

Public Version



LINEAR COLLIDER COLLABORATION

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Impact of Escalation and Purchasing Powers on
the TDR Value Estimate
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- What is a “Value” estimate, and what are Purchasing Power Parities?
 - Calculating “Costs” from the Value estimate
 - From 2012 to 2017: Escalation, Exchange Rates, Purchasing Powers
 - Result: How much more (or less) would the ILC cost in 2017?
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- Disclaimer: **This is work in progress – values subject to change!**
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- “Value” is the intrinsic material worth of a contribution (a component or a service), expressed in a monetary unit
- For the ILC, Value is measured in ILC-Units (ILCU): 1 ILCU = 1\$ in 2012
- The “Value” of a component or service is the same everywhere, although the local price may vary
- to translate a Value to a local cost, the “buying power” (PPP: Purchasing Power Parity) has to be taken into account.
- PPP rates depend on country / region and type of goods
-> 1\$ may correspond to 0.90€ for fruits or 1.10€ for transport in Germany, or 0.92€ in Germany and 1.12€ in Finland for beverages
- PPP rates are evaluated and published by OECD and Eurostat every 3 years (last evaluation for 2014 appeared 2016)
- the “Value” is the correct basis for (cost) sharing in an in-kind project: if 3 regions each contribute 1/3 of the cryo modules, they all contribute the same Value
- **The TDR “Cost” Estimate gives the total Value of all components in ILCU**



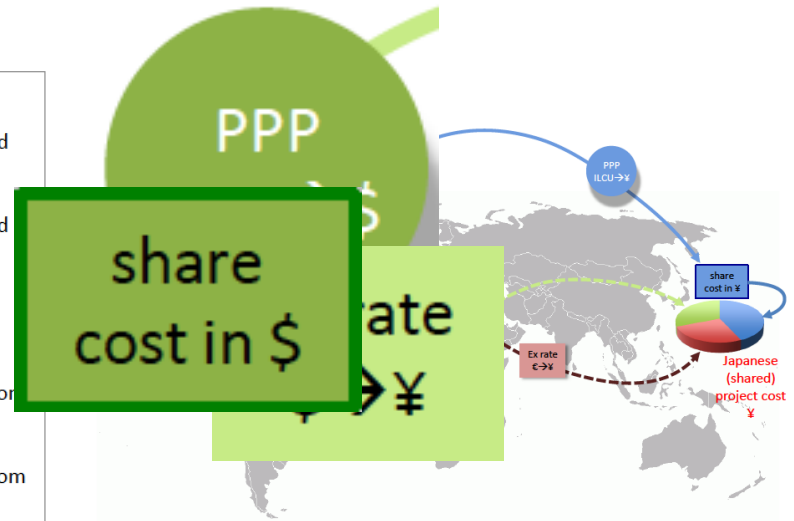
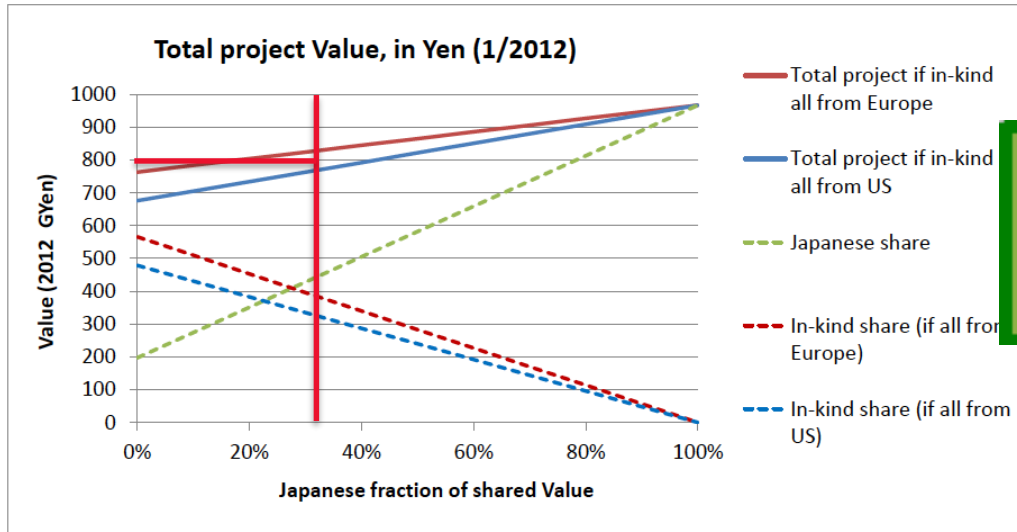
- TDR “Value” estimate can be translated to a local cost using PPP rates: “what would it cost to construct the ILC in a certain region, in local currency?”
- Because exchange rates deviate from purchasing powers, producing components “in kind” locally can be more or less expensive than in other regions
- Cost: **total sum of money** (converted to a single currency using exchange rates) to be spent to purchase all components / services to construct the ILC
- The cost (not the value!) depends
 - which region produces the components / services (value sharing between regions)
 - the current exchange rates (which may fluctuate wildly)
- If a currency is overvalued (exchange rate is better than buying power), the total cost may be reduced if larger fraction of components is produced elsewhere and contributed in-kind



Calculation of Cost from Value



- Cost = Sum of Money needed to produce/purchase items
- Depends on where the purchase is made
- Assume: CFS costs paid by host (Japan), rest is in-kind, purchased in regions
- Convert value to local cost with PPP, then cost to host currency with exchange rate

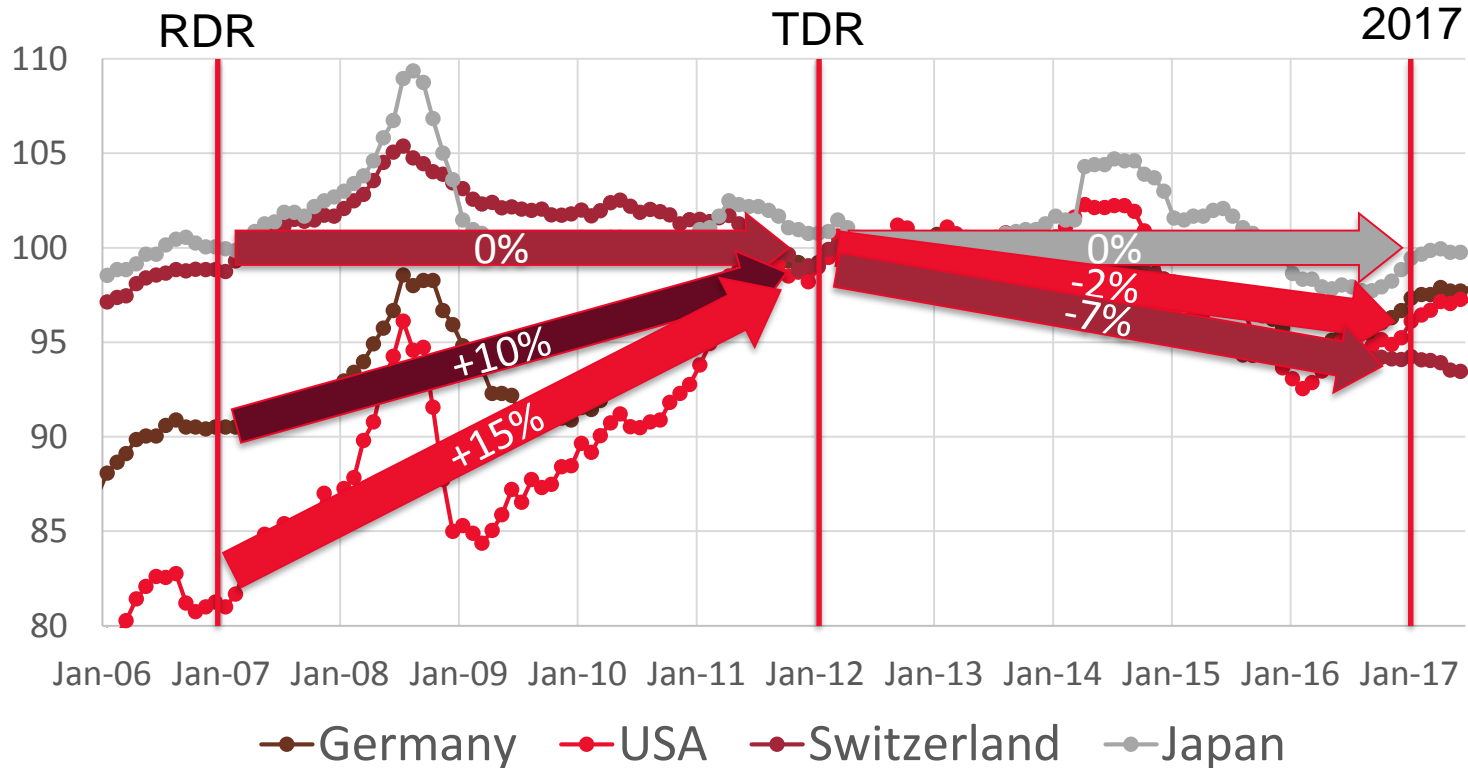


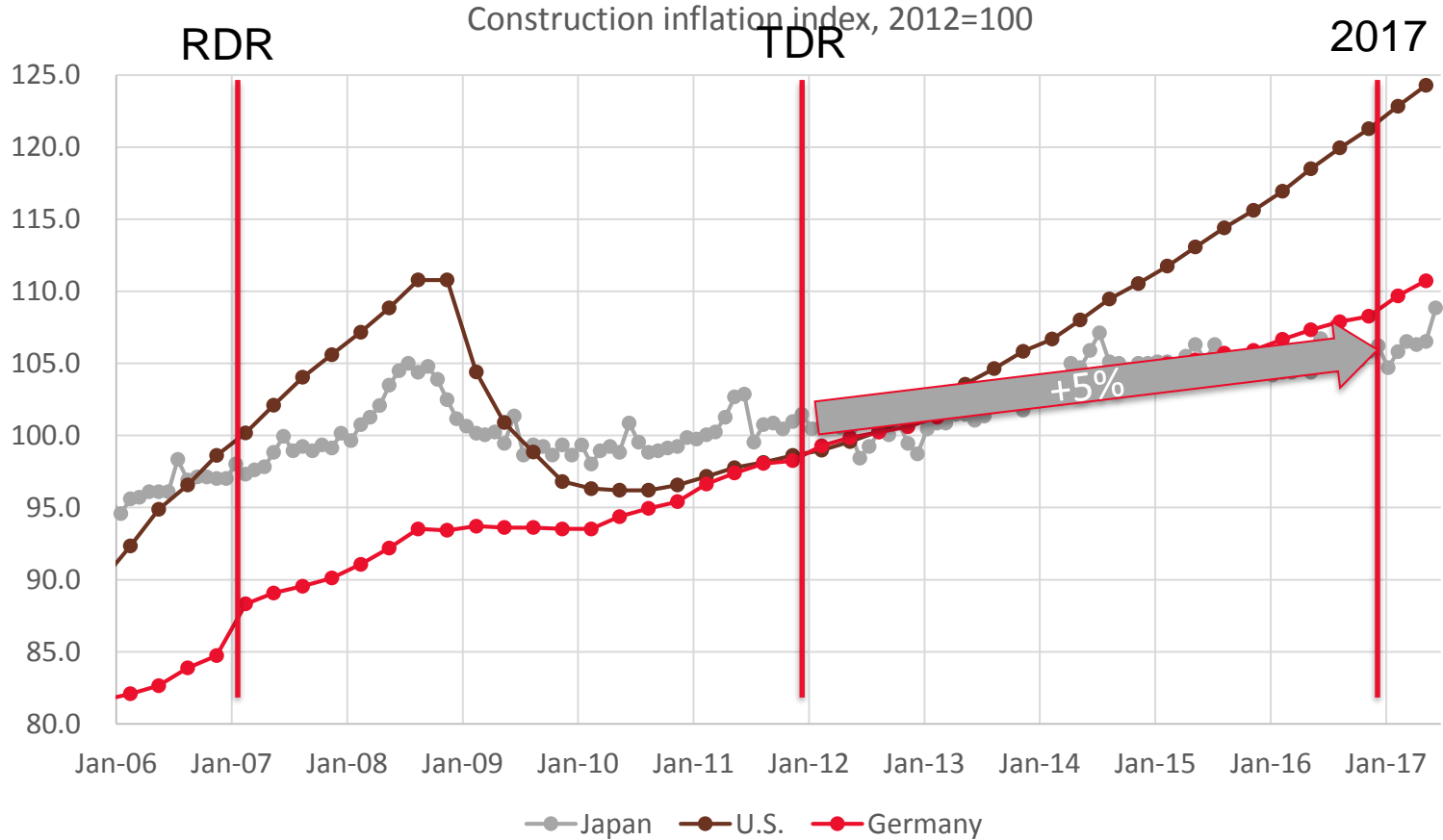
Guidelines for preparation of national cost estimates based on the ILC TDR value estimate. D*1020055.



- Prescription developed to escalate RDR estimate to TDR
- Recipe:
 - Start with cost estimate in local currency (\$, ¥, €, CHF) at date of estimate
 - Escalate in local currency to target date (1.1.2012 for TDR), using local inflation indices
 - Transform to ILCU using PPP rates at target date
- Recipe for escalation to 2017:
 - take TDR value, transform back to original currency (using PPP rates used in TDR)
-> needs break-down of TDR cost into currencies and type of good (CFS, non-CFS)
 - escalate using local inflation indices
-> needs local inflation indices (“deflators”)
 - convert back to $\$_{2017}$ (call that “ILCU₂₀₁₇”) using 2017 PPP rates
-> needs 2017 PPP rates
-> use 2014 rates from OECD and extrapolate using OECD deflators

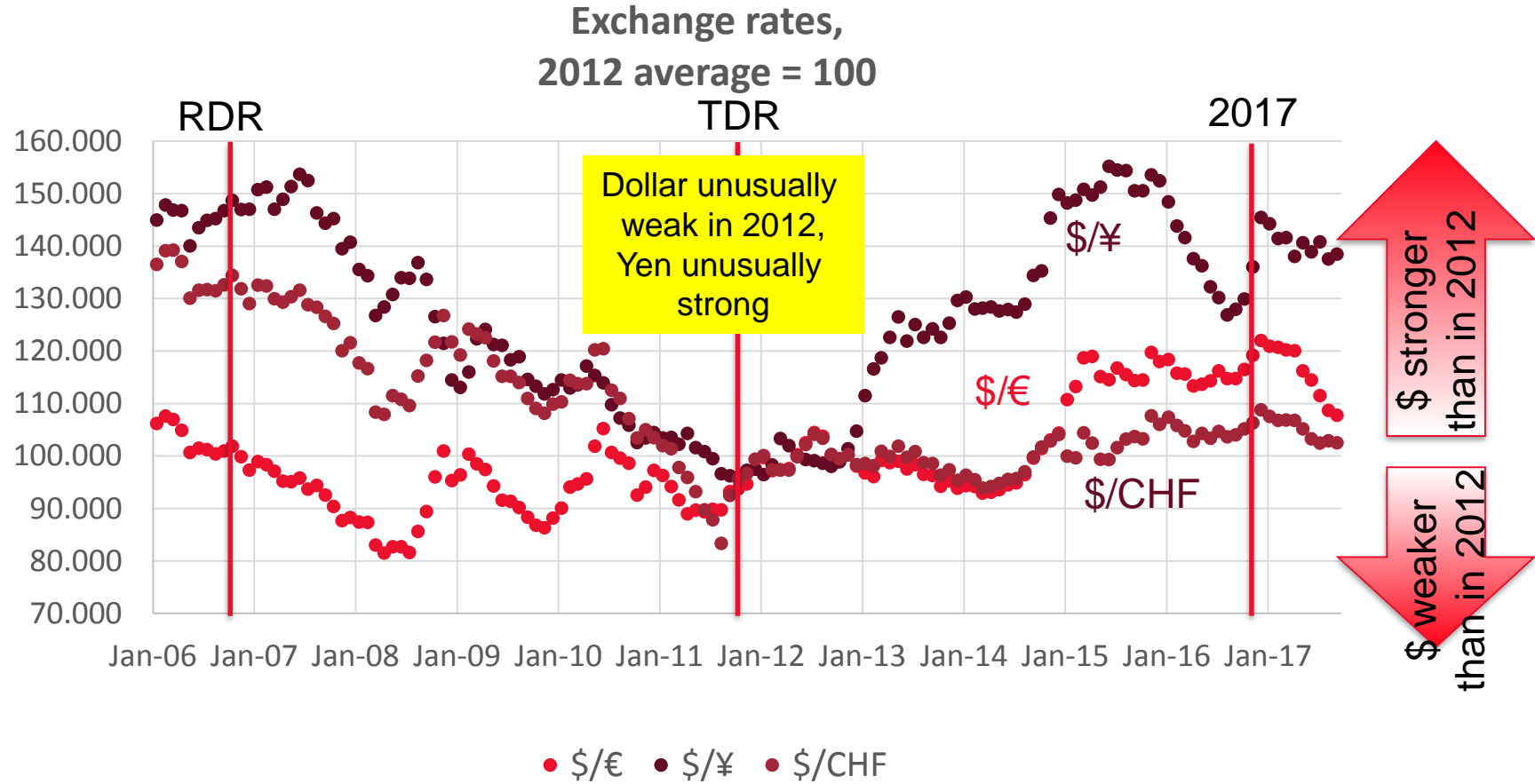
Escalation indices for manufacturing goods (monthly),
normalized to 2012 = 100







Exchange Rates





- PPP rates are published by OECD/Eurostat every 3 years
- Last edition: 2014 PPP indices, appeared in 2017
- 2017 indices will be published in 2019
- -> use inflation indices to estimate PPP rates in Jan. 2017

Rate	PPP(2014) (OECD)	PPP(2017) my estimate
EUR-NCON	0,795	0,844
CHF-NCON	1,09	1,089
YEN-NCON	107	108,3
EUR-CON	0,726	0,679
YEN-CON	118	105,4



- Basis: Gerry Dugan's final cost estimate for Asia
- 6 currencies / goods:
 - Dollars (Industrial goods)
 - Euro, PPP (Industrial)
 - Yen, PPP (Construction): CFS
 - Yen, PPP (Industrial): Vacuum system, LLRF, Cryomodules (parts), CFS
 - Euro, Exchange rate: Niobium sheets
 - CHF, PPP (Industrial): Installation equipment



Escalation Rates (very preliminary)



Currency	Country	Goods	Inflation 2012-17
€	Germany	Equipment	+1.1%
€	Germany	Construction	+10.5%
CHF	Switzerland	Equipment	-4.9%
US\$	USA	Equipment	-2.8%
US\$	USA	Construction	+24.1%
¥	Japan	Equipment	-1.3%
¥	Japan	Construction	+5.0%

Use these escalation rates for inflation from Jan 2012 to Jan 2017

Result depends on whether monthly indices or quarterly or yearly averages are used



Putting it together



	Rate (TDR)	Rate 2017	Escalation	Change In ILCU	to Yen(TDR)	to Yen(2017)	Change in Yen
Dollar-NCON	1	1	-2,85%	-3%	127,3	108,3	-17%
EUR-PPP-NCON	0,927	0,844	1,05%	11%	137,3	128,3	-6%
YEN-PPP-CON	109	105,4	5,02%	9%	1	1	+5%
YEN-PPP-NCON	127	108,3	-1,29%	16%	1	1	-1%
EUR-EX	0,776	0,941	1,05%	-17%	99,2	122,3	+25%
CHF-PPP-NCON	1,480	1,089	-4,89%	29%	86,0	99,4	+10%
YEN-EX	76,9	115,1	-1,29%	-34%	1	1	-1%



	Rate (TDR)	Rate 2017	Escalation	Change In ILCU	to Yen(TDR)	to Yen(2017)	Change in Yen	Value cange in Yen (% total cost)
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SUM								

This means: Escalation to 2017 and conversion to Yen with new **PPP** indices reduces total value in Yen by several%!

Due to deflation in Japan, which makes Yen in PPP stronger (opposite of exchange rate!)

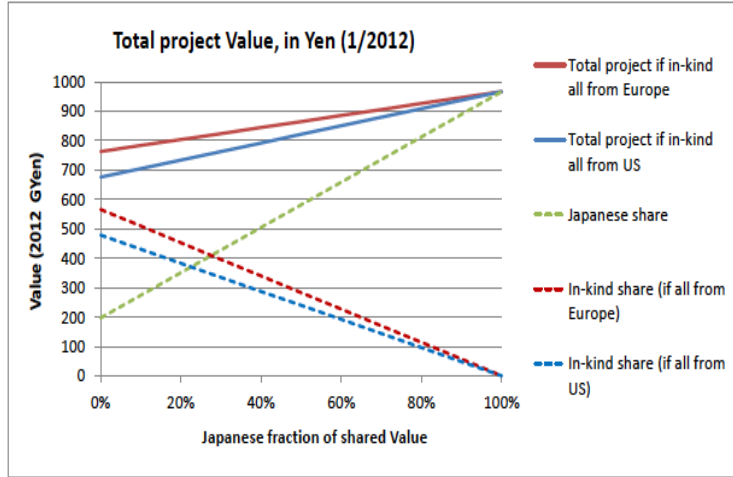
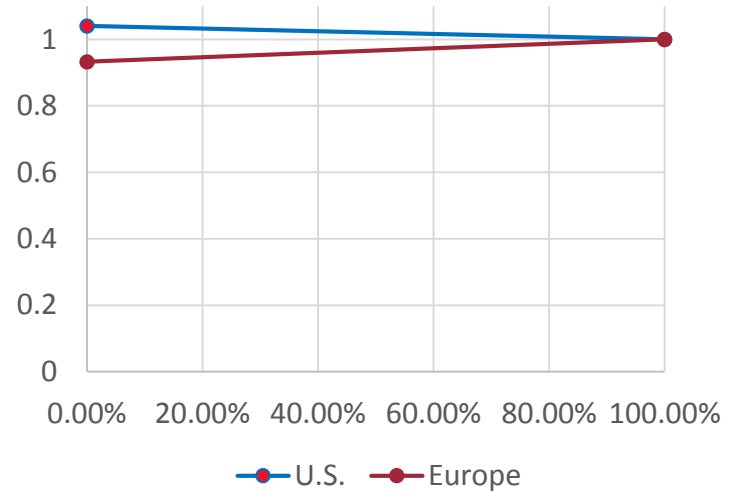


Figure 5. Total project Value, in Yen, vs. Japanese fraction of the shared Value



Contrary to 2012, in 2017 the share between regions does not influence total Cost much

Reason: Yen in 2012 was severely overvalued, not anymore



- It is possible to evaluate the effect of escalation and new PPP and exchange rates on the TDR value estimate
- Value estimate expressed in U.S. dollar (or “ILCU₂₀₁₇”) rises considerably because of U.S. inflation
- **Low inflation / slight deflation in Japan leads to reduction of Value expressed in Japanese Yen of 2017 by several %**
- Calculation of Cost depends on value share between regions
-> because Yen is not overvalued anymore, Cost dependence on share between regions is now small (was a big effect in TDR)