



**UNITED STATES  
INTERNATIONAL TRADE COMMISSION**

**An Overview of Global Value Chain Research, Implications for Empirical Research, and Potential Developments in Asian Trade**

**Bob Koopman, Director of Operations  
Prepared for  
IDE-JETRO and WTO International Symposium  
Global Value Chains: Quo Vadis?  
Friday 5 July 2013, Tokyo**

**These comments are my own and do not reflect the views of the USITC or any of its Commissioners.**



# Plan

- Motivation and methods for GVC analysis
  - US policymakers concerns
- High level overview of data developments – a lot! Too much to cover thanks to WTO/OECD, EC WIOD, and GTAP (and others...)
- Does the new perspective on data have some empirical implications for applied trade analysis?
  - Short answer - yes
- The focus on Asia – Trade, I mean, economic partnership agreements and China rebalancing.
  - TPP, RCEP, and implications of TTIP?
  - China...



## Global Value Chains, estimating Trade in Value Added and Decomposing Traditional Trade Statistics

- USITC Motivation - While a long term and historical issue ITC focus initially in the early 2003 – 4.
  - Tried to answer questions from Congress regarding China's growing role in US imports. But traditional trade data was not always convincing
- Conceptually economic literature has talked about fragmentation, outsourcing, offshoring, unbundling etc. From Katz and Murphy (1992), Feenstra and Hanson (1996), Leamer (1996), Krugman (1995), to Grossman and Rossi-Hansberg (2008,) Acemoglu and Autor (2011) etc....
- Vertical Specialization literature – Hummels, Ishi, and Yi (2001)
  - Led to aggregate China and Mexico work – Koopman, Wang, Wei (2008) and De La Cruz, Koopman, Wang and Wei (2011)
    - Aligned well with product specific examples - iPod, iPad, iPhone, and notebook computers. Boeing.
    - Large literature led by folks like Gereffi and Sturgeon
  - Led to GVC work – Significant US Import Restraints, Koopman, Powers, Wang, and Wei (2010), Koopman, Wang, and Wei (forthcoming)
- Could we build macro data bases to measure what we were observing and link to traditional trade statistics?
  - Tie in to WIOD, GTAP, WTO, OECD efforts
  - WTO and OECD TiVA estimates
  - Various USITC efforts and Koopman, Wang, Wei 2008, KPWW 2010, KWW forthcoming,



## Some exploratory applied trade analysis efforts

- We have built GVC based GTAP data for 2007.
- Built a global, dynamic CGE model around that data.
  - Also built a similar database using WIOD data, using for econometric purposes.
  - Continuing to investigate empirical implications of using such data. In Koopman, Tsigas, Riker, Powers (forthcoming) we demonstrate that for both simulation and econometric applications the new database generates substantially different insights than traditional databases.
- In this presentation will focus on global CGE model and implications for China's rebalancing.
  - Will use World Bank and National Development and Reform Commission 2030 view of rebalanced China



# Jobs, Manufacturing Output and Trade

- Imports from China up
- Manufacturing output affected
- Jobs lost
- Role of trade
  - currency, subsidies, unfair competition?
- Role of technology, consumption composition
  - automation, IT, services

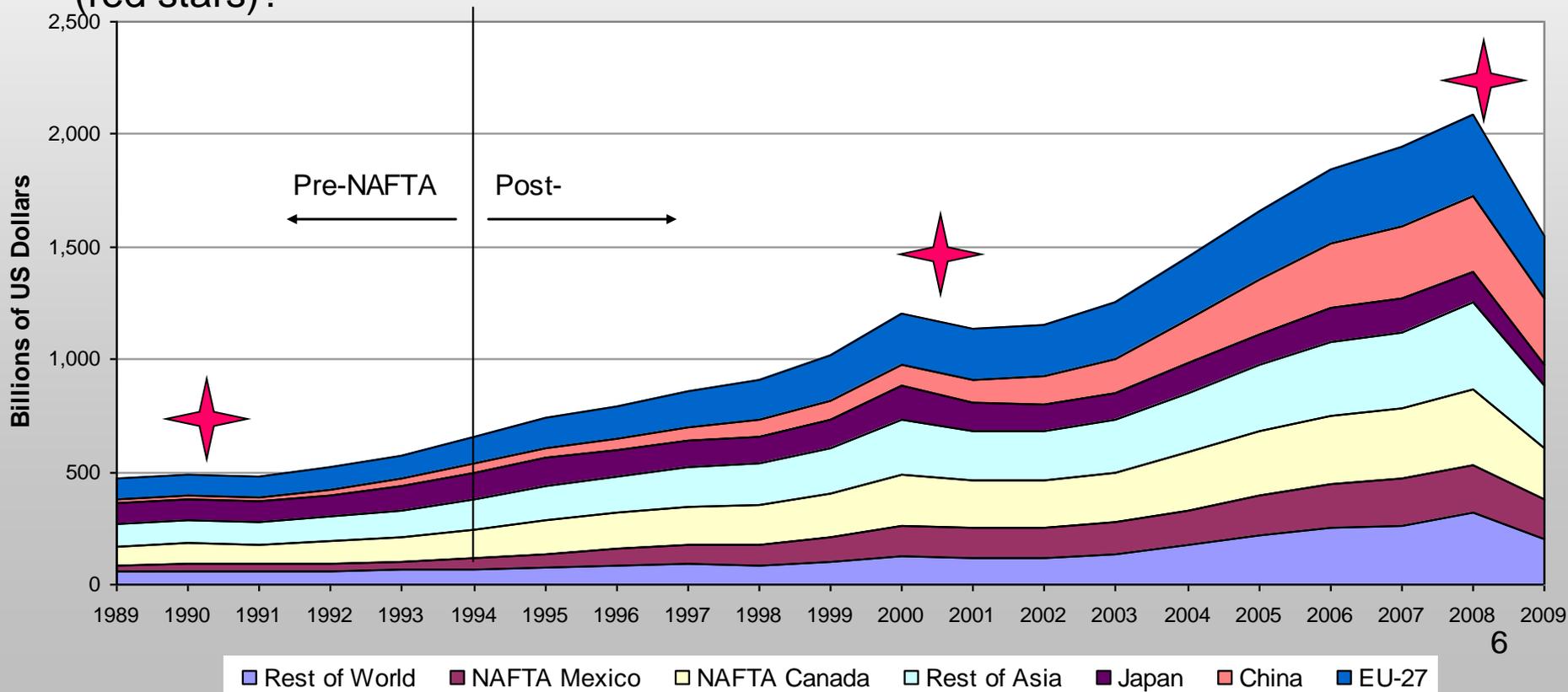


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Some background from the US perspective - What explains fast growing imports from China and the bilateral trade deficit with China:

A traditional presentation of U.S. non oil imports from the World, 1989-2009

Fast growth, changing composition - role of macro environment – recessions (red stars)?



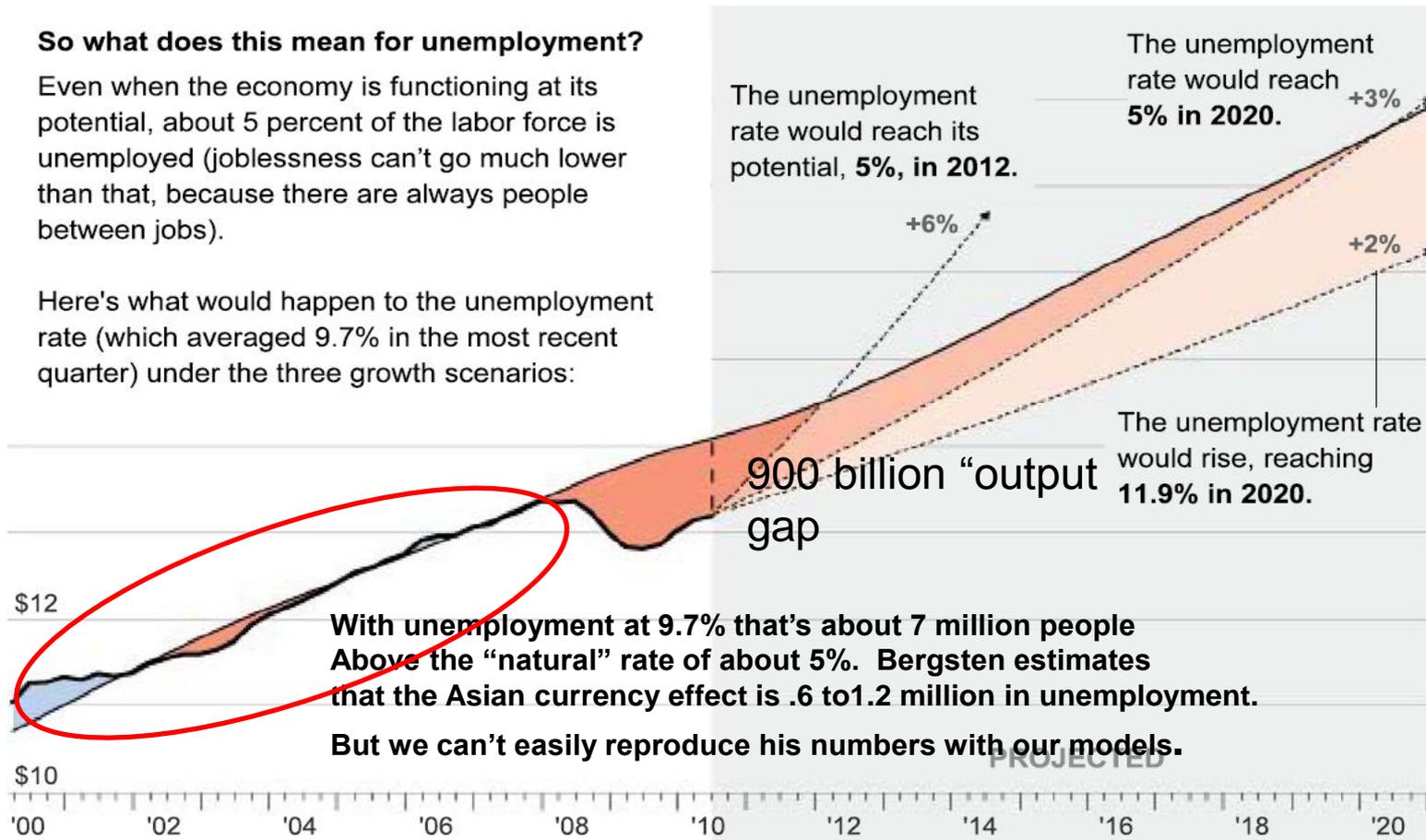


# The crisis, trade, and employment?

## So what does this mean for unemployment?

Even when the economy is functioning at its potential, about 5 percent of the labor force is unemployed (joblessness can't go much lower than that, because there are always people between jobs).

Here's what would happen to the unemployment rate (which averaged 9.7% in the most recent quarter) under the three growth scenarios:



With unemployment at 9.7% that's about 7 million people Above the "natural" rate of about 5%. Bergsten estimates that the Asian currency effect is .6 to 1.2 million in unemployment. But we can't easily reproduce his numbers with our models.



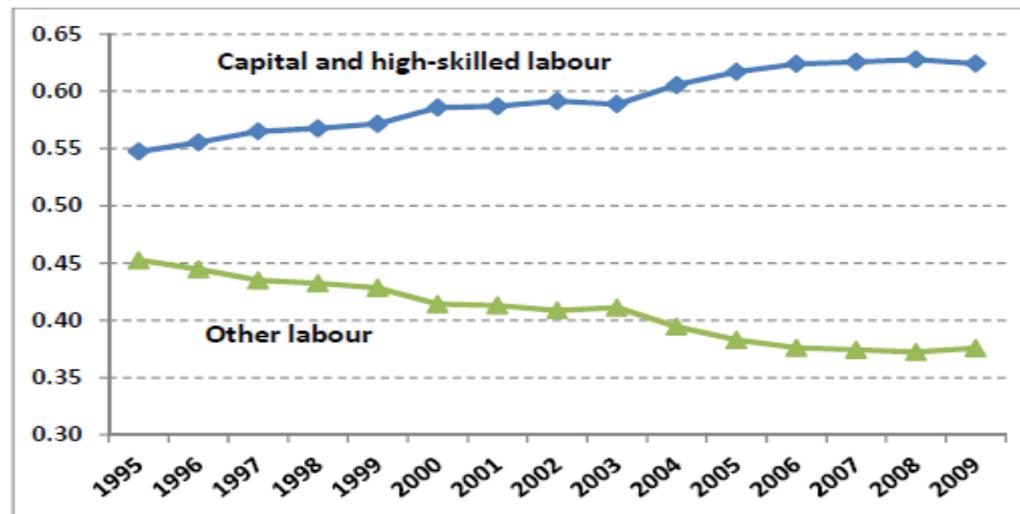
## Jobs, wages and employment

- We can show with fragmentation of production that there can be substantial impact on wages, particularly by skill type.
- Separating out technological bias in labor demand from fragmentation of production?
  - Empirical work sensitive to specification of technology variable – Feenstra and Hanson (2003), Geishecker (2002), Hsieh and Woo (1999), Head and Ries (2002)
  - Do labor demand curves get flatter? – Rodrik (1997) Slaughter (2001)



# WIOD work – Timmer, et al

Figure 4 Value added by labour and capital (share of global final manufactures output).



*Notes:* Value added to global output of final manufacturing goods. Value added by labour is measured as wages and salaries and other employer costs, and includes an imputation for self-employed workers. Capital compensation is residually defined as non-labour value added such that the labour and capital shares add up to one. High-skilled workers are defined as having college education or above.

*Source:* Author's calculations based on World Input-Output Database, April 2013.



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**Table 2 Value added shares by factor in all manufactures GVCs**

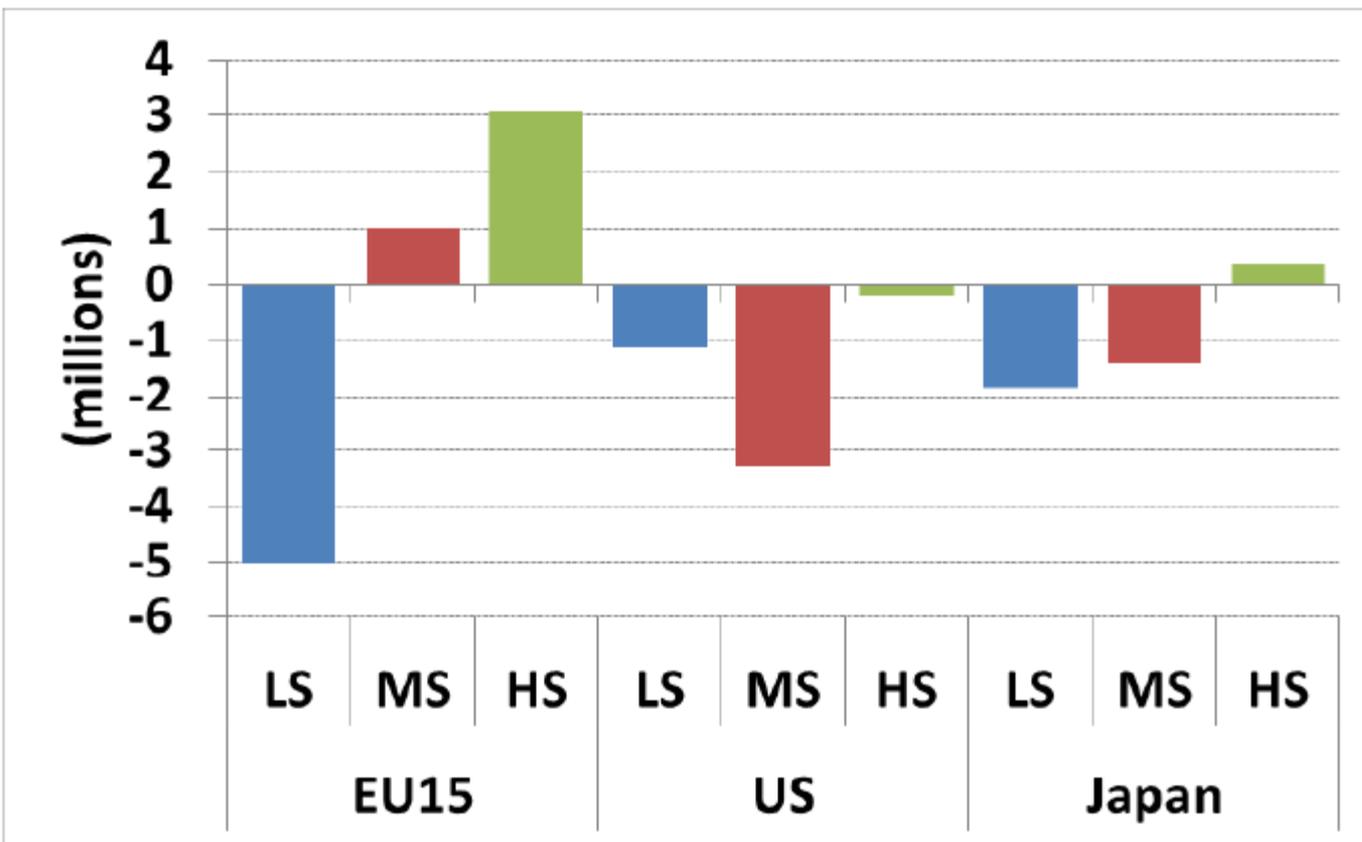
|   | 1995         | 2008         | 2008<br>minus 1995 |
|---|--------------|--------------|--------------------|
| <b>Total value added (billion<br/>US\$), by</b> | <b>6,586</b> | <b>8,684</b> | <b>2,098</b>       |
| capital (%)                                     | 40.9         | 47.4         | 6.5                |
| high-skilled labor (%)                          | 13.8         | 15.4         | 1.5                |
| medium-skilled labor (%)                        | 28.7         | 24.4         | -4.2               |
| low-skilled labor (%)                           | 16.6         | 12.8         | -3.8               |

*Note:* Breakdown of value added to global output of all final manufactures by factor of production. Value added is at basic prices (hence excluding net taxes, trade and transport margins on output). It is converted to US\$ with official exchange rates and deflated to 1995 prices with the US CPI. Figures may not add due to rounding.

*Source:* Author's calculations based on World Input-Output Database, April 2013.



## Change in number of GVC jobs between 1995 and 2008, by skill type, EU, US and Japan





# Krugman...Globalization...

- “Since when it comes to macro issues I am pretty much a curmudgeon, someone who thinks that the similarities between our time and the 90s in Japan or the 30s everywhere are a lot more important than the differences. But obviously things do change over the decades. And this morning I find myself wondering, how are these times different?”
- Not, as I’ve argued, because of globalization. But there is at least one important respect in which the 21st-century economy is different in a way that ought to have a significant effect on macroeconomics: the much larger role of rents on intangible assets. This isn’t an original insight, but I haven’t been finding systematic analyses of the point.
- What do I mean by the role of rents? “
- Apple...”The reality is that the company is basically built around technology, design, and a brand identity.”
- “There are a couple of obvious implications from this change in the nature of corporate success. ***One is that profits are no longer anything remotely resembling a “natural” aspect of the economy; they’re very much an artifact of antitrust policy or the lack thereof, intellectual property policy, etc. Another is that a lot of what we consider output is “produced” at low or zero marginal cost.***
- So in some respects these times are different.”
- Source: <http://krugman.blogs.nytimes.com/2013/06/19/how-are-these-times-different/>

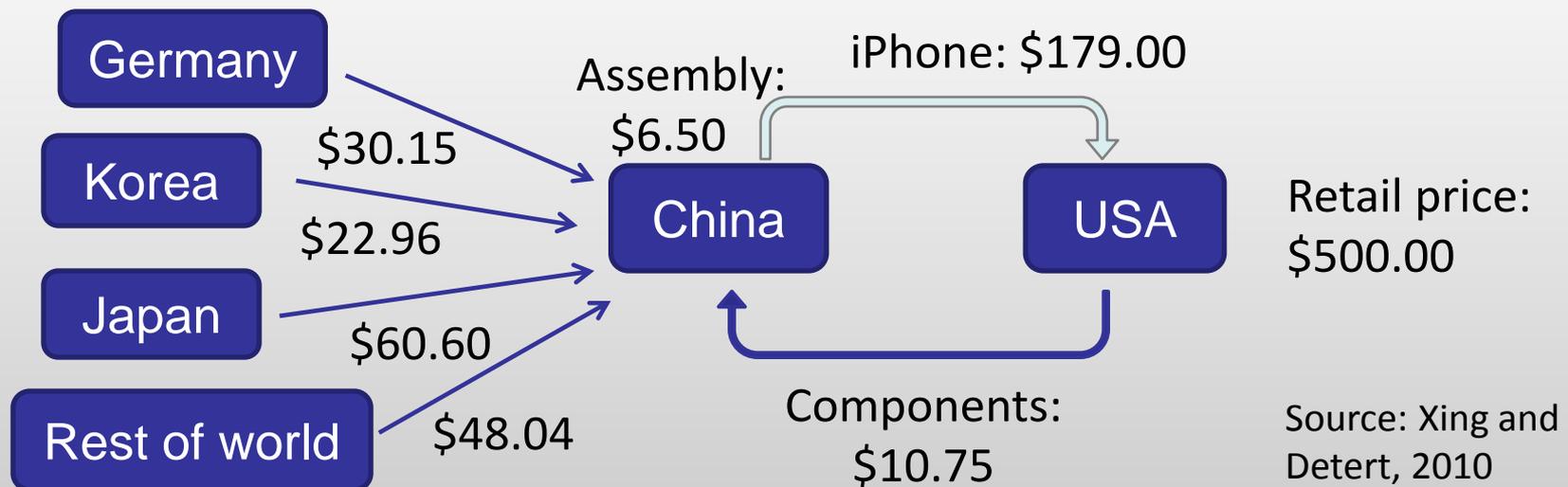


# Krugman continued...

- The question is, does this change macroeconomics in a fundamental way? In particular, does it mean that nations no longer have much control over their own destiny, even if they retain their own currencies?
- I say no. ***There are several reasons for this, but one important point is the nature of that rapid growth in manufactures trade. For it mainly involves vertical specialization, breaking up the value chain, so that in the course of producing \$1 of final consumer goods one may have several dollars' worth of trade. The gains from this trade are as real as those from any kind of trade; but the macro implications are different. Put it this way: while we trade a lot more than we used to, we probably if anything spend a higher share of our income on nontraded goods and (mostly) services than we did a few decades ago, and maybe even more than in 1913.***
- As a result, statements you commonly hear, like “Stimulus doesn’t work, because all the money ends up being spent on stuff made in China”, are just not true. ***Actually, even a dollar spent on Chinese-made consumer goods has a large U.S. value-added component. Yes, some demand leaks abroad — but not nearly as much as people imagine.*** In general, I’d argue that the rules for macro policy have changed relatively little since the 1930s, and globalization certainly hasn’t produced a qualitative change.
- Source: <http://krugman.blogs.nytimes.com/2013/06/18/globalization-and-macroeconomics/>



# The iPhone story? Global supply chains: Sources of value in a specific product



- Although the iPhone says “made in China”, only a small amount (\$6.50) of the \$179 value of each iPhone exported to the US is added in Chinese assembly.
- The United States adds \$10.75 of value in components to each phone—more than China!
- Apple and other U.S. retailers capture substantial value (\$321)



# Estimating DVA and FVA in China's exports?

**Table 2 Shares of domestic and foreign value added in total exports (%)**

|                                    | The HIY Method |      |      | The KWW Method |      |      |
|------------------------------------|----------------|------|------|----------------|------|------|
|                                    | 1997           | 2002 | 2007 | 1997           | 2002 | 2007 |
| <b>All Merchandise</b>             |                |      |      |                |      |      |
| Total Foreign value-added          | 17.6           | 25.1 | 28.7 | 46.0           | 46.1 | 39.4 |
| <i>Direct foreign value-added</i>  | 8.9            | 14.7 | 13.7 | 44.4           | 42.5 | 31.6 |
| Total Domestic Value-added         | 82.4           | 74.9 | 71.3 | 54.0           | 53.9 | 60.6 |
| <i>Direct domestic value-added</i> | 29.4           | 26.0 | 20.3 | 22.2           | 19.7 | 17.1 |
| <b>Manufacturing Goods Only</b>    |                |      |      |                |      |      |
| Total Foreign value-added          | 19.0           | 26.4 | 27.1 | 50.0           | 48.7 | 40.3 |
| <i>Direct foreign value-added</i>  | 9.7            | 15.6 | 16.3 | 48.3           | 45.1 | 32.4 |
| Total Domestic Value-added         | 81.1           | 73.6 | 72.9 | 50.0           | 51.3 | 59.7 |
| <i>Direct domestic value-added</i> | 27.5           | 24.6 | 24.6 | 19.6           | 18.1 | 16.5 |

**Source:** Authors' estimates based on China's 1997, 2002 and 2007 Benchmark input-output table published by Bureau of National Statistics and Official China trade statistics from China Customs.

**Note:** The HIY method refers to estimates from using the approach in Hummels, Ishii, and Yi (2001). The KWW method refers to estimates from using the approach developed in this paper that takes into account special features of processing exports.



**Table 3: Domestic and Foreign Values Added: Processing vs. Normal Exports**

(in percent of total exports)

|                                    | Normal Exports |      |      | Processing Exports |      |      |
|------------------------------------|----------------|------|------|--------------------|------|------|
|                                    | 1997           | 2002 | 2007 | 1997               | 2002 | 2007 |
| <b>All Merchandise</b>             |                |      |      |                    |      |      |
| Total Foreign value-added          | 5.2            | 10.4 | 16.0 | 79.0               | 74.6 | 62.7 |
| <i>Direct foreign value-added</i>  | 2.0            | 4.2  | 5.0  | 78.6               | 73.0 | 58.0 |
| Total Domestic Value-added         | 94.8           | 89.6 | 84.0 | 21.0               | 25.4 | 37.3 |
| <i>Direct domestic value-added</i> | 35.1           | 31.9 | 23.4 | 11.7               | 10.1 | 10.9 |
| <b>Manufacturing Goods Only</b>    |                |      |      |                    |      |      |
| Total Foreign value-added          | 5.5            | 11.0 | 16.4 | 79.4               | 75.2 | 63.0 |
| <i>Direct foreign value-added</i>  | 2.1            | 4.5  | 5.2  | 79.0               | 73.6 | 58.3 |
| Total Domestic Value-added         | 94.5           | 89.0 | 83.6 | 20.7               | 24.8 | 37.0 |
| <i>Direct domestic value-added</i> | 31.5           | 29.5 | 22.4 | 11.7               | 10.0 | 10.9 |

**Source:** Authors' estimates based on China's 1997, 2002 and 2007 Benchmark input-output table published by Bureau of National Statistics and Official China trade statistics from China Customs.

**Note:** The HIY method refers to estimates from using the approach in Hummels, Ishii, and Yi (2001). The KWW method refers to estimates from using the approach developed in this paper that takes into account special features of processing exports.



# A more general, global, decomposition...

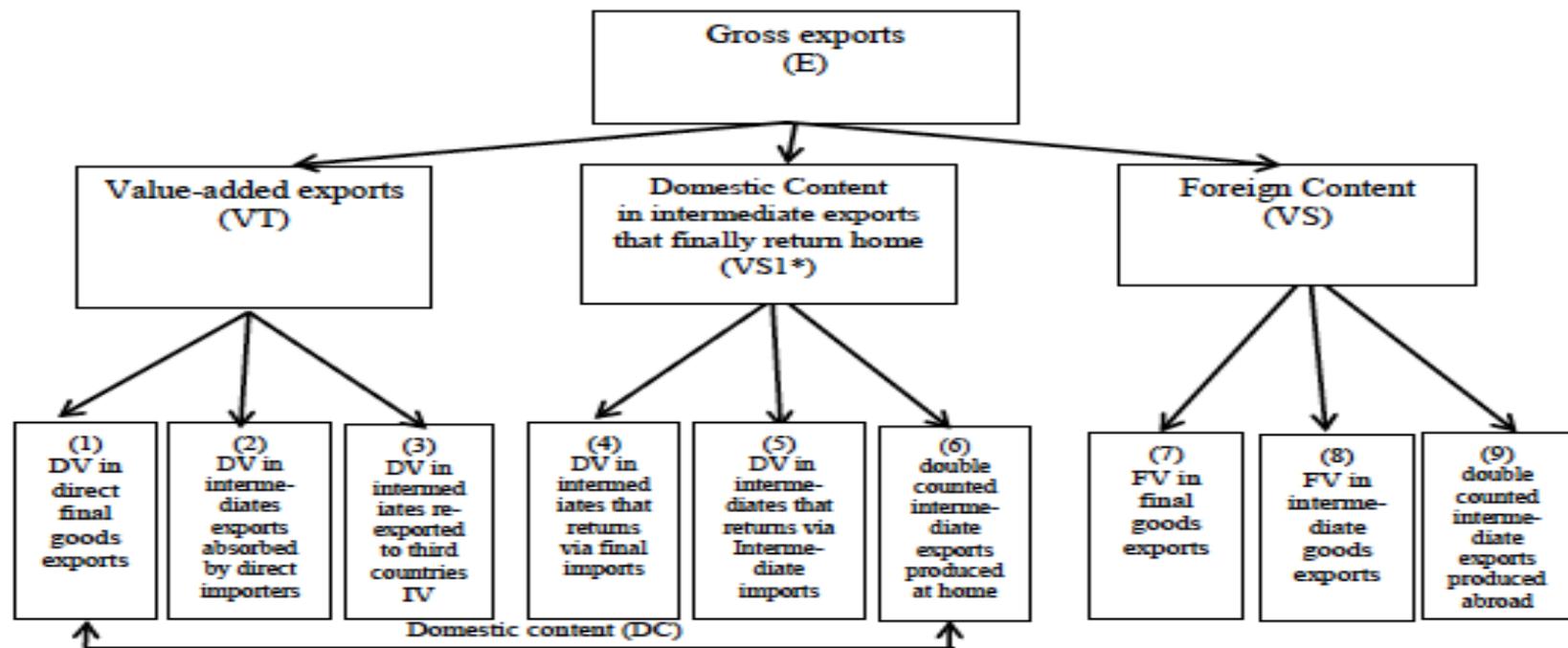
source – KWW 2012 NBER W18579

$$\begin{aligned}
 uE_{st} = & \left\{ V_s \sum_{F \neq S}^G B_{st} Y_{st} + V_s \sum_{F \neq S}^G B_{st} Y_{st} + V_s \sum_{F \neq S}^G \sum_{F \neq S, F}^G B_{st} Y_{st} \right\} \\
 & + \left\{ V_s \sum_{F \neq S}^G B_{st} Y_{st} + V_s \sum_{F \neq S}^G B_{st} A_{st} (I - A_{st})^{-1} Y_{st} \right\} + V_s \sum_{F \neq S}^G B_{st} A_{st} (I - A_{st})^{-1} E_{st} \\
 & + \left\{ \sum_{F \neq S}^G \sum_{F \neq S}^G V_s B_{st} Y_{st} + \sum_{F \neq S}^G \sum_{F \neq S}^G V_s B_{st} A_{st} (I - A_{st})^{-1} Y_{st} \right\} + \sum_{F \neq S}^G V_s B_{st} A_{st} \sum_{F \neq S}^G (I - A_{st})^{-1} E_{st}
 \end{aligned} \tag{36}$$



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**Figure 1 Accounting of gross exports: concepts**



Note:

a. value-added exports by a country equals  $(1) + (2) + (3)$ .

b. GDP in exports  $(1) + (2) + (3) + (4) + (5)$ .

c. domestic content in a country's exports equals  $(1) + (2) + (3) + (4) + (5) + (6)$ .

d.  $(7) + (8) + (9)$  is labeled as VS, and  $(3) + (4) + (5) + (6)$  is part of VS1 labeled by HIY (2001).

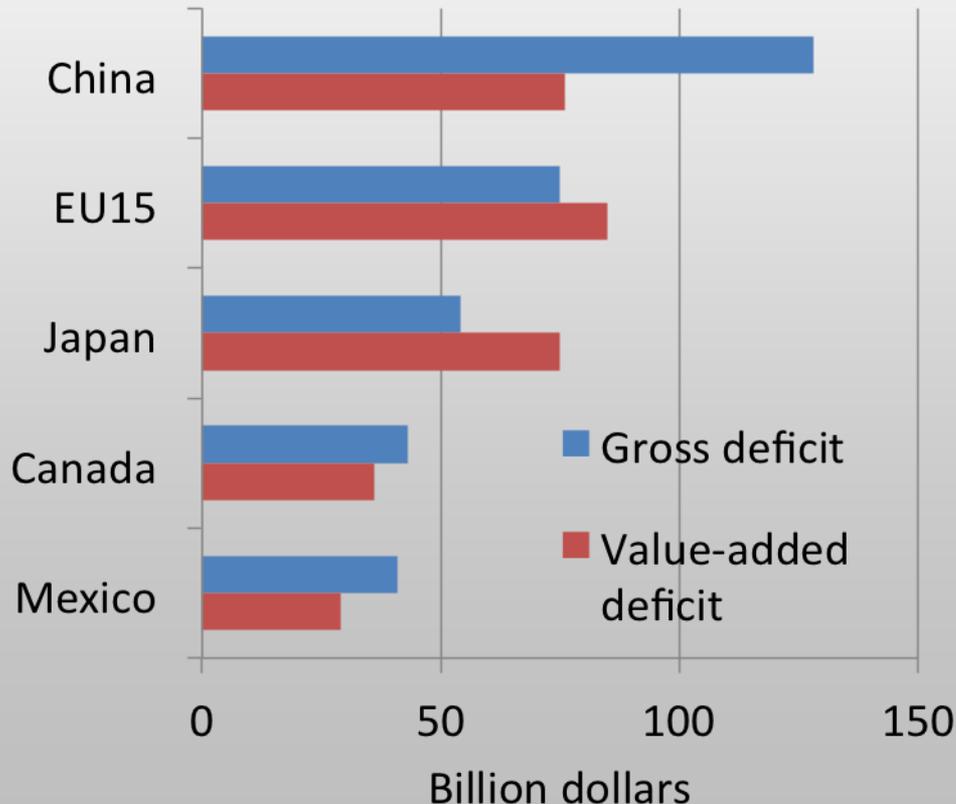
e. (4) are also labeled as VS1\* by Daudin et al (2011).

f. (4) through (9) involve value added that crosses national borders at least twice, and are the sources of multiple counting in official trade statistics.<sup>22</sup>



# Global supply chains: A new look at bilateral trade deficits

U.S. Bilateral Trade Deficits, 2004

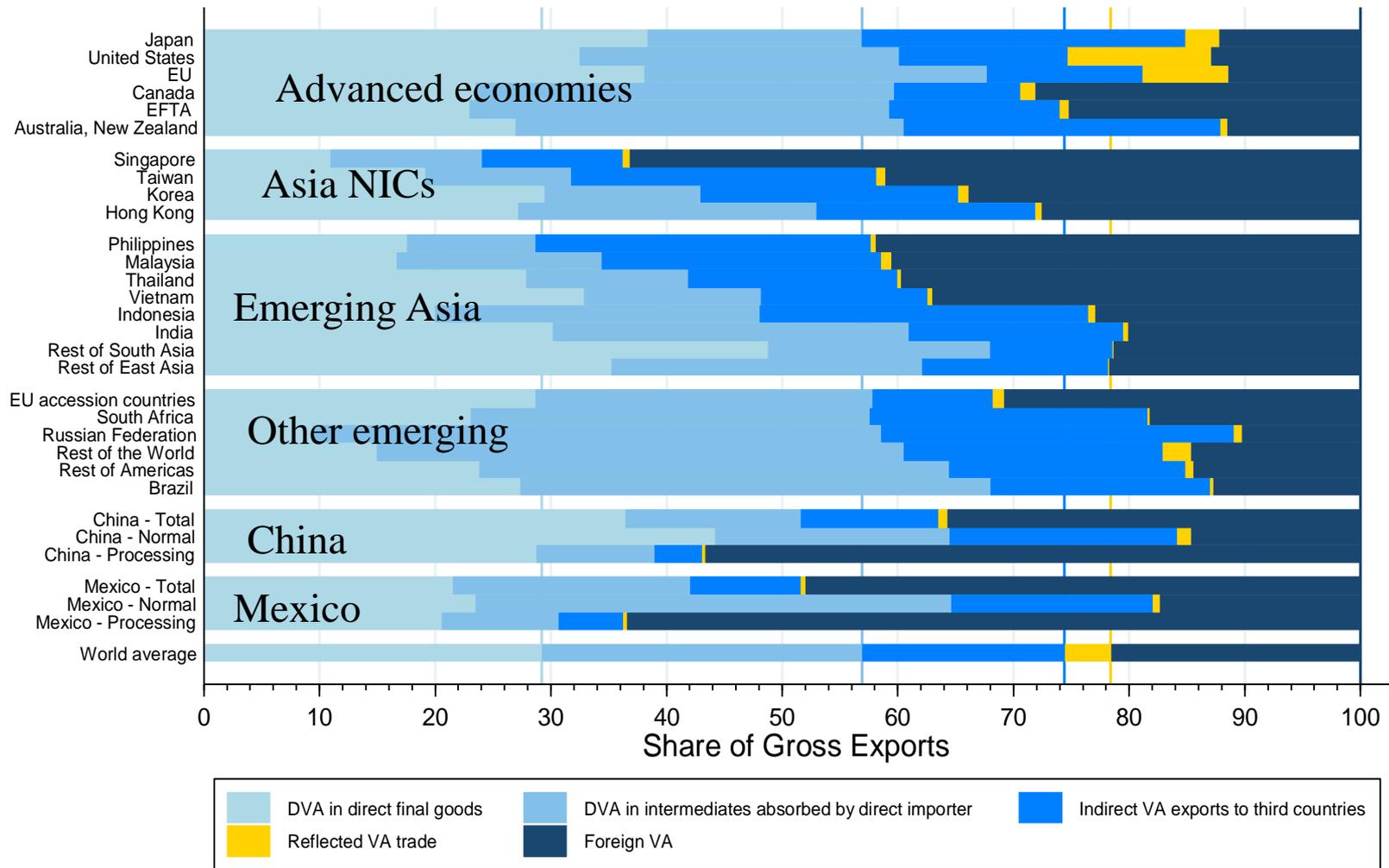


- Bilateral Trade deficits with China and Mexico are smaller in value-added terms
  - Their value-added is much lower than the official “gross” trade value for many products they export to the US



# Decomposition of Gross Exports

--Actual data, 2004

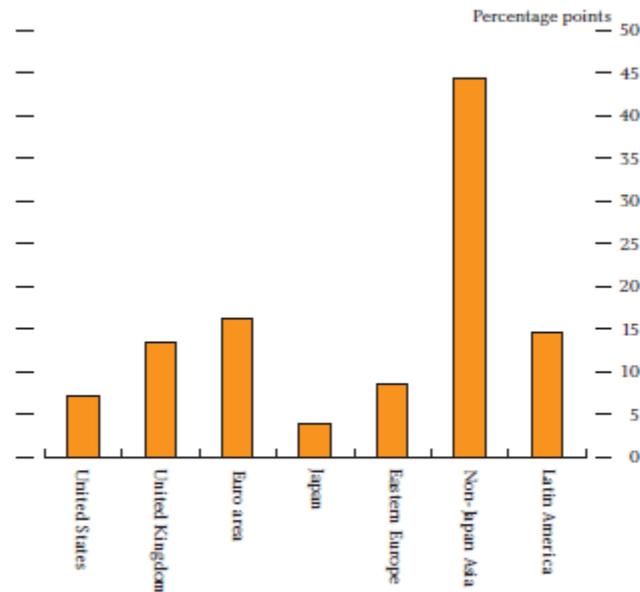




## Asia – integration into GVCs...

Source: Dean and Sebastia-Barriel

**Chart 3**  
Increase in the real import share of GDP (1985–2003)<sup>(a)</sup>



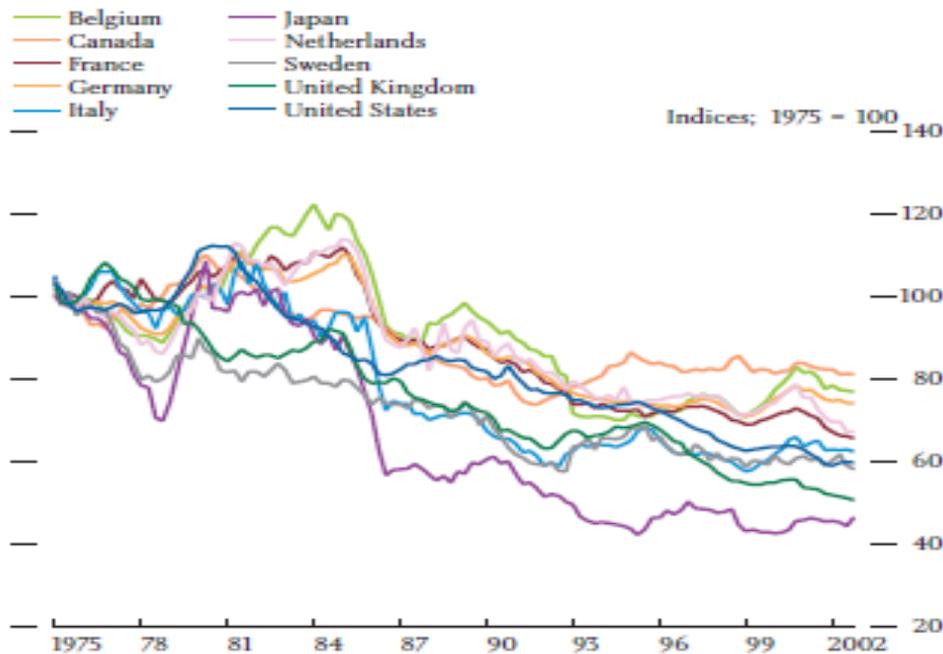
Source: IMF World Economic Outlook (April 2004).

(a) Eastern Europe: Albania, Bulgaria, Croatia, Estonia, Moldova, Poland, Russia, Slovak Republic and Slovenia. Non-Japan Asia: China, India, Malaysia, Maldives, Myanmar, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan and Thailand. Latin America: Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Paraguay and Peru.



# Bringing benefits to the world...

**Chart 6**  
**Price of tradable goods relative to whole-economy prices**



Source: Thomson Financial Datastream.



## Asia – Economic Partnership Agreements – focus on TPP

- Rules in addition to traditional Market Access – but rules more important.
- Petri et al – Trans Pacific Partnership Agreement, and Regional Comprehensive Economic Partnership Agreement...TTIP.
  - Mega-negotiations – TTP, RCEP, TTIP
  - Big payoffs
  - Positive dynamics – competitive liberalization
- Kawasaki – assessment of various EPAs



# Gains and their sources...

- Tariffs
- Regulatory
  - ROO
  - Non-tariff barriers – SPS – TBT
  - Services, IPR, Intellectual Property



# Effects of the TPP

(Equivalent variations in 2025, US\$2010) from Petri...

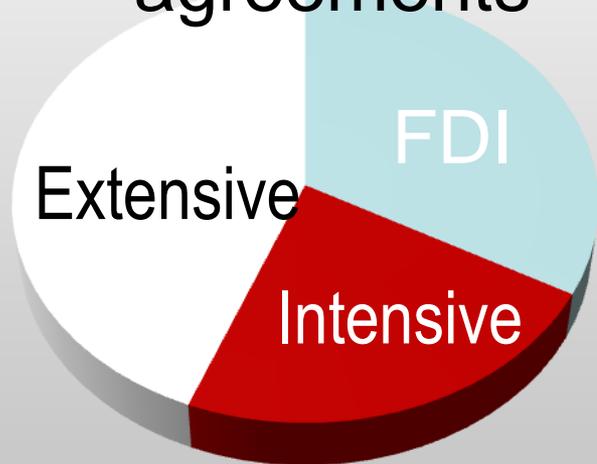
- **Big gains:** Viet Nam, Malaysia, Japan
- **Modest losses**
  - \$62 total diversion (22% of gains)
- **Large effects**
  - Income up \$223 bill. (1% GDP)
  - Trade up \$315 bill. (4% trade)
  - FDI stocks up \$255 bill. (3% FDI)
  - of which China \$35 bill. (0.2% GDP)



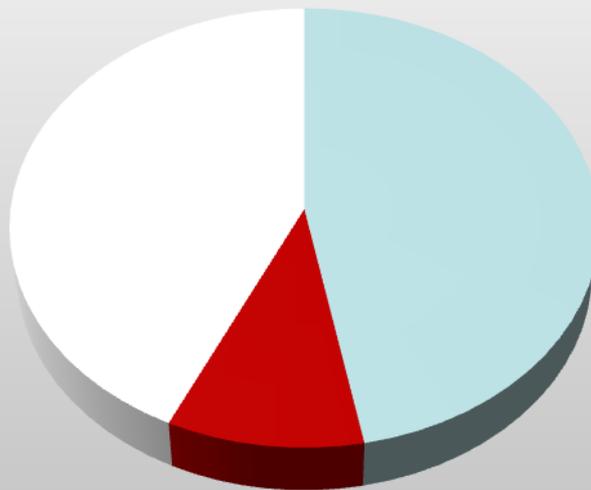
# Sources of gains (%) - Petri

World:  
all

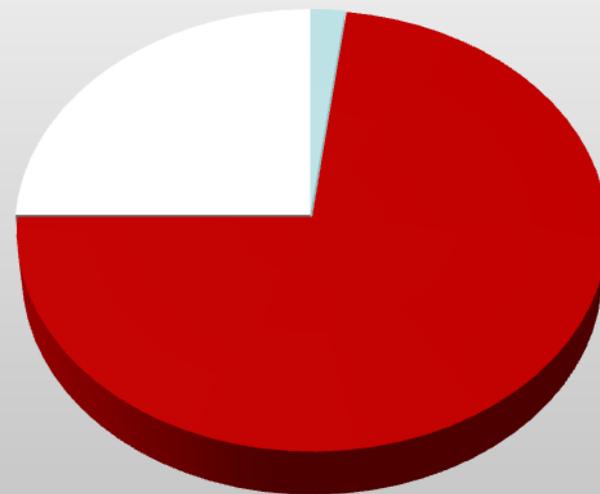
agreements



United States:  
TPP



Viet Nam:  
RCEP





# Effects of the TPP

(Equivalent variations in 2025, US\$2010) - Petri

- **Large effects**
  - Income up \$223 bill. (1% GDP)
  - Trade up \$315 bill. (4% trade)
  - FDI stocks up \$255 bill. (3% FDI)
- **Big gains:** Viet Nam, Malaysia, Japan
- **Modest losses**
  - \$62 total diversion (22% of gains)
  - of which China \$35 bill. (0.2% GDP)



# Kawasaki

Table 1: Impact of regional trade liberalization on real GDP

|                  | Worldwide | FTAAP | ASEAN+6 | ASEAN+3 | Japan, China<br>and Korea | (%)<br>TPP |
|------------------|-----------|-------|---------|---------|---------------------------|------------|
| Japan            | 1.25      | 1.36  | 1.10    | 1.04    | 0.74                      | 0.54       |
| China            | 7.35      | 5.83  | 3.43    | 3.16    | 2.27                      | -0.30      |
| Korea            | 8.68      | 7.10  | 6.34    | 5.94    | 4.53                      | -0.33      |
| Hong Kong, China | 3.19      | 2.65  | -0.24   | -0.10   | -0.30                     | -0.22      |
| Chinese Taipei   | 7.51      | 6.44  | -1.88   | -1.73   | -1.18                     | -0.33      |
| Singapore        | 3.53      | 2.42  | 3.15    | 2.71    | -0.42                     | 0.97       |
| Indonesia        | 4.71      | 3.64  | 3.69    | 3.00    | -0.32                     | -0.36      |
| Malaysia         | 12.34     | 9.43  | 8.27    | 7.53    | -0.52                     | 4.57       |
| Philippines      | 6.00      | 6.07  | 4.60    | 4.42    | -0.75                     | -0.39      |
| Thailand         | 26.35     | 20.24 | 17.03   | 16.31   | -1.19                     | -0.89      |
| Vietnam          | 37.50     | 34.75 | 23.42   | 23.13   | -0.50                     | 12.81      |
| LCM              | 12.95     | -1.78 | 9.21    | 9.04    | -0.23                     | -0.35      |
| India            | 8.39      | -0.91 | 2.99    | -0.29   | -0.16                     | -0.22      |
| Australia        | 2.46      | 2.08  | 2.44    | -0.04   | -0.11                     | 1.16       |
| New Zealand      | 4.86      | 3.80  | 2.29    | -0.19   | -0.24                     | 2.15       |
| U.S.             | 0.35      | 0.26  | -0.07   | -0.03   | -0.05                     | 0.09       |
| Canada           | 0.71      | 0.71  | -0.02   | 0.03    | -0.02                     | -0.24      |
| Mexico           | 4.46      | 3.03  | -0.10   | -0.07   | -0.08                     | -0.42      |
| Chile            | 1.57      | 1.35  | -0.13   | -0.02   | -0.13                     | 0.40       |
| Peru             | 1.88      | 0.94  | -0.06   | -0.02   | -0.04                     | 0.64       |
| Russia           | 5.45      | 1.50  | -0.05   | 0.06    | -0.08                     | -0.17      |
| EU               | 0.87      | -0.31 | -0.12   | -0.05   | -0.09                     | -0.14      |
| Switzerland      | 2.30      | -0.10 | -0.09   | 0.01    | -0.04                     | -0.08      |



## An applications with new database and model

- We use an updated Global Trade Analysis Project database and build a new GVC model to use it..
  - Conduct A “China Rebalancing scenario” based on WB/NDRC study and compare it to a baseline scenario of sustained current approach to growth in China, but with slower growth resulting.



# GVC GTAP data and model

- In the standard GTAP model the sourcing of imports is placed at the border (first level of the Armington assumption). Imagine an agent that blends imports of a particular product from the various economies into a composite imported variety. This imported variety is then demanded by producers and consumers (second level of the Armington assumption).
- The GVC/ProcTrade model places the sourcing of imports at the agent level. This change in the specification of the Armington assumption is made possible by additional data: the sourcing of imports at the agent level. Actually, the sourcing of imports at the agent level is different for the following three groups: consumers, investment, and producers (i.e., all producing sectors have the same sourcing for each imported product). This change in the modeling brings to front the global supply chains characteristics of international trade.
- In addition, this model breaks China into two parts: processing trade zone and rest of China.



# China GDP Growth Has Been Rapid, Sustained & Consequential → Now the 2<sup>nd</sup> largest economy

China's GDP



Source: World Bank Development Indicators



## Pressures Towards Consumption-Led Growth

| Expenditure Side of GDP |         |            |   |
|-------------------------|---------|------------|---|
| (% of GDP)              | History | Projection | Note                                    |
| Savings                 | ↑       | ↓↓         |   |
| Private Consumption     | ↓       | ↑          | <i>As wealth ↑</i>                      |
| Government Consumption  | ↔       | ↑          | <i>Social safety spending to ↑</i>      |
| Investment              | ↑       | ↓          | <i>Rate of return dropping</i>          |
| Current Account         | ↑       | ↓          | <i>Same direction as balance w/US</i>   |
| Production Side of GDP  |         |            |   |
|                         | History | Projection | Note                                    |
| Ag                      | ↓       | ↓          |   |
| Industry                | ↑↑↑     | ↓          | <i>Drop in manufacturing as wages ↑</i> |
| Services                | ↑       | ↑↑↑        | <i>Same direction as balance w/US</i>   |



## Pressures Towards Consumption-Led Growth

*Richer consumers and gov initiatives  
will increase consumption levels*

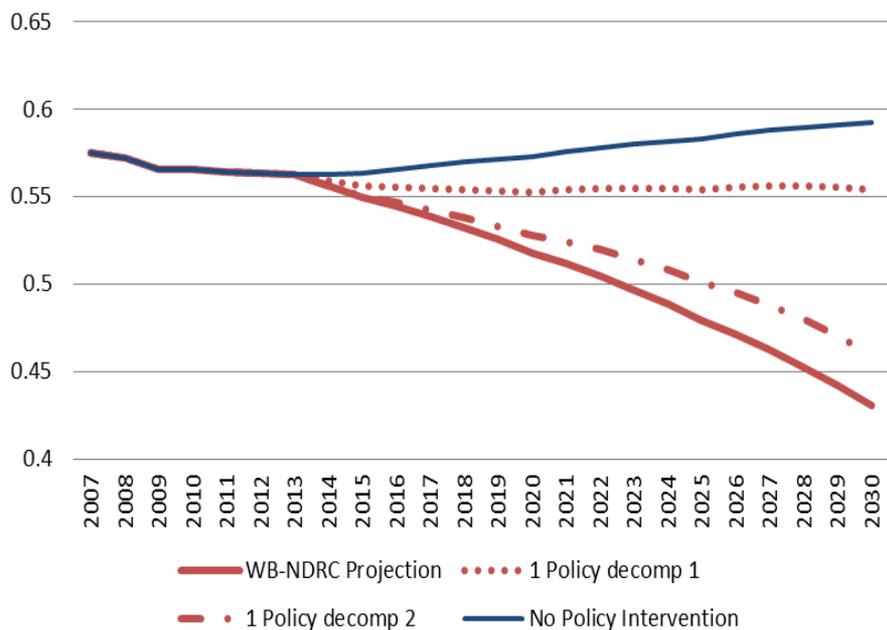
| Expenditure Side of GDP |         |            |                                  |
|-------------------------|---------|------------|----------------------------------|
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| Services                | ↑       | ↑↑↑        | Same direction as balance w/US   |

*Demand-driven shock  
(changing consumption preferences)*

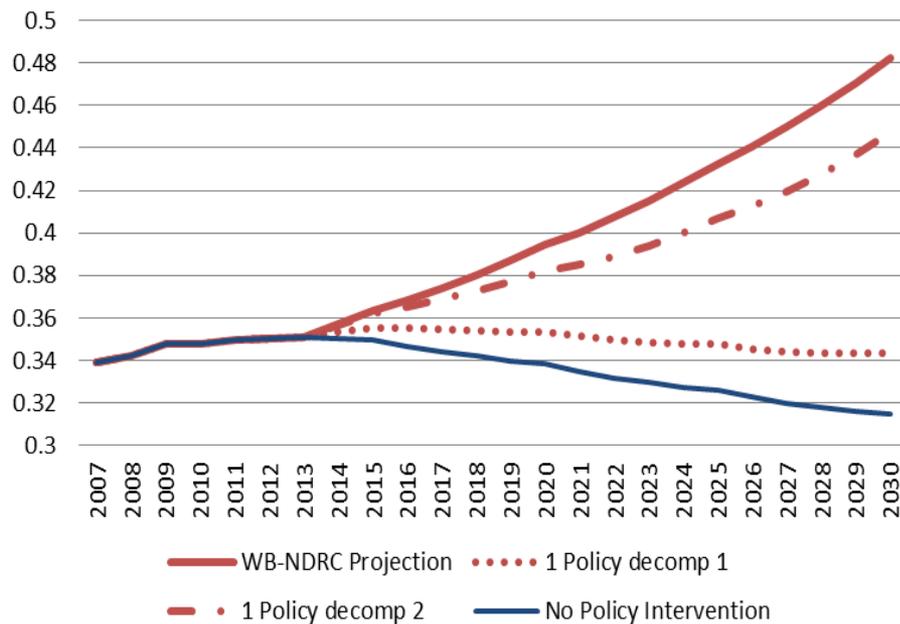


## The Simulation Results- Economy

### Share of manufactures in China economy



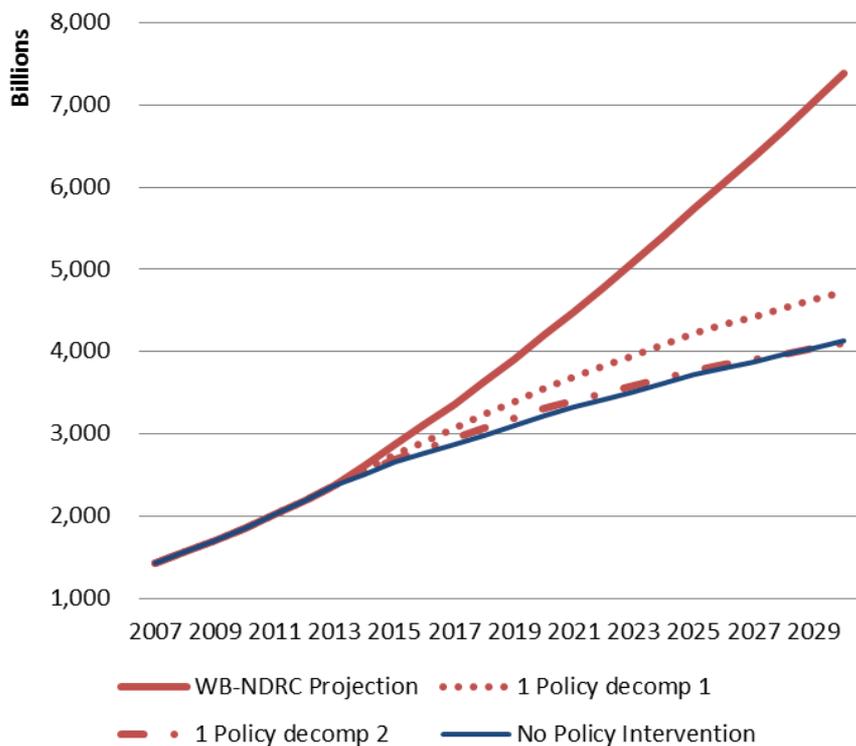
### Share of services in China economy



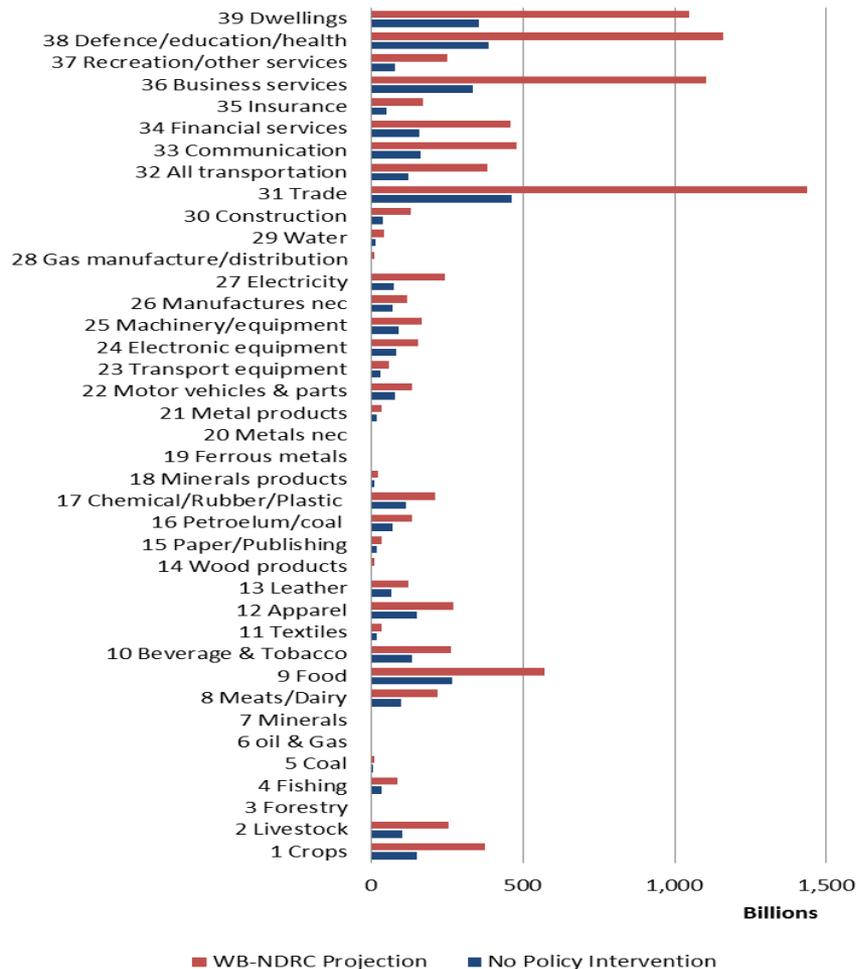


# The Simulation Results- China Household Consumption

## Real private household consumption in China



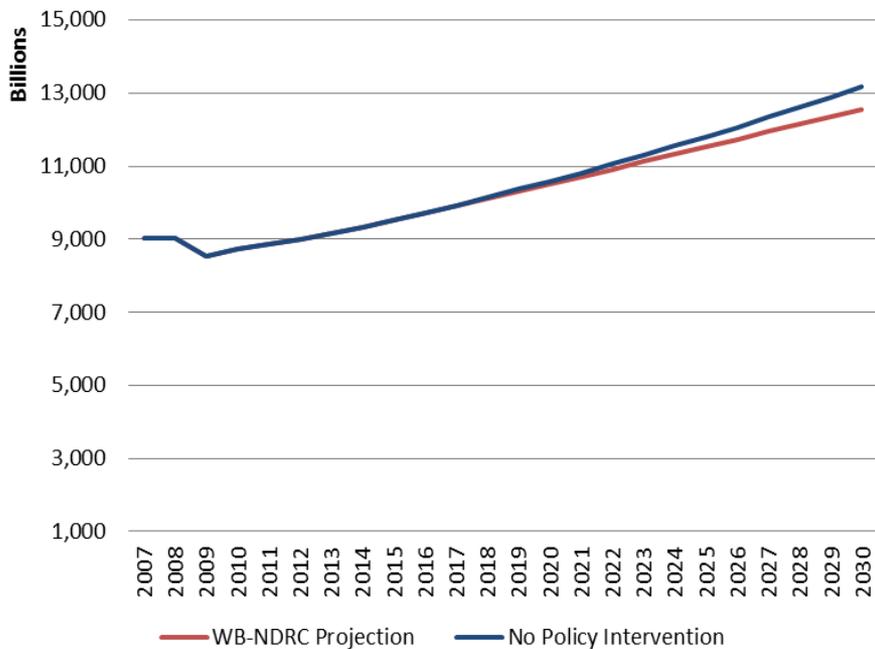
## China Private household Consumption in 2030



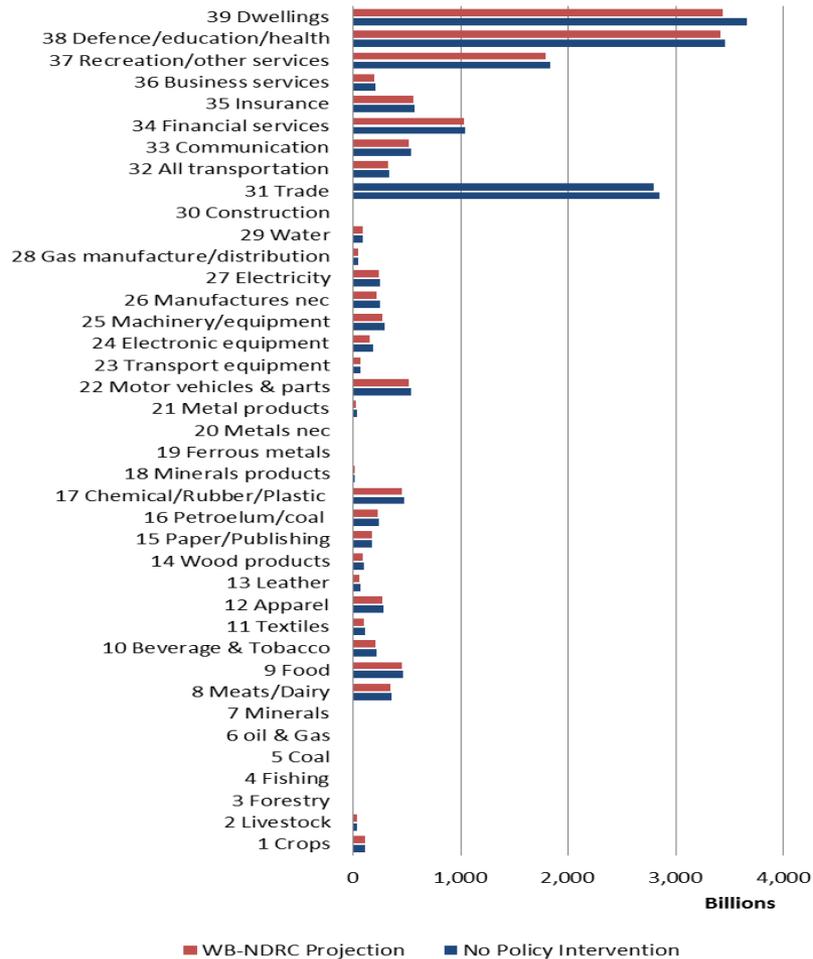


# The Simulation Results- U.S. Household Consumption

Real private household consumption in U.S.

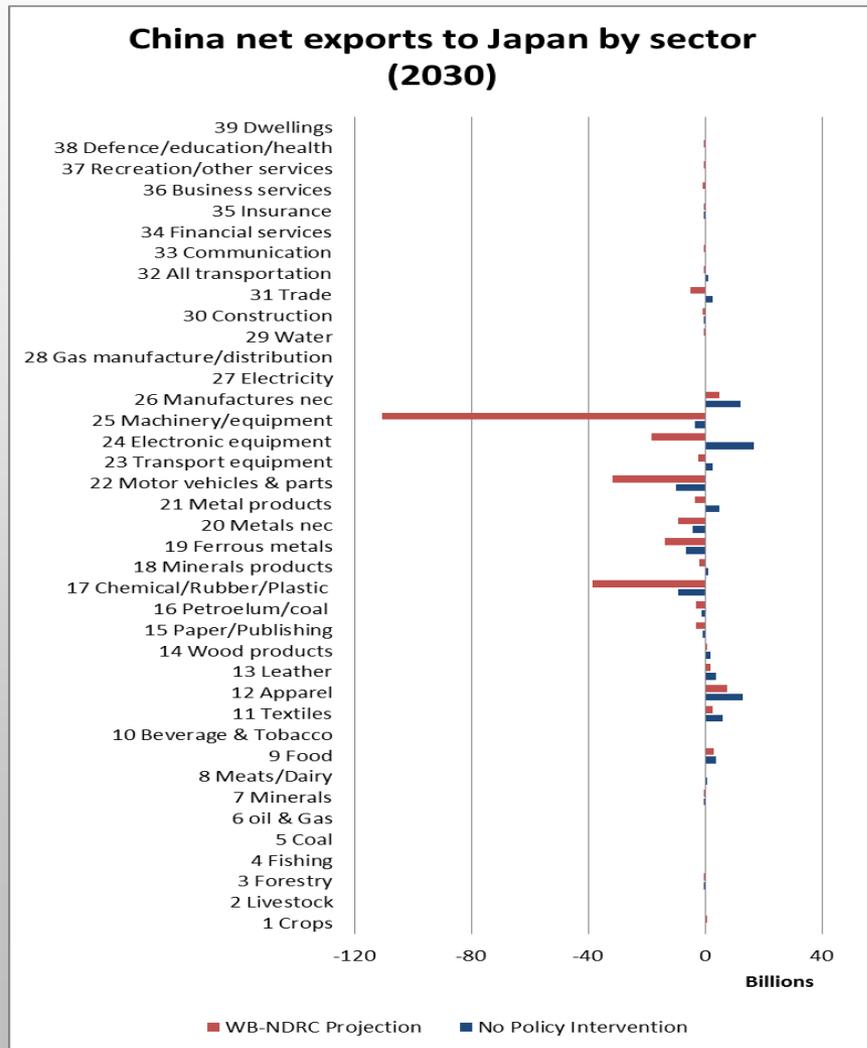
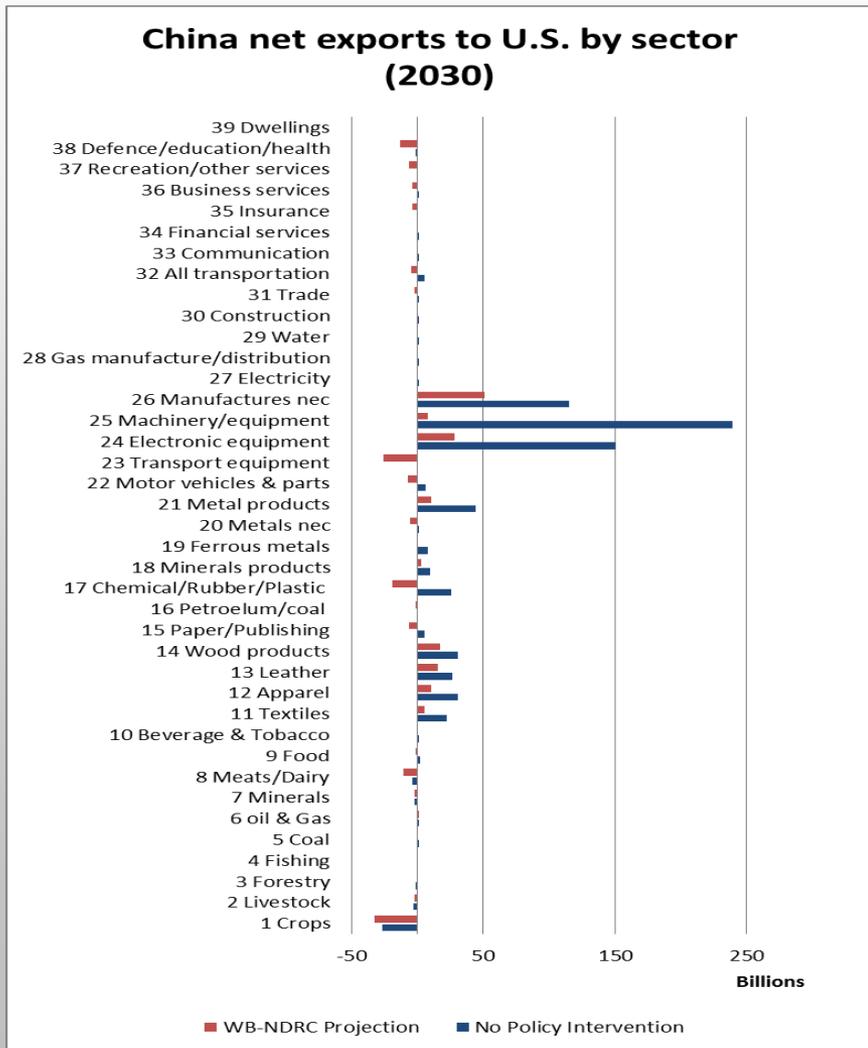


U.S. Private Household Consumption in 2030





## The Simulation Results- Trade Balance by Sector





## To conclude...

- GVC data efforts by many national and international organizations improving ability to capture “globalization” in data.
- Policy makers care deeply and are trying to sort out effects of trade, globalization, technology and consumer shifts.
- Asia – growth illustrates both integration into GVCs as well as benefits from.
  - But also illustrates importance of coherence in border, behind border, and institutional reform.
- TPP, RCEP, TTIP represent important initiatives
- Regardless of international policy negotiations implications of China’s rebalancing efforts likely to have big implications on global growth and GVCs.