Was Stalin necessary for Russia's economic development?

Anton Cheremukhin
FRB of Dallas

Mikhail Golosov
Princeton

Sergei Guriev
NES

Aleh Tsyvinski
Yale

October 2013

Stalin's Industrialization

- Economic historians consider Soviet industrialization as one of the few catch-up episodes in non-Western countries
- Created an important global player
- Is a quintessential example of Big Push
  - Influenced generations of development economists
  - Inspired top-down industrialization policies in many developing countries including China, India, and Turkey
- But was it worth the unprecendent tragedies of famine, repression and terror?

Russian Industrialization in 1928-1940

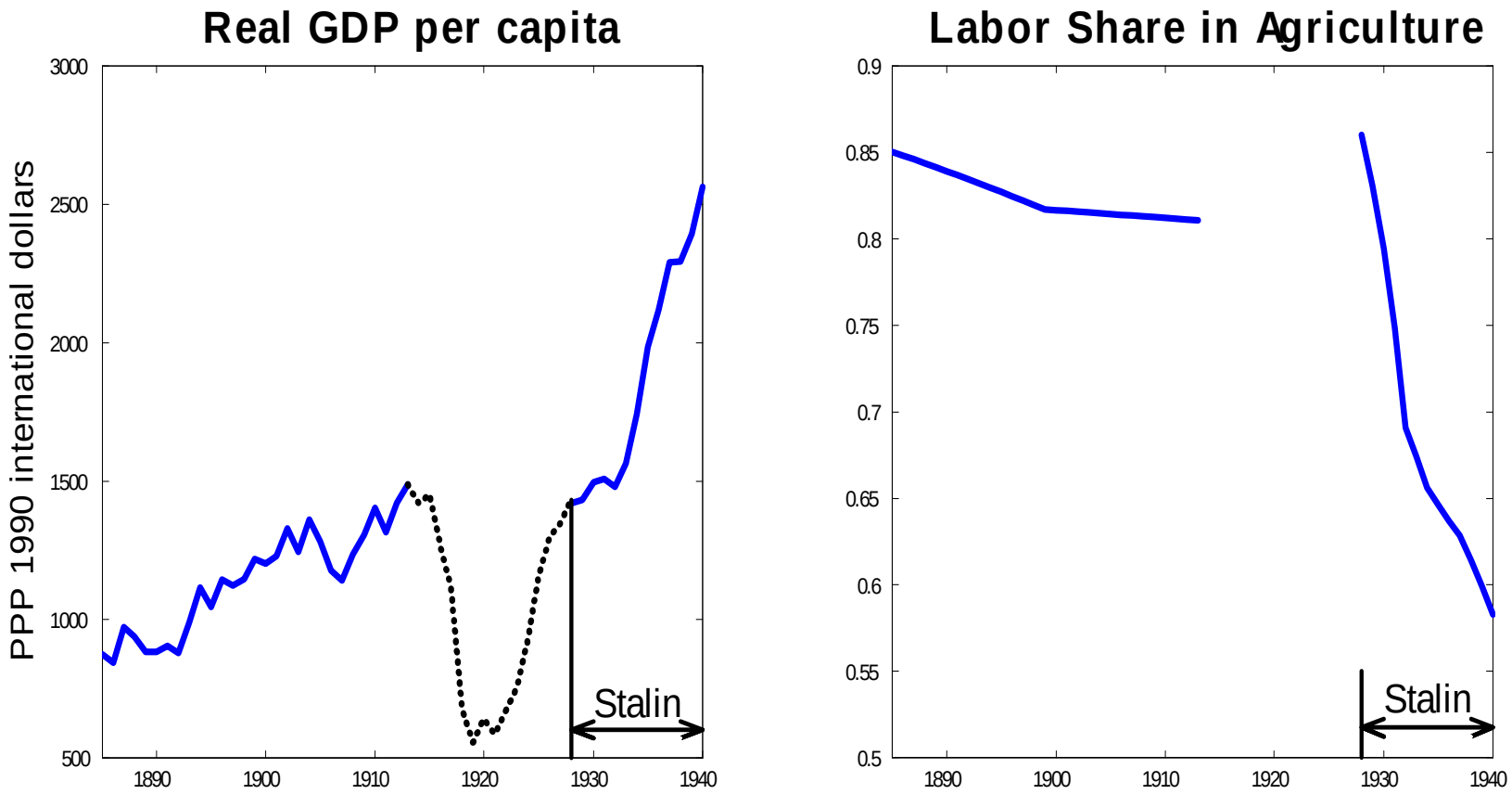


Figure: Real GDP and sectoral labor share in Russia in 1885-1940.

Was Stalin Necessary?

- **General agreement**: Stalin's policies unnecessarily brutal
- **Critics:** rapid growth may be just a catch-up to pre-WWI trend
- **Supporters:** Stalin's policies fundamentally improved economic allocations
- **Main channels:**
  - "Big Push": massive state intervention kick-starts productivity growth
  - Stalin's policies "broke barriers" that existed under the tsars

  (Rosenstein-Rodan (1943), Murphy, Schleifer and Vishny (1989), Allen (2003), Acemoglu and Robinson (2012))

This paper

- **Creates consistent dataset of aggregate and sectoral variables for Russia**:
  - under the tsars (1885-1913)
  - under Stalin (1928-1940)
- **Standard two-sector neoclassical growth model**
  - use sectoral data to measure wedges/distortions under different regimes
  - different policies map into different wedges, can help to differentiate between different stories
- **Counterfactuals: compare**
  - Simulated Tsarist economy (with tsarist's distortions) (1914-...)
  - Stalin's economy (1928-1940) and simulations without WWII (1941-...)
  - Extension of New Economic Policy (1921-28) until 1940 and post-1940
  - Japan (1885-1940) and extrapolation of Russian economy with Japan's wedges

Japan as a counterfactual for Russia

Main Results

- **Tsarist economy (1885-1913)**:
  - substantial distortions, especially in the intersectoral labor wedge
- **Stalin's economy (1928-40):**
  - large welfare costs early on
  - eventually lower distortions but also lower productivity level
- Consumption is significantly lower under Stalin than under tsarist counterfactuals in 1928-1940, but higher after 1940
  - representative agent loses **-1 to -5%** under Stalin if born in 1928, gains **+8 to +16%** if born in 1941
  - Stalin's gains include 5% due to change in trade – would take place anyway
- Both paths are much worse than that of Japan
  - representative agent gains **+31%** if born in Japan in 1928, gains **+23%** if born in Japan in 1941
- Extrapolated "New Economic Policy" would perform same or better
  - "NEP" would bring **0 to 20%** to generation-1928, and **-3% to +28%** to generation-1941 relative to Stalin

Different views on Stalin's economic policies

- Return to pre-WWI trend? X
  - Soviet economy eventually reaches a higher level
- Russia would have industrialized anyway? $?$
  - no trends in distortions pre-WWI, distortions higher in 1928-29
  - Japan succeeded in the inter-war period despite similar dynamics pre-WWI
- Productivity growth? X
  - productivity is below trend in both sectors
- "Brutal way to break barriers"? ✓
  - distortions eventually go down, reallocation does take place
  - consistent with the view that autocratic ruler can improve allocations if far away from technological frontier, but hard to allocate resources efficiently

Theoretical framework: two-sector growth model (I)

- **Consumers:**

$$\sum_{t=0}^{\infty} \beta^t \left[\eta \log \left(c_t^A - \gamma^A \right) + (1-\eta) \log c_t^M \right], \qquad \gamma_A \geq 0$$

- **Producers:**
  - manufacturing (non-agriculture)

$$Y_t^M = F_M \left(K_t^M, N_t^M \right) = A_t^M \left(K_t^M \right)^{\alpha_M} \left(N_t^M \right)^{\beta_M}$$

  - agriculture

$$Y_t^A = F_A \left(K_t^A, N_t^A \right) = A_t^A \left(K_t^A \right)^{\alpha_A} \left(N_t^A \right)^{\beta_A}$$

- **Capital and labor shares:**

$$\begin{aligned} \alpha_{K,A} + \alpha_{N,A} &< 1 \\ \alpha_{K,M} + \alpha_{N,M} &= 1 \end{aligned}$$

Theoretical framework: two-sector growth model (II)

- **Goods market clearing:**

$$N_t c_t^A + ex_t^A = Y_t^A$$
$$N_t c_t^M + ex_t^M + G_t^M + I_t = Y_t^M$$

- **Labor and Capital markets clearing:**

$$N_t^A + N_t^M = \chi_t N$$
$$I_t + (1 - \delta) K_t = K_{t+1}$$
$$K_t^A + K_t^M = K_t$$

- **Exports** (exogenous at price q_t):

$$q_t ex_t^A + ex_t^M = 0$$

Benchmark: competitive equilibrium with no distortions

- **Competitive equilibrium is optimal**
- **First order conditions** ($p_t^M = 1$):

$$\begin{aligned}
\frac{F_{M,K}(t)}{p_{A,t}F_{A,K}(t)} &= \frac{r_M(t)}{r_A(t)} = 1 \\
\frac{F_{L,K}(t)}{p_{A,t}F_{L,K}(t)} &= \frac{w_M(t)}{w_A(t)} = 1 \\
\frac{U_{C,A}(t)}{U_{C,M}(t)} &= p_{A,t} \\
U_{C,M}(t) &= U_{C,M}(t+1)\beta\left(1 + F_{M,K}(t) - \delta\right)
\end{aligned}$$

- **The data will reject the implications of this frictionless economy**

Economy with frictions

- **Chari, Kehoe, McGrattan (2007) accounting procedure:**
  - compute wedges from observed quantities/prices
- Given these wedges, neoclassical equilibrium replicates data exactly.
- In our context: A_t^M, A_t^A, G_t, $q_t ex_t^M$, ex_t^A, K_0 plus
  - **Inter-sectoral capital wedge:**

$$\mathbf{1} + \boldsymbol{\tau}_R(\mathbf{t}) = \frac{F_{M,K}(t)}{p_{A,t} F_{A,K}(t)} = \frac{r_M(t)}{r_A(t)}$$

  - **Inter-sectoral labor wedge:**

$$\mathbf{1} + \boldsymbol{\tau}_W(\mathbf{t}) = \frac{F_{L,K}(t)}{p_{A,t} F_{L,K}(t)} = \frac{w_M(t)}{w_A(t)}$$

  - **Price scissors: (producer faces $p_{A,t}$ and consumer faces $\tilde{p}_{A,t}$)**

$$\mathbf{1} + \boldsymbol{\tau}_C(\mathbf{t}) = \frac{\tilde{p}_{A,t}}{p_{A,t}} = \frac{U_{C,A}(t)}{p_{A,t} U_{C,M}(t)}$$

  - **Intertemporal wedge:**

$$\mathbf{1} + \boldsymbol{\tau}_K(\mathbf{t+1}) = \frac{\beta U_{C,M}(t+1)}{U_{C,M}(t)} \left(1 + F_{M,K}(t+1) - \delta\right)$$

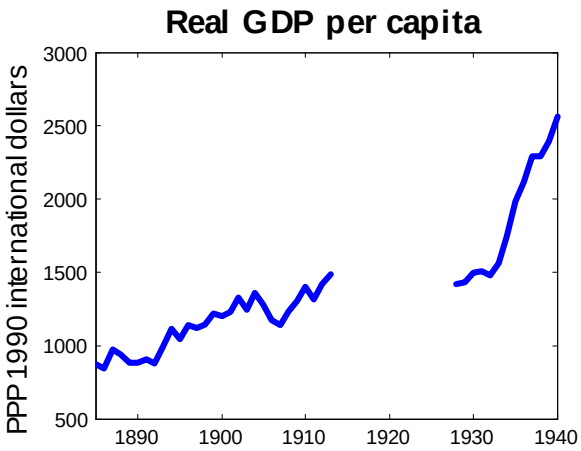
Data (1885-1913, 1928-1940)

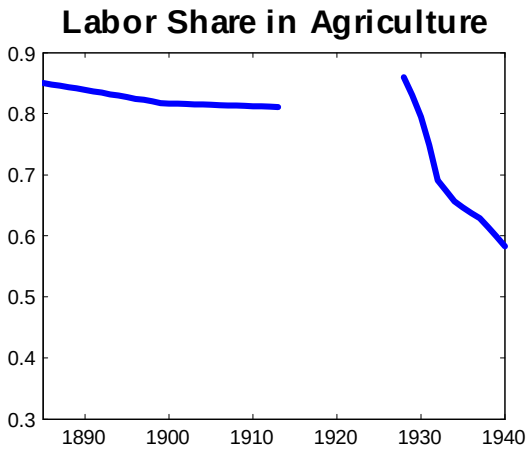
- **Create consistent dataset** for aggregate and sectoral variables
- **Tsarist period**: data reconstructed using Gregory (1982)
- **Soviet period**: data reconstructed using Moorsteen and Powell (1966) and Davies et al. (1993)
  - quantities are reliable, prices are not
  - measure quantities in 1913 prices

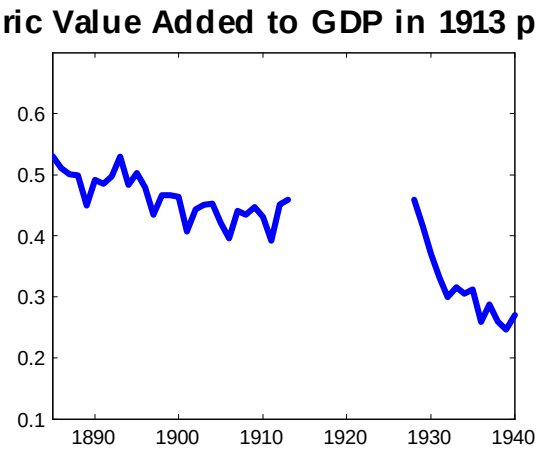
Brief History of Stalin's economic policies

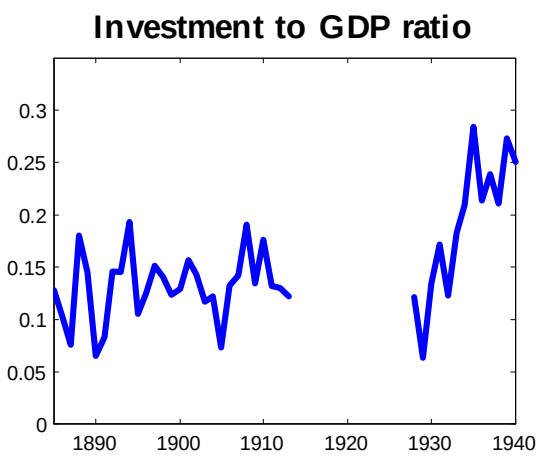
- Following tsars, WWI, Revolution, Civil War, New Economic Policy
- In 1928 Stalin consolidates power, two major economic reforms:
  - **Industrialization:** significant increase in state's investment in manufacturing, especially in heavy industry
  - **Collectivization:** forced organization of peasants into communes, abolishing private property on means of agricultural production (horses, cows, plows, etc.)
    - **"Price scissors":** a mechanism of surplus extraction
    - Peasants were forced to sell agricultural goods at artificially low prices.

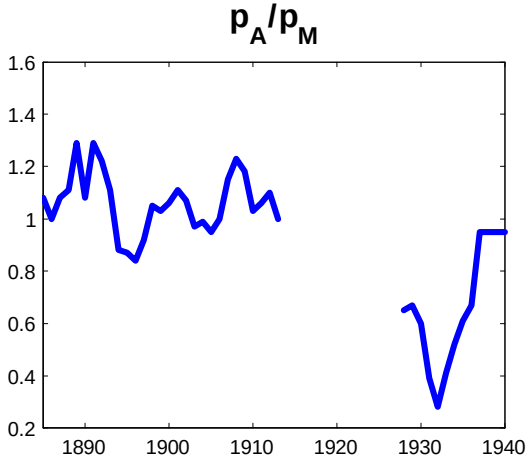
Aggregate economic indicators in Russia in 1885-1940

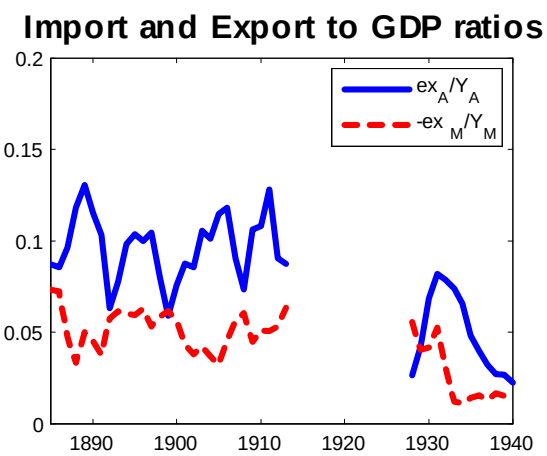










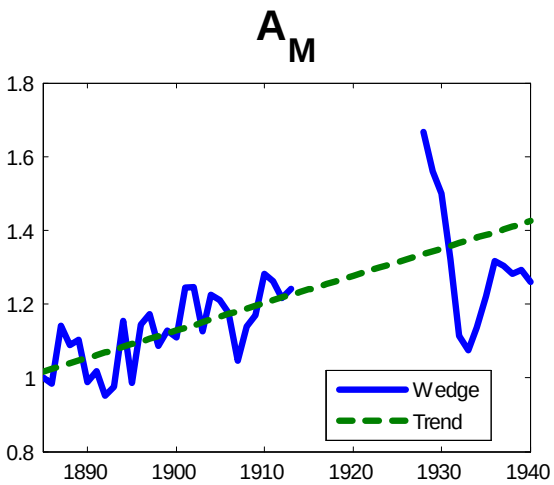


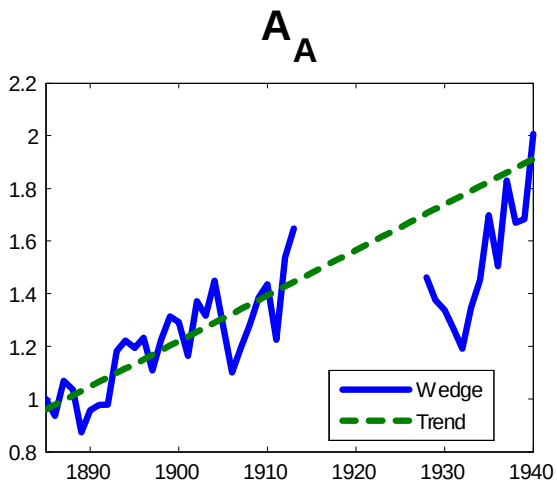
Calibration

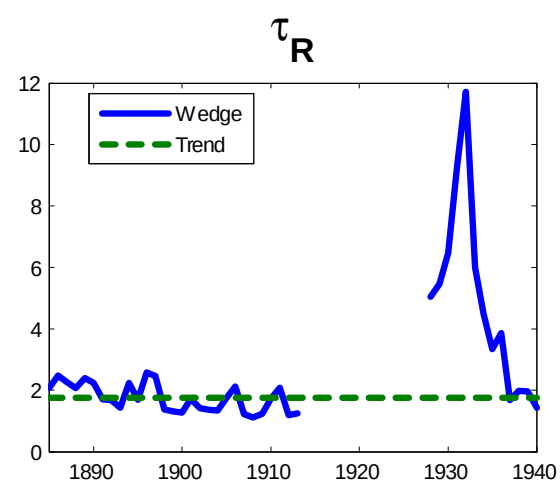
- **Russia and Japan are quite similar before 1913**
  - Use Hayashi-Prescott calibration of preferences and technology in Japan
  - No intermediate goods; assign to labor in M, land in A
- **Parameters from HP:**
  - **Utility:** $\beta = 0.96$; $\eta = 0.15$; $1 - \eta = 0.85$
  - **Manufacturing sector:** $\alpha_{K,M} = 0.3$; $\alpha_{N,M} = 0.7$
  - **Agricultural sector:** $\alpha_{K,M} = 0.14$; $\alpha_{N,A} = 0.55$ (the rest is land)

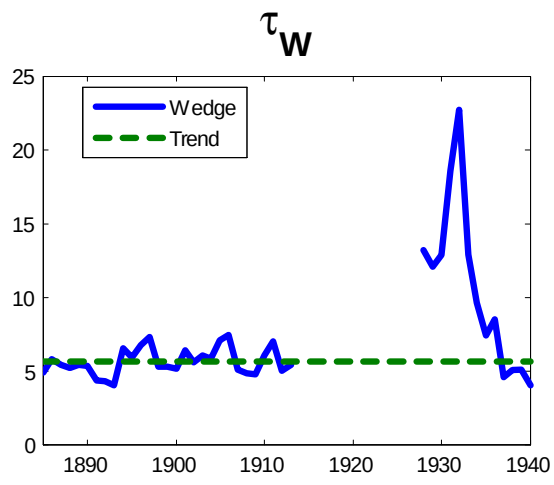
  (also similar to Caselli and Coleman (2001))
- **Other parameters:**
  - **Subsistence** γ^A
    - set to 28 rubles per capita in 1913 prices;
    - 72% of agricultural consumption in 1885
  - **Fraction of labor force to population** χ_t
    - set to 1897 census $= 0.53$;
    - slightly higher than 1926, 1939 census

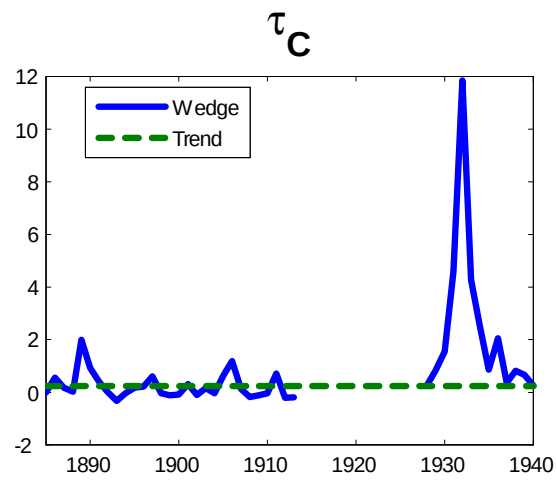
Wedges

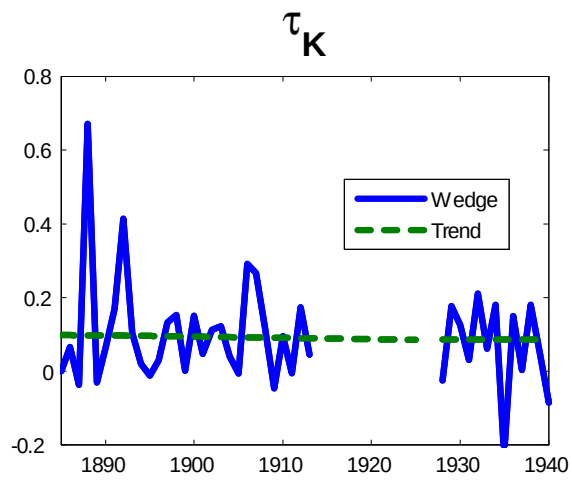

A_M
1.8
1.6
1.4
1.2
1
0.8
1890
1900
1910
1920
1930
1940
Wedge
Trend


A_A
2.2
2
1.8
1.6
1.4
1.2
1
0.8
1890
1900
1910
1920
1930
1940
Wedge
Trend

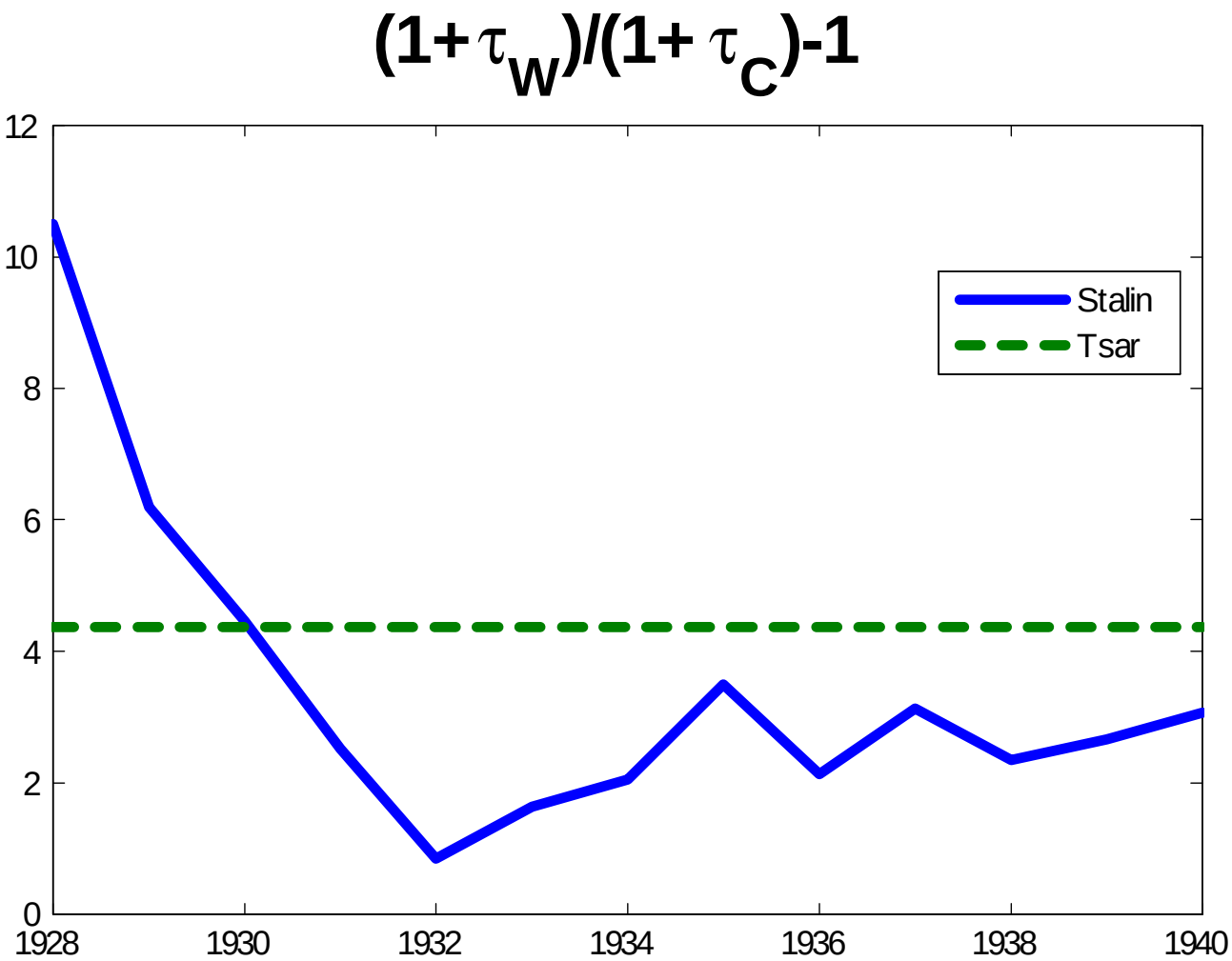

τ_R
12
10
8
6
4
2
0
1890
1900
1910
1920
1930
1940
Wedge
Trend


τ_W
25
20
15
10
5
0
1890
1900
1910
1920
1930
1940
Wedge
Trend


τ_C
12
10
8
6
4
2
0
-2
1890
1900
1910
1920
1930
1940
Wedge
Trend


τ_K
0.8
0.6
0.4
0.2
0
-0.2
1890
1900
1910
1920
1930
1940
Wedge
Trend

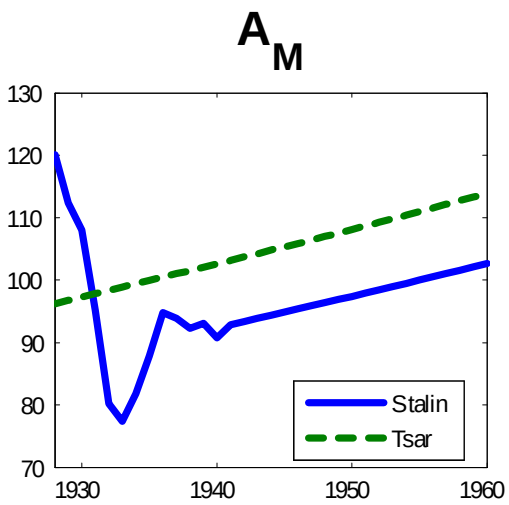
Intersectoral Labor Wedge

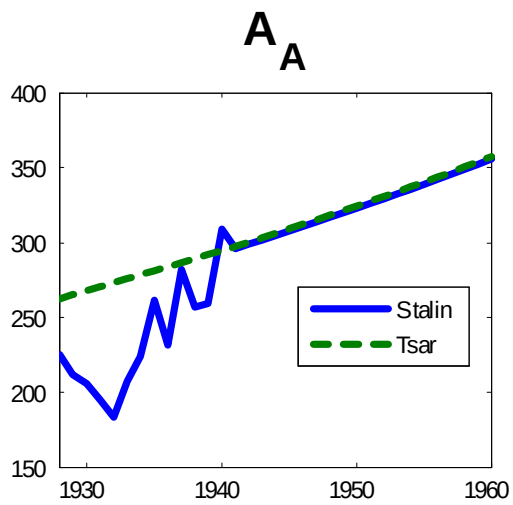


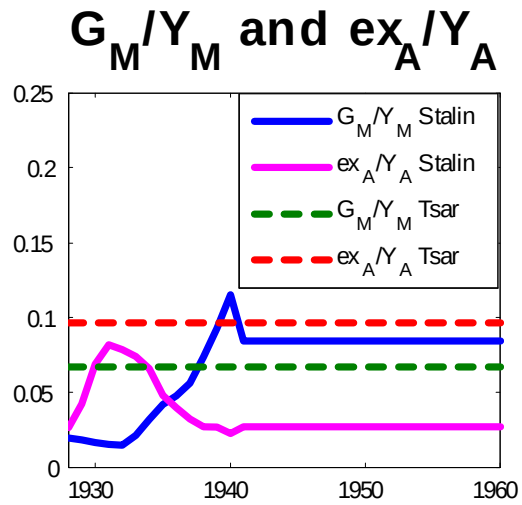
Russia with and without Communists

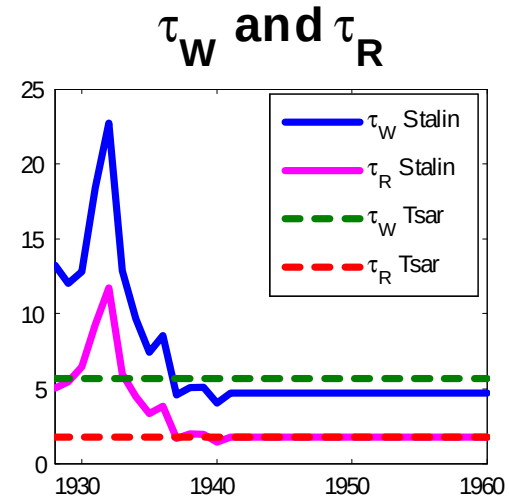
- **Tsarist counterfactual:**
  - Extrapolate average (1885-1913) tsarist wedges
  - Actual population for the whole period
- **1928-1940:** compare paths and welfare
  - Data under Stalin
  - Tsarist counterfactual
- **1941-onward (with no WWII**):
  - Simulated economy with Stalin's average 1937-40 wedges
  - Tsarist counterfactual
  - Assume same TFP growth post-1940 (probably too generous for Stalin)
- **These assumptions are probably biased in favor of Stalin**
  - Stalin manages to grow TFP with tsarist trend
  - Tsar does not reduce wedges

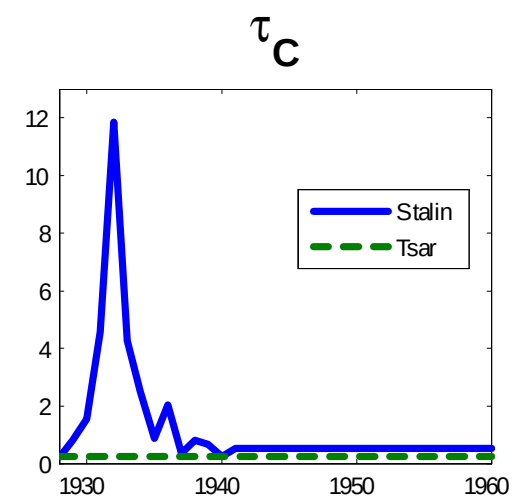
Extrapolating Wedges

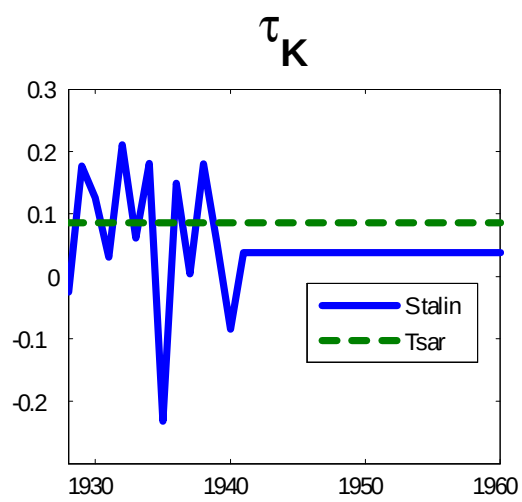




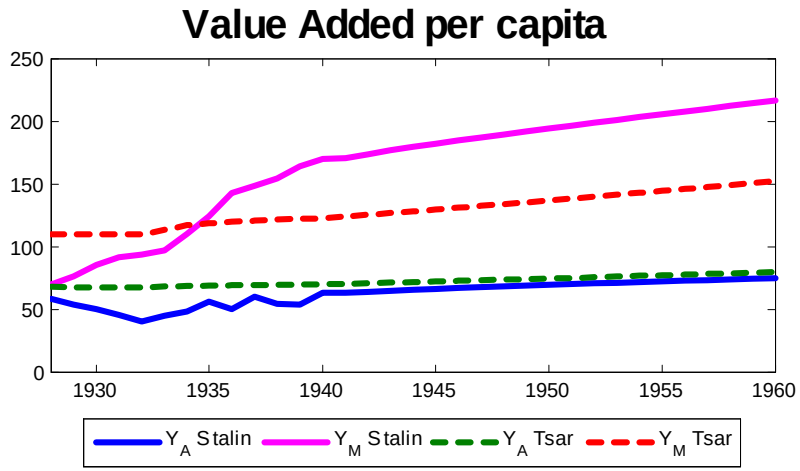


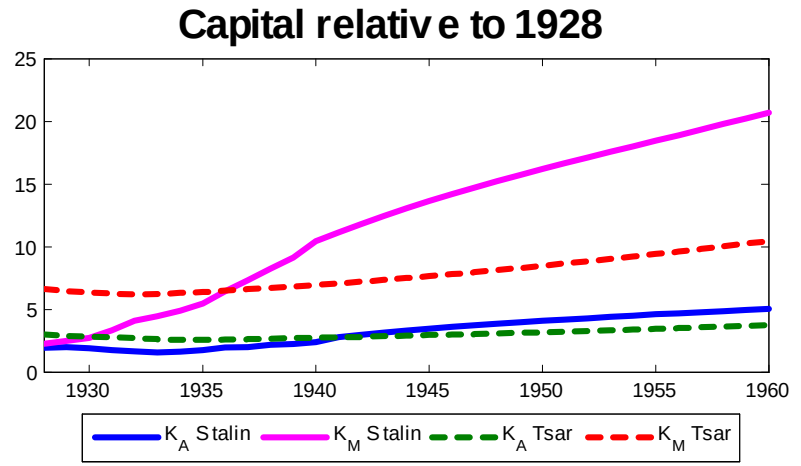


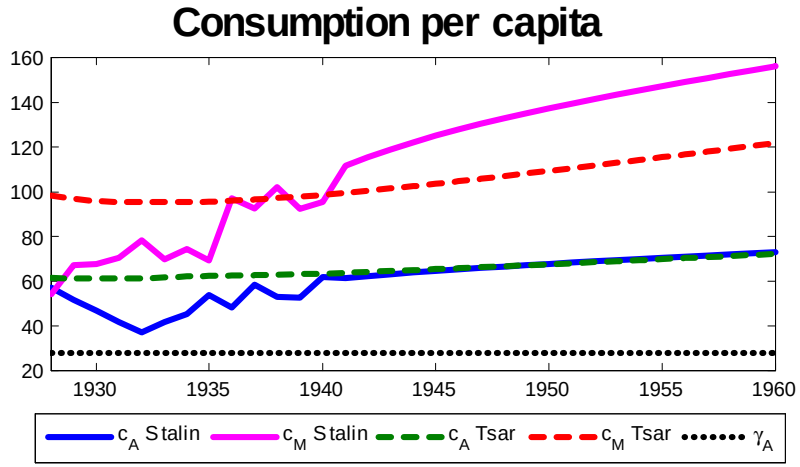


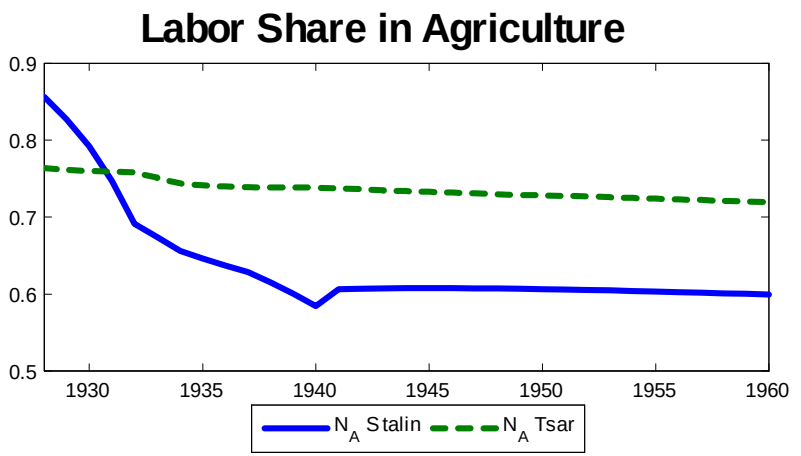


Russia without Communists vs. Stalin









Russia without the Communist Revolution

- **1928-1940:** Consumption in both sectors is significantly lower
  - Welfare loss **-24.1%** of consumption
- **1941-onward**: Consumption is higher under Stalin
  - Lower wedges lead to **higher capital accumulation** and **reallocation of labor**
  - Welfare gain **+16.5%** of consumption
- **Net effect on Generation 1928**: lifetime welfare loss **-1.0%**

Wedges and Welfare: Decomposition

Period	Stalin vs. Tsar [28-40]	[28-∞]	[40-∞]
Contribution			
τ_K	-2.2%	4.7%	9.9%
τ_C	11.4%	13.0%	9.9%
τ_W	-10.1%	-4.6%	3.6%
A_M	-1.9%	-6.6%	-10.2%
A_A	-15.4%	-7.4%	-1.3%
Trade	5.5%	5.4%	5.3%
Total	-24.1%	-1.0%	16.5%

Effects of Policies on Welfare

- **Manufacturing TFP falls**: large welfare losses
- **Wedges fall**: long-run welfare gains
- **Trade collapse**: sped up transition, welfare gains
  - Hard to attribute to Stalin: ToT deteriorated in the 30s

Stalin vs. Tsarist: Wedges and Structural Change

Policy	$\Delta \frac{N_A}{N}$ in 1945	Contribution
τ_K	-3%	23%
τ_C	-3%	24%
τ_W	-4%	31%
G_M and τ_R	-0.3%	3%
A_M	0.4%	-4%
A_A	-0.2%	2%
Trade	-3%	21%
Total	-13%	100%

Alternative post-1940 growth scenarios

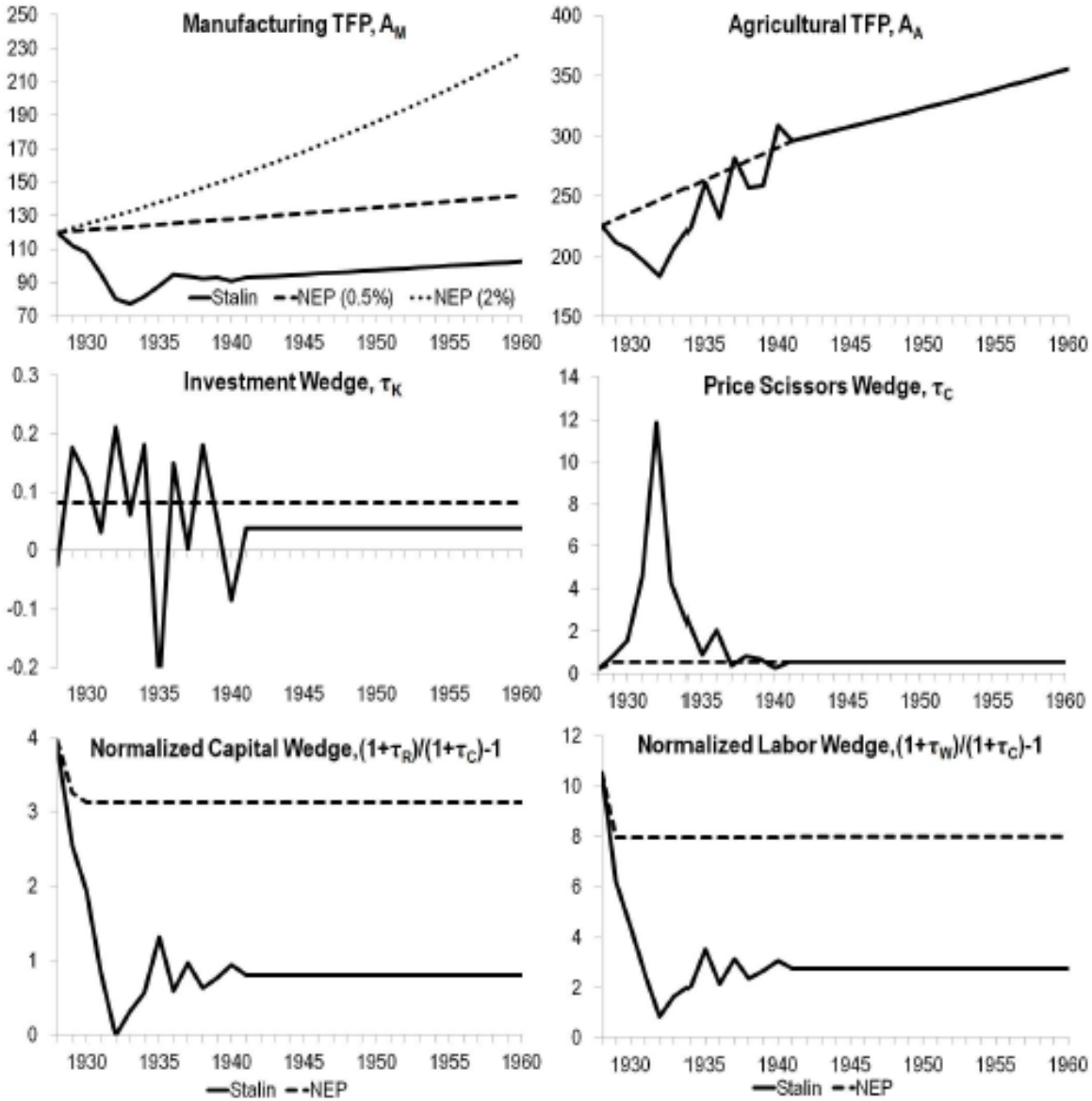
- Assuming Tsarist TFP trend post 1940 may be too favorable to Stalin
- Alternative scenario: extrapolate 1937-40 average trend

Incremental results:
-4.5% for generation-1928
-7.8% for generation-1940

Another counterfactual: What if NEP continued after 1928?

- Allen (2003): Industrialization, but NO Collectivization
  - Fast capital accumulation (low investment wedge)
  - Trend growth in TFP (no drop in 1930s)
  - Labor barrier intact (labor distortion fixed, price scissors fixed)
- Collectivization reduces welfare in the short run, improves allocations in the long run
- Problem:
  - NEP included post-war recovery hence very fast TFP growth (10% p.a.)
  - Clearly unsustainable
  - We use Tsarist trend 0.5% as a lower bound for post-1928
  - But also check the scenario with TFP growth at 2% (Japan post-war)

What if NEP continued: Wedges

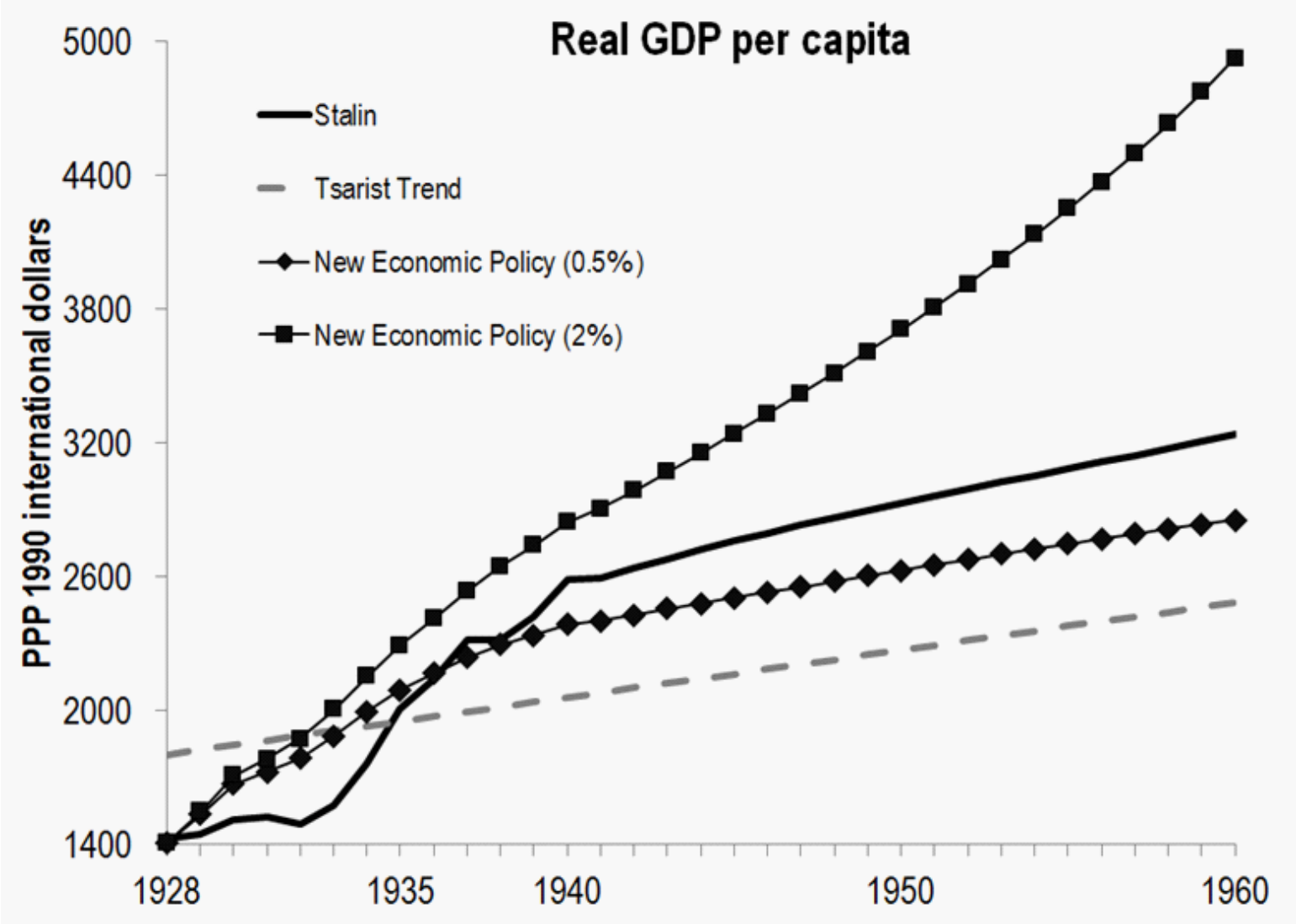


What if NEP continued: Results

- Stalin vs NEP 0.5% and vs NEP 2%
- Collectivization is costly in the short-run, improves allocation in the long run
- NEP's performance crucially depends on assumption about productivity

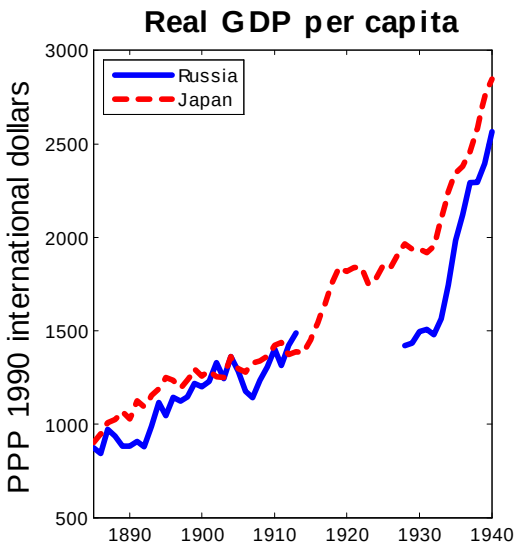
	Stalin vs. NEP		
Period	[28-40]	[28-∞]	[40-∞]
τ_C	-2.6%	3.0%	7.3%
τ_K	6.5%	6.0%	1.6%
τ_W	20.7%	26.5%	34.8%
G_M and τ_R	4.0%	-0.5%	-3.9%
A_M (0.5%)	-23.6%	-29.9%	-34.6%
A_M (2%)	-30.1%	-50.8%	-66.0%
A_A	-8.4%	-4.1%	-0.8%
ex and q	-0.3%	-0.8%	-1.2%
Total (0.5%)	-3.7%	0.2%	3.2%
Total (2%)	-9.8%	-20.1%	-27.7%

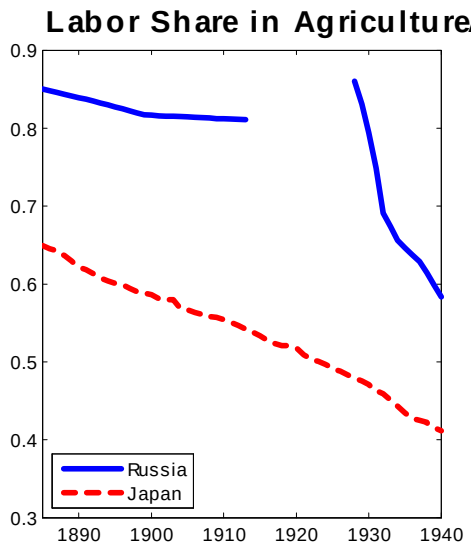
What if NEP continued: GDP

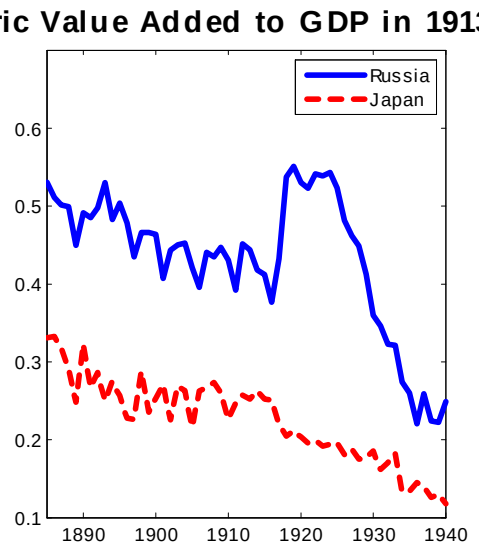


Comparison with Japan

- Russia and Japan undertake major economic reforms arond the same time
  - both because of fear of external aggression
- Similar growth rates and levels of GDP per capita 1885-1913

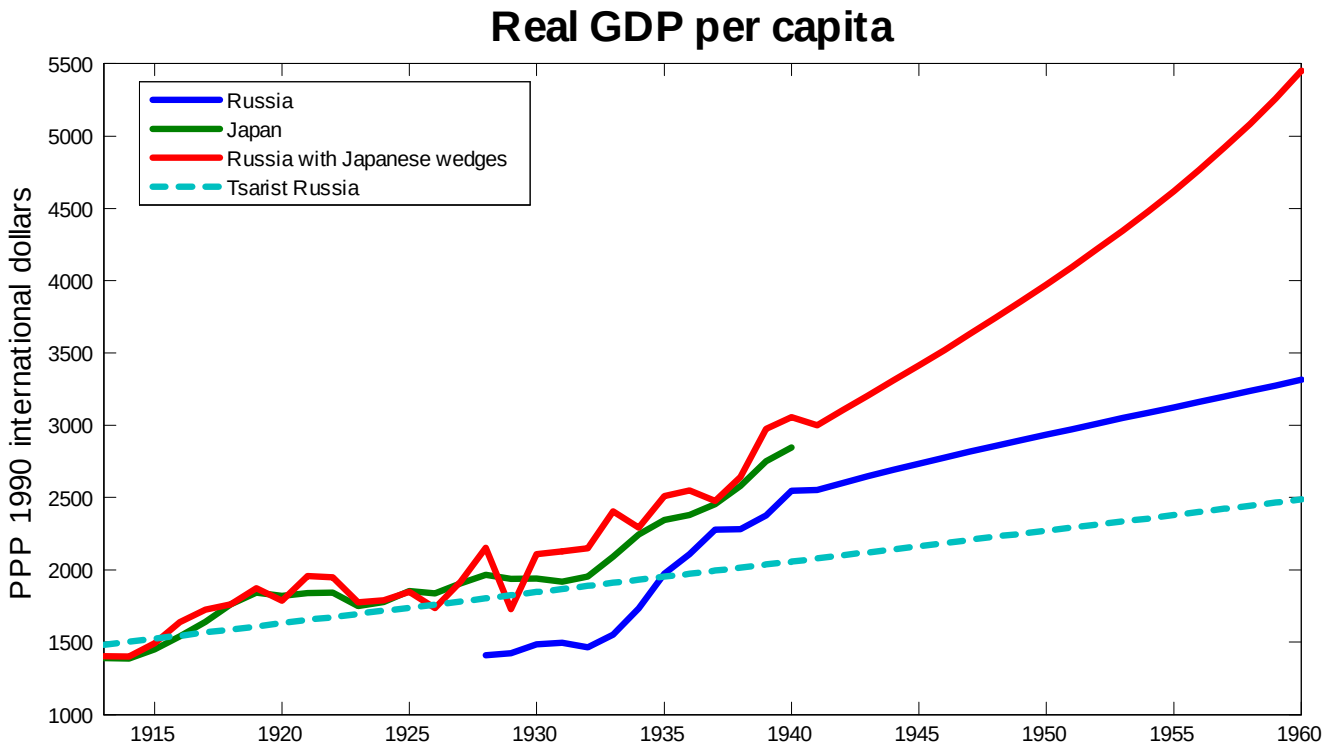






Alternative counterfactual: Stalin vs. Japan

- **Experiment**: Russia replicates Japanese transition after 1913: $\tilde{\tau}_t^{Rus} = \tau_{1913}^{Rus} \times \frac{\tau_t^{Jap}}{\tau_{1913}^{Jap}}$.
- After 1940 take the average growth rate of wedges for 1928-1940



Effects of Policies on Welfare

- Faster Manufacturing TFP growth in Japan
- Barriers lower under Stalin, not enough to overcome TFP losses

	Stalin vs. Japan		
Period	[28-40]	[28-∞]	[40-∞]
τ_K	-4.5%	1.6%	6.4%
τ_C	3.2%	9.7%	9.4%
τ_W	3.5%	4.5%	12.4%
A_M	-17.4%	-36.6%	-53.1%
A_A	-12.9%	-5.7%	-0.1%
Total	-41.3%	-31.0%	-22.7%

Conclusions

- **Stalin's policies**:
  - Eventually lowered barriers and succeeded in reallocation
  - Substantial reduction in productivity
- **Welfare**:
  - Large short-run cost of policies
  - Modest long-run benefits
  - Short-run costs outweigh long-run benefits
- **Could Russia have done better?**
  - Projected tsars' and Stalin's policies much worse than experience of Japan
  - If tsarist or NEP economy managed to reduce at least some wedges to Japan's levels, Russia would significantly outperform Stalin