	385
GDP growth	3.759*** (0.351)	2.629*** (0.380)	385	2.577*** (0.347)	1.436*** (0.375)	385
Exports	4.658*** (0.564)	5.528*** (0.610)	365	2.769*** (0.560)	0.457 (0.605)	365
Imports	4.156*** (0.556)	5.717*** (0.601)	365	2.879*** (0.514)	1.680*** (0.556)	365
FDI	1.363*** (0.369)	2.985*** (0.398)	385	0.016 (0.379)	-0.299 (0.410)	385
Govt spending	-1.072*** (0.233)	-1.380*** (0.252)	385	-0.841*** (0.240)	-0.761*** (0.259)	385
Investment	0.553 (0.373)	2.232*** (0.404)	368	0.726** (0.354)	2.309*** (0.383)	368
Inflation (log)	-0.077** (0.032)	-0.074** (0.034)	377	-0.028 (0.033)	-0.016 (0.036)	377
Crisis	-0.147*** (0.029)	-0.144*** (0.031)	319	-0.111*** (0.029)	-0.111*** (0.031)	319
War	0.000 (0.021)	0.005 (0.023)	363	0.014 (0.021)	0.025 (0.023)	363
Polity	0.939*** (0.246)	1.631*** (0.266)	363	0.337 (0.262)	0.436 (0.283)	363

Growth  
Accelerates

## Evolution of Key Explanatory Variables (2/3)

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Trade  
Surges

## Evolution of Key Explanatory Variables (2/3)

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Government spending decreases, investment increases

## Evolution of Key Explanatory Variables (2/3)

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Incidence of crises  
abates



# Evolution of Key Explanatory Variables (3/3)

$$Y_{it} = \beta_B \text{Beginning} + \beta_E \text{End} + u_i + \varepsilon_{it}$$

Evolution of Key Explanatory Variables: FE Regressions

Variable	Level			Demeaned		
	Beginning (t=1,2,3,4)/se	End (t=5,6,7)/se	N	Beginning (t=1,2,3,4)/se	End (t=5,6,7)/se	N
Financial Openness	0.084*** (0.015)	0.140*** (0.018)	313	-0.002 (0.010)	-0.009 (0.011)	313
Dom Credit	3.876*** (1.459)	15.398*** (1.570)	383	0.130 (1.437)	5.881*** (1.546)	383
UB GRR	0.004 (0.005)	-0.009 (0.006)	313	-0.006 (0.006)	-0.035*** (0.006)	313
Min Wage Stringency	0.009 (0.012)	0.024* (0.014)	259	-0.002 (0.012)	-0.002 (0.013)	259
EPL	0.033 (0.027)	0.057* (0.031)	313	-0.019 (0.027)	-0.022 (0.032)	313
Advance Notice	-0.075 (0.086)	0.100 (0.100)	313	-0.156* (0.086)	-0.073 (0.100)	313
Economic Freedom	0.354*** (0.045)	0.584*** (0.049)	385	0.167*** (0.037)	0.198*** (0.040)	385
Regulation	0.323*** (0.046)	0.560*** (0.049)	379	0.114*** (0.037)	0.149*** (0.040)	379
Free trade	0.195*** (0.047)	0.218*** (0.051)	385	-0.010 (0.032)	-0.099*** (0.034)	385
Government Size	0.214*** (0.066)	0.519*** (0.071)	382	0.024 (0.065)	0.099 (0.070)	382
Legal System	0.056 (0.058)	0.314*** (0.063)	375	0.089* (0.053)	0.300*** (0.057)	375
Sound Money	0.944*** (0.117)	1.283*** (0.127)	385	0.488*** (0.107)	0.466*** (0.115)	385

Regulation improves....



# Predicting Miracles

Probit Model

$$\Pr(Miracle_{it} | X_{it}) = \Phi(X_{it}'\beta)$$

Where

$$Miracle_{it} \begin{cases} 0 & \text{if a miracle did not start but could have} \\ 1 & \text{if a miracle started in year } t \text{ in country } i \end{cases}$$

Country-year observations in which miracles cannot commence (i.e. the first seven years after the onset of a miracle) are excluded.

# Predicting Miracles

Predicting Miracles:						
Probit Models – Marginal Effects (Standard Errors)						
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	0.009*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.012*** (0.003)	0.009*** (0.002)	0.009*** (0.002)
GDP per capita growth	-0.001 (0.003)		-0.001 (0.004)	-0.003 (0.004)	-0.002 (0.003)	-0.004 (0.004)
Log GDP per capita	-0.001 (0.011)		-0.002 (0.015)	0.010 (0.014)	-0.024 (0.015)	-0.038* (0.023)
Openness		0.001 (0.000)	0.001 (0.000)			0.000 (0.000)
Total Investment % of GDP		-0.004 (0.003)	-0.004 (0.003)			-0.004 (0.003)
FDI - net inflows		0.000 (0.001)	0.001 (0.001)			0.000 (0.001)
Government Spending % of GDP		-0.000 (0.002)	0.000 (0.002)			0.005* (0.003)
Inflation (log)		-0.034 (0.034)	-0.039 (0.039)			-0.009 (0.031)
Polity		-0.001 (0.002)	-0.001 (0.003)			0.002 (0.003)
War				0.064 (0.060)		0.104 (0.092)
Crisis				-0.002 (0.042)		0.000 (0.038)
Economic Freedom (EFW)					0.036** (0.015)	0.050*** (0.019)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	498	459	459	367	498	355
Pseudo R2	0.100	0.113	0.114	0.138	0.121	0.181

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample.

# Predicting Miracles

## Predicting Miracles:

Probit Models – Marginal Effects (Standard Errors)

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	0.009*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.012*** (0.003)	0.009*** (0.002)	0.009*** (0.002)
GDP per capita growth	-0.001 (0.003)		-0.001 (0.004)	-0.003 (0.004)	-0.002 (0.003)	-0.004 (0.004)
Log GDP per capita	-0.001 (0.011)		-0.002 (0.015)	0.010 (0.014)	-0.024 (0.015)	-0.038* (0.023)
Openness		0.001 (0.000)	0.001 (0.000)			0.000 (0.000)
Total Investment % of GDP		-0.004 (0.003)	-0.004 (0.003)			-0.004 (0.003)
FDI - net inflows		0.000 (0.001)	0.001 (0.001)			0.000 (0.001)
Government Spending % of GDP		-0.000 (0.002)	0.000 (0.002)			0.005* (0.003)
Inflation (log)		-0.034 (0.034)	-0.039 (0.039)			-0.009 (0.031)
Polity		-0.001 (0.002)	-0.001 (0.003)			0.002 (0.003)
War				0.064 (0.060)		0.104 (0.092)
Crisis				-0.002 (0.042)		0.000 (0.038)
Economic Freedom (EFW)					0.036** (0.015)	0.050*** (0.019)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	498	459	459	367	498	355
Pseudo R2	0.100	0.113	0.114	0.138	0.121	0.181

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample.

Macro does not matter

(conditional on initial unemployment)

# Predicting Miracles

Predicting Miracles: Probit Models – Marginal Effects (Standard Errors)						
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	0.009*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.012*** (0.003)	0.009*** (0.002)	0.009*** (0.002)
GDP per capita growth	-0.001 (0.003)		-0.001 (0.004)	-0.003 (0.004)	-0.002 (0.003)	-0.004 (0.004)
Log GDP per capita	-0.001 (0.011)		-0.002 (0.015)	0.010 (0.014)	-0.024 (0.015)	-0.038* (0.023)
Openness		0.001 (0.000)	0.001 (0.000)			0.000 (0.000)
Total Investment % of GDP		-0.004 (0.003)	-0.004 (0.003)			-0.004 (0.003)
FDI - net inflows		0.000 (0.001)	0.001 (0.001)			0.000 (0.001)
Government Spending % of GDP		-0.000 (0.002)	0.000 (0.002)			0.005* (0.003)
Inflation (log)		-0.034 (0.034)	-0.039 (0.039)			-0.009 (0.031)
Polity		-0.001 (0.002)	-0.001 (0.003)			0.002 (0.003)
War				0.064 (0.060)		0.104 (0.092)
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Economic Freedom (EFW)					0.036** (0.015)	0.050*** (0.019)
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Better regulation is associated with increased incidence of miracles

note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample.

# Relationship between Regulation and Miracles is Robust

- Alternate indicators and sample restrictions
  - WGI, Doing Business
  - Excluding countries at war, crisis; no unemployment restriction
- Alternative filters and different thresholds
  - Stricter sustainability; Excluding declines in participation
  - Different thresholds—10 and 20 percent higher lower
- Accounting for unobserved heterogeneity and rare-events bias
  - Fixed effects.
  - Modified logistic regression.

# Alternate Technique

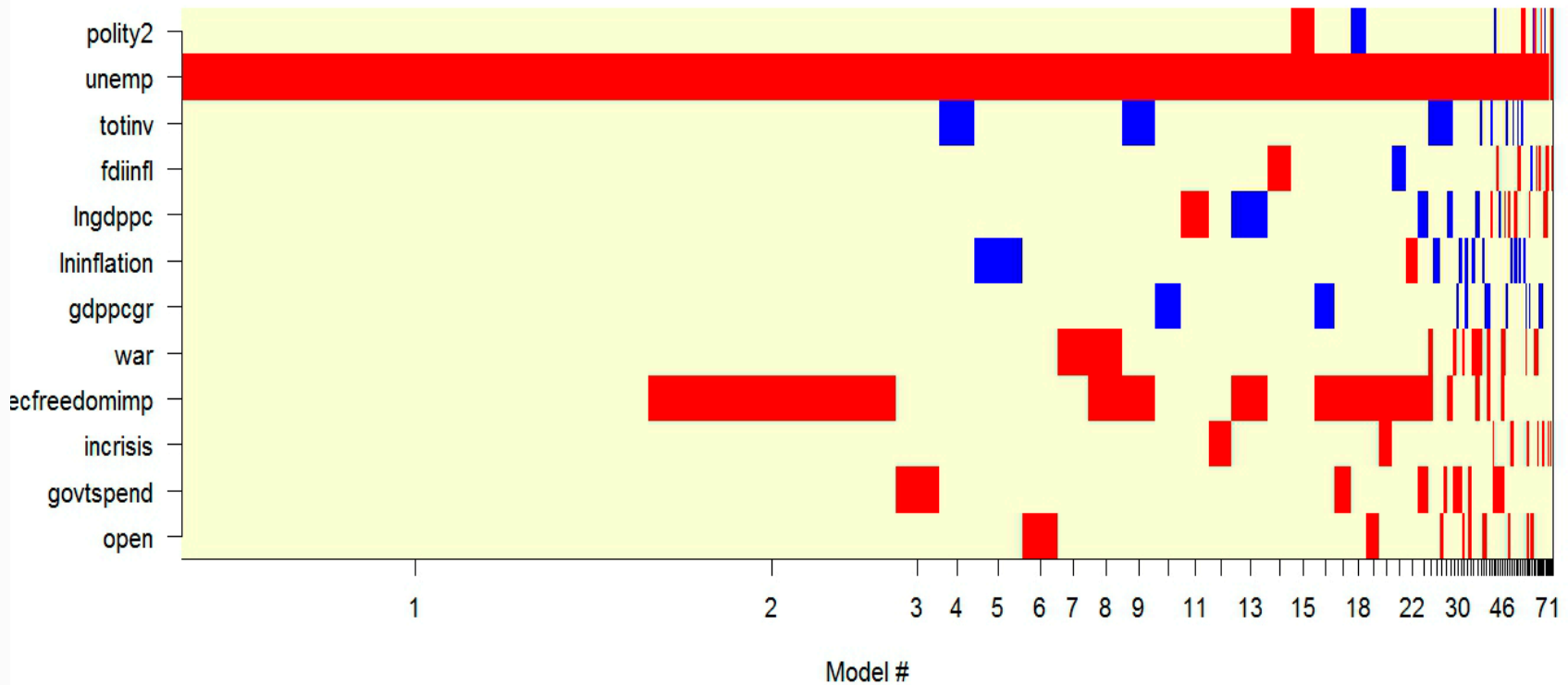
## Bayesian Model Averaging

- **Bayesian Model Averaging:** a method to deal with uncertainty in model selection and also test robustness.
  - Estimate all possible combinations of models
  - Average over them
  - Attaching more weight to ones that receive support from the data.



# BMA Results

Models selected by BMA



# BMA Results (1/3)

## Replicating the Extended Specification

### Bayesian Model Averaging Results

(Dependent Variable: Onset of an Employment Miracle – Logistic Regression Models)

*Extended Specification*

	Mean	SD	PIP	
Unemployment	0.167	0.040	99.9	Unemployment is the strongest predictor
Economic Freedom (EFW)	0.493	0.246	35.3	
Total Investment % of GDP	-0.063	0.055	7.6	
Log GDP per capita	-0.145	0.343	7.5	Followed by regulation
War	0.765	0.694	7.4	
GovtSpending % of GDP	0.044	0.040	7.0	
Inflation (log)	-0.550	0.801	6.6	
Openness	0.004	0.005	5.2	
GDP per capita growth	-0.041	0.052	4.8	
Polity	-0.007	0.045	3.9	
FDI - net inflows	0.001	0.038	3.8	
Crisis	0.147	0.578	3.6	
N		355		

## BMA Results (2/3)

### Different Dimensions of “Economic Freedom”

#### Bayesian Model Averaging Results

(Dependent Variable: Onset of an Employment Miracle – Logistic Regression Models)

Different dimensions of “Economic Freedom”

	Mean	SD	PIP
<b><i>Initial unemployment</i></b>			
Unemployment	0.165	0.041	99.7
<b><i>Sub-components of the EFW index</i></b>			
Legal System	0.323	0.180	34.8
Regulation	0.474	0.238	23.9
Sound Money	0.164	0.108	12.4
Free Trade	0.093	0.261	5.1
Government Size	-0.048	0.162	4.5
<b><i>Other</i></b>			
Log GDP per capita	-0.446	0.414	13.1
War	1.146	0.782	11.4
GovtSpending % of GDP	0.040	0.043	5.9
Inflation (log)	-0.041	0.970	3.9
Openness	0.004	0.005	4.4
GDP per capita growth	0.004	0.005	4.4
Polity	-0.028	0.049	4.1
FDI - net inflows	-0.005	0.042	4.0
Crisis	0.137	0.584	2.9
Total Investment % of GDP	-0.052	0.054	4.9
N		329	

The legal system and regulation are especially important

# BMA Results (3/3)

## Alternative Policy Indicators

### Bayesian Model Averaging Results

(Dependent Variable: Onset of an Employment Miracle – Logistic Regression Models)

Alternative Policy Indicators

	Mean	SD	PIP	
<b><i>Initial Unemployment</i></b>				
Unemployment	0.16	0.04	100	Contract enforcement and the control of corruption seem especially important for job creation
<b><i>Alternative Policy Indicators</i></b>				
Time to Enforce a Contract (log)	-0.950	0.434	33.3	
Control of Corruption	0.590	0.528	22.9	
Rule of Law	-0.404	0.802	12.5	
Time to Start a Business (log)	-0.353	0.229	12.4	
Severance Pay	0.178	0.156	9.3	
Political Stability	0.291	0.304	9.3	
Time to Export	-0.312	0.443	6.3	
Financial Openness	-0.272	0.874	4.5	
Time to Close a Business	-0.241	0.566	4.5	
Unemployment Benefits	0.150	0.905	3.9	
Advance Notice	0.023	0.114	3.9	
Rigidity of Employment - DB	-0.004	0.010	3.9	
N		377		Labor regulations fall at the bottom

## Conclusion (1/3)

Miracles are prevalent, and coincide with improved economic conditions

- **Miracles are prevalent and associated with a large decline in unemployment**
  - Unemployment halves on average
- **Yet, they are difficult to predict;**
  - initial conditions in countries that embark on miracles are similar to those in countries that do not
  - Except for higher initial unemployment, and less prompt contract enforcement
- Miracles are accompanied by
  - i) an **acceleration of growth**
  - ii) an **improvement in macroeconomic conditions**
  - iii) **improved regulation**

## Conclusion (2/3)

Sound business regulation and good governance are crucial

- **Better regulation is strongly and robustly correlated with a higher incidence of miracles.**
  - Robust to: allowing for fixed effects, different definitions of a miracle, alternative sample restrictions, correcting for rare-events bias.
- **Contract enforcement and good governance appear important enablers of employment growth.**

## Conclusion (3/3)

### Policy Priorities

- **Prudent Macroeconomic Management**
  - Employment miracles coincide with an acceleration of growth, and an overall improvement in macroeconomic conditions
- **Sound Business Regulation (Regulation, Control of Corruption)**
  - Pays a double dividend: Associated with:
    - lower unemployment on average
    - Decreased likelihood of remaining stuck with high unemployment
- **Good Governance (Legal system, Contract Enforcement)**
  - Consistent implementation and enforcement of rules is critical

# Comments Welcome





# Supplementary Slides

# Employment Miracles

WORLD BANK MIDDLE EAST AND NORTH AFRICA REGION  
A REGIONAL ECONOMIC UPDATE –APRIL 2012



**ENABLING EMPLOYMENT MIRACLES**



THE WORLD BANK

**Caroline Freund and Bob Rijkers**

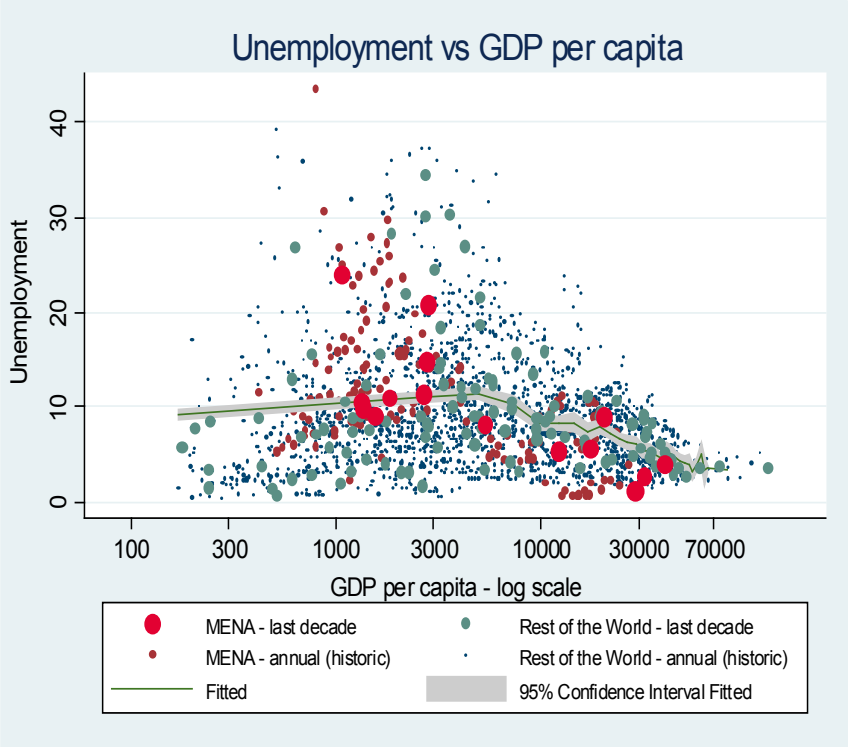
**World Bank, Office of the Chief Economist  
Middle East and Northern Africa Region**

# Employment, Growth and Regulation: A Bird's Eye View

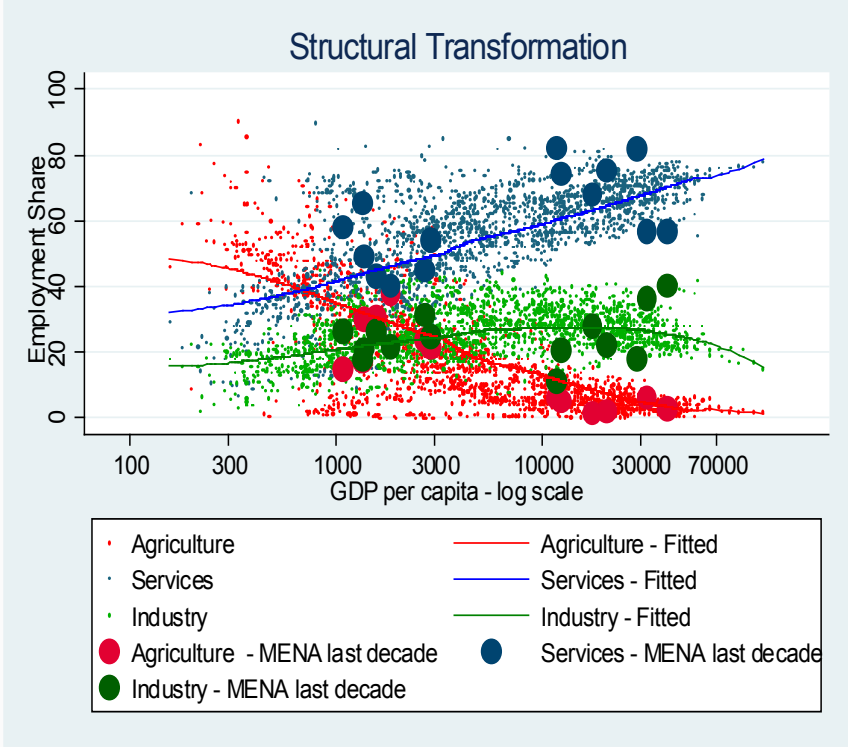


# Development and Unemployment

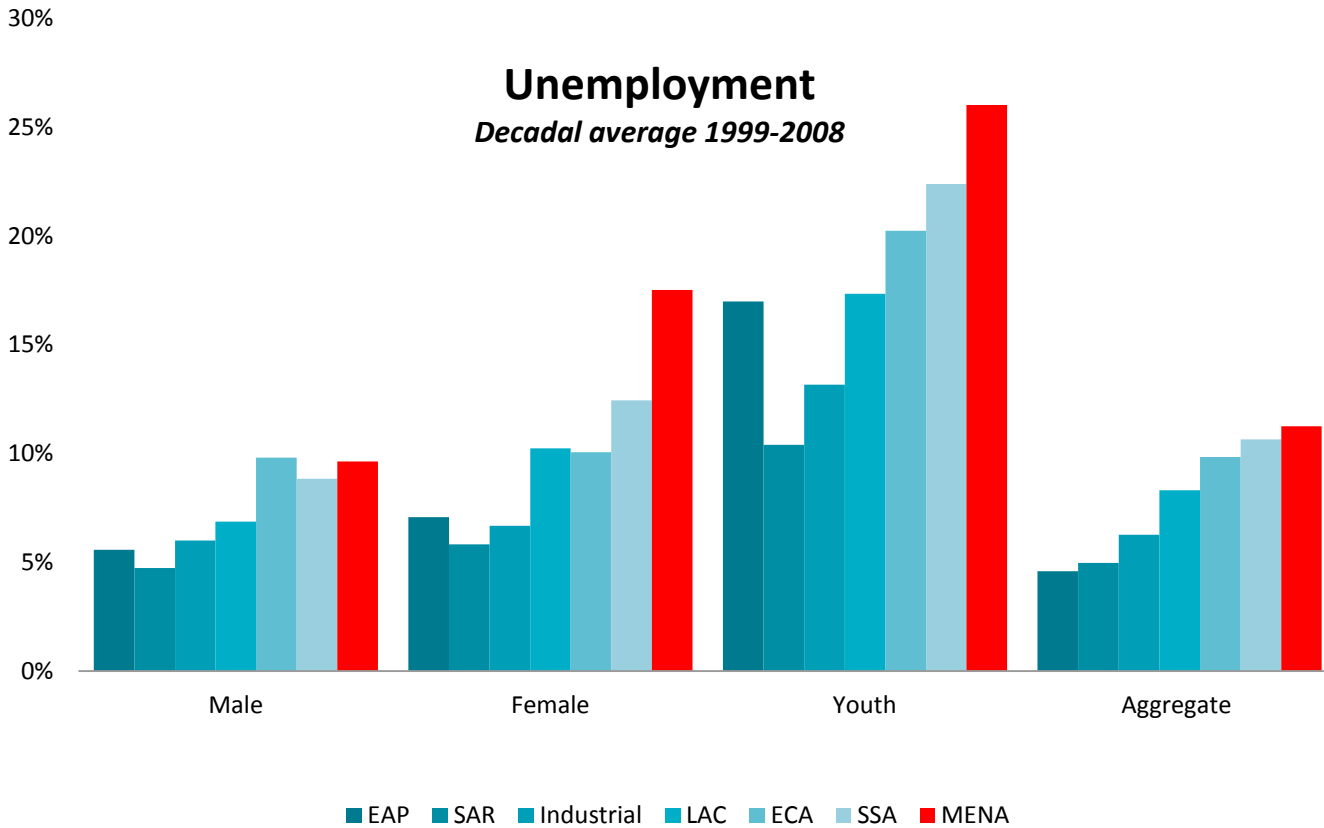
*An inverse U-shaped relationship*



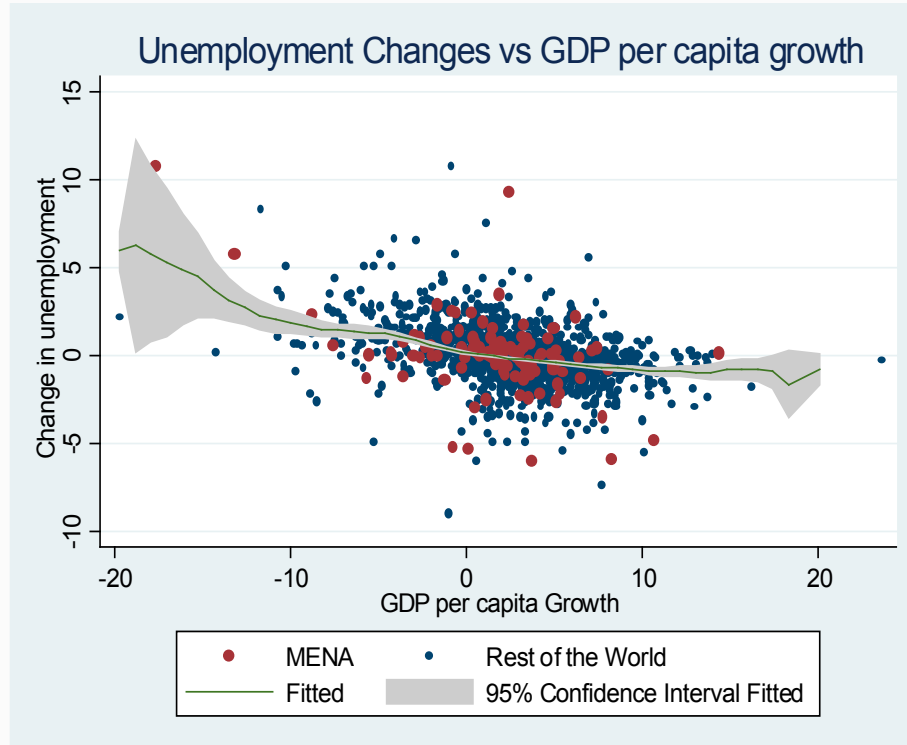
*Accompanied by structural transformation*



# The Global Employment Challenge: Urgent and Large



# Growth is typically, but not always, associated with unemployment declines



# Robustness (1/3)

## Alternative Indicators and Sample Restrictions

<b>Robustness Checks</b>				
Probit models – Marginal Effects (Standard Errors in parentheses)				
<i>Alternative Indicators of Regulatory Quality</i>				
	<i>Doing Business</i>		<i>WGI</i>	
Ease of Doing Business	-0.001*** (0.000)	-0.001** (0.000)		
Regulatory Quality (WGI)			0.026** (0.012)	0.041*** (0.014)
Controls	IC	Full	IC	Full
Number of observations	488	355	471	333
Pseudo R2	0.118	0.178	0.115	0.174
<i>Sample Restrictions</i>				
	<i>No restrictions on initial unemployment</i>		<i>Excluding countries at war, in crisis or recovering from these</i>	
Economic Freedom (EFW)	0.036** (0.015)	0.050*** (0.019)	0.057*** (0.017)	0.096*** (0.033)
Controls	IC	Full	IC	Full
Number of observations	498	355	298	156
Pseudo R2	0.121	0.181	0.141	0.247

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample. “IC” means initial unemployment, GDP per capita (log), GDP per capita growth and year dummies were included as controls. “Full” means that, in addition to these, openness, investment, FDI, government spending as a share of GDP, inflation, polity, war and crisis were included as controls.

**Results are robust to using alternative proxies and sample restrictions**

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Results obtain using alternative proxies for regulatory quality

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# Robustness (2/3)

## Alternative Filters and Different Treshholds

<b>Robustness Checks</b>				
Probit models – Marginal Effects (Standard Errors in parentheses)				
<i>Different Definitions of the Filter</i>				
	<i>Stricter Sustainability</i>		<i>Excluding declines in participation</i>	
Economic Freedom (EFW)	0.045***	0.054***	0.0569***	0.028***
	(0.015)	(0.019)	(0.011)	(0.023)
Controls	IC	Full	IC	Full
Number of observations	393	291	502	325
Pseudo R2	0.183	0.310	0.217	0.147
<i>Different Treshholds</i>				
	<i>10% higher</i>		<i>20% higher</i>	
Economic Freedom (EFW)	0.032**	0.042***	0.013	0.006*
	(0.013)	(0.016)	(0.012)	(0.006)
	IC	Full	IC	Full
Number of observations	484	330	439	297
Pseudo R2	0.142	0.284	0.202	0.466
	<i>10% lower</i>		<i>20% lower</i>	
Economic Freedom (EFW)	0.035**	0.041**	0.033**	0.029
	(0.014)	(0.019)	(0.015)	(0.020)
Controls	IC	Full	IC	Full
Number of observations	545	396	522	376
Pseudo R2	0.122	0.174	0.147	0.205

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample. "IC" means initial unemployment, GDP per capita (log), GDP per capita growth and year dummies were included as controls. "Full" means that, in addition to these, openness, investment, FDI, government spending as a share of GDP, inflation, polity, war and crisis were included as controls.

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Imposing stricter standards strengthens the result

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The result is robust to excluding miracles during which participation declines

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Results are also robust to using different treshholds

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# Robustness (3/3)

## Accounting for Unobserved Heterogeneity and Rare-Events Bias

<i>Alternative Estimation Methods</i>				
	<i>Random Effects Probit</i>		<i>Linear FE Model</i>	
Economic Freedom (EFW)	0.375**	0.494**	0.054*	0.069*
	(0.186)	(0.237)	(0.029)	(0.040)
Controls	IC	Full	IC	Full
Number of observations	626	460	626	460
Tests for RE and FE	LR $\chi^2(1)=0.48$	LR $\chi^2(1)=0.03$	F(72,529)	F(53,374)
	0.243	0.431	=2.44(p=0.00)	=2.84(p=0.00)
<i>Rare Events Logit</i>				
	Coef/Se	<u>Attributable Risk</u>	Coef/Se	<u>Attributable Risk</u>
Economic Freedom reomFreedom (EFW)	0.565**	3.93%	0.932**	7.01%
	(0.229)		(0.365)	
Controls	IC		Full	
N	488		355	

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**Results are robust to controlling for unobserved heterogeneity and rare events bias**

**Conclusion:** Sound regulation is **robustly** correlated with an increased incidence of miracles

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Controlling for unobserved heterogeneity does not change the results

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Controls	IC	Full	IC	Full
Number of observations	626	460	626	460
Tests for RE and FE	LR $\chi^2$ (1)=0.48	LR $\chi^2$ (1)=0.03	F(72,529)	F(53,374)
	0.243	0.431	=2.44(p=0.00)	=2.84(p=0.00)
<i>Rare Events Logit</i>				
	Coef/Se	<u>Attributable Risk</u>	Coef/Se	<u>Attributable Risk</u>
Economic Freedom reecomFreedom (EFW)	0.565**	3.93%	0.932**	7.01%
	(0.229)		(0.365)	
Controls	IC		Full	
N	488		355	

Correcting for rare events bias does not alter the qualitative pattern of results dramatically

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, standard errors are heteroscedasticity robust and clustered by country, observations with unemployment lower than 6% were excluded from the sample. "IC" means initial unemployment, GDP per capita (log), GDP per capita growth and year dummies were included as controls. "Full" means that, in addition to these, openness, investment, FDI, government spending as a share of GDP, inflation, polity, war and crisis were included as controls.

**Results are robust to controlling for unobserved heterogeneity and rare events bias**

**Conclusion:** Sound regulation is **robustly** correlated with an increased incidence of miracles



# Which Policies Matter Most?

## Bayesian Model Averaging (Theory 1/2)

- **Bayesian Model Averaging:** a method to deal with uncertainty in model selection.
  - Estimate all possible combinations of models,
  - Average over them,
  - Attach more weight to ones that receive support from the data.

- Some notation:

$Y$  is assumed to follow a logistic distribution with mean  $\mu = X\beta$   
 $X$  is a  $n \times p$  matrix of candidate explanatory variables  
 $M = \{M_1, M_2, \dots, M_q\}$  Possible models (with model space  $M_k$ )

- **Marginal distribution of data for a given model**

$$P(Y | M_K) = \int p(Y | M_K, \beta_K) * \pi(\beta_K | M_k) * d\beta_K$$

- Where  $\pi(\beta_K | M_k)$  is the prior distribution of coefficients given model k.

# Which Policies Matter Most?

## Bayesian Model Averaging (Theory 2/2)

- **Posterior model probability**

$$P(M_K | Y) = \frac{P(Y | M_K) * \pi(M_k)}{\sum_{k=0}^q P(Y | M_K) * \pi(M_k)}$$

Where  $\pi(M_k)$  is the prior probability that model  $M_k$  is true

- **Posterior expected model coefficients:**

$$E(\beta | Y) = \sum_{k=0}^q P(M_K | Y) * E(\beta_K | M_K, Y)$$

# Frazer Institute: Economic Freedom Index

- The index published in *Economic Freedom of the World* measures the degree to which the policies and institutions of countries are supportive of economic freedom. The cornerstones of economic freedom are personal choice, voluntary exchange, freedom to compete, and security of privately owned property. Forty-two data points are used to construct a summary index and to measure the degree of economic freedom in five broad areas: (1) size of government: expenditures, taxes, and enterprises; (2) legal structure and security of property rights; (3) access to sound money; (4) freedom to trade internationally; and (5) regulation of credit, labor and business.