

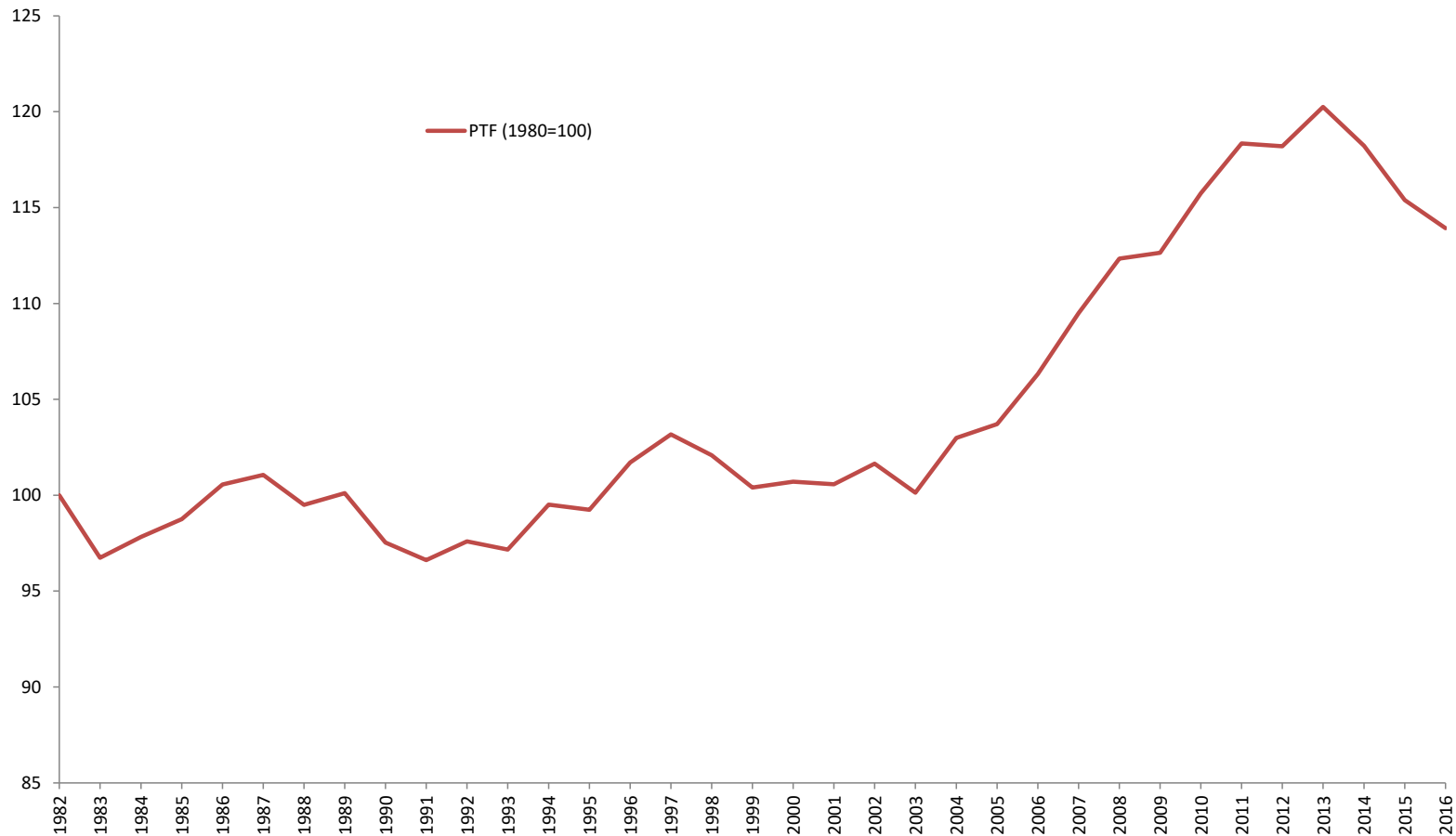
Productivity in Brazil

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Introduction

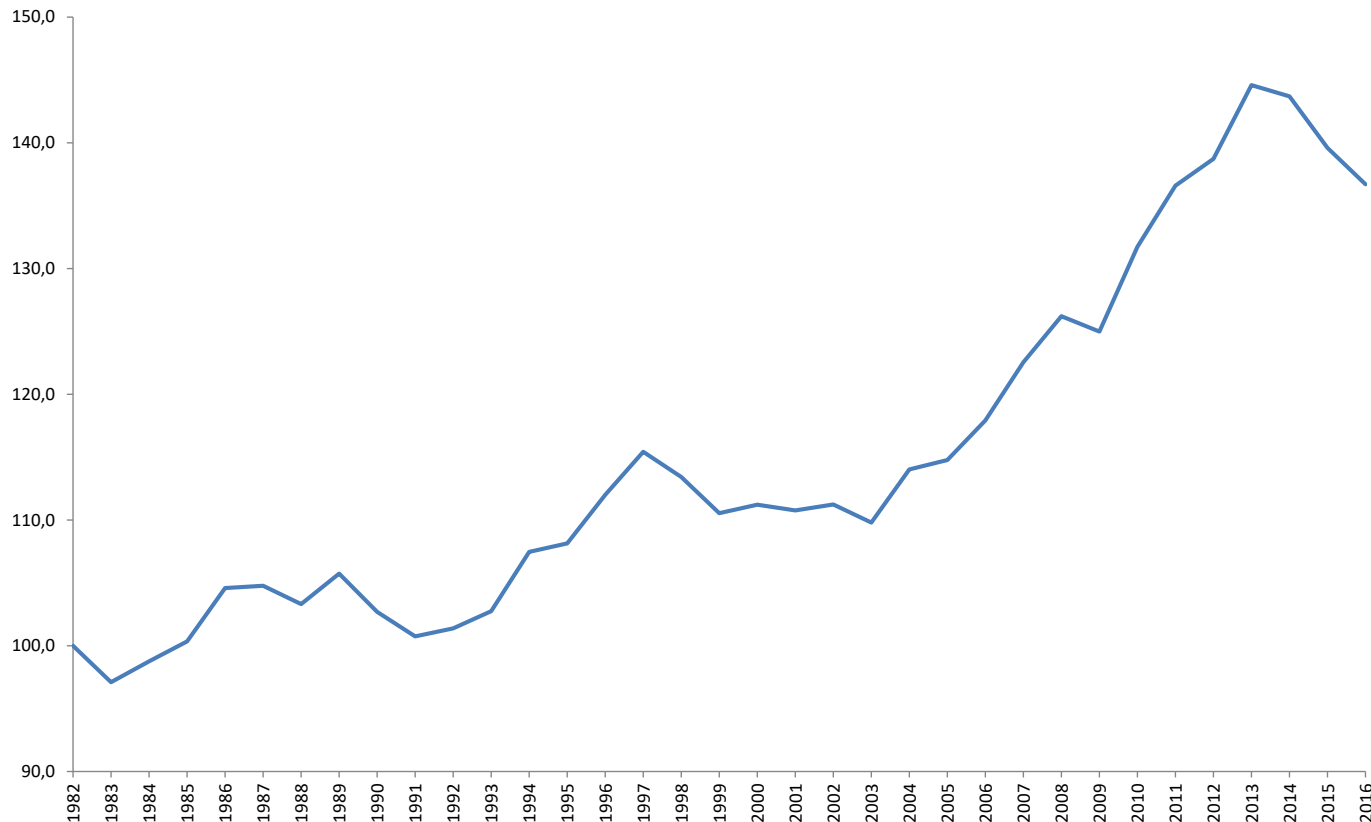
- Total Factor Productivity is stagnant in Brazil since the 1980's.
- Brazilian output growth is mainly a result of factor expansion and not a productivity outcome.
- The only period of important productivity growth was between 2003-2008, during Lula's government..

- TFP growth only between 2003 and 2010.



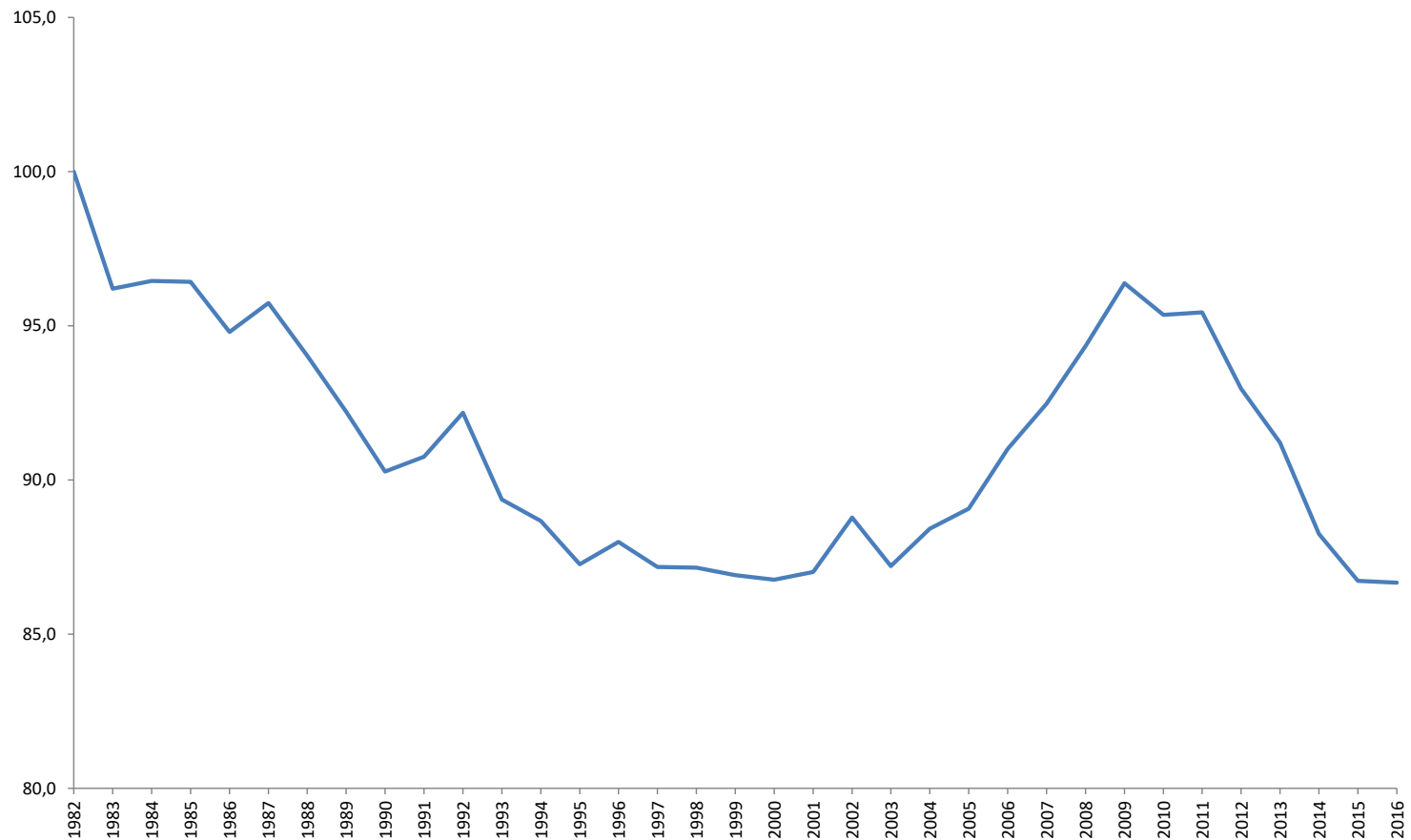
Labor Productivity Evolution

- Labor productivity growth is steady but modest over time.



Capital Productivity Evolution

- Capital productivity decreased since 1982. The only exception is between 2003 and 2008.



Growth Decomposition

- The evolution of the product can be decomposed into three basic components: productivity, capital and labor.

$$Y = A(uK)^\alpha L^{1-\alpha}$$

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha \frac{\dot{(uK)}}{uK} + (1-\alpha) \frac{\dot{L}}{L}$$

Growth Decomposition

	GDP		TFP		Hours Worked		Used Capital
1982-2016	2,4		0,4		0,9		1,1
(% total)			16,2		36,7		47,1
1982-1994	2,5	▲	0,0	▲	1,1	▲	1,4
(% total)			-1,7		45,3		56,3
1994-2002	2,3		0,3	▲	1,1	▲	0,9
(% total)			11,6		48,7		39,7
2002-2010	3,9		1,6	▲	1,1	▲	1,2
(% total)			41,1		27,9		31,0
2010-2014	2,2		0,5	▲	0,0	▲	1,7
(% total)			24,2		0,5		75,3
2014-2016	-3,7	▲	-1,9	▲	-0,7	▲	-1,1
(% total)			49,9		19,8		30,3
2010-2016	0,2	▲	-0,3	▲	-0,2	▲	0,7
(% total)			-119,8		-107,9		327,7
Δ(Dilma1-Lula)	-1,8	▲	-1,1	▲	-1,1	▲	0,4
(% total)			62,3		62,2		-24,5
Δ(Dilma2-Lula)	-3,7	▲	-1,9	▲	-1,3	▲	-0,5
(% total)			50,7		36,0		13,3

Growth Decomposition

- Growth decomposition using only labor.

$$Y = \frac{Y}{L} \times L = y \times L = \frac{Y}{H} \times \frac{H}{L} \times L = y_h \times JT \times L$$

$$\frac{\dot{Y}}{Y} = \frac{\dot{y}}{y} + \frac{\dot{L}}{L} = \frac{\dot{y}_h}{y_h} + \frac{\dot{JT}}{JT} + \frac{\dot{L}}{L}$$

Growth Decomposition

	GDP		Labor Productivity		JT		L
1982-2016	2,4		0,9		-0,4		1,9
(% total)		▾	38,8	▾	-18,4	▾	79,6
1982-1994	2,5		0,6		-0,6		2,4
(% total)		▾	24,5	▾	-24,2	▾	99,8
1994-2002	2,3		0,4		-0,1		2,0
(% total)		▾	18,9	▾	-5,0	▾	86,1
2002-2010	3,9		2,1		-0,3		2,1
(% total)		▾	53,5	▾	-6,9	▾	53,4
2010-2014	2,2		2,2		-0,9		0,9
(% total)		▾	99,2	▾	-40,9	▾	41,7
2014-2016	-3,7		-2,5		-0,5		-0,7
(% total)		▾	67,0	▾	13,6	▾	19,4
2010-2016	0,2		0,6		-0,8		0,4
(% total)		▾	279,8	▾	-346,3	▾	166,5
Δ(Dilma1-Lula)	-1,8		0,1		-0,6		-1,2
(% total)		▾	-3,7	▾	35,7	▾	68,0
Δ(Dilma2-Lula)	-3,7		-1,5		-0,5		-1,7
(% total)			40,0		13,3		46,7

Growth Decomposition

- Growth decomposition with capital.

$$Y = \frac{Y}{uK} \times uK = y_{uK} \times uK$$

$$\frac{\dot{Y}}{Y} = \frac{\dot{y}_{uK}}{y_{uK}} + \frac{\dot{u}}{u} + \frac{\dot{K}}{K}$$

Growth Decomposition

	GDP	Capital Productivity	Capital Utilization	Capital
1982-2016	2,4	-0,4	-0,1	2,9
(% total)		█ -17,8	█ -3,4	█ 121,2
1982-1994	2,5	-1,0	0,5	3,0
(% total)		█ -40,8	█ 20,0	█ 120,8
1994-2002	2,3	0,0	-0,1	2,4
(% total)		█ 0,7	█ -6,5	█ 105,8
2002-2010	3,9	0,9	0,8	2,3
(% total)		█ 22,6	█ 19,9	█ 57,6
2010-2014	2,2	-1,9	-0,4	4,5
(% total)		█ -88,3	█ -18,4	█ 206,8
2014-2016	-3,7	-0,9	-6,0	3,2
(% total)		█ 24,2	█ 162,5	█ -86,7
2010-2016	0,2	-1,6	-2,3	4,1
(% total)		█ -719,2	█ -1032,3	█ 1851,4
Δ(Dilma1-Lula)	-1,8	-2,8	-1,2	2,3
(% total)		█ 161,2	█ 67,8	█ -129,0
Δ(Dilma2-Lula)	-3,7	-2,5	-3,1	1,8
(% total)		█ 66,6	█ 82,4	█ -49,0

Growth Decomposition

- TFP decomposition: Capital productivity and labor productivity.

$$A = \frac{Y}{(uK)^\alpha (L)^{1-\alpha}} = \left(\frac{Y}{uK}\right)^\alpha \left(\frac{Y}{L}\right)^{1-\alpha} = (P_k)^\alpha (P_T)^{1-\alpha}$$

Growth Decomposition

	TFP		Labor Productivity		Capital Productivity
1982-2016	0,4		0,6		-0,2
(% total)			144		-44
1982-1994	0,0	▲	0,4	▲	-0,4
(% total)			-888		988
1994-2002	0,3	▲	0,3	▲	0,0
(% total)			98		2
2002-2010	1,6	▲	1,3	▲	0,4
(% total)			78		22
2010-2014	0,5	▲	1,3	▲	-0,8
(% total)			246		-146
2014-2016	-1,9	▲	-1,5	▲	-0,4
(% total)			81		19
2010-2016	-0,3	▲	0,4	▲	-0,6
(% total)			-140		240
Δ(Dilma1-Lula)	-1,1	▲	0,0	▲	-1,1
(% total)			-3,6		103,6
Δ(Dilma2-Lula)	-1,9	▲	-0,9	▲	-1,0
(% total)			47,4		52,6

Potential Output

- The decline in total factor productivity has reduced the potential output growth of the Brazilian economy since 2008.

	GDP	TFP	L	K
2002-2008	4,3%	2,3%	1,9%	2,0%
2002-2010	3,6%	1,6%	1,8%	2,3%
2010-2015	2,3%	-0,1%	1,0%	4,4%
Actual A	1,5%	0,0%	1,2%	2,0%
Actual B	2,2%	0,5%	1,2%	2,5%

Labor Productivity

- Labor productivity is low in Brazil.
- Low labor productivity is not a composition problem, but a level problem
- Composition effect is small.
- Why low labor productivity?
 - Low productivity sectors.
 - Low productivity services. Importance of traditional services and low productivity modern services.
 - Long tail of low productivity firms in all sectors

Labor Productivity Comparison (US\$PPP)

	Agropecuary	Industry	Services	Total
Brazil	4.779	19.389	15.814	14.689
USA	66.271	109.937	85.647	89.318
Ireland	27.976	114.873	80.397	84.949
Australia	65.469	88.358	61.589	67.555
France	50.027	64.056	69.225	66.488
Japan	18.102	70.607	65.400	64.967
Great-Britain	25.184	70.852	54.643	56.729
South Korea	24.290	74.759	44.429	52.503
Mexico	6.109	31.423	27.836	25.260
China	3.599	25.661	18.549	14.792
India	2.224	11.984	17.307	8.423
Average SEA	25.250	52.802	48.218	46.994
USA/Brasil	13,9	5,7	5,4	6,1
Average SEA/Brasil	5,3	2,7	3,0	3,2

Fonte: Veloso, Matos, Ferreira e Coelho (2016)

Productivity Differential

- Level and composition effect.
- Level effect explains most of the difference

Productivity Differential

	Original	Counterfactual (Composition)	Counterfactual (level)
CHL	93%	92%	-3%
CHN	103%	90%	13%
COL	89%	71%	-10%
MEX	3%	11%	9%
PER	59%	67%	10%
RUS	84%	81%	-9%

Labor Productivity Comparison

Composition Effect

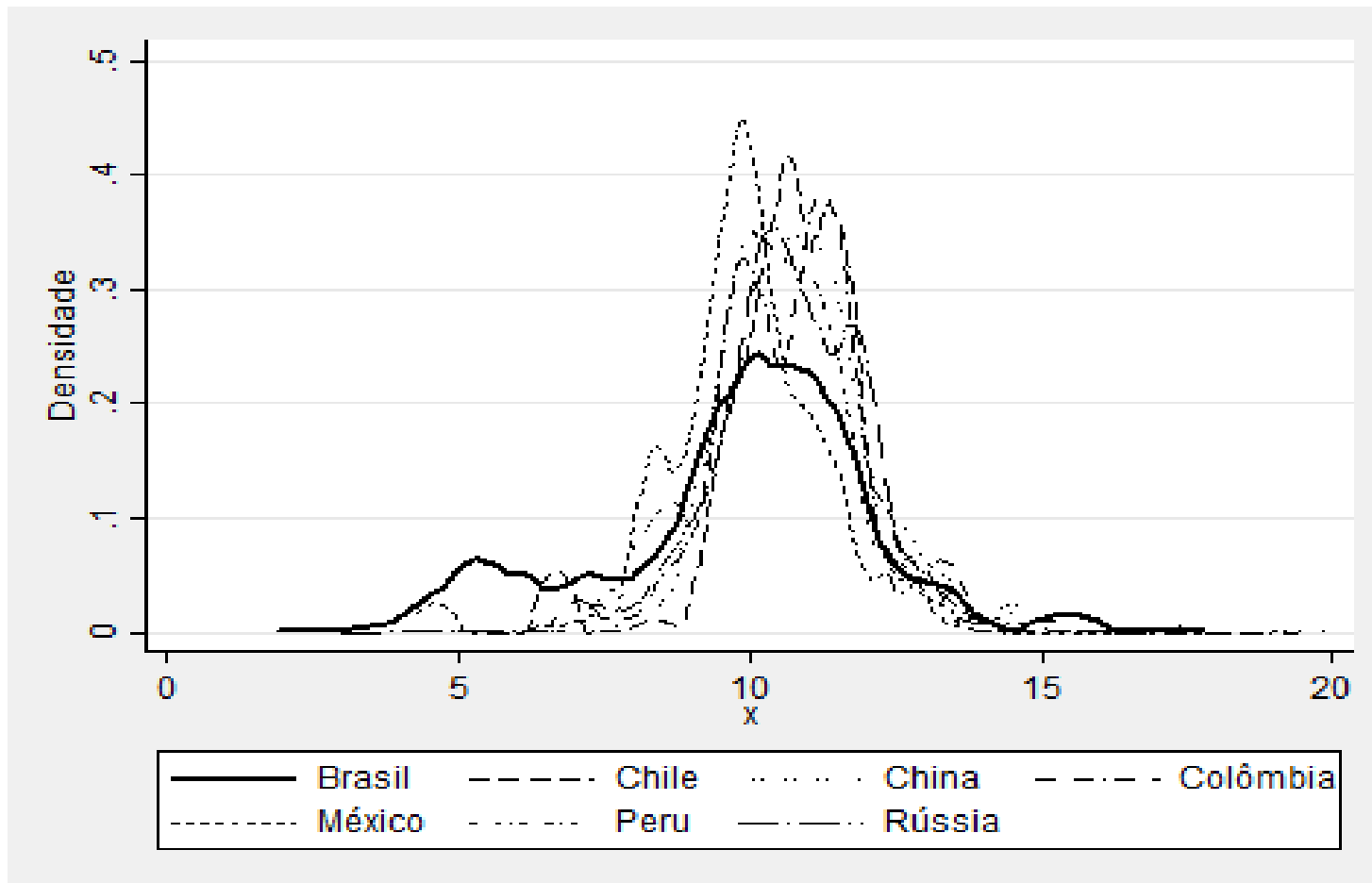
	Brazil	Counterfactual (USA)	Counterfactual (Mexico)	Contrafactual (South Korea)
Productivity	14.633	24.623	15.170	23.684
Counterfactual Ratio		1,68	1,04	1,62
Observed ratio		6,10	1,73	3,59

Labor Productivity Comparison

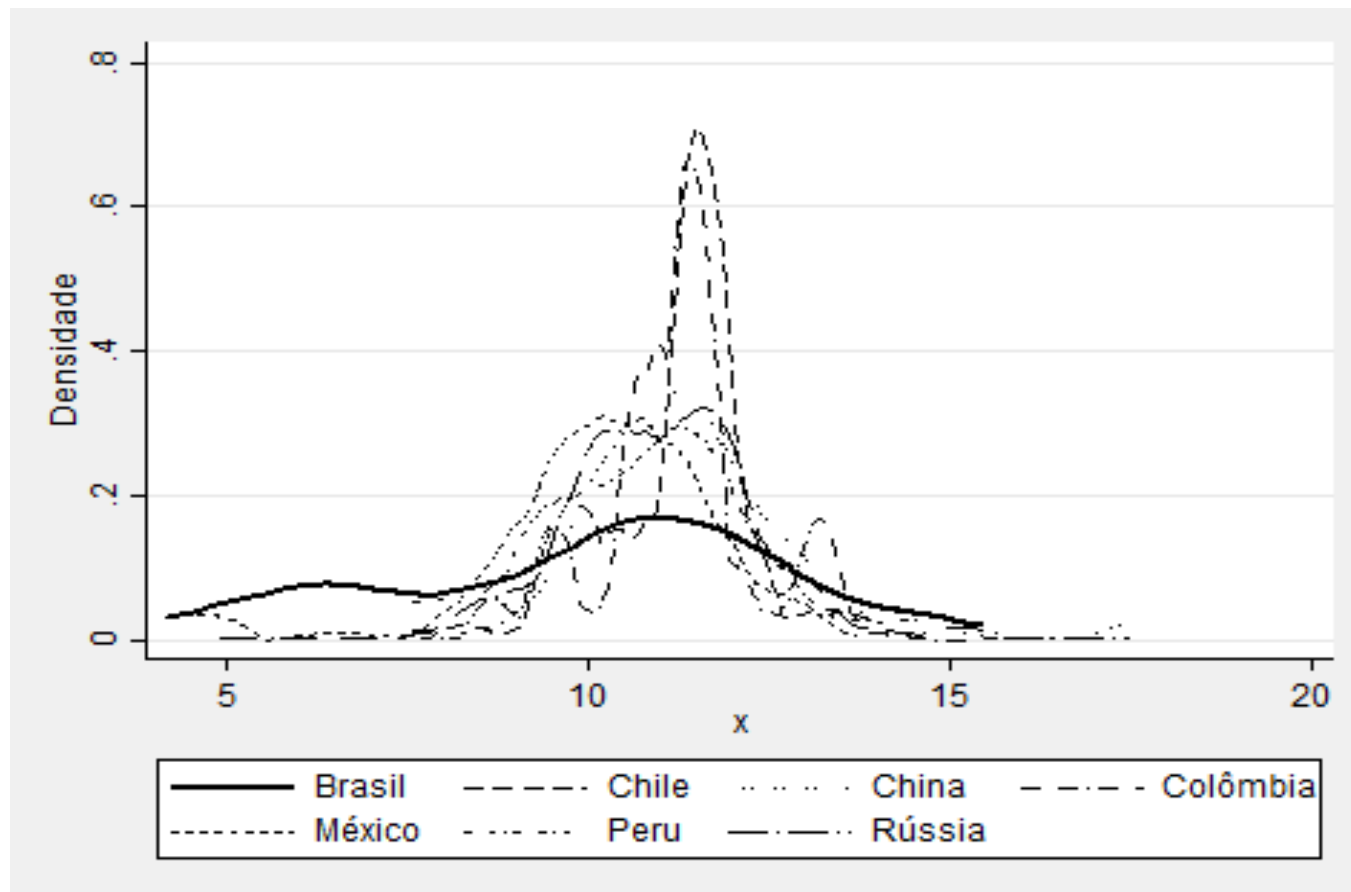
Level Effect

	Brazil	Counterfactual (USA)	Counterfactual (Mexico)	Counterfactual (South Korea)
Productivity	14.633	77.542	26.716	42.835
Counterfactual Ratio		5,30	1,83	2,93
Observed ratio		6,10	1,73	3,59

Firms Labor Productivity Distribution Brazil and Selected Countries (WBES)



Firms Labor productivity Distribution Retail and Wholesale Trade



Conclusion

- Total factor productivity did not grow overtime in Brazil.
- Labor productivity grows overtime.
- Capital productivity is the real problem.
- Potential output growth declined recently.
- Labor productivity level is low in Brazil.
- Labor productivity is low due to sector low productivity. It is a level effect not a composition effect.
- Brazil has a long tail of low productivity firms.