The True Cost of War:
Conflict in Eastern Ukraine 2014-2019

Development Research Group
World Bank

Based on Artuc, Gomez-Parra and Onder (2022)
What is the impact of conflict on welfare?

- Conflicts have heavy toll on people
- Difficult to account for non-monetary aspects
  - Deaths, sexual violence, erosion of social trust, institutional degradation
- GDP and other economic measures are inaccurate
- We need creative methods to measure the impact
  - Can we use data on outmigation from conflict areas?
  - Artuc, Gomez-Parra and Onder (2022) makes some progress
Measure impact of conflict in data-constrained environments?

Building on experience and data from previous policy work

- Donbas: Donetskyi vuhilnyi basein (Donetsk & Luhansk)
- Center of Ukraine’s declining mining industry
- Conflict started in 2014
- Separatists took control of eastern regions
Basic economic intuition: migration elasticity

Impact of income change in on migration outflows

- Ukraine 2008-2012
- Instrumental variables
- 10% increase in income in an oblast, reduces outflows by 6%
- Elasticity = 0.6 (roughly)
Back out welfare change from migration outflows

**Invert the mapping from income to migration**

- Assume migration probability \( \uparrow \) by 700%
- What does it say about welfare?
- Flipping the graph provides a sufficient statistics
Calculating welfare from migration outflows

• A well-established concept, but not well-understood
  • Labor: Artuc, Chaudhuri and McLaren (2010)
  • Trade: Arkolakis, Costinot and Rodriguez-Clare (2012)

• Very general with only few assumptions (not a black box!)
  • Static or dynamic, agnostic about expectation formation, risk-averse or risk-neutral, different time preferences, etc.

• A framework that generalizes popular discrete choice setups
  • Static: Eaton and Kortum (2002), Redding (2016), Ghose (2022)
  • Dynamic: Caliendo, Dvorkin and Parro (2019), and many others

Donetsk

Kyiv City

Chernihiv

Lviv

Poland
Average 7x ↑ in outflows → Very large ↓ in utility $U_{Donetsk}$

To make the residents equally worse off, what would be the equivalent reduction in income?
Results

• Similar numbers for Donetsk and Luhansk, precisely estimated
• Ukraine-wide impact unaccounted: Numbers are lower bounds
• Equivalent impact depends on the structure of utility function

• Amortized as a ten-year loss
  • Risk-averse \([\sigma = 1]\) \(\rightarrow\) Donetsk loss: 31% to 40%
  • Risk-neutral \([\sigma = 0]\) \(\rightarrow\) Donetsk loss: 28% to 38%

• Calculated as a life-time loss
  • Risk-averse \([\sigma = 1]\) \(\rightarrow\) Donetsk loss: 9% to 8%
  • Risk-neutral \([\sigma = 0]\) \(\rightarrow\) Donetsk loss: 7% to 25%
Conclusion

• Welfare impact of conflict can be estimated from migration outflows

• Requirements:
  • Proper estimation of the elasticity governing parameter
  • Migration outflow data *before* and *after* the shock

• The conflict in Eastern Ukraine pre-2022 invasion significantly reduced welfare of Donbas residents:
  • Lower-bound estimates suggest welfare reduction equivalent to about 7% to 25% life-time income loss
Extra Slides
Extra Slides

(a) Real GRP per capita

(b) Population
(c) Migration inflows
(of destination population)

(d) Migration outflows
(of source population)
Table 1: Estimates for migration elasticity parameter ($\theta$)

<table>
<thead>
<tr>
<th></th>
<th>$\beta = 0.97$</th>
<th>$\beta = 0.90$</th>
<th>$\beta = 0$</th>
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</thead>
<tbody>
<tr>
<td>$\sigma = 0$</td>
<td>0.682</td>
<td>0.667</td>
<td>0.479</td>
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<tr>
<td></td>
<td>(0.053)</td>
<td>(0.063)</td>
<td>(0.197)</td>
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<tr>
<td>$\sigma = 1$</td>
<td>0.612</td>
<td>0.601</td>
<td>0.458</td>
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<tr>
<td></td>
<td>(0.027)</td>
<td>(0.035)</td>
<td>(0.162)</td>
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Table 2: The estimated welfare impact of the conflict by region

<table>
<thead>
<tr>
<th></th>
<th>$\sigma = 0$</th>
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<tbody>
<tr>
<td></td>
<td>Donetsk</td>
<td>Luhansk</td>
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<tr>
<td>$\beta = 0.97$</td>
<td>-2.91</td>
<td>-2.60</td>
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<td>(0.15)</td>
<td>(0.29)</td>
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<tr>
<td>$\beta = 0.90$</td>
<td>-2.97</td>
<td>-2.66</td>
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<tr>
<td></td>
<td>(0.15)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>$\beta = 0$</td>
<td>-4.14</td>
<td>-3.70</td>
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<tr>
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<td>(0.21)</td>
<td>(0.41)</td>
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Table 3: Income equivalent of the welfare loss, percent

<table>
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<th>$T = 1$</th>
<th>$T = 10$</th>
<th>$T = \infty$</th>
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<td>Donetsk</td>
<td>Luhansk</td>
<td>Donetsk</td>
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<tr>
<td>$\sigma = 0$</td>
<td>[\beta = 0.97]</td>
<td>-242.61</td>
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<td>(11.93)</td>
<td>(27.07)</td>
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<td>[\beta = 0.90]</td>
<td>-247.92</td>
<td>-250.79</td>
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<td>(12.20)</td>
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<td>[\beta = 0]</td>
<td>-345.22</td>
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<td>(16.98)</td>
<td>(38.52)</td>
</tr>
<tr>
<td>$\sigma = 1$</td>
<td>[\beta = 0.97]</td>
<td>-96.08</td>
<td>-94.48</td>
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<td>(0.62)</td>
<td>(1.69)</td>
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<td>[\beta = 0.90]</td>
<td>-96.31</td>
<td>-94.77</td>
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<td>(0.59)</td>
<td>(1.63)</td>
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<tr>
<td></td>
<td>[\beta = 0]</td>
<td>-98.69</td>
<td>-97.93</td>
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<td>(0.28)</td>
<td>(0.86)</td>
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