

Trade, Inequality and Costly Redistribution

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Introduction

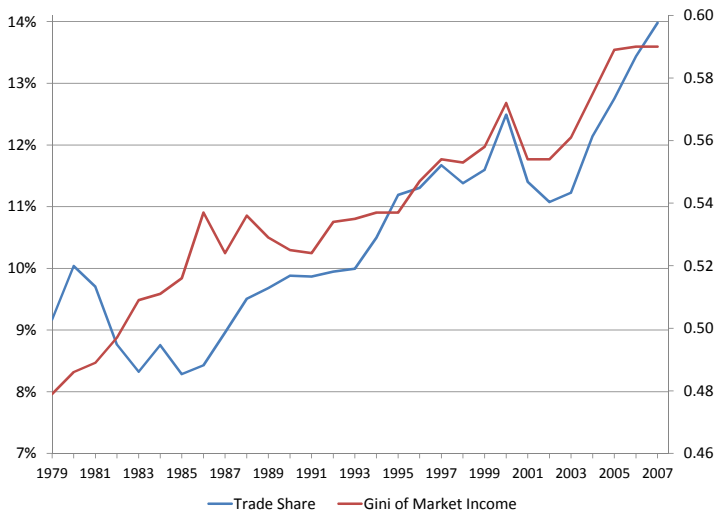
- ▶ Empirical evidence suggests that increased trade integration raises real income but also increases inequality and makes some worse off
- ▶ Standard approach to demonstrating and quantifying the gains from trade largely ignores trade-induced inequality
- ▶ Kaldor-Hicks compensation principle:
 1. Compute compensation variation or equivalent variation at the individual level of a move to free trade
 2. Aggregate these monetary transfers across agents and show that everybody **can** be compensated
- ▶ Two issues with this approach:
 - ▶ How much compensation/redistribution **actually** takes place?
 - ▶ Is this redistribution **costless**, as the Kaldor-Hicks approach assumes?

This Paper

- ▶ We study the welfare implications of trade opening in a world in which trade affects the income distribution...
- ▶ ... and in which redistribution policies are constrained by information frictions (Mirrlees, 1971)
- ▶ In the model, trade increases inequality and redistribution needs to occur via a distortionary income tax/transfer system
 - ▶ Consistent with very limited role of trade adjustment assistance programs
- ▶ Despite the fact that the tax system is progressive, trade still leads to an increase in inequality in the after-tax distribution of income
- ▶ We propose two types of adjustments to standard welfare measures:
 1. A 'welfarist' correction reflecting the preferences of an inequality-averse social planner (risk-adjustment under the veil of ignorance)
 2. A 'costly-redistribution' correction capturing behavioral responses to *trade-induced* shifts across marginal tax rates

A Motivating Graph

Openness and Inequality in the United States (1979-2007)



A Motivating Quote

"If, as will often happen, the best methods of compensation feasible involve some loss in productive efficiency, this loss will have to be taken into account."



Hicks (1939, p. 712)

Building Blocks

- ▶ Skeleton of Trade Model: Itskhoki (2008)
 - ▶ Melitz (2003) with heterogeneous workers/entrepreneurs and a labor supply decision
- ▶ Costly Redistribution: Nonlinear tax system as in Heathcote et al. (2014)
 - ▶ After-tax income is log-linear function of pre-tax income (great fit)
- ▶ Welfarist correction: constant degree of inequality- (or risk-) aversion
 - ▶ widely used in Public Finance; veil of ignorance rationale, Vickers (1945)
- ▶ Model calibrated to fit 2007 U.S. data:
 - ▶ distribution of skills calibrated to match U.S. distribution of (adjusted gross) income from IRS public records
 - ▶ trade costs calibrated to match U.S. trade share

Related Literature (see paper for full list)

- ▶ Trade models with heterogeneous workers: Itskhoki (2008) but also
 - ▶ matching/sorting models (see Grossman, 2013, and Costinot and Vogel, 2015, for surveys)
 - ▶ models with imperfect labor markets (Helpman, Itskhoki, Redding..., and earlier Davidson and Matusz)
- ▶ Gains from trade and costly redistribution: Dixit and Norman (1986), Rodrik (1992), Spector (2001), Naito (2006)
- ▶ Old literature on Kaldor-Hicks: Kaldor (1939), Hicks (1939), Scitovszky (1941)
- ▶ Welfarist approach: Bergson (1938), Samuelson (1947), Diamond & Mirlees (1971), Saez more recently
- ▶ Costly-redistribution: Kaplow (2008), Hendren (2014)

Road Map

1. A Motivating Example
2. Economic Model
3. Calibration
4. Counterfactuals: Inequality and the Gains from Trade

A Motivating Example

- ▶ Consider a society composed of a measure one of individuals indexed by an ability φ and associated (real) earnings $r(\varphi)$
- ▶ Agents' preferences are represented by an indirect utility function v defined over (real) disposable income

$$r^d(\varphi) = (1 - \tau(r(\varphi)))r(\varphi) + T(\varphi)$$

where $\tau(r)$ is a nonlinear income tax and $T(\varphi)$ a lump-sum transfer

- ▶ The cumulative distribution of φ in the population is $H(\varphi)$, while the associated income distribution for real earnings is denoted by $F(r)$
- ▶ Society is evaluating the consequences of a trade liberalization that would shift $F(r)$ from some initial $F_0(r)$ to $F_1(r)$.
- ▶ What are the welfare consequences of the move from $F_0(r)$ to $F_1(r)$?

The Kaldor-Hicks Principle: An Illustration

- ▶ Suppose only lump-sum transfers are used and the government budget is balanced so $\int T(\varphi) dH(\varphi) = 0$ and $\int r^d(\varphi) d\varphi = \int r dF(r)$
- ▶ The equivalent variation for individual of type φ is the amount of money agent φ would be willing to pay to avoid trade opening, or

$$v\left(r_0^d(\varphi) - EV(\varphi)\right) = v\left(r_1^d(\varphi)\right)$$

- ▶ Hence

$$\begin{aligned} -\int EV(\varphi) dH(\varphi) &= \int r_1^d(\varphi) dH(\varphi) - \int r_0^d(\varphi) dH(\varphi) \\ &= \int r dF_1(r) - \int r dF_0(r) = R_1 - R_0 \end{aligned}$$

- ▶ Gains from trade = Aggregate Real Income Growth

$$\left. \frac{\Delta W}{W} \right|_{\text{Kaldor-Hicks}} = \mu \equiv \frac{R_1 - R_0}{R_0}$$

Pros and Cons of the Kaldor-Hicks Principle

- ▶ Principle does not rely on interpersonal comparisons of utility
 - ▶ indirect utility can be heterogeneous across agents
 - ▶ result relies on ordinal rather than cardinal preferences
 - ▶ notion of efficiency argued to be free of value judgments
- ▶ What if redistribution does not take place and the losers are not compensated?
 - ▶ under the veil of ignorance, agents will see a probability distribution over potential outcomes
 - ▶ VN-M preferences over these lotteries are necessarily cardinal
 - ▶ risk aversion \approx inequality aversion
- ▶ Even if some redistribution takes place, whenever it is costly, shouldn't $\Delta W/W$ reflect those costs?
 - ▶ Dixit and Norman (1986) showed that $\Delta W/W > 0$ using a course set of tax policies - but by how much is $\Delta W/W$ diminished?

A Welfarist Correction

- ▶ Consider an original position in which individuals evaluate policies under a veil of ignorance (not knowing φ)
- ▶ Ex-ante symmetry implies that individual/social welfare is

$$W|_{\text{Welfarist}} = \int g\left(v\left(r^d(\varphi)\right)\right) dH(\varphi), \quad (1)$$

where $g(v(\cdot))$ is concave reflecting risk or inequality aversion

- ▶ Suppose preferences feature constant degree of inequality aversion

$$g\left(v\left(r^d\right)\right) = \frac{\left(r^d\right)^{1-\rho} - 1}{1-\rho} \text{ for } \rho \geq 0 \quad (2)$$

- ▶ Consider transformation $\tilde{W} = ((1-\rho)W + 1)^{1/(1-\rho)}$ of welfare such that without inequality aversion ($\rho = 0$), we have $\tilde{W} = \mathbb{E}(r^d) = R$.
- ▶ For $\rho > 0$, Jensen's inequality ensures

$$\tilde{W} = \left[\mathbb{E}\left(\left(r^d\right)^{1-\rho}\right) \right]^{1/(1-\rho)} < \mathbb{E}\left(r^d\right) = R$$

Welfarist Correction: Two Special Cases

- Suppose $H(\varphi)$ is such that the distribution of **disposable** income is

$$\text{Pareto: } \tilde{W} \Big|_{\text{Welfarist}} = \left(\frac{1+G}{1-G(1-2\rho)} \right)^{1/(1-\rho)} \frac{1-G}{1+G} R$$

$$\text{Lognormal: } \tilde{W} \Big|_{\text{Welfarist}} = \exp \left\{ -\rho \left[\Phi^{-1} \left(\frac{1+G}{2} \right) \right]^2 \right\} R$$

where G is the Gini coefficient of the distribution of r^d

- \tilde{W} increases in mean income R but decreases in inequality G
- Notice that in both cases

$$\frac{\Delta \tilde{W}}{\tilde{W}} \Big|_{\text{Welfarist}} = \frac{\delta(G_1; \rho)}{\delta(G_0; \rho)} \times (1 + \mu) - 1, \quad (3)$$

so $\Delta \tilde{W} / \tilde{W} = \mu$ when $G_1 = G_0$ but $\Delta \tilde{W} / \tilde{W} < \mu$ when $G_1 > G_0$ (and the more so, the higher ρ)

A Preliminary Quantitative Assessment

- ▶ How large is the negative correction to social welfare associated with trade-induced inequality?
- ▶ Consider U.S. during the period 1979–2007:

	1979	2007
Trade Share	0.092	0.140
Gini Coefficient	0.367	0.489

- ▶ Two crucial questions:
 1. How much did the rise in the trade share increase aggregate disposable income?
 2. Which share s of the 0.122 increase in the Gini is caused by that trade opening?
- ▶ Trade model will answer these questions, but suppose $\mu = 3\%$ and $s = 5\%$, 10% , and 20%

A Preliminary Welfarist Correction

- It does not take an awful lot of inequality aversion to generate significant downward corrections to gains from trade

Table 1. Social Welfarist Inequality Correction to Welfare Effects of Trade Integration

Inequality Aversion	Pareto Correction			Lognormal Correction		
	Contribution of Trade to Inequality			Contribution of Trade to Inequality		
	$s = 5\%$	$s = 10\%$	$s = 20\%$	$s = 5\%$	$s = 10\%$	$s = 20\%$
	(1)	(2)	(3)	(4)	(5)	(6)
$\rho = 0$	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
$\rho = 0.1$	2.85%	2.69%	2.36%	2.91%	2.83%	2.65%
$\rho = 0.25$	2.67%	2.33%	1.64%	2.79%	2.57%	2.12%
$\rho = 0.5$	2.46%	1.92%	0.80%	2.57%	2.14%	1.25%
$\rho = 0.75$	2.32%	1.63%	0.23%	2.36%	1.72%	0.39%
$\rho = 1$	2.22%	1.43%	-0.18%	2.15%	1.29%	-0.46%
$\rho = 2$	1.98%	0.96%	-1.08%	1.31%	-0.39%	-3.81%

A Costly Redistribution Correction

- ▶ Suppose now that lump-sum transfers are not feasible (i.e., $T(\varphi) = 0$ for all φ) and redistribution has to happen through the income tax/transfer system
- ▶ Focus on the particular case (as in Heathcoate et al., 2014) in which

$$1 - \tau(r(\varphi)) = k(r(\varphi))^{-\phi}, \quad (4)$$

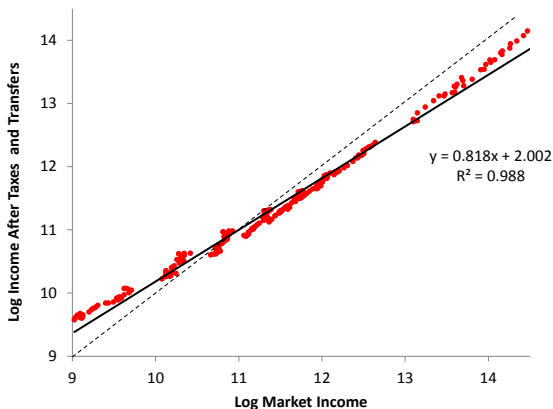
for some constant k which can be set to ensure that the government budget is balanced

- ▶ Average net-of-tax rates decrease in reported income at a constant rate ϕ , which captures the degree of progressivity of the tax system
- ▶ Behavioral response to taxation: positive, constant elasticity of reported income to the net-of-tax rate, or

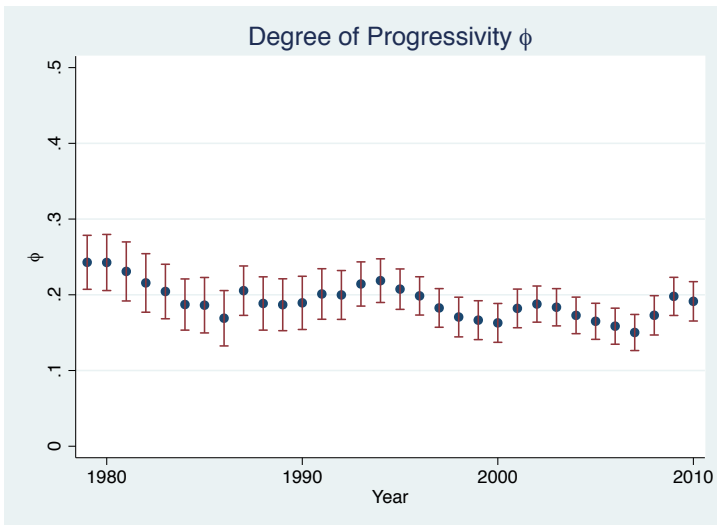
$$\varepsilon \equiv \frac{\partial r(\varphi)}{\partial (1 - \tau(r(\varphi)))} \frac{1 - \tau(r(\varphi))}{r(\varphi)} > 0 \quad (5)$$

On the Shape of the Tax Schedule

- ▶ Equation (4) may seem ad hoc, but it fits U.S. data remarkably well
 - ▶ CBO data for several percentiles of the income distribution for 1979-2010 (similar fit with PSID data)



On the Shape of the Tax Schedule Over Time



Costly Redistribution Correction

- ▶ Note that reported income and disposable income are respectively

$$r(\varphi) = (k)^{\varepsilon/(1+\varepsilon\phi)} \tilde{r}(\varphi)^{1/(1+\varepsilon\phi)}$$

$$r^d(\varphi) = (k)^{(1+\varepsilon)/(1+\varepsilon\phi)} \tilde{r}(\varphi)^{(1-\phi)/(1+\varepsilon\phi)}$$

where $\tilde{r}(\varphi)$ is **potential** revenue (in the absence of taxes) and k is such that

$$k = \left[\frac{\int \tilde{r}(\varphi)^{1/(1+\varepsilon\phi)} dH(\varphi)}{\int (\tilde{r}(\varphi))^{(1-\phi)/(1+\varepsilon\phi)} dH(\varphi)} \right]^{1+\varepsilon\phi}$$

- ▶ Aggregate income can thus be written as

$$R = \frac{\left[\mathbb{E} \left(\tilde{R}^{1/(1+\varepsilon\phi)} \right) \right]^{1+\varepsilon}}{\left[\mathbb{E} \left(\tilde{R}^{(1-\phi)/(1+\varepsilon\phi)} \right) \right]^{\varepsilon}} < \mathbb{E} \left(\tilde{R} \right),$$

where the inequality follows from Holder's inequality.

Costly Redistribution Correction: Two Special Cases

- ▶ If $H(\varphi)$ is such that the distribution of **potential** income is

$$\text{Pareto: } \tilde{W} \Big|_{\text{Costly}} = \frac{(1-\phi)(1+G)-(1+\varepsilon\phi)2G}{(1-\phi)(1+G)-2G} \left(\frac{(1-\phi)(1-G)}{(1-\phi)(1+G)-2G} \right)^\varepsilon \tilde{R}$$

$$\text{Lognormal: } \tilde{W} \Big|_{\text{Costly}} = \exp \left\{ -\frac{\phi^2 \varepsilon (\varepsilon + 1)}{(1-\phi)^2} \left[\Phi^{-1} \left(\frac{1+G_1}{2} \right) \right]^2 \right\} \tilde{R}$$

where G is the Gini coefficient of the distribution of **disposable income**.

- ▶ \tilde{W} increases in aggregate potential income \tilde{R} but decreases in inequality G in disposable income
- ▶ Notice that in both cases

$$\frac{\Delta \tilde{W}}{\tilde{W}} \Big|_{\text{Welfarist}} = \frac{\theta(G_1; \varepsilon)}{\theta(G_0; \varepsilon)} \times (1 + \tilde{\mu}) - 1,$$

so $\Delta \tilde{W} / \tilde{W} = \tilde{\mu}$ when $G_1 = G_0$ but $\Delta \tilde{W} / \tilde{W} < \tilde{\mu}$ when $G_1 > G_0$ (and the more so, the higher ε)

A Preliminary Quantitative Assessment

- ▶ Significant downward corrections to gains from trade for reasonable labor supply elasticities in Pareto case

Table 2. Costly Redistribution Correction to Welfare Effects of Trade Integration

Inequality Aversion	Pareto Correction			Lognormal Correction		
	Contribution of Trade to Inequality			Contribution of Trade to Inequality		
	$s = 5\%$	$s = 10\%$	$s = 20\%$	$s = 5\%$	$s = 10\%$	$s = 20\%$
	(1)	(2)	(3)	(4)	(5)	(6)
$\varepsilon = 0$	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
$\varepsilon = 0.1$	2.96%	2.92%	2.83%	3.00%	2.99%	2.98%
$\varepsilon = 0.25$	2.88%	2.76%	2.49%	2.99%	2.97%	2.95%
$\varepsilon = 0.5$	2.69%	2.36%	1.63%	2.97%	2.94%	2.87%
$\varepsilon = 0.75$	2.40%	1.75%	0.31%	2.94%	2.89%	2.77%
$\varepsilon = 1$	1.96%	0.84%	-1.67%	2.92%	2.83%	2.65%
$\varepsilon = 2$	-3.71%	-11.01%	-27.59%	2.75%	2.49%	1.96%

Closed Economy: Environment

- ▶ Unit measure of heterogeneous households with ability $\varphi \sim H(\varphi)$
- ▶ Each household provides its own differentiated good or task
- ▶ Linear production technology $y = \varphi \ell$
- ▶ All tasks are imperfectly substitutable and are combined into a final good according to CES aggregator with elasticity of substitution $1/(1 - \beta) > 1$
- ▶ Real market revenue of household φ is

$$r_{aut}(\varphi) = Q^{1-\beta} y(\varphi)^\beta, \quad (6)$$

where Q is the quantity of final output in the economy

- ▶ Households have utility over consumption and labor:

$$u(\varphi) = c(\varphi) - \frac{1}{\gamma} \ell(\varphi)^\gamma, \quad \gamma > 1 \quad (7)$$

where $1/(\gamma - 1)$ is the Frish elasticity of labor supply (no income effects)

Closed Economy: Taxation

- ▶ **Informational constraint:** Only household income (not household ability) is observable to the government
- ▶ Market revenue of households are taxed according to a tax schedule $T(r)$
- ▶ Households consume disposable income net of tax payments:

$$c(\varphi) = r(\varphi) - T(r(\varphi)) \quad (8)$$

- ▶ The household chooses labor input $\ell(\varphi)$ to maximize utility in (7) given $y(\varphi) = \varphi\ell(\varphi)$, the revenue function (6) and the budget constraint (8)
- ▶ We adopt the same tax schedule as in (4), so that the disposable income is given by

$$r(\varphi) - T(r(\varphi)) = kr(\varphi)^{1-\phi},$$

where k is chosen to ensure balanced government budget

$$\int T(r(\varphi))dH(\varphi) = 0$$

Equilibrium

- ▶ Distribution of disposable income (and utility) is shaped by underlying distribution of ability and by parameters β , γ and ϕ :

$$c(\varphi) \propto \varphi^{\frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}}$$

- ▶ Higher after-tax income inequality when
 - ▶ tasks are more substitutable (higher β)
 - ▶ labor supply is more elastic (lower γ)
 - ▶ taxes are less progressive (higher ϕ)
- ▶ For distributions closed under power transformations (Pareto, Lognormal, Pareto-lognormal), the distribution of disposable income will inherit that of φ , i.e., $H((\varphi))$

Social Welfare

- ▶ Individual utility levels are proportional to $\varphi \frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}$
- ▶ Suppose social preferences feature a constant degree of inequality aversion, then in the Pareto and Lognormal cases, we can write

$$\tilde{W} = \delta(G) \cdot R$$

where R is aggregate income (both market and disposable) and G is the Gini coefficient of disposable income

- ▶ In those cases, we can also write

$$R = \theta(G) \cdot \tilde{R}$$

where $\theta(G) < 1$ decreases in G , and \tilde{R} is aggregate income with zero tax progressivity (i.e., $\phi = 0$)

- ▶ Optimal degree of tax progressivity trades off reducing inequality versus tax distortions

Open Economy: Environment

- ▶ Consider a world economy with $N + 1$ symmetric countries
- ▶ Households can market their output locally or in any of the other N countries
- ▶ Trade/Offshoring involves two types of additional costs
 1. Symmetric iceberg cost τ (reduces revenue per unit shipped)
 2. Fixed cost of exporting $f(n)$ increasing in the number n of foreign markets served $f(n) = f_x n^\alpha$ (in terms of final output)
 - ▶ enhances potential inequality effects from trade
- ▶ Household sale revenue is now

$$r(\varphi) = \Upsilon_{n(\varphi)}^{1-\beta} Q^{1-\beta} y(\varphi)^\beta, \quad (9)$$

where

$$\Upsilon_{n(\varphi)} = 1 + n(\varphi) \tau^{-\frac{\beta}{1-\beta}}$$

and $y(\varphi)$ is total household output, i.e., $y(\varphi) = \varphi l(\varphi)$

Open Economy: Taxation

- ▶ Assume again that the government only observes market revenue of households and taxes according to the tax schedule $T(r)$ in (4)
 - ▶ government does not observe exporting decisions and $f(n(\varphi))$ is not tax deductible
- ▶ Disposable income or consumption is thus

$$c(\varphi) = r(\varphi) - T(r(\varphi)) - f_x n(\varphi)^\alpha. \quad (10)$$

- ▶ Households now choose labor input $\ell(\varphi)$ and market access investment $n(\varphi)$ to maximize utility (7) given the revenue function (6) and budget constraint (10)
- ▶ Given symmetry, goods market clearing imposes

$$Q = \left(\int_0^1 \tau_{n(\varphi)}^{1-\beta} y(\varphi)^\beta \right)^{1/\beta} \quad (11)$$

Trade and Inequality

- ▶ **Result:** Trade increases inequality of revenues and utilities

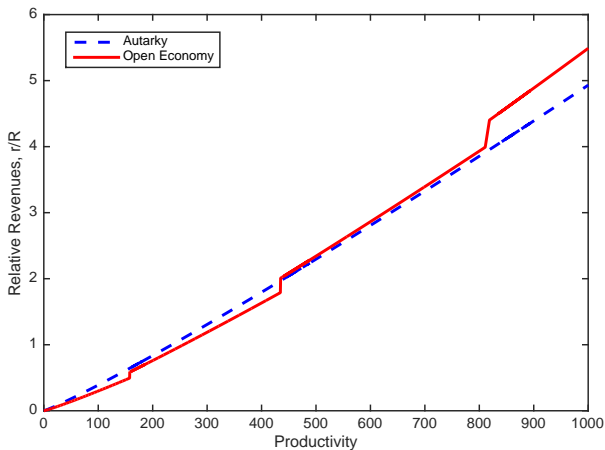
$$\frac{c(\varphi)}{Q} \propto \begin{cases} \varphi^{\frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}}, & \varphi < \varphi_{x1}, \\ \Upsilon_1^{\frac{\gamma(1-\beta)(1-\phi)}{\gamma-\beta(1-\phi)}} \varphi^{\frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}}, & \varphi < \varphi_{x2}, \\ \vdots & \vdots \\ \Upsilon_N^{\frac{\gamma(1-\beta)(1-\phi)}{\gamma-\beta(1-\phi)}} \varphi^{\frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}} & \varphi \geq \varphi_{xN} \end{cases} \quad \Upsilon_n = 1 + n\tau^{-\frac{\beta}{1-\beta}}$$

- ▶ **Two limiting cases:**
 - ▶ no agent exports ($\varphi_{x1} \rightarrow \infty$)
 - ▶ all agents export ($\varphi_{xN} \rightarrow \varphi_{\min}$)

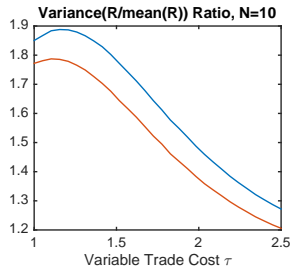
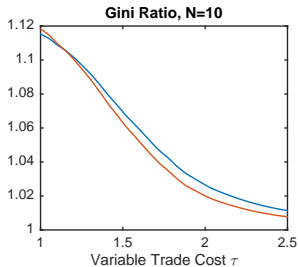
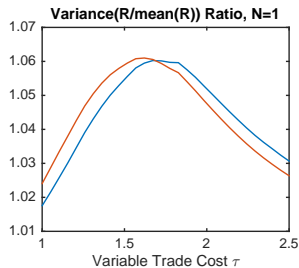
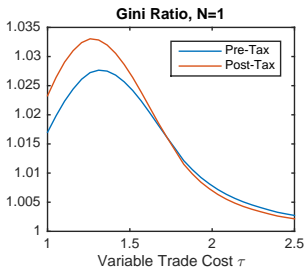
$$\frac{c(\varphi)}{Q} = \frac{c_{\text{aut}}(\varphi)}{Q_{\text{aut}}} \propto \varphi^{\frac{\gamma\beta(1-\phi)}{\gamma-\beta(1-\phi)}}$$

Trade and Inequality (cont.)

- ▶ Trade increases sale revenue of high-ability households but reduces that of low-ability households

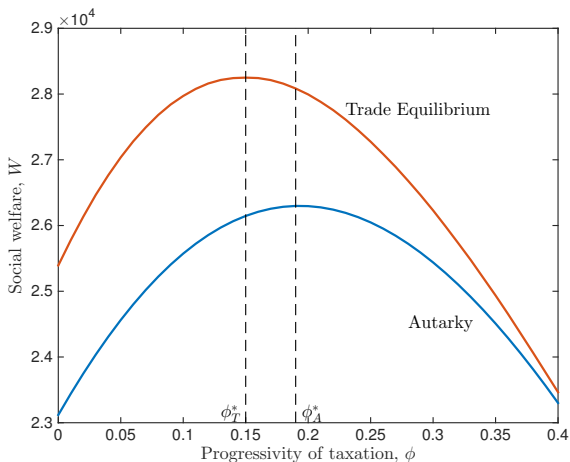


Trade and Inequality (cont.)



Optimal Degree of Progressivity

- ▶ Despite increased inequality, optimal degree of inequality typically goes down with trade (Itskhoki, 2008)



Calibration and Counterfactuals: Road Map

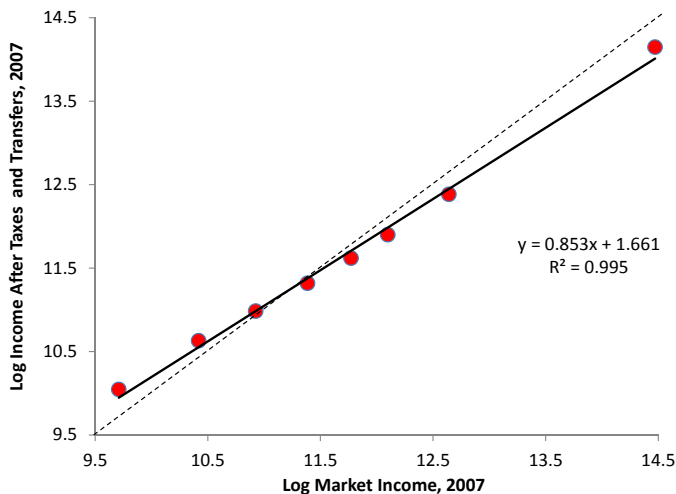
- ▶ We first calibrate the model to 2007 U.S. data (trade share, income distribution, tax progressivity)
- ▶ We then explore the implication of a move to autarky on
 1. Aggregate Income
 2. Income Inequality
- ▶ We use the model to gauge the quantitative importance of the two corrections developed above
 1. How large are the gains from trade for different degrees of inequality aversion?
 2. How large would the gains from trade be in the absence of costly redistribution (i.e., $\phi = 0$)?

Calibration

- ▶ Hold the following parameters fixed
 1. Elasticity of substitution = 4 ($\beta = 3/4$)
 - ▶ BEJK (2003), Broda and Weinstein (2006), Antràs, Fort and Tintelnot (2014)
 2. Iceberg trade costs ($\tau = 1.83$)
 - ▶ Melitz and Redding (2014), Anderson and Van Wincoop (2004)
 3. Number of countries ($N = 10$)
 - ▶ U.S. roughly 15% of world manufacturing output; results not too sensitive to N above 5
- ▶ Set baseline fixed cost f_x to match a U.S. trade share of 0.14
- ▶ Set convexity of fixed costs to either $\alpha = 1$ or $\alpha = 3$ (consistent with preliminary estimates exploiting cross-section of U.S. exports)
- ▶ Labor supply elasticity: experiment with various values for γ between $\gamma = 10000$ (or $\varepsilon \simeq 0$) and $\gamma = 5/3$ (or $\varepsilon = 1.5$)
 - ▶ hotly debated parameter in the literature

Calibration: Progressivity

- Note from (4) that $\ln r^d = \ln k + (1 - \phi) \ln r(\varphi) \implies \phi = 0.147$

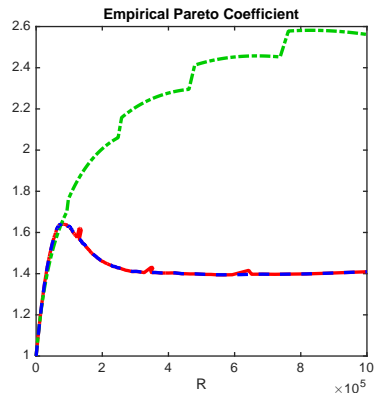
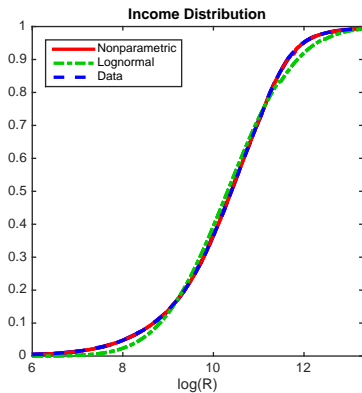


Calibration: Distribution of Ability

- ▶ Use 2007 U.S. Individual Income Tax Public Use Sample
 - ▶ approximately 2.5 million anonymized tax returns
 - ▶ use NBER weights to ensure this is a representative sample
 - ▶ we map market income to adjusted gross income in line 37 of IRS Form 1040
 - ▶ we work with a sample of roughly 140,000 returns
- ▶ We follow two types of approaches:
 1. Nonparametric approach: given other parameter values, one can recover the φ 's from the observed distribution of adjusted gross income
 2. Parametric approach: assume that $\varphi \sim \text{LogNormal}(\mu, \sigma)$ and calibrate μ and σ to match the mean and the Gini coefficient of adjusted gross income

Parametric vs. Non-Parametric Approach

- Lognormal provides a reasonably good approximation, but it does a poor fit for the right-tail of the distribution, which looks Pareto



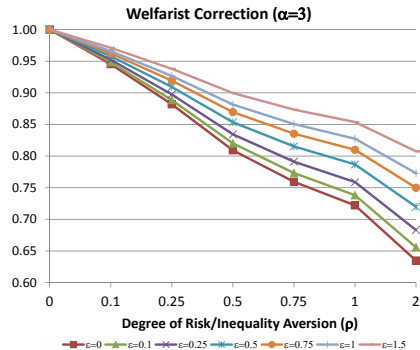
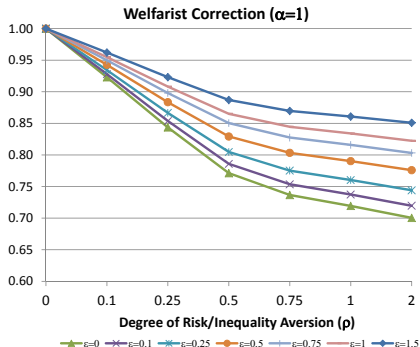
Calibrated Welfare Gains from Trade and Inequality

- ▶ Calibrated welfare gains from trade are higher, the higher is the labor supply elasticity ε (Arkolakis and Esposito, 2014)
- ▶ But relative to autarky trade induces more inequality when ε is high

Labor supply elasticity	Gains from Trade		Increase in Gini Coefficient	
	$\alpha = 1$	$\alpha = 3$	$\alpha = 1$	$\alpha = 3$
$\varepsilon = 0$	4.86%	4.02%	2.31%	1.70%
$\varepsilon = 0.1$	5.52%	4.54%	2.44%	1.81%
$\varepsilon = 0.25$	6.54%	5.36%	2.64%	1.95%
$\varepsilon = 0.5$	8.31%	6.77%	2.92%	2.17%
$\varepsilon = 0.75$	10.40%	8.32%	3.16%	2.35%
$\varepsilon = 1$	12.41%	9.89%	3.36%	2.51%
$\varepsilon = 1.5$	16.72%	13.21%	3.72%	2.78%

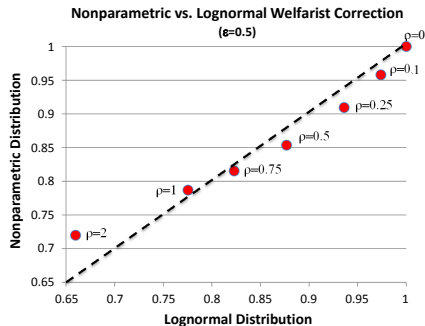
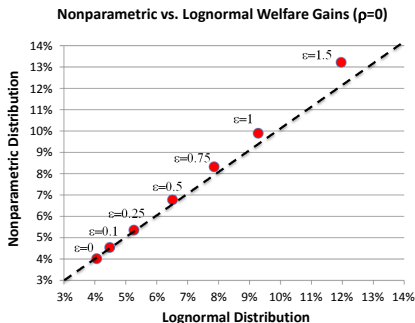
Welfarist Correction

- Welfarist correction is higher, the higher is risk/inequality aversion ρ and the lower is the labor supply elasticity ε
- With log utility ($\rho = 1$) and a labor supply elasticity of $\varepsilon = 0.5$, welfare gains are 21% lower for both $\alpha = 1$ and $\alpha = 3$



Nonparametric versus Lognormal Case

- ▶ Lognormal underpredicts uncorrected welfare gains, especially for high ε (underpredicts the behavior of the right tail)
- ▶ Lognormal overpredicts welfarist correction for high ρ , underpredicts it for low ρ

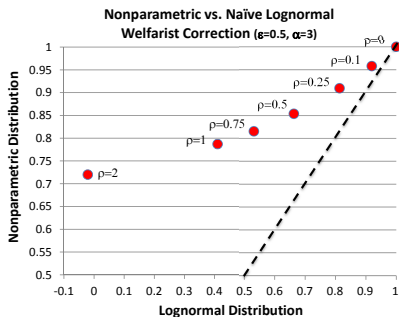


Nonparametric versus Naïve Lognormal Case

- Suppose instead that one used the counterfactuals to compute (under trade and autarky):

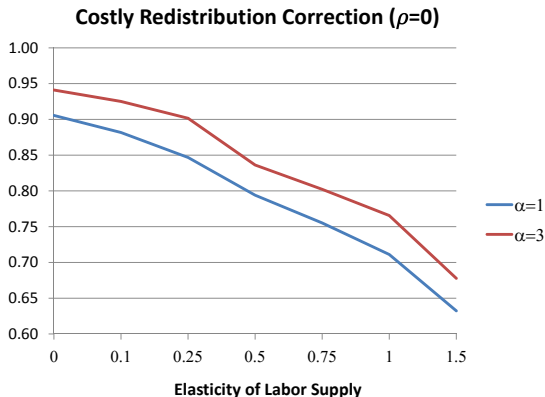
$$\tilde{W} \Big|_{\text{Welfarist}} = \exp \left\{ -\rho \left[\Phi^{-1} \left((1 + G_1) / 2 \right) \right]^2 \right\} R$$

ρ	0	0.1	0.25	0.5	0.75	1	2
$\Delta \tilde{W} / \tilde{W}$	6.77%	6.23%	5.51%	4.49%	3.60%	2.78%	-0.14%



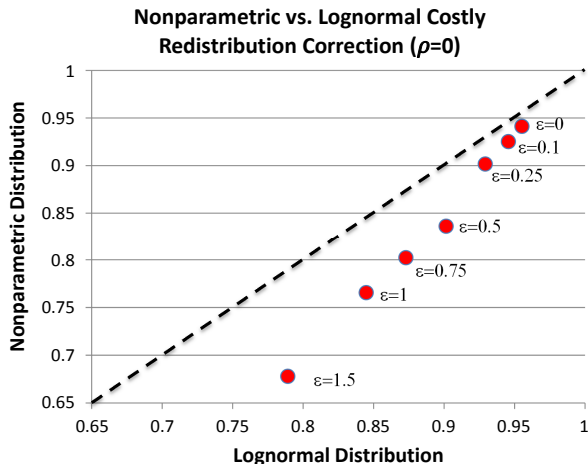
Costly Redistribution Correction

- ▶ Costly redistribution correction is higher, the higher is the labor supply elasticity ε
- ▶ When $\varepsilon = 0.5$, welfare gains are 21% lower for $\alpha = 1$ and 16% lower for $\alpha = 3$



Nonparametric versus Lognormal Case

- Lognormal **underpredicts** costly redistribution correction, especially for high ε (underpredicts the behavior of the right tail)

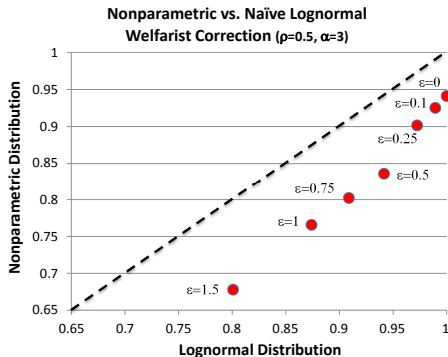


Nonparametric versus Nave Lognormal Case

- Suppose instead that one used the counterfactuals to compute (under trade and autarky):

$$\tilde{W}|_{\text{Costly}} = \exp \left\{ - \left[\Phi^{-1} \left((1 + G_1) / 2 \right) \right]^2 \phi^2 \varepsilon (\varepsilon + 1) / (1 - \phi)^2 \right\} \tilde{R}$$

- Back-of-the-envelope formula significantly **underpredicts** correction

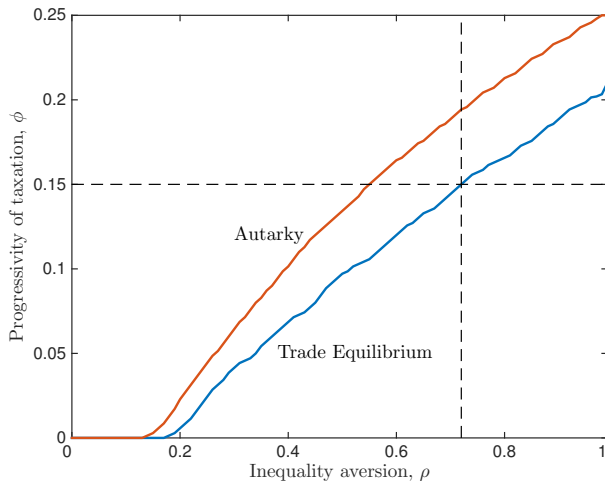


Corrections Do Not Compund

- ▶ Assume $\varepsilon = 0.5$ and $\alpha = 3$ so both corrections reduce welfare gains by 21%
- ▶ Does this imply an overall reduction of 37.6% ($= 1 - 0.79^2$) in the welfare gains?
- ▶ Not if one evaluates the welfare gains under the same social welfare function (same ρ)!
- ▶ For $\rho = 0$, the overall correction is clearly 21%
- ▶ For $\rho > 0$, the welfarist correction kicks in, but the costly redistribution correction is diminished
- ▶ An inequality averse social planner is more likely to tolerate costly redistribution to compensate for trade-induced inequality
- ▶ For high enough ρ , 'welfarist' gains from trade strictly higher with costly redistribution than without it

Optimal Progressivity and Implied Inequality Aversion

- ▶ The observed degree of progressivity in 2007 is optimal if ρ is around 0.7



Conclusions

- ▶ Trade-induced inequality is partly mitigated via a progressive income tax/transfer system
- ▶ Still, compensation is not full so trade induces an increase in the distribution of disposable income
 - ▶ Is it so clear that the Kaldor-Hicks principle is free of value judgements in that case?
- ▶ Income taxation induces behavioral responses that affect the aggregate income response to trade integration
 - ▶ Shouldn't the Kaldor-Hicks principle adjust for this “leaky bucket” effect?
- ▶ In this paper, we have developed welfarist and costly redistribution corrections to standard measures of the gains from trade integration
- ▶ Under plausible parameter values, these corrections are nonnegligible and eliminate about one-fifth of the (static) gains from trade