Global Imbalances and Structural Change in the United States

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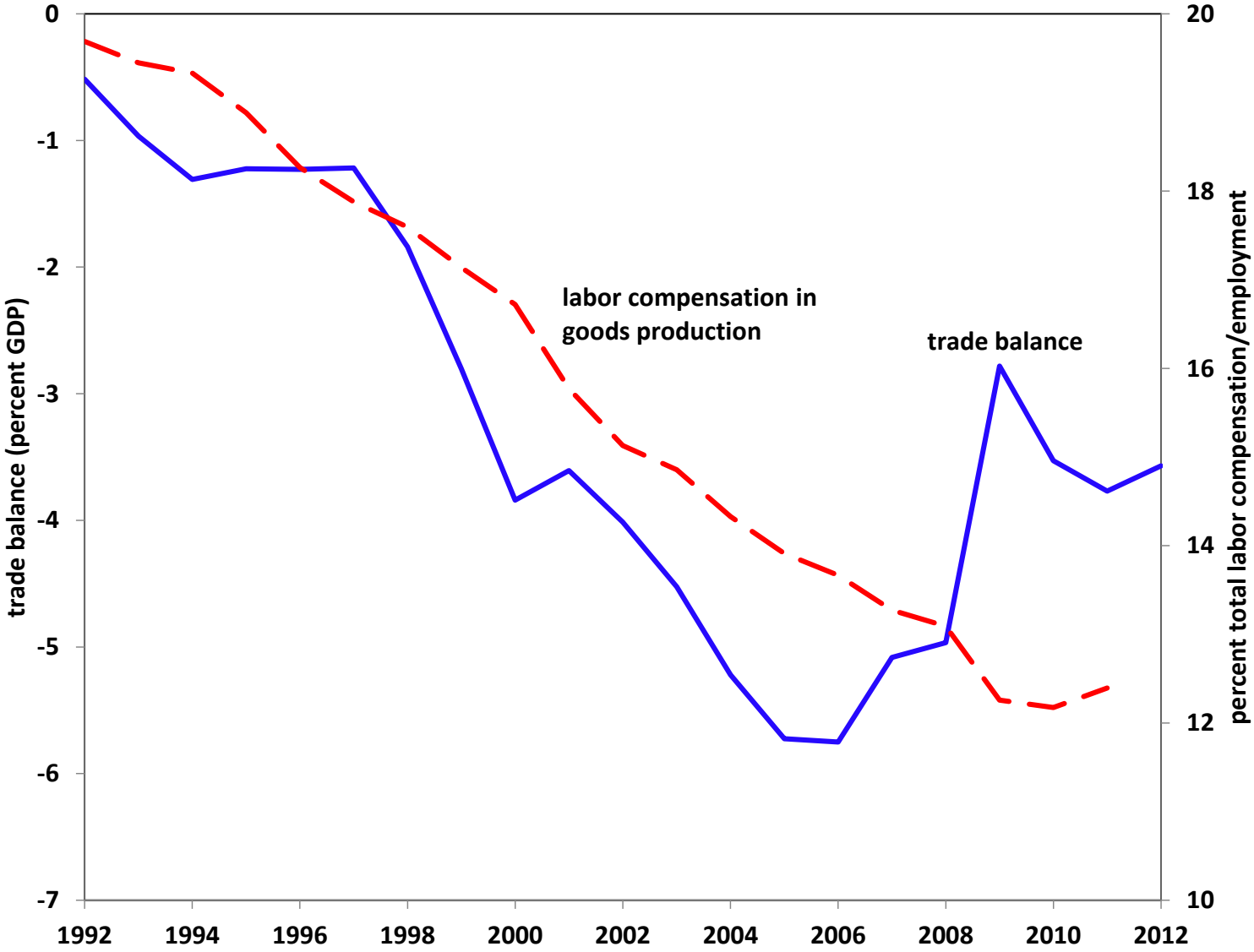
Traded sector employment and trade deficit



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- What are the welfare implications of U.S. borrowing?

Global saving glut

Why is the United States, with the world's largest economy, borrowing heavily on international capital markets – rather than lending, as would seem more natural?. . . [O]ver the past decade a combination of diverse forces has created a significant increase in the global supply of saving — ***a global saving glut*** *— which helps to explain both the increase in the U.S. current account deficit and the relatively low level of long-term real interest rates in the world today.*

(Ben S. Bernanke, 2005)

- Large literature seeks to explain saving glut
  - Example: Financial integration with asymmetric financial development (Mendoza et al., 2009; Caballero et al. 2008)
- We take the saving glut as given and focus on its impact on U.S. economy over past 20 years and in future [U.S.-driven "savings drought" yields counterfactual model predictions]

What we do

- Build GE model of United States and the rest of the world
  1. Exogenous "saving glut:" increase foreign demand for U.S. bonds
  2. Differential productivity growth across sectors
- Consistent with key facts about U.S. economy over past 20 years

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- Consistent with key facts about U.S. economy over past 20 years
- Counterfactual without saving glut
- Saving glut impact on macro aggregates and welfare

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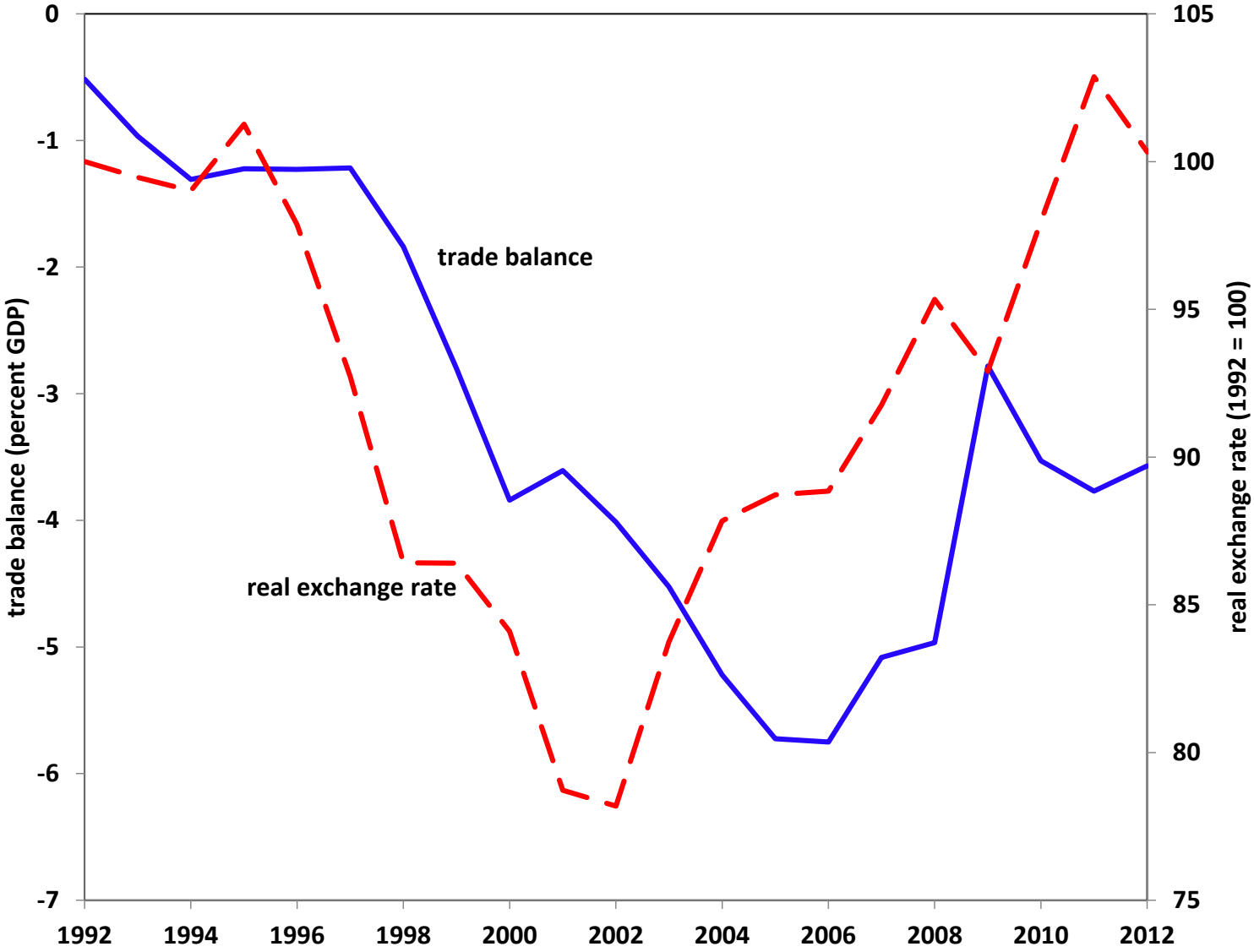
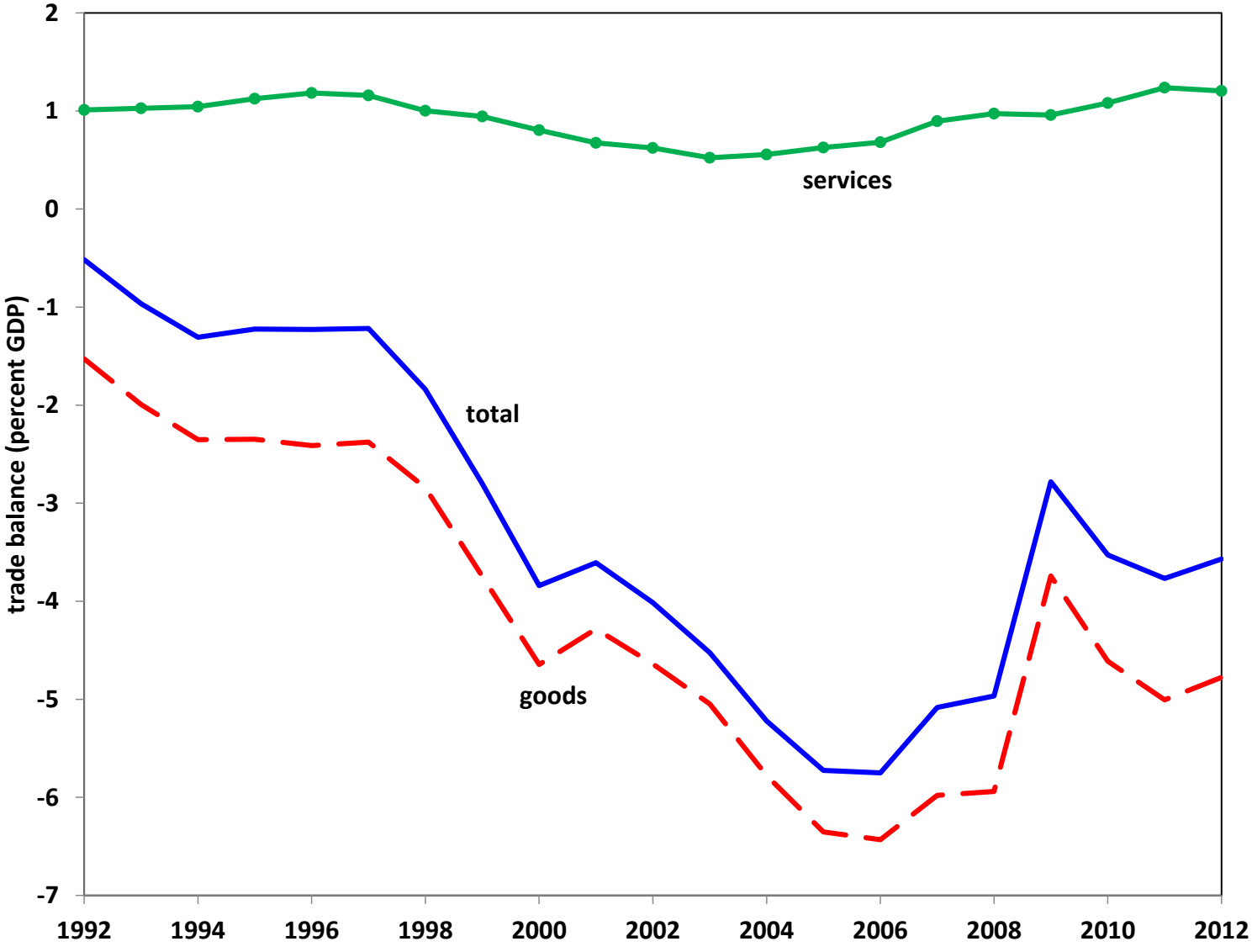
  - Remaining from faster productivity growth in goods production
- Goods employment will continue to fall as U.S. repays debt
  - Services trade surplus reduces need to export goods
- Saving glut raised real value of U.S. households' lifetime consumption by 10.7% of 1992 GDP
- If saving glut ends in sudden stop, welfare gains may be wiped out

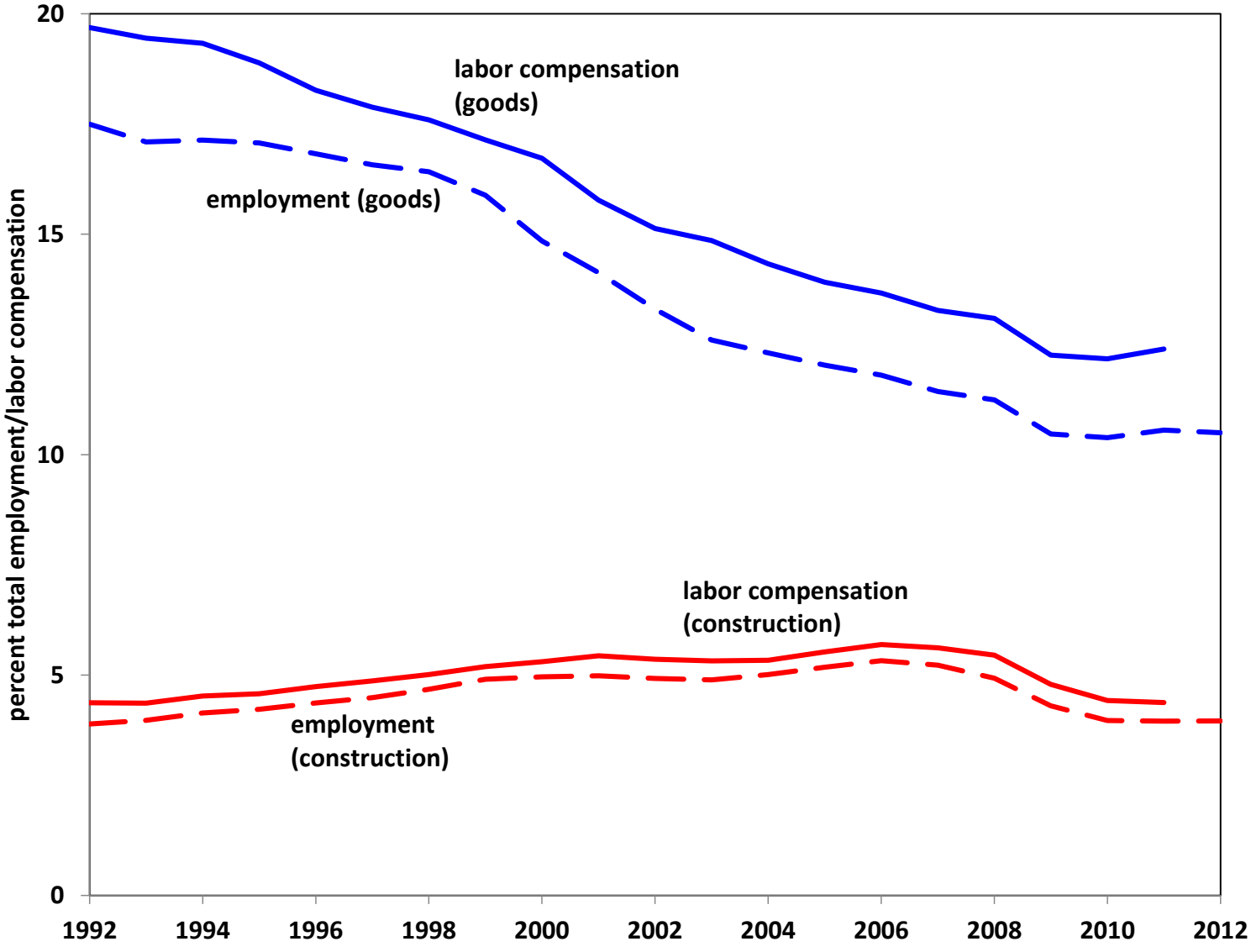
Fact 1: U.S. real exchange rate appreciates, then depreciates



Fact 2: Trade deficit dynamics driven by goods trade



Fact 3: Goods-sector employment falls, construction booms



Model

- Dynamic general equilibrium model with two countries:
  - United States (U.S.), Rest of the world (R.W.)
- Multiple sectors with differential productivity growth:
  - U.S.: goods, services, construction, investment
  - R.W.: goods and services
- Key assumption that generates the saving glut:
  - R.W.'s discount factor matches the U.S. in the long run
  - R.W.'s discount factor varies over time (deterministically), calibrated to match the trade balance during 1992–2012

Timing and expectations

- The saving glut
  - In 1992, agents expect deterministic economy without saving glut; R.W.'s discount factor constant at long-run level
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- Exit scenarios:
  1. Gradual rebalancing: agents expect economy to follow deterministic path in which demand for U.S. bonds (driven by R.W.'s discount factor) falls slowly after 2012
  2. Sudden stop: lending stops unexpectedly in 2015–2016; 10% TFP loss in 2015, 5% TFP loss in 2016

U.S. production

- Goods, services, and construction ($j = g, s, c$):

$$y_{jt}^{us} = M_j^{us} \left(\mu_j^{us} D_{jt} + \left(1 - \mu_j^{us}\right) \left(m_{jt}^{us}\right)^{\zeta_j} \right)^{\frac{1}{\zeta_j}}$$

$$D_{jt} = \min \left[\frac{z_{gjt}^{us}}{a_{gjt}^{us}}, \frac{z_{sjt}^{us}}{a_{sjt}^{us}}, \frac{z_{cjt}^{us}}{a_{cjt}^{us}}, A_j^{us} \left(k_{jt}^{us}\right)^{\alpha_j} \left(\gamma_{jt}^{us} \ell_{jt}^{us}\right)^{1-\alpha_j} \right]^{\zeta_j}$$

  - Domestic: goods z_{gjt}^{us}, services, z_{sjt}^{us}, construction z_{cjt}^{us}
  - Imports from sector j: m_{jt}^{us}
  - Labor productivity γ_{jt}^{us} grows at different rates across sectors

- Investment is Cobb-Douglas aggregate of goods, services, construction

U.S. households

- Bonds (denominated in U.S. CPI) held by: U.S. household, U.S. government, R.W.

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- Households choose consumption of goods and services, labor, investment, and bonds to maximize

$$\sum_{t=0}^{\infty} \beta^t u\left(\frac{c_{gt}^{ush}}{n_t^{us}}, \frac{c_{st}^{ush}}{n_t^{us}}, \frac{\ell_t^{us}}{\bar{\ell}_t^{ush}}\right)$$

subject to

$$\begin{aligned} p_{gt}^{us} c_{gt}^{ush} + p_{st}^{us} c_{st}^{ush} + p_{it}^{us} i_t^{ush} + q_t b_{t+1}^{ush} \\ = w_t^{us} \ell_t^{ush} + p_{cpi}^{us}(p_{gt}^{us}, p_{st}^{us}) b_t^{ush} + (1 - \tau_k^{us}) r_{kt}^{us} k_t^{us} - T_t^{us} \\ k_{t+1}^{us} = (1-\delta) k_t^{us} + i_t^{ush} \end{aligned}$$

- Adult-equivalent n_t^{us} and working-age population $\bar{\ell}_t^{us}$

U.S. government

- Spending, ν_t, and debt, υ_t, levels are exogeneous
- Goods and services consumption maximize

$$(c_{gt}^{usg})^{\varepsilon^{usg}}(c_{st}^{usg})^{1-\varepsilon^{usg}}$$

subject to :

$$b_{t+1}^{usg} = \upsilon_t GDP_t$$

$$p_{gt}^{us}c_{gt}^{usg} + p_{st}^{us}c_{st}^{usg} = \nu_t GDP_t$$

$$p_{gt}^{us}c_{gt}^{usg} + p_{st}^{us}c_{st}^{usg} = \tau_k^{us}r_{kt}^{us}k_t^{us} + T_t^{us} + p_{cpi}^{us}(p_{gt}^{us}, p_{st}^{us})b_t^{usg} - q_t b_{t+1}^{usg}$$

- Ricardian equivalence except for onset of savings glut

Rest of the world

- Solves a similar, but simpler problem
- R.W. households choose consumption, bonds, and labor to maximize

$$\sum_{t=0}^{\infty} \omega_t^{rw} \beta^t u \left(\frac{c_{gt}^{rw}}{n_t^{rw}}, \frac{c_{st}^{rw}}{n_t^{rw}}, \frac{\ell_t^{rw}}{\bar{\ell}_t^{rw}} \right)$$

subject to budget constraint

  - ω_t^{rw} shift intertemporal marginal rate of substitution
  - ω_t^{rw} fall during 1992–2012, creating increased demand for saving

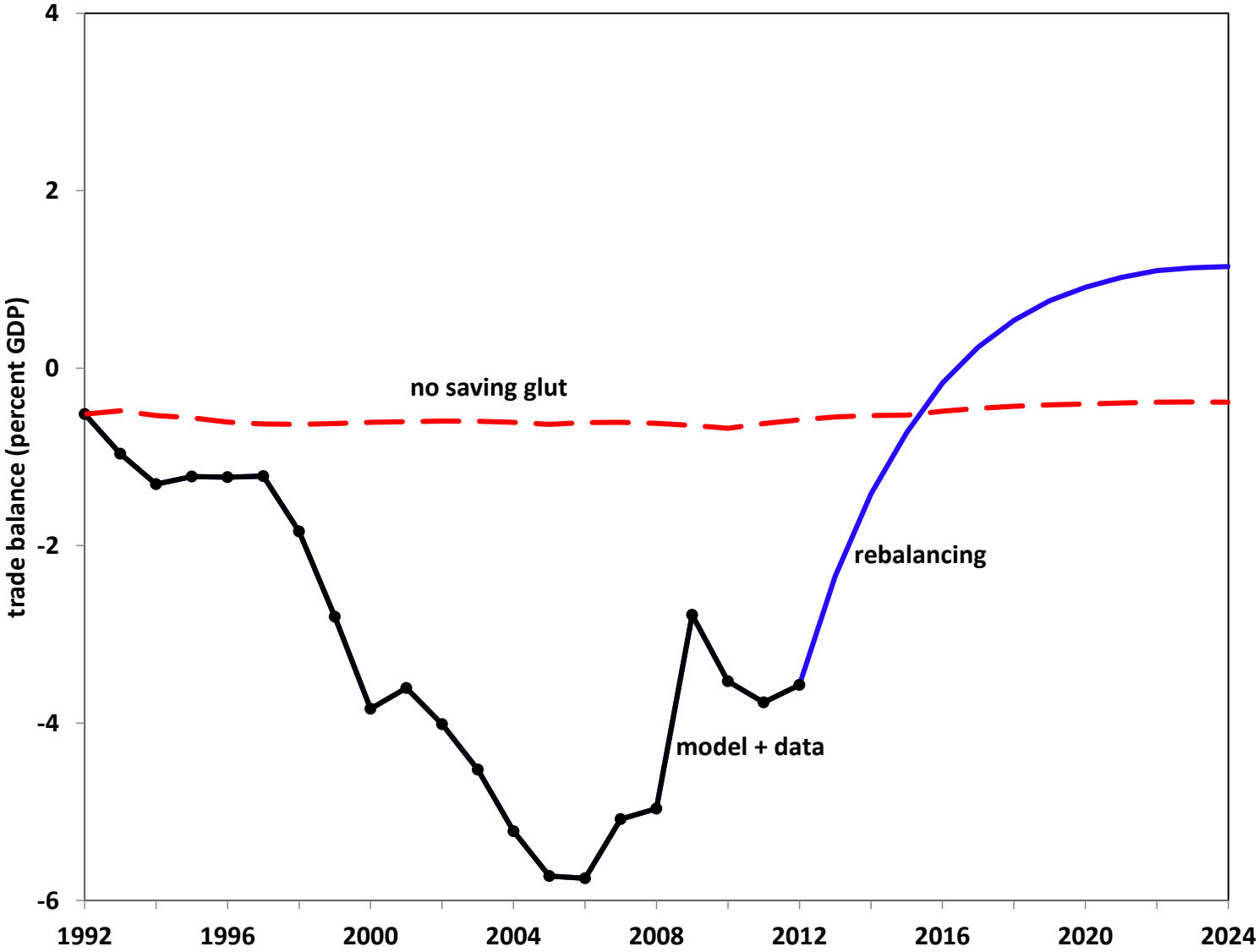
Overview of quantitative strategy

- ROW: weighted average of top 20 U.S. trade partners by imports
- Calibrate all parameters except ω_t^{rw} to match 1992 input-output matrix and national accounts
- Choose time series for ω_t^{rw} to match trade balance during 1992–2012
- Solve for equilibrium assuming BGP in 100 years
- Compare with data on key facts, then study short and long-run dynamics following
  1. Gradual rebalancing
  2. Sudden stop in 2015–2016

Important parameters

- Armington elasticities: 3 for goods, 1 for services
- (μ_g, μ_s) imply goods trade deficit, services trade surplus
- $(a_{gc}, a_{sc}, a_{cc}) \approx 0$ means construction used primarily for investment
- Goods and services consumption are complements: elasticity of substitution in private consumption $= 0.5$
- Labor productivity in goods grows faster (4.3% per year) than in services (1.3%)

R.W.'s savings behavior calibrated to generate saving glut



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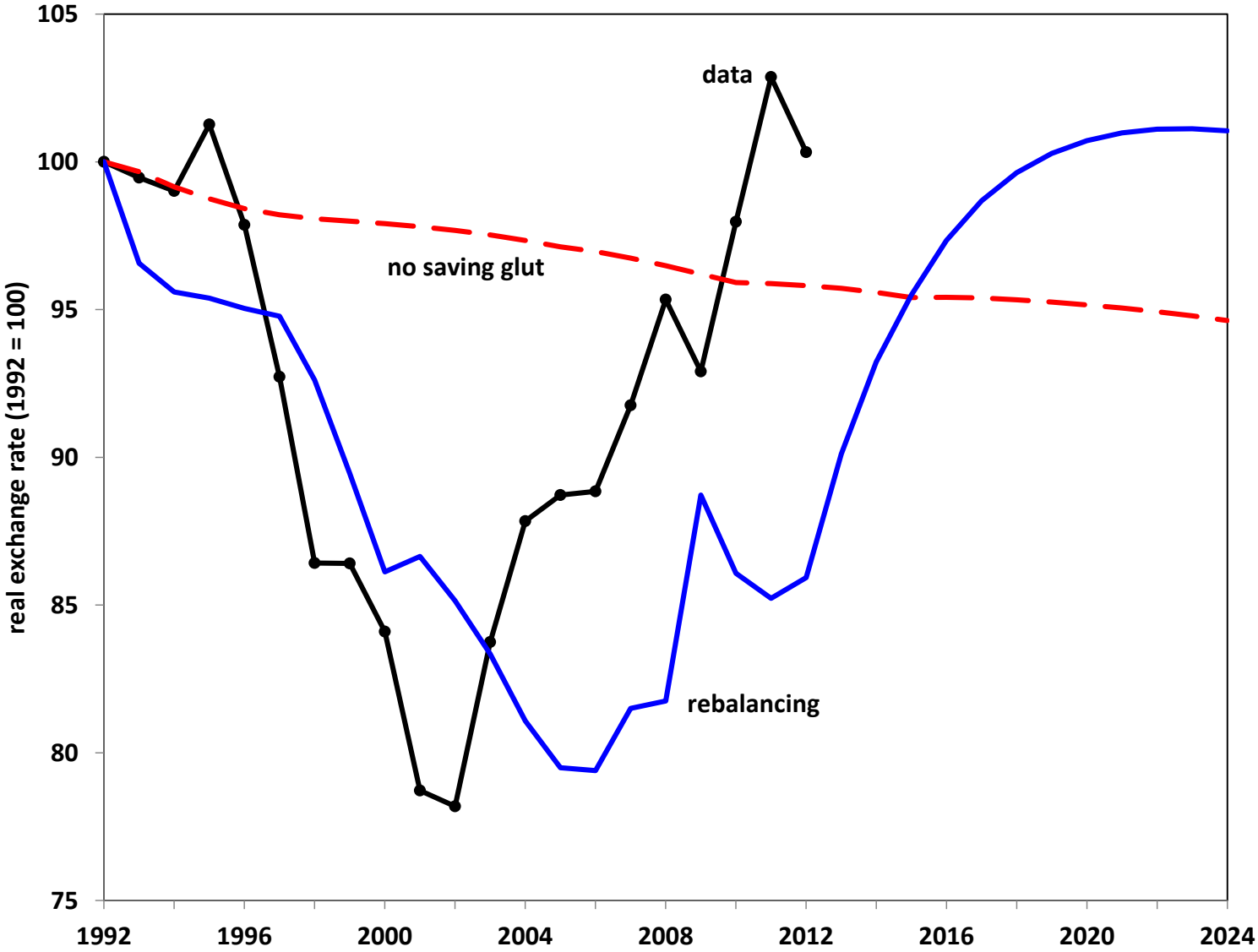

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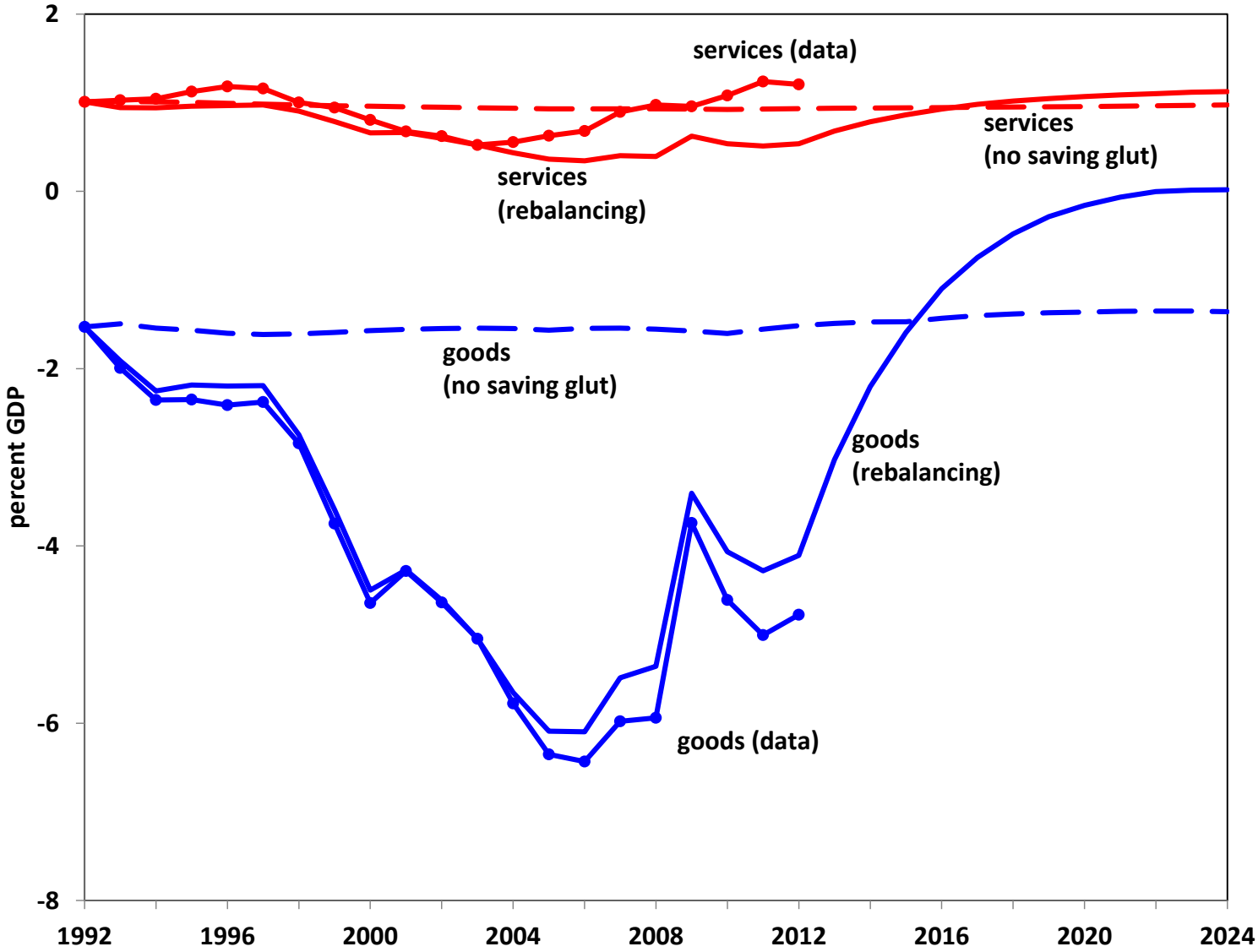

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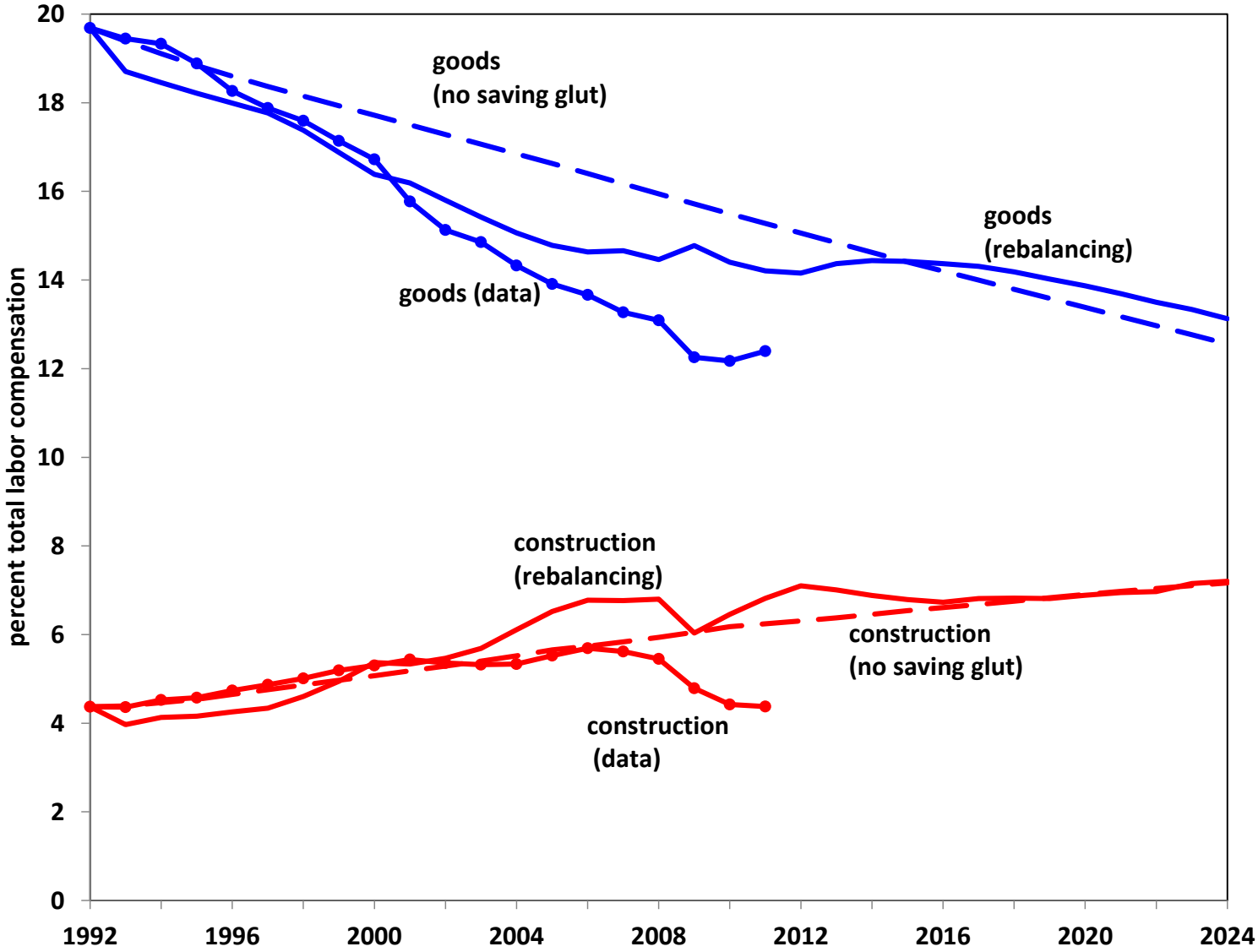
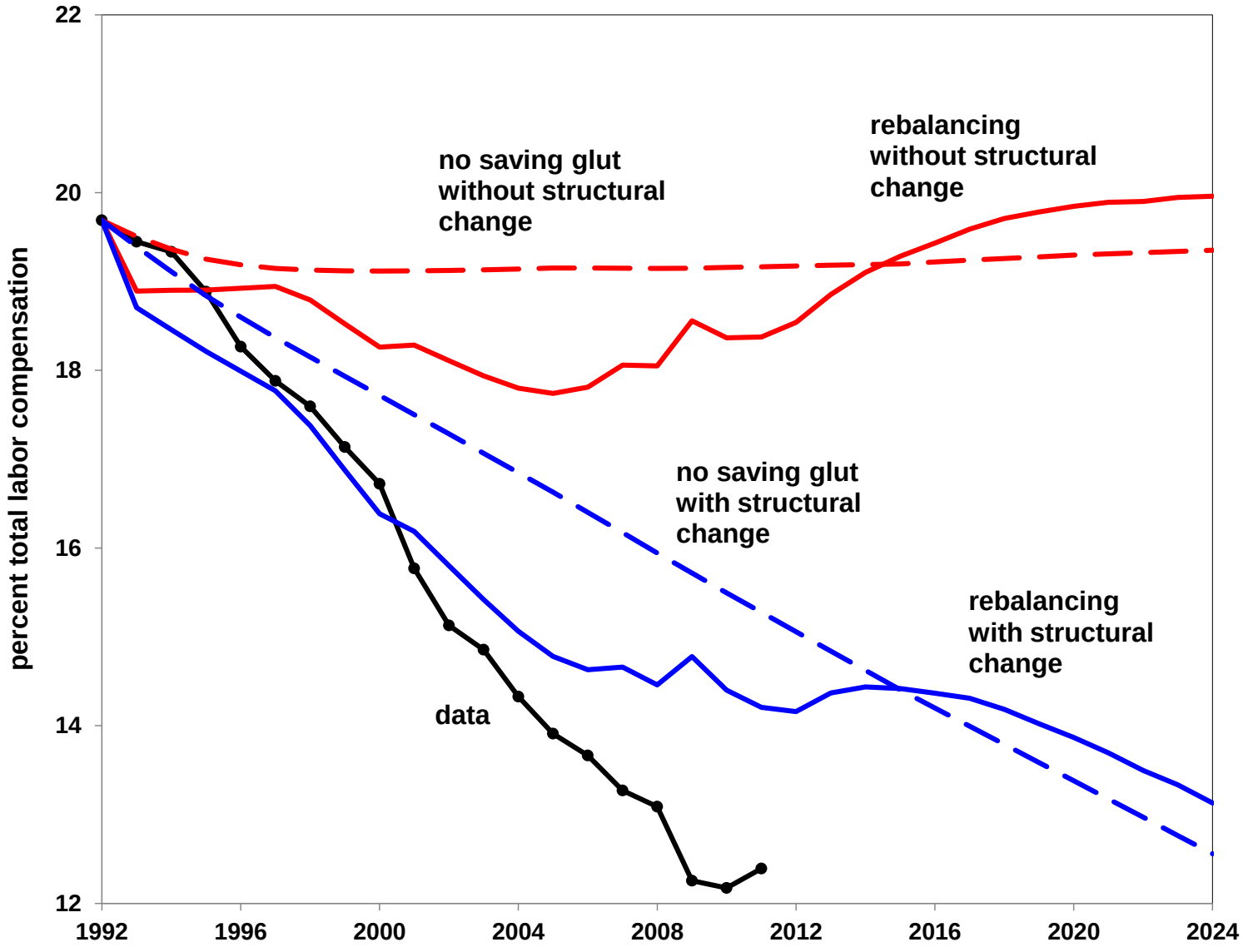


Goods-sector employment: no structural change



Summary: In-sample fit and gradual rebalancing

- Key facts during 1992–2012:
  - Increase in borrowing drives up trade deficit (by construction)
  - Relative increase in imported goods: RER appreciation
  - Low services import share: Goods imports drive trade balance
  - Labor shifts out of goods into construction and services; most of this shift would have occurred even in absence of saving glut
- Post–2012 rebalancing:
  - Bond repayment associated with trade balance and RER reversal
  - Trade balance dynamics again driven by goods
  - Goods employment continues to decline

Welfare

Change in real value of lifetime consumption compared to gradual rebalancing scenario

	Bil. 1992 dollars	Pct. 1992 GDP
No saving glut counterfactual	-689	-10.7
Sudden stop (no TFP shock)	-386	-6.0
Sudden stop (TFP shock)	-1,019	-15.8

- Saving glut made U.S. households substantially better off...
- ...but sudden stop may reverse those gains

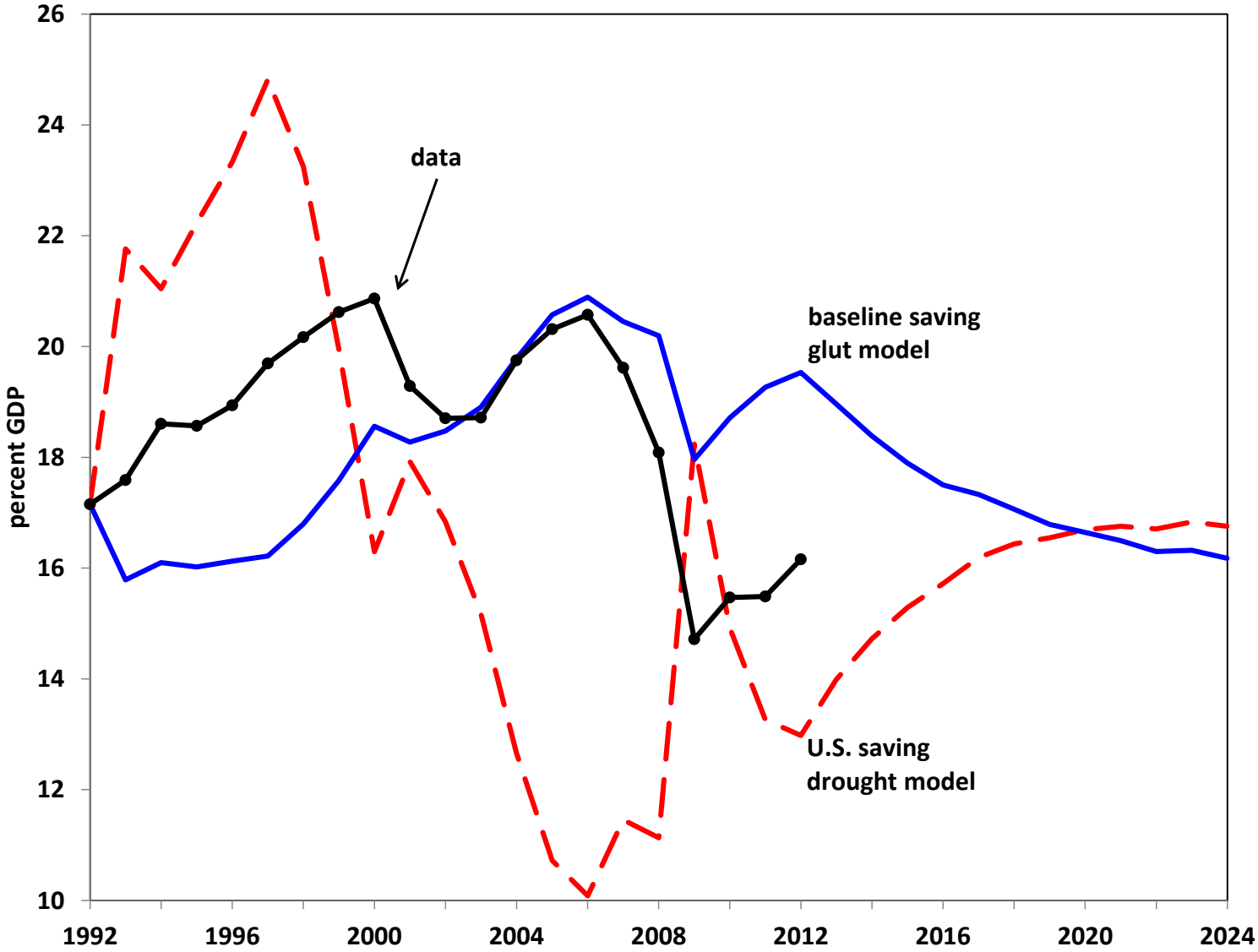
Conclusion

- Increased foreign demand for U.S. assets important driver of U.S. trade balance and real exchange rate...
- ...But NOT decline in goods-sector employment
- Goods-sector employment decline due primarily to fast productivity growth compared to other sectors
- Decline will continue regardless of how saving glut ends
- Sudden stop in 2015–2016 will temporarily halt decline, but will be very costly, completely wiping out welfare gains caused by the saving glut in the first place

Global saving glut vs. U.S. saving drought

- Did the Chinese make us do it?
- We model source of global imbalances as being outside United States
- What if we alter preferences of U.S. households instead to generate observed borrowing?
- "Savings drought" (Chinn and Ito, 2007) in United States rather than saving glut in rest of world

Saving drought model: investment



Puzzle: U.S. real interest rates

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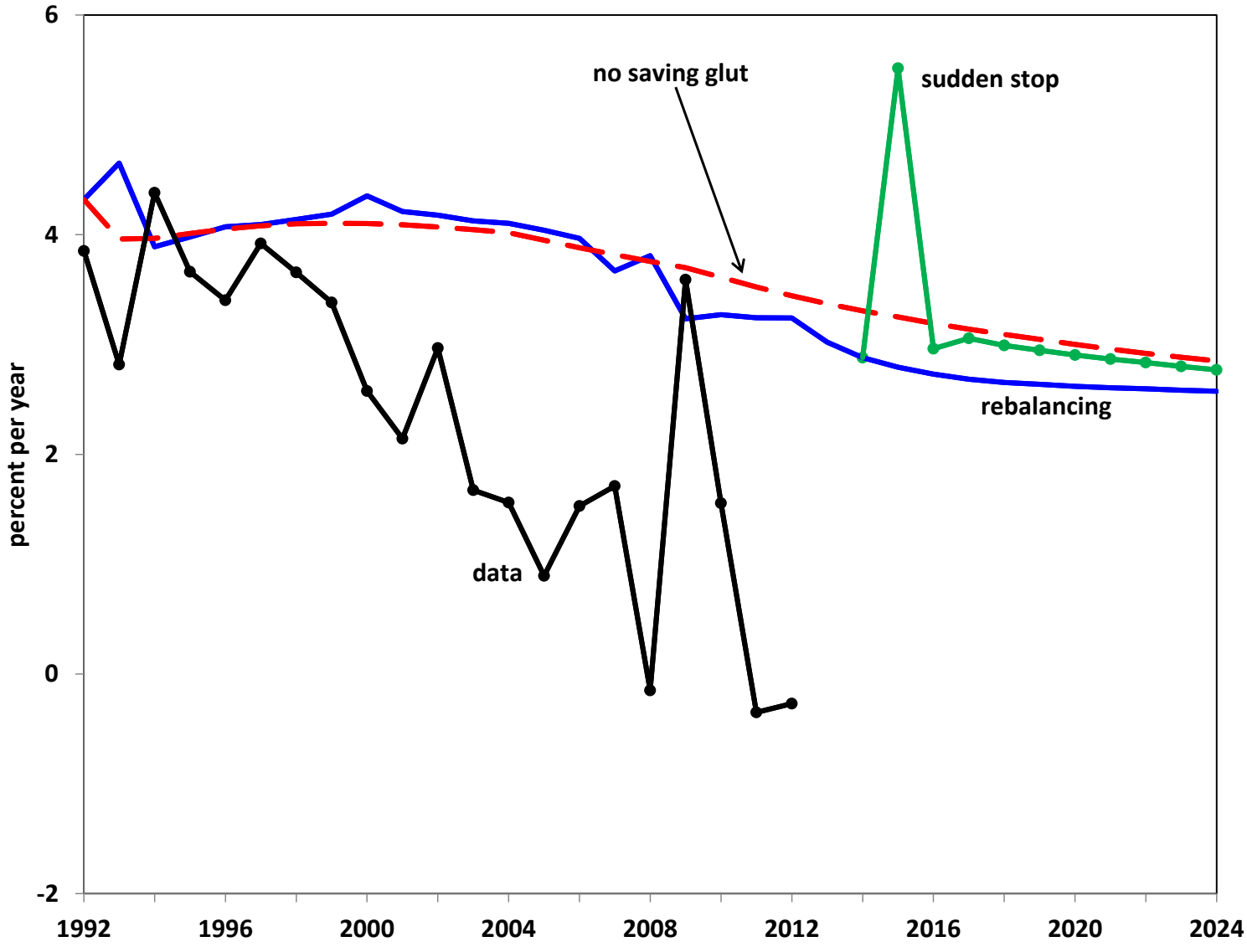
- Model: saving glut has little impact on interest rates

$$1 + r^{us}_{t+1} = \left(1 + r^{rw}_{t+1}\right) \frac{rer_{t+1}}{rer_t}$$

- Results consistent with some empirical estimates of foreign lending's impact on U.S. real interest rates, e.g. Warnock and Warnock (2008)

U.S. real interest rates in the model vs. data



Puzzle: timing of real exchange rate vs. trade balance

- Real exchange rate and trade balance out of sync in data
- Peak real exchange rate appreciation occurs in 2002, but peak trade deficit does not occur until 2006
- Why do U.S. imports continue to rise after 2002, even though imports are becoming more expensive?
- Is this just a long J-curve (Backus, Kehoe and Kydland, 1994), or is something else at play?

U.S. real exchange rates with China and other trade partners