The Intergenerational Effects of Economic Sanctions
Online Appendix: Model

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In this online appendix, I present the calculations of the model which I left out of the main text.

1 Appendix: Model

The model used in this paper identifies the channels through which sanctions affect children's education. People live for two periods. In period one, parents work, consume, save, and decide how much money to spend on their children's education. Households receive utility from consuming goods and children's human capital:

$$U = u(c, c') + h(HC)$$

where c and c' are the first period and second period household's consumption, respectively. Children's human capital (HC) is determined by quantity (Edu) and quality ($QEdu$) of education. Parents expect that their investment in children's education will have payoffs in terms of higher income later for their children. Parents may value children's education for a number of reasons. First, in the second period, they depend on their children and highly educated children will be better providers. I assume parents receive μ percent of their children's income in the second period. Second, the happiness of children may make parents happier ($h(HC)$), so they have an incentive to spend money on children's education. The cost of schooling for a family is $exp(Edu, QEdu, \theta)$, where θ is children's ability which is transmitted from parents. Parents' ability reflects in their income. Thus, this model allows for heterogeneity among households. A low quality education is provided by the government which is costless for parents. Low educated workers receive w^u and return to education for any additional year of schooling is w^e and to any additional spending on schooling is w^q. The household maximization problem with income y is choosing consumption (c and c') and children's education (Edu and $QEdu$) subject to:

$$c + exp(Edu, QEdu, \theta) + s \leq y$$
$$c' = \mu[w^u + w^e(1 + w^q QEdu)Edu] + s$$

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where s is household saving in period one ($s \geq 0$). Therefore, the cost of investment in children's education is lower consumption in the first period. If parent's income and/or return to education are high enough, parents would like to spend on their children's education.

First order conditions of the households optimization problem are:

$$
\begin{aligned}
&u_c = \lambda \\
&u_{c'} = \mu \\
&h_E = \lambda exp_E - \mu w^e - \mu w^e w^q QEdu \\
&h_Q = \lambda exp_Q - \mu w^e w^q Edu \\
&c + exp + s = y \\
&c' = w^u + w^e Edu + w^e w^q Edu\ QEdu + s
\end{aligned}
$$

Thus, total derivatives are:

$$
\begin{aligned}
&u_{cc}dc + u_{cc'}dc' = d\lambda \\
&u_{cc'}dc + u_{c'c'}dc' = d\mu \\
&h_{EE}dE + h_{EQ}dQ = \lambda dexp_E + exp_E d\lambda - w^e d\mu - \mu w^e w^q dQ - \mu w^e\ QEdu\ dw^q \\
&-\mu(1 + w^q\ QEdu)dw^e - w^e w^q\ QEdu\ d\mu \\
&h_{EQ}dE + h_{QQ}dQ = \lambda dexp_Q + exp_Q d\lambda - \mu w^e w^q dE - \mu w^e\ Edu\ dw^q - \mu w^q\ Edu dw^e - w^e w^q\ Edu\ d\mu \\
&dc + dexp_E + dexp_Q + ds = dy \\
&dc' = dw^u + w^e dE + Edu dw^e + w^e w^q Edu\ dQ + w^e w^q\ QEdu\ dE + w^e Edu\ QEdu\ dw^q + w^e Edu\ QEdu\ dw^q + ds
\end{aligned}
$$

Or:

$$
A \begin{bmatrix} dc \\ dc' \\ d\lambda \\ d\mu \\ dEdu \\ dQEdu \\ ds \end{bmatrix} = \begin{bmatrix} dy \\ dw^u \\ dw^e \\ dw^q \end{bmatrix}
$$

where A is a the coefficient matrix.

$$
\begin{aligned}
dEdu &= constant + f_y(.)dy + f_e(.)dw^e + f_q(.)dw^q + f_u(.)dw^u \\
dQEdu &= constant + g_y(.)dy + g_e(.)dw^e + g_q(.)dw^q + g_u(.)dw^u
\end{aligned}
$$

Amusing u and h are strictly concave functions, $g_u, f_u < 0$ and sign of f_y, f_e, f_q, g_y, g_e, and g_q are positive.

Labor income shocks caused by sanctions may affect family income (y) and/or return to education (w^e, w^q) and thus discourage parents from investing in children's education. However, sanctions also decease wage rates for low educated workers (w^u). Thus, the incentive to invest in education can increase after the sanctions.