

The Real Exchange Rate and Female Labor Force Participation

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Outline

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1. Background:

Undervaluation as a Development Strategy

- Expected improvement of
 - Current account balance
 - Production, employment and income
 - International investment position
- Formula to kick-start economies and advance development
 - Boosting GDP/capita
 - Creating employment opportunities
 - Lifting governmental scope of intervention
- Would women benefit from such a strategy in terms of FLFP?
- Would women benefit from such a strategy at least as much as men do?

2. Focus of the Paper

- Impact of undervalued real exchange rate on female labor force participation (FLFP)
- Impact of undervalued real exchange rate on closing the gap between female and male labor force participation
- Cross-country data set of 96 countries in 5-year time periods from 1960 to 2015
 - 35 OECD countries
 - 61 developing countries and emerging markets
- Control variables (age, initial income, female / male education, fertility rate, urban population, infant mortality)

3. Results: Impacts on FLFP (1) – Baseline Effect on FLFP

- Positive relationship between undervalued RER and FLFP
 - A 50% undervaluation is associated with an increase in FLFP of 16.4 percentage points over the whole sample
 - Positive effect is declining with increasing income levels
- Interpretation:
 - In early stages of development the increase of FLFP is highest
 - Export profile of low income countries: Low-technology, female intensive manufacturing
 - Technological upgrading of export profile does not have proportional effects on female and male employment opportunities

TABLE 1: PANEL EVIDENCE ON THE RELATIONSHIP BETWEEN UNDERVALUATION AND FEMALE LABOR FORCE PARTICIPATION: FIXED EFFECTS

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	<i>UNDERVAL</i> greater than negative 150%	<i>UNDERVAL</i> greater than negative 100%	<i>UNDERVAL</i> greater than negative 50%	<i>UNDERVAL</i> greater than negative 25%	<i>UNDERVAL</i> less than positive 50%
$\ln \textit{UNDERVAL}$	0.327*** (0.082)	0.324*** (0.086)	0.351*** (0.089)	0.306*** (0.077)	0.278*** (0.064)	0.346*** (0.105)
$\ln \textit{initial income} * \ln \textit{UNDERVAL}$	-0.031*** (0.004)	-0.031*** (0.004)	-0.031*** (0.004)	-0.029*** (0.004)	-0.028*** (0.004)	-0.051*** (0.011)
$\ln \textit{initial income}$	0.042*** (0.013)	0.041*** (0.013)	0.049*** (0.011)	0.056*** (0.010)	0.059*** (0.009)	-0.087*** (0.022)
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
Observations	987	955	832	637	528	719

Notes: The dependent variable is the average female labor force participation rate measured in 5-year time periods from 1960 to 2015 (Mean: 0.48, Std. dev.: 0.19). 96 countries are included in the estimation: Afghanistan, Algeria, Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Benin, Botswana, Brazil, Cameroon, Canada, Central African Republic, Chile, China, Colombia, Congo Rep., Costa Rica, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt Arab Rep., El Salvador, Fiji, Finland, France, Gambia, Ghana, Greece, Guatemala, Guinea-Bissau, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea Rep., Kuwait, Lesotho, Liberia, Malawi, Malaysia, Mali, Mauritius, Mexico, Mozambique, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Norway, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Rwanda, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe. Three countries with extreme observations for *UNDERVAL* have been excluded from the sample (Iraq, Laos, and People's Republic of Korea). Robust standard errors are clustered at the country level. ***, **, * denote significance at the 1, 5, and 10 percent levels, respectively. The data section provides data descriptions and sources.

3. Results: Impacts on FLFP (2) - Heterogeneous Effects on FLFP

- Positive robust impacts are strong for the following groups:
 - Developing countries with an income per capita under 7,500 USD per year
 - Non-OECD countries
 - Prime age group (between 30 and 44 years)

- Interpretation
 - In developing countries, undervaluation stimulates economic growth by increasing the profitability of tradable production, which tends to be more female-intensive in low-tech manufacturing (e.g. toys, textiles).
 - With increasing income levels women reduce certain employment (due to underpayment, unfavorable working conditions)
 - OECD countries: social security systems would support such a move
 - Prime age group: group of women who are willing and prepared to join the formal labor market, but have the least opportunity to do so (drop out rates due to child and elderly care; reinforced by recessions)

TABLE 3: COMPARISON OF DIFFERENT COUNTRY GROUPS ON THE RELATIONSHIP BETWEEN UNDERVALUATION AND FEMALE LABOR FORCE PARTICIPATION: FIXED EFFECTS WITH ADDITIONAL COVARIATES

	(1) All countries	(2) Advanced countries RGDPPC > \$7500	(3) Developing countries RGDPPC < \$7500	(4) OECD countries	(5) Non-OECD countries
$\ln \text{ UNDERVAL}$	0.316*** (0.107)	-0.086 (0.148)	0.234** (0.106)	-0.114 (0.235)	0.346*** (0.094)
$\ln \text{ initial income} * \ln \text{ UNDERVAL}$	-0.028*** (0.007)	-0.011 (0.016)	-0.020* (0.010)	-0.019 (0.028)	-0.031*** (0.006)
$\ln \text{ initial income}$	0.041** (0.019)	-0.057* (0.031)	0.038* (0.021)	0.099 (0.090)	0.050*** (0.015)
Fertility rate	-1.064 (0.804)	-1.813 (1.742)	-1.770** (0.844)	0.295 (2.960)	-1.578* (0.867)
Female education	-0.004 (0.011)	-0.002 (0.012)	-0.000 (0.019)	0.017 (0.027)	-0.008 (0.012)
Male education	0.006 (0.010)	0.004 (0.012)	0.009 (0.010)	-0.008 (0.025)	0.004 (0.011)
Capital stock (as a share of working age population)	0.000 (0.001)	-0.001 (0.001)	-0.003* (0.002)	0.001 (0.001)	-0.000 (0.001)
Urban population (as a share of total population)	-0.054 (0.097)	0.078 (0.066)	0.131 (0.131)	0.464*** (0.098)	-0.050 (0.090)
Infant mortality rate	0.032 (0.066)	0.304*** (0.103)	-0.047 (0.040)	0.437*** (0.135)	-0.019 (0.043)
Country fixed effects	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes
Observations	886	388	498	191	695

TABLE 4: PANEL EVIDENCE ON THE RELATIONSHIP BETWEEN UNDERVALUATION AND FEMALE LABOR FORCE PARTICIPATION BY AGE GROUP: FIXED EFFECTS WITH ADDITIONAL COVARIATES

	Dep. variable: female labor force participation, by age group					
	20-24	25-29	30-34	35-39	40-44	45-49
$\ln \text{ UNDERVAL}$	0.243*	0.392***	0.501***	0.522***	0.504***	0.424***
	(0.127)	(0.117)	(0.125)	(0.131)	(0.125)	(0.131)
$\ln \text{ initial income} * \ln \text{ UNDERVAL}$	-0.021***	-0.041***	-0.049***	-0.048***	-0.047***	-0.037***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.009)
$\ln \text{ initial income}$	0.036**	0.064***	0.074***	0.072***	0.073***	0.059**
	(0.018)	(0.019)	(0.022)	(0.023)	(0.022)	(0.023)
Fertility rate	-2.705***	-2.899***	-2.261**	-1.828	-1.458	-0.616
	(0.971)	(1.054)	(1.131)	(1.110)	(1.069)	(1.031)
Female education	0.011	0.006	0.003	0.001	-0.005	-0.005
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)
Male education	-0.006	-0.001	0.004	0.006	0.008	0.007
	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)
Capital stock (as a share of working age population)	-0.000	0.001	0.000	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Urban population (as a share of total population)	-0.084	-0.103	-0.134	-0.149	-0.057	-0.080
	(0.135)	(0.111)	(0.122)	(0.133)	(0.126)	(0.131)
Infant mortality rate	0.001	0.045	0.043	0.025	0.061	0.065
	(0.065)	(0.073)	(0.081)	(0.086)	(0.085)	(0.085)
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
Observations	881	882	879	879	881	878

3. Results: Impacts on FLFP (3) - Causal Effects on FLFP using an IV

- Instrumental variable (IV) approach to address the concern of reversed causality:
 - Positive productivity shock may lead to an increased FLFP
 - Positive productivity shock may result in a decline of average price level and thus undervaluation
- To address these concern: Undervaluation index is instrumented by
 - World capital flows considering capital account liberalisation
 - The growth rate of foreign exchange reserves
 - Both are considered as strong predictors of undervaluation
 - We still find significant and positive effects of undervaluation on FLFP

TABLE 5: PANEL EVIDENCE ON THE RELATIONSHIP BETWEEN UNDERVALUATION AND FEMALE LABOR FORCE PARTICIPATION: IV WITH FIXED EFFECTS

	Dep. variable: average female labor force participation				
	(1)	(2)	(3)	(4)	(5)
$\ln \textit{UNDERVAL}$	0.768** (0.357)	0.794** (0.372)	0.805** (0.373)	0.823** (0.384)	0.793* (0.418)
$\ln \textit{initial income} * \ln \textit{UNDERVAL}$	-0.033* (0.017)	-0.035* (0.018)	-0.039** (0.018)	-0.037** (0.017)	-0.034* (0.020)
$\ln \textit{initial income}$	0.069 (0.071)	0.069 (0.068)	0.053 (0.064)	0.067 (0.068)	0.052 (0.061)
Fertility rate		-0.195 (1.020)	-0.004 (1.129)	0.130 (1.131)	-0.091 (1.122)
Female education			0.011 (0.012)	-0.009 (0.015)	-0.008 (0.015)
Male education				0.024* (0.014)	0.021 (0.015)
Capital stock (as a share of working age population)					0.001 (0.001)
Urban population (as a share of total population)					-0.018 (0.085)
Infant mortality rate					-0.057 (0.083)
Observations	619	619	619	619	619

3. Results:

Impacts on the Gender Gap in LFP

- Undervaluation has a stable impact on the gender gap:
 - An increase in undervaluation leads to a decline in the male-female labor force participation gap.
 - A 50% undervaluation reduces the gender gap in LFP by 9.7 percentage points on average for the whole sample.
- Interpretation:
 - Expansion of tradable sectors disproportionately expands more female-intensive production in earlier stages of development
 - Co-ordinated monetary and exchange rate policy with a target of an undervalued ER could be beneficial to developing countries

TABLE 6: PANEL EVIDENCE ON THE RELATIONSHIP BETWEEN UNDERVALUATION AND MALE-FEMALE LABOR FORCE PARTICIPATION GAP: FIXED EFFECTS

Dependent variable: difference between male-female labor force participation					
	(1)	(2)	(3)	(4)	(5)
$\ln \text{ UNDERVAL}$	-0.164*	-0.176**	-0.174*	-0.197**	-0.194*
	(0.084)	(0.084)	(0.089)	(0.090)	(0.116)
$\ln \text{ initial income} * \ln \text{ UNDERVAL}$	0.030***	0.031***	0.028***	0.030***	0.033***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.010)
$\ln \text{ initial income}$	0.017	0.016	0.004	0.002	-0.004
	(0.024)	(0.023)	(0.023)	(0.023)	(0.024)
Fertility rate		0.301	-0.191	0.106	-0.243
		(0.998)	(1.053)	(1.049)	(1.244)
Female education			-0.004	0.018	0.019
			(0.010)	(0.016)	(0.016)
Male education				-0.025*	-0.027**
				(0.013)	(0.013)
Capital stock (as a share of working age population)					0.001
					(0.001)
Urban population (as a share of total population)					-0.046
					(0.090)
Infant mortality rate					-0.036
					(0.086)
Observations	850	848	752	752	749

Conclusion

- From a multilateral perspective: Export-led growth strategy is highly ambivalent and risky
- From an individual country's perspective: positive impact on FLFP
- With increasing diversification of export profile and sophistication of production with higher value added: decreasing benefit for women by undervalued RER
- Impacts strongly depend on how undervaluation is brought about

Annex

5. Theoretical Framework
6. Data
7. Empirical Strategy

5. Theoretical Framework

$$\begin{aligned}
 RER_{ij} &= NER_{ij} \\
 &= \frac{\left[\frac{\gamma_j w_{jf} L_{jf}}{Y_j^r} + (1 - \gamma_j) \frac{w_{jm} L_{jm}}{Y_j^r} \right] [1 + m_j] + \frac{(I_j - S_j) + (G_j - T_j) + (X_j - M_j)}{Y_j^r}}{\left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + (1 - \gamma_i) \frac{w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{(I_i - S_i) + (G_i - T_i) + (X_i - M_i)}{Y_i^r}}
 \end{aligned}$$

- *NER: nominal exchange rate (i: home country; j: foreign country)*
- *L: Labor employed*
- *w: average wage per employee*
- *(X - M): Net exports*
- *Y^r: real GDP*

Theoretical Framework

The impact of an improvement of the RER on the trade balance

- Core motivation of mercantilist strategy:
- Increase in price competitiveness → rise in demand for domestic products and decline in demand for imports
- Depends on behavior of direct competitors
- Depends on reaction of major trading partners

Theoretical Framework

The impact of the increase of net exports on GDP

- Rise in one of the four demand categories
- Counteracted by dampening effect of contractionary monetary or fiscal policies on other demand categories

→ increase of net exports can turn into an engine of growth the shorter and less comprehensive restrictive monetary and fiscal policy is used and the more the REER of peers and trading partners appreciates

Theoretical Framework

The impact of the increase of GDP on female labor force participation

- Rise in production → increase of employment
- Male-intensive versus female-intensive sectors
- Higher elasticity of female employment with an increasing level of education, a declining fertility rate and higher share of urban population (+cultural background)

We use the following equations (4a) and (4b):

Relationship between the real exchange rate and female labor force participation (4a)

$$RER_{ij} = NER_{ij} \frac{\left[\frac{\gamma_j w_{jf} L_{jf}}{Y_j^r} + (1 - \gamma_j) \frac{w_{jm} L_{jm}}{Y_j^r} \right] [1 + m_j] + \frac{(I_j - S_j) + (G_j - T_j) + (X_j - M_j)}{Y_j^r}}{\left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + (1 - \gamma_i) \frac{w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{(I_i - S_i) + (G_i - T_i) + (X_i - M_i)}{Y_i^r}}$$

Changes of the real exchange rate and changes of female labor force participation (4b)

$$\Delta RER_{ij} = \Delta NER_{ij} \frac{\Delta \left[\frac{\gamma_j w_{jf} L_{jf}}{Y_j^r} + (1 - \gamma_j) \frac{w_{jm} L_{jm}}{Y_j^r} \right] [1 + m_j] + \frac{\Delta(I_j - S_j) + \Delta(G_j - T_j) + \Delta(X_j - M_j)}{Y_j^r}}{\Delta \left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + (1 - \gamma_i) \frac{w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{\Delta(I_i - S_i) + \Delta(G_i - T_i) + \Delta(X_i - M_i)}{Y_i^r}}$$

Where:

RER: real exchange rate

NER: nominal exchange rate in price notation

i: country i

j: country j

$\gamma_i + (1 - \gamma_i) = 1$

$\gamma_j + (1 - \gamma_j) = 1$

Y^r : real GDP

P: domestic price index

Y: nominal GDP ($=Y^r P$)

wl: wage per employee x total number of employees

f: female

m: male

We derive these equations by using the traditional real exchange rate equation and ordinary aggregate output equations as the following:

$$\text{Real exchange rate } RER = NER_{ij} \frac{P_j}{P_i}$$

$$\text{Effective demand / creation income } Y_i = C_i + I_i + G_i + (X_i - M_i)$$

$$\text{Use on factor income } Y_i = C_i + S_i + T_i$$

$$\text{Distribution of income } Y_i = W_i + Q_i$$

I In the **first step** we require that ex post or in equilibrium Y must always be identical independent which output equation we use

$$C_i + I_i + G_i + (X_i - M_i) = C_i + S_i + T_i$$

$$I_i + G_i + (X_i - M_i) = S_i + T_i$$

$$(I_i - S_i) + (G_i - T_i) + (X_i - M_i) = 0 \tag{1}$$

In equilibrium of aggregate demand and aggregate supply the individual demand categories taken together must add up to zero.

II In the **second** step we use the distribution-of-income equation in order to derive the relationship between the price index and female labor force participation

$$Y_i = W_i + Q_i = W_i + Q_{ih} + Q_{iu} \quad (2a)$$

W_i : Total wage sum ($= w_i L_i$)

Q_i : Total profits ($= Q_{ih} + Q_{iu}$)

Q_{ih} : calculated profits

Assuming an equilibrium between demand and supply

Q_{iu} : uncalculated profits which originate only from disequilibrium between aggregate demand and aggregate supply:

- in a boom phase we record excess demand and accordingly $Q_{iu} > 0$
- in a bust phase the economy displays excess supply and accordingly $Q_{iu} < 0$

Using equation 1 we can describe Q_{iu} as

$$Q_{iu} = (I_i - S_i) + (G_i - T_i) + (X_i - M_i) \quad (2b)$$

While Q_{ih} determines prices, Q_{iu} is determined by prices.
In equilibrium ($Q_{iu} = 0$) we get:

$$Y_i = W_i + Q_{ih}$$

We extend the equation into:

$$Y_i^r P_i = W_i + \frac{W_i Q_{ih}}{W_i}$$

As $\frac{Q_{ih}}{W_i} = m_i(\text{mark-up})$, we get

$$Y_i^r P_i = W_i(1 + m_i)$$

We convert the equation into:

$$P_i = \frac{w_i L_i}{Y_i^r} (1 + m_i) \quad (2c)$$

The price index in equilibrium is determined by unit labor costs and the mark-up. Unit labor costs consist of wages, number of employees and the real GDP.

The price index considering both equilibrium and disequilibrium taking into account both calculated and uncalculated profits looks like the following:

$$P_i = \frac{w_i L_i}{Y_i^r} (1 + m_i) + \frac{Q_{iu}}{Y_i^r}$$

$$P_i = \frac{w_i L_i}{Y_i^r} (1 + m_i) + \frac{(I_j - S_j) + (G_j - T_j) + (X_j - M_j)}{Y_i^r} \quad (2d)$$

III In the **third** step we differentiate equation (2d) according to female and male wages and female and male employment for one country

$$P_i = \left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + \frac{(1-\gamma_i) w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{Q_{iu}}{Y_i^r}$$

$$P_i = \left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + \frac{(1-\gamma_i) w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{(I_j - S_j) + (G_j - T_j) + (X_j - M_j)}{Y_i^r} \quad (3)$$

IV In the **forth** step we integrate equation (3) in the real exchange rate equation

$$RER = NER_{ij} \frac{P_j}{P_i}$$

and get our final **equation (4a)** which relates the real exchange rate to female labor force participation:

$$RER = NER_{ij} \frac{\left[\frac{\gamma_j w_{jf} L_{jf}}{Y_j^r} + (1 - \gamma_j) \frac{w_{jm} L_{jm}}{Y_j^r} \right] [1 + m_j] + \frac{(I_j - S_j) + (G_j - T_j) + (X_j - M_j)}{Y_j^r}}{\left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + (1 - \gamma_i) \frac{w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{(I_i - S_i) + (G_i - T_i) + (X_i - M_i)}{Y_i^r}} \quad (4a)$$

The same way we derive the relationship between changes in the real exchange rate to changes in female labor participation and get **equation(4b)**:

$$\begin{aligned}
 \Delta RER &= \Delta NER_{ij} \frac{\Delta P_j}{\Delta P_i} \\
 &= \Delta NER_{ij} \frac{\Delta \left[\frac{\gamma_j w_{jf} L_{jf}}{Y_j^r} + (1 - \gamma_j) \frac{w_{jm} L_{jm}}{Y_j^r} \right] [1 + m_j] + \frac{\Delta(I_j - S_j) + \Delta(G_j - T_j) + \Delta(X_j - M_j)}{Y_j^r}}{\Delta \left[\frac{\gamma_i w_{if} L_{if}}{Y_i^r} + (1 - \gamma_i) \frac{w_{im} L_{im}}{Y_i^r} \right] [1 + m_i] + \frac{\Delta(I_i - S_i) + \Delta(G_i - T_i) + \Delta(X_i - M_i)}{Y_i^r}}
 \end{aligned} \tag{5}$$

6. Data

Databases from ILO, IMF, World Bank, Penn World Tables 8.1, United Nations

- Female labor force participation ratio and gender labor participation ratio from Key Indicators of the Labor Market (KILM) ILO database which offers data in 5-year time periods from 1960 to 2000 for 96 countries

Country-level

- Undervaluation index is constructed from data on RER and real GDP per capital from the Penn World Tables 8.1.

Notes: The dependent variable is the difference between male and female labor force participation rates measured in 5-year time periods from 1960 to 2015 (Mean: 0.32, Std. dev.: 0.19). 96 countries are included in the estimation: Afghanistan, Algeria, Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Benin, Botswana, Brazil, Cameroon, Canada, Central African Republic, Chile, China, Colombia, Congo Rep., Costa Rica, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt Arab Rep., El Salvador, Fiji, Finland, France, Gambia, Ghana, Greece, Guatemala, Guinea-Bissau, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea Rep., Kuwait, Lesotho, Liberia, Malawi, Malaysia, Mali, Mauritius, Mexico, Mozambique, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Norway, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Rwanda, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe. Three countries with extreme observations for *UNDERVAL* have been excluded from the sample (Iraq, Laos, and People's Republic of Korea). Robust standard errors are clustered at the country level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively. The data section provides data descriptions and sources.

7. Empirical Strategy (1)

$$FLFP_{it} = \alpha + \beta \ln UNDERVAL_{it} + X'_{it} \sigma + \eta_i + v_t + u_{it}$$

- FLFP: female labor force participation rate
- $UNDERVAL_{it}$: undervaluation index
- X' : vector of time varying control variables
- η : country – level fixed effects
- v : time period fixed effects
- Estimation according to age groups of ranges of 5 years

7. Empirical Strategy (2)

Undervaluation index is constructed following Rodrik (2008):

$$\ln UNDERVAL_{it} = \ln RER_{it} - \ln \widehat{RER}_{it}$$

$$\ln \widehat{RER}_{it} = \alpha + \beta \ln RGDPCH_{it} + \lambda_t + v_t$$

- *RGDPCH*: real GDP per capita
- λ_t : time period fixed effects

Notes: The dependent variable is the average female labor force participation rate measured in 5-year time periods from 1980 to 2010 (Mean: 0.50, Std. dev.: 0.18). The undervaluation index and its interaction with log of initial income level are instrumented by world capital flows multiplied by the *de jure* (Chinn-Ito) index of capital account liberalization at time t-1, the growth rate of foreign exchange reserves, and the interaction of these two variables with of the log of initial income level. 96 countries are included in the estimation: Afghanistan, Algeria, Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Benin, Botswana, Brazil, Cameroon, Canada, Central African Republic, Chile, China, Colombia, Congo Rep., Costa Rica, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt Arab Rep., El Salvador, Fiji, Finland, France, Gambia, Ghana, Greece, Guatemala, Guinea-Bissau, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran Islamic Rep., Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea Rep., Kuwait, Lesotho, Liberia, Malawi, Malaysia, Mali, Mauritius, Mexico, Mozambique, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Norway, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Rwanda, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, Zimbabwe. Three countries with extreme observations for *UNDERVAL* have been excluded from the sample (Iraq, Laos, and People's Republic of Korea). Robust standard errors are clustered at the country level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively. The data section provides data descriptions and sources.