

The Birthweight Gains from Trade: Chinese Imports and Infant Health in Sub-Saharan Africa[§]

Jorge M. Agüero & Patralekha Ukil

April 2022

Abstract

A growing number of papers has focused on the impact of Chinese manufacturing imports in developed economies such as the United States and western Europe. However, less is known about the impact on developing economies, especially in the context of Sub-Saharan Africa, even though the magnitude of China-Africa bilateral trade has increased by almost 10 times since the early 2000s. Unlike advanced economies, Chinese imports to Africa are taking place at the time when the region is yet to experience a structural transformation away from agriculture and has an incipient manufacturing sector. Thus, the increased trade with China could have differential impacts on health outcomes compared to negative effects observed in advanced economies. We find evidence supporting this claim using a sample of over 350,000 births from 25 countries in Sub-Saharan Africa. Our identification strategy relies on the comparison of siblings from the same mother who were born at different levels of Chinese imports to their country. We find that increased exposure to Chinese imports led to large gains in birthweight. This finding is robust to several specifications and is mainly driven from improvements among children born to less-educated mothers.

Keywords: Infant Health; Birthweight; Trade Exposure; Chinese Imports; Sub-Saharan Africa

JEL Codes: F14, F16, F61, I15, J13, O15

[§] Contact information: Agüero, Dept. of Economics and El Instituto, University of Connecticut, 365 Fairfield Way Unit 1063, Storrs, CT 06269; Email: jorge.aguero@uconn.edu. Ukil, Dept. of Economics, San José State University, One Washington Square, San José, CA 95192; Email: patralekha.ukil@sjsu.edu. We thank comments and suggestions received at the Eastern Economic Association, Southern Economic Association as well as seminars at the University of Connecticut and Universidad del Pacífico.

1. Introduction

The impact of international trade on economic development has been a long-standing topic in the economics literature. Theory predicts that international trade expands the production possibility frontier of an economy: increasing exports to other nations provide access to larger markets and a diverse base of consumers, while imports increase domestic access to cheaper goods, in terms of both final and intermediate goods (Hausman and Leibtag, 2007; Basker, 2007). However, the benefits of increased trade do not necessarily reach all of the citizens equally, which could lead to an increase in income inequality within the country (Mayda and Rodrik, 2001; Weissman, 2003). On the policy side, many governments have restricted international trade and adopted protectionist domestic trade policies. Major reasons for such policies have ranged from the idea that rising imports dislocate local production and harm local workers (Autor et al., 2013), negatively impact countries that export primary goods as discussed in the Prebisch-Singer hypothesis and could potentially lead to premature deindustrialization (Rodrik, 2016). Thus, understanding whether the possible negative effect of trade for developing countries, such as premature deindustrialization and the displacement of local production, could be mitigated in the long run is an important research question.

In this paper, we address this question by examining the role of international trade on human capital formation. Specifically, we focus on the impact of Chinese imports on infant health outcomes in sub-Saharan African countries. The impact of Chinese trade on the rest of the world has received a large amount of attention, but mainly centered on the role on labor markets and outcomes in the United States and European countries (e.g., Autor et al. 2013; Autor et al. 2016; Bloom et al. 2016; Pierce and Schott, 2020). Yet, the impact of Chinese imports in sub-Saharan African countries has received little attention. This is despite the large increase in the China-Africa

bilateral trade (grown by almost 10 times since China's entry into WTO in 2001) and Africa's lower levels of economic development. The latter implies that the impact of Chinese imports could be different compared to the negative impact observed in more advanced nations given that countries in Sub-Saharan Africa have yet to experience a structural transformation away from agriculture and into manufacturing sector (Barrett et al, 2017). Chinese imports into sub-Saharan African countries could arguably face less local competition. As a result, the displacement impacts on the local production could be lower, at least in the short run, and the gains from access to cheaper imported goods could be higher for families and favor human capital accumulation.

We find evidence of a positive impact of Chinese imports on health outcomes of children. We focus on birthweight as our outcome of interest. This is an infant health outcome that has significant, long-lasting consequences on both child and adult life outcomes (e.g., Cooper and Sandler, 1997; Black, Devereux and Salvanes, 2007; Bharadwaj et al. 2018). Our analysis uses data from 25 countries in sub-Saharan Africa leading to a sample of over 350,000 birth records. Our identification strategy uses mother fixed effects, which compares siblings born to the same mother but exposed to different levels of Chinese trade into the country. This approach allows us to account for the unobserved heterogeneity among the mothers in the data. As such, our identification strategy does not rely on the typical Bartik-type instruments that are often used in the literature and thus we avoid the recent criticisms leveled against such instruments (Borusyak, Hull, and Jaravel, 2018; Goldsmith-Pinkham, Sorkin and Swift, 2019; Adao, Kolesar, and Morales, 2019).

The main results show that an increase in Chinese imports of \$100 (constant USD) is associated with an increase in birthweight by almost 14 grams. These findings are comparable to the losses generated by stress due to bombs (Camacho, 2008), conflict (Mansour and Rees, 2012)

and recessions (Bozzoli and Quintana-Domeque, 2014). Our results are robust to adjusting for purchasing power parity, but also to the use of an additional source of trade data.

Our findings remain robust to even after accounting for the demand-driven components of trade that may not be fully captured by our mother fixed effects methodology. First, we control for secular trends, thus capturing sibling-year variations in trade separating from the trend. Second, we control for the GDP per capita with the intention of accounting for the primary component of any demand-driven trade shocks. Third, we further account for demand-driven components of trade by looking at non-Chinese imports into these sub-Saharan African countries. We also discuss how our identification strategy is also unaffected by the criticisms against the literature surrounding selection into identification (Miller, Shenhav, Grosz, 2019) and by the possible heaping in birthweight data. Furthermore, we also provide a wider external validity to our findings by using data from 25 countries in sub-Saharan Africa.

Our work contributes to several strands of the literature. First, our focus on Africa expands prior work who has mainly documented a negative impact of Chinese imports on labor market and human capital outcomes. For example, Autor et al. (2013) find negative impacts of increasing Chinese import penetration on U.S. local labor markets leading to reduced wages, lower labor force participation, and higher unemployment. Autor et al. (2016) find that workers exposed to higher import competition experience increased job churning and lower lifetime earnings. More recently, work has shown that these imports have led to worsening health outcomes in the United States. This includes declines in infant health (Ukil, 2019), adults' health and mental health impacts (Lang et al., 2019) and fatal drug overdose (Pierce and Schott, 2020). Our results of a positive effect of Chinese imports on infant health for poorer countries speaks to the importance

of initial conditions and structure of the economy when considering the impact of trade on economic development.

Our paper is also related to the work on health outcomes of country-wide shocks such as international price shocks (Loken, Mogstad, and Wiswall, 2012); Adhvaryu et al., 2019), tariffs (Mocan et al., 2015), business cycle fluctuations (Dehejia and Lleras-Muney, 2004; Page, Schaller and Simon (2019) on health outcomes. We expand this strand of the literature by focus on an alternative aggregate shock stemming from rising Chinese imports. We differentiate from these papers by using data from 25 Sub-Saharan African countries and expanding the external validity of or analysis.

Finally, we also contribute to the general literature on trade and economic growth and development. Erten et al. (2019) investigate the causal effect of tariff reforms in South Africa on labor market outcomes, and find that workers in those districts that faced higher reductions also experienced a significant decline in both informal and formal employment in the tradable sector. Artuc et al (2019) study the impact of trade reforms on households in low-income and middle-income countries and find that the unilateral elimination of tariffs on agriculture would increase household income by 2.5 percentage points. Panda (2020) finds that the non-reciprocal trade agreement, the African Growth and Opportunity Act, signed by sub-Saharan African countries largely reduced infant mortality and effect was stronger for nations that exported large amounts of agricultural goods and mineral ores, compared to those that exported oil. McMillan and McCaig (2019) study the impact of domestic trade liberalization on labor markets in Botswana, and find that trade liberalization did not impact the relative size of industries in terms of employment but had impacts within industries, resulting in an increase in the prevalence of informal employment and self-employment. These studies have mainly focused on the impact of increasing exports from

developing countries, often as a result of increased liberalization and the outward orientation of such countries. On the other hand, we study the effect increasing trade in the opposite direction, i.e., rising exports from China to several developing countries.

The rest of the paper is organized as follows. Section 2 describes the empirical methodology and the data respectively while section 3 presents and discusses the main results as well as the robustness checks. Heterogeneity analyses are shown in section 4 and section 5 concludes the paper.

2. Data and Empirical Methodology

We use micro-data from Demographic and Health Surveys Program (DHS) which are standardized and nationally representative household surveys on women aged 15 to 49 in developing countries. The sample used in our analyses consist of over 350000 birth records from 25 countries in sub-Saharan Africa.

The main outcome of interest that we focus on is birthweight in grams. This data is available only for children aged under five at the time the survey was conducted in the DHS database. We have children born between 1992 and 2017 in our sample. Maternal controls in our model include years of schooling, marital status, religion and a dummy variable for urban location of residence. Child controls include gender of the child and dummy variables for multiple birth and the birth order.

The trade data come from the United Nations Comtrade Database, where data on Chinese imports to different countries are available at the detailed six-digit Harmonized System (HS) product level. We conduct additional analysis using international trade data from the International

Monetary Fund and find our results to be robust to this. We also provide analyses using both trade data in constant USD and purchasing power parity (PPP) as a robustness check to account for the different living standards in these sub-Saharan African countries.

Our empirical strategy uses mother fixed-effects in order to account for unmeasured heterogeneity among the mothers in our sample. Specifically, in order to account for self-selection into giving birth during different time periods, we compare birth outcomes of siblings who were born to the same mother but at different levels of Chinese imports to their country. By following this strategy, we hold constant unobserved characteristics at the level of the country, the mother and the family and are comparing per-capita imports pertaining to the birth year.

Our estimating equation is as follows:

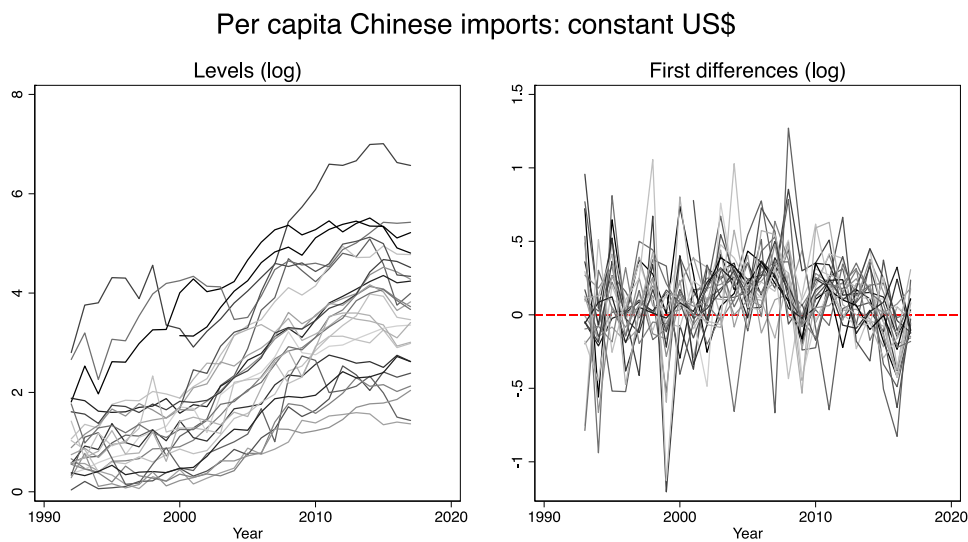
$$Y_{ijtc} = \alpha + \beta PCI_{ijtc} + \gamma X'_{ijtc} + v_j + \theta_t + \rho_c + \varepsilon_{ijtc}; \quad (1)$$

where Y_{ijtc} refers to the birthweight outcome for child i born to mother j in year t in country c ; PCI stands for per-capita imports corresponding and X refers to the vector of child (gender, birth order, multiple birth) and maternal controls (education, religion, urban or rural location, marital status). The equation also includes child birth-year fixed effect (θ_t) and country fixed-effect (ρ_c) in addition to the mother fixed-effect (v_j). β is our coefficient of interest and would be positive if imports increase birth weight. We cluster standard errors at the mother level (de Chaisemartin and Jaime Ramirez-Cuellar, 2020) and as a robustness check we also cluster at the level of the country, without affecting our findings.

For our empirical strategy to work, we require considerable variation in the level of imports to the different sub-Saharan African countries across the years of birth of children, and not simply an

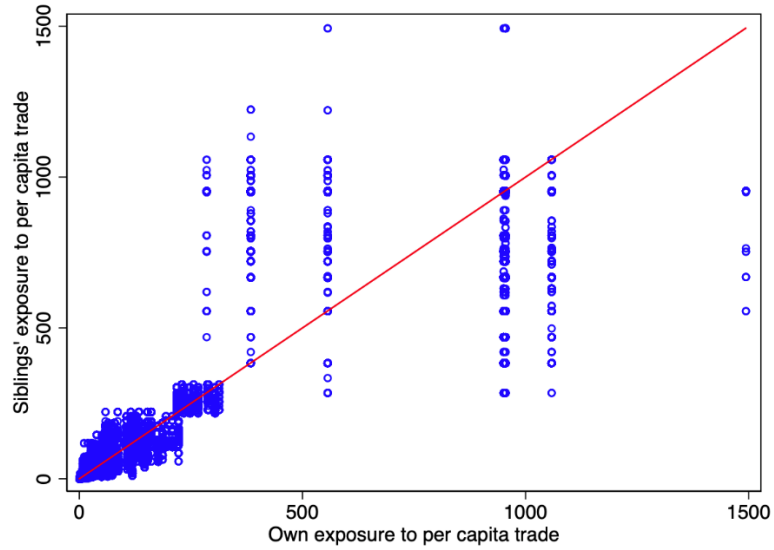
increasing level of imports across time. Our data supports this requirement when we look at the first difference of per-capita Chinese imports by year, as shown in Figure 1 below:

Figure 1: Trends in Chinese imports to African countries



Now, in models using the mother fixed-effects identification, there has been a recent criticism that the identifying samples in such papers may not be representative especially when the treatment is binary or when there is a very small variation in the treatment (Miller et al. 2019). This criticism is not binding for us because our treatment is continuous as opposed to being a binary variable, and most importantly, in our data, the “switchers” are truly representative of the overall sample of families with two or more children: we find that only 56 children live in non-switcher households out of 142,901 children with siblings. Furthermore, we find considerable variation in the treatment across the siblings in our overall sample, as can be seen in Figure 2 below:

Figure 2: Variation in treatment across siblings



It is possible that our estimating equation will not fully capture any potential time-varying unobservable changes at the mother or the household level occurring at different levels of Chinese imports to these countries, stemming from demand-driven shocks internal to these countries. To isolate such demand shocks, we extend equation (1) in three ways. First, we add country-specific time trends. Second, we include further controls for the GDP per capita in different ways: linear, quadratic and cubic polynomials. Third, we compare the effect from Chinese imports vis-à-vis imports from the rest of the world. That is, we control for non-Chinese imports to these sub-Saharan African countries in order to further capture and control for the demand-driven components of trade.

3. Results

3.1. Main Results

The main results of the analysis are shown in Table 1. In column (1), we show that an increase in Chinese imports by \$100 (constant USD) increases birthweight by almost 16.1 grams when we consider the overall sample of births, without including mother characteristics and ignoring also fixed effects for the mother. When controls for mothers' characteristics are included, column 2, the results remained unaltered. These variables include her years of schooling of the mother, her religion, her marital status and whether or not she lives in an urban location.

Table 1. Birthweight and Chinese imports
(dependent variable: birthweight in grams)

	(1)	(2)	(3)	(4)
	All	All	2+	2+
Per-capita trade (const. USD)	0.161*** [0.024]	0.165*** [0.024]	0.199*** [0.034]	0.137*** [0.043]
Child controls	Yes	Yes	Yes	Yes
Mother controls	No	Yes	Yes	Yes
adj. R^2	0.052	0.053	0.050	0.373
Mother FE	No	No	No	Yes
Mean dep var	3221	3221	3247	3247
N	350376	350376	142901	142901

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Yet, these results cannot be taken as causal because there could unobserved features that influence at the same time, a child's birth weight and her exposure to different levels of exports. Using a mother-fixed effect model we can account for such possibility. However, the source of variation comes from families with at least two children. So, in column 3, we restrict the same to such a group and find that our estimates remain. Our preferred specification is in column (4) where we include the mother fixed effect and we find that an increase in Chinese imports by \$100

(constant USD) increases birthweight by almost 14 grams. This finding is statically significant at the one percent level.

3.2. Robustness Checks:

As the first robustness check, in Table 2, we use import data that has been adjusted for purchasing power parity, instead of using import data in constant USD, since we have a wide range of countries with varying standards of living and economic productivity. We find that our results are robust to this modification. In our preferred specification in column (4), we find that an increase in Chinese imports by \$100 (PPP-adjusted) increases birthweight by almost 10 grams, with fixed effects for the mother, the year-of-birth, the country and including the full set of child and maternal controls.

Table 2. Birthweight and Chinese imports, using PPP data
(dependent variable: birthweight in grams)

	(1)	(2)	(3)	(4)
	All	All	2+	2+
Per-capita trade (PPP)	0.129*** [0.019]	0.131*** [0.019]	0.155*** [0.026]	0.102*** [0.033]
Child controls	Yes	Yes	Yes	Yes
Mother controls	No	Yes	Yes	Yes
adj. R^2	0.053	0.054	0.051	0.374
Mother FE	No	No	No	Yes
Mean dep var	3221	3221	3246	3246
N	331818	331818	135767	135767

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The estimates shown so far could be confounded by the presence of time-varying unobservable characteristics at the country level driven by the varying levels of demand shocks. We attempt to isolate these demand-driven shocks to the countries in the three ways. First, in Table 3, we consider alternative global trends and add different country-specific time trends to our main

specification with the mother fixed effects (Baird et al., 2011). We find that our results are mainly robust to the inclusion to these time trends.

Table 3. Adding country-specific trends
(dependent variable: birthweight in grams)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Per-capita trade (const. USD)	0.137*** [0.042]	0.072** [0.036]	0.089** [0.037]	0.034 [0.066]	-0.009 [0.058]	0.204** [0.099]	0.210** [0.087]
Global trend	FE	Linear	Quad	FE	Linear	FE	Linear
Country specific trend	No	No	No	Linear	Linear	Quad	Quad
Mother FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	142901	142901	142901	142901	142901	142901	142901

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Second, as shown in Table 4, we include flexible controls for the countries' GDP-per capita (using different polynomials) in our mother fixed effects specification. This allows us to control for the main components of demand-driven shocks to trade. We find our results to be robust to all of these additions, and we have no erosion of our estimates.

Table 4. Accounting for demand shocks using GDP per capita
(dependent variable: birthweight in grams)

	(1)	(2)	(3)	(4)
Per-capita trade (const. USD)	0.1355*** [0.0426]	0.1241*** [0.0432]	0.1243*** [0.0432]	0.1430*** [0.0440]
GDP pc	No	Yes	Yes	Yes
GDP pc squared	No	No	Yes	Yes
GDP pc cubic	No	No	No	Yes
adj. R^2	0.374	0.374	0.374	0.374
Mother FE	Yes	Yes	Yes	Yes
Mean dep var	3246	3246	3246	3246
N	135767	135767	135767	135767

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As a third check, we now compare the effect of imports from China relative to the imports from the rest of the world.¹ If the impact of Chinese imports described above are driven by demand-driven forces at the country level, then we should expect *all* imports and not just those from China to have a positive impact on birthweights. However, if the effect from rest of the world imports behaves differently from those coming from China, we could rule out a demand-driven explanation.

In Table 5, we include as an additional control to Equation (1) the imports to the sub-Saharan African countries from all nations except China, to further capture the demand-driven components that could be driving domestic trade and hence any unobservable behavior at the household level. We find that our results in column (4) still remain robust to this addition. We also see that non-Chinese imports do not seem to be very relevant to explain any gains to birthweight from trade.

Table 5. Adding imports from rest of the world
(dependent variable: birthweight in grams)

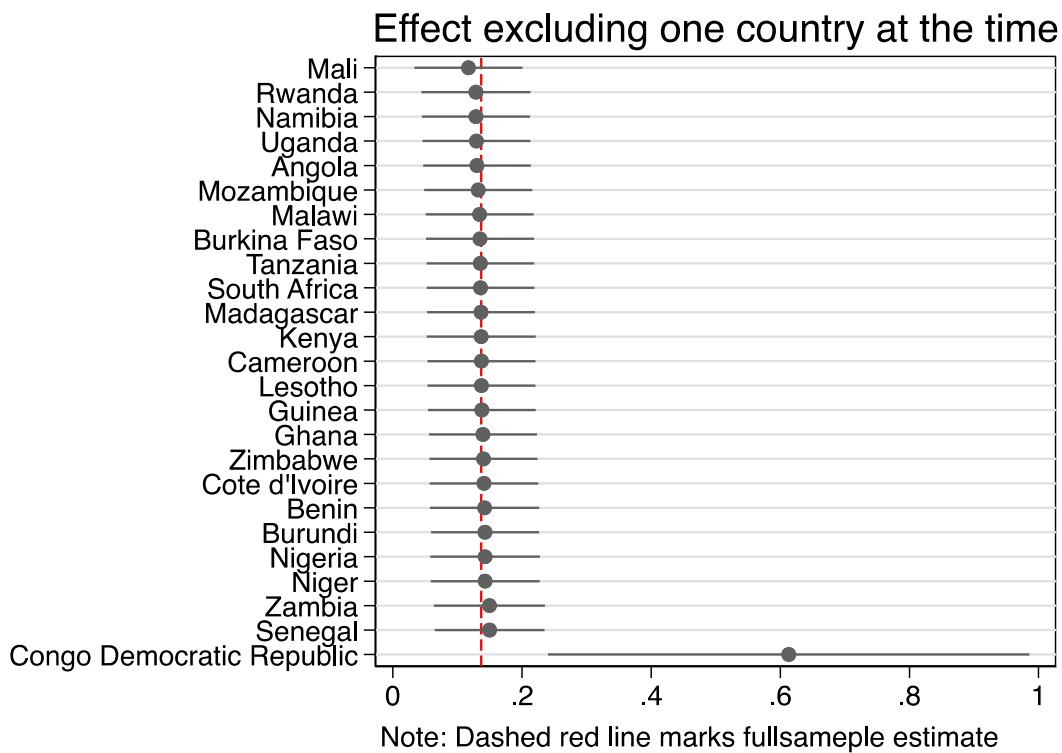
	(1) All	(2) All	(3) 2+	(4) 2+
Per-capita trade (China)	0.144*** [0.041]	0.147*** [0.041]	0.215*** [0.061]	0.136* [0.070]
Per-capita trade (ROW)	0.004 [0.008]	0.004 [0.008]	-0.004 [0.012]	0.000 [0.013]
Child controls	Yes	Yes	Yes	Yes
Mother controls	No	Yes	Yes	Yes
adj. R^2	0.052	0.053	0.050	0.373
Mother FE	No	No	No	Yes
Mean dep var	3221	3221	3247	3247
N	350376	350376	142901	142901

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

¹ This mimics the strategy used by Currie and Thomas (1995), who used a mother-fixed effect model to evaluate the impact of Head Start on several adult outcomes. They compare the effect of attending Head Start vis-à-vis other pre-school programs.

We conduct two additional robustness checks. First, we explore whether the effects are driven by a particular country. We do so by removing one country at a time from our entire sample of sub-Saharan African countries and the results are shown in Figure 3. This exercise show that our analysis is conservative. Removing each country does not matter with the exception of the Democratic Republic of Congo. If this country is excluded our estimates would be much larger than reported. In that sense, our results are conservative.

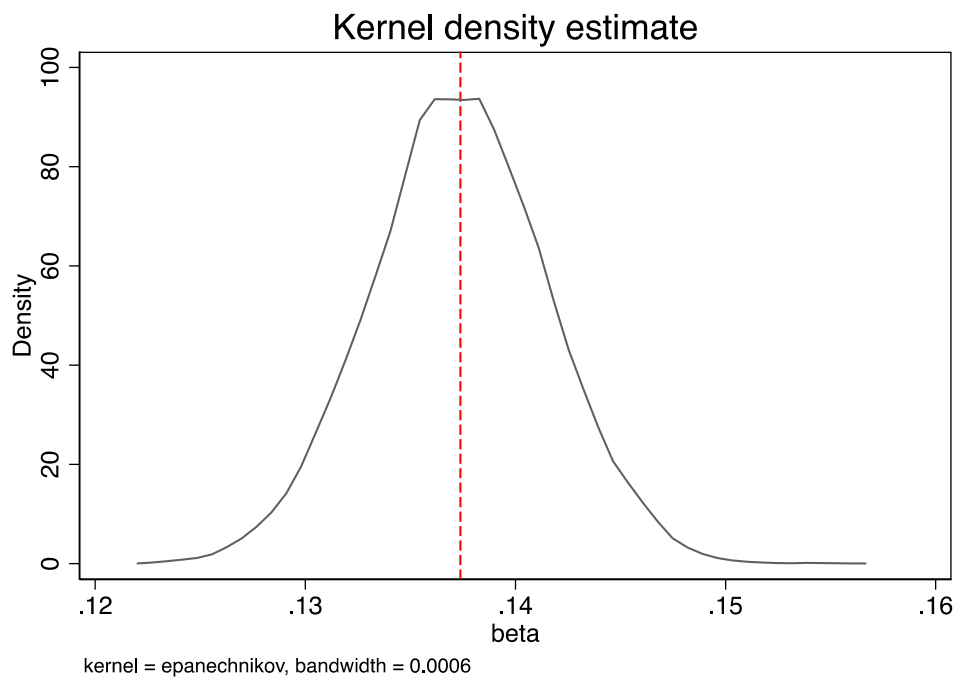
Figure 3: Effect after excluding one country at a time



Second, the issue of rounding of birthweight data has been well document in both advanced countries (Emerson and Roberts, 2013) and developing countries (Channon et al, 2010). This leads to heaping in birthweight data, in particular when focusing on a cutoff such as those using low birthweight as an outcome, and also designs using regression discontinuity. Even though these

mentioned above do not apply to our empirical model, we still check robustness to heaping issues using the methods elaborated in Grob and Rendtel (2016) and Drechler and Kiesl (2016) and expanding on Heitjan and Rubin (1990). In particular, we assume that birthweight data which are in multiples of 100 grams are measured with error and so we estimate the kernel around them. We use 10,000 replications of our main specification in Equation (1) and the results are shown in Figure 4. As expected, our results (shown by the dashed vertical line) are not driven by heaping and the distribution of the 10,000 replications is heavily centered around this main point estimate.

Figure 4: Heaping – Kernel density estimate



4. Who benefits more from trade?

It is also crucial and informative to know if there any distributional effects from trade and whether there are certain sections who might be gaining more or less from trade. Specifically, in

this section we explore whether the effects affect children from more disadvantaged backgrounds. We start with Table 6 where we show that the effects are the same for boys and girls.

Table 6: Effects by gender of the child
(dependent variable: birthweight in grams)

	(1) Child is male
Per-capita imports (const. USD)	0.157***
	[0.045]
Girl * Per-capita imports	-0.037
	[0.028]
Child controls	Yes
adj. R^2	0.372
Mother FE	Y
Mean dep var	3247
N	142901

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Next, we consider whether the effects vary by mothers' education, urban/rural and marital status. This is shown in Table 7 where we split the sample by each of these categories. In column 1 we reproduce our main finding to ease comparison. In columns 2 and 3, respectively, we focus on women with low education (less than secondary) and high education status (secondary or more). We observe a higher impact for children born to less-educated women. Overall, we find that the higher gains in infant health from imports are children born to more disadvantaged women. Not just the less educated, but also those in rural areas as well as single mothers. Thus, the gains from this angle of international trade in sub-Saharan Africa are more progressive.

Table 7. Effects by mother's socioeconomic status

	Dependent variable: birthweight (in grs)						
	(1) All women	(2) Low ed	(3) High ed	(4) Rural	(5) Urban	(6) Single mothers	(7) Married mothers
Per-capita trade (const. USD)	0.137*** [0.043]	0.154*** [0.055]	0.110 [0.067]	0.144** [0.056]	0.137** [0.065]	0.289*** [0.085]	0.090* [0.050]
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.373	0.370	0.377	0.384	0.353	0.363	0.376
Mother FE	Yes	Yes	Yes	Y	Y	Y	Y
Mean dep var	3247	3234	3282	3246	3249	3271	3240
N	142901	104654	38247	85814	57087	33970	108931

Note: Robust standard errors (in brackets) are clustered at the mother level. All models include survey, country and children year of birth FE. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusion

This paper investigates the impact of Chinese imports on infant health outcomes in sub-Saharan African countries. Our analysis uses data from 25 countries in sub-Saharan Africa leading to a sample of over 350,000 birth records. Our identification strategy uses mother fixed effects, which compares siblings born to the same mother but exposed to different levels of Chinese trade into the country. This approach allows us to account for the unobserved heterogeneity among the mothers in the data. We address the possible confounding factors from domestic demand shocks in multiple ways: we control for secular trends, thus capturing sibling-year variations in trade separating from the trend; we control for the GDP per capita with the intention of accounting for

the primary component of any demand-driven trade shocks and also control for further demand-driven components of trade by looking at non-Chinese imports into these sub-Saharan African countries. Our identification strategy is also unaffected by the recent criticisms against the literature surrounding selection into identification.

The main results show that an increase in Chinese imports of \$100 (constant USD) is associated with an increase in birthweight by almost 14 grams. Our results are robust to adjusting for purchasing power parity, but also to the use of an additional source of trade data. Our findings remain even after accounting for the demand-driven components of trade that may not be fully captured by our mother fixed effects methodology, and by the possible heaping in birthweight data. In further analyses, we show that the effects are the same for boys and girls. We also observe a higher impact for children born to less-educated women and we find higher gains in infant health from imports on children born to more disadvantaged women. We find this effect not just on the less educated mothers, but also those in rural areas as well as single mothers.

References

- Adao, R., Kolesár, M., & Morales, E. (2019). Shift-share designs: Theory and inference. *The Quarterly Journal of Economics*, 134(4), 1949-2010.
- Adhvaryu, A., Fenske, J., & Nyshadham, A. (2019). Early life circumstance and adult mental health. *Journal of Political Economy*, 127(4), 1516-1549.
- Artuc, E., Porto, G., & Rijkers, B. (2019). Household Impacts of Tariffs: Data and Results from Agricultural Trade Protection.
- Autor, D. H., Dorn, D., & Hanson, G. H. (2016). The China shock: Learning from labor-market adjustment to large changes in trade. *Annual Review of Economics*, 8, 205-240.
- Baird, S., Friedman, J., & Schady, N. (2011). Aggregate income shocks and infant mortality in the developing world. *Review of Economics and Statistics*, 93(3), 847-856.
- Barrett, C. B., Christiaensen, L., Sheahan, M., & Shimeles, A. (2017). *On the structural transformation of rural Africa*. The World Bank.
- Basker, E. (2007). The causes and consequences of Wal-Mart's growth. *Journal of Economic Perspectives*, 21(3), 177-198.
- Bharadwaj, P., Bietenbeck, J., Lundborg, P., & Rooth, D. O. (2019). Birth weight and vulnerability to a macroeconomic crisis. *Journal of Health Economics*, 66, 136-144.
- Bharadwaj, P., Lundborg, P., & Rooth, D. O. (2018). Birth weight in the long run. *Journal of Human Resources*, 53(1), 189-231.
- Black, S. E., Devereux, P. J., & Salvanes, K. G. (2007). From the cradle to the labor market? The effect of birth weight on adult outcomes. *The Quarterly Journal of Economics*, 122(1), 409-439.
- Bloom, N., Draca, M., & Van Reenen, J. (2016). Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity. *The review of economic studies*, 83(1), 87-117.
- Borusyak, K., Hull, P., & Jaravel, X. (2018). *Quasi-experimental shift-share research designs* (No. w24997). National Bureau of Economic Research.
- Bozzoli, C., & Quintana-Domeque, C. (2014). The weight of the crisis: Evidence from newborns in Argentina. *Review of Economics and Statistics*, 96(3), 550-562.
- Camacho, A. (2008). Stress and birth weight: evidence from terrorist attacks. *American Economic Review*, 98(2), 511-15.
- Channon, A. A., Padmadas, S. S., & McDonald, J. W. (2011). Measuring birth weight in developing countries: does the method of reporting in retrospective surveys matter?. *Maternal and child health journal*, 15(1), 12-18.

- Cooper, P. A., & Sandler, D. L. (1997). Outcome of very low birth weight infants at 12 to 18 months of age in Soweto, South Africa. *Pediatrics*, 99(4), 537-544.
- Currie, J., & Thomas, D. (1995). Does Head Start Make a Difference? *American Economic Review*, 85(3), 341-364.
- David, H., Dorn, D., & Hanson, G. H. (2013). The China syndrome: Local labor market effects of import competition in the United States. *American Economic Review*, 103(6), 2121-68.
- Dehejia, R., & Lleras-Muney, A. (2004). Booms, busts, and babies' health. *The Quarterly Journal of Economics*, 119(3), 1091-1130.
- Drechsler, J., & Kiesl, H. (2016). Beat the heap: An imputation strategy for valid inferences from rounded income data. *Journal of Survey Statistics and Methodology*, 4(1), 22-42.
- Emmerson, A. J., & Roberts, S. A. (2013). Rounding of birth weights in a neonatal intensive care unit over 20 years: an analysis of a large cohort study. *BMJ open*, 3(12).
- Erten, B., Leight, J., & Tregenna, F. (2019). Trade liberalization and local labor market adjustment in South Africa. *Journal of International Economics*, 118, 448-467.
- Goldsmith-Pinkham, P., Sorkin, I., & Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8), 2586-2624.
- Groß, M., & Rendtel, U. (2016). Kernel density estimation for heaped data. *Journal of Survey Statistics and Methodology*, 4(3), 339-361.
- Hausman, J., & Leibtag, E. (2007). Consumer benefits from increased competition in shopping outlets: Measuring the effect of Wal-Mart. *Journal of Applied Econometrics*, 22(7), 1157-1177.
- Heitjan, D. F., & Rubin, D. B. (1990). Inference from coarse data via multiple imputation with application to age heaping. *Journal of the American Statistical Association*, 85(410), 304-314.
- Lang, M., McManus, T. C., & Schaur, G. (2019). The effects of import competition on health in the local economy. *Health economics*, 28(1), 44-56.
- Løken, K. V., Mogstad, M., & Wiswall, M. (2012). What linear estimators miss: The effects of family income on child outcomes. *American Economic Journal: Applied Economics*, 4(2), 1-35.
- Mansour, H., & Rees, D. I. (2012). Armed conflict and birth weight: Evidence from the al-Aqsa Intifada. *Journal of development Economics*, 99(1), 190-199.
- Mayda, A. M., & Rodrik, D. (2001). *Why Are Some People and Countries More Protectionist Than Others?*. Working Paper 8461. Cambridge, Mass.: National Bureau of Economic Research (September).

- McMillan, M. S., & McCaig, B. (2019). *Trade liberalization and labor market adjustment in Botswana* (No. w26326). National Bureau of Economic Research.
- Miller, D. L., Shenhav, N. A., & Grosz, M. Z. (2019). *Selection into identification in fixed effects models, with application to Head Start* (No. w26174). National Bureau of Economic Research.
- Mocan, N., Raschke, C., & Unel, B. (2015). The impact of mothers' earnings on health inputs and infant health. *Economics & Human Biology*, *19*, 204-223.
- Page, M., Schaller, J., & Simon, D. (2019). The effects of aggregate and gender-specific labor demand shocks on child health. *Journal of Human Resources*, *54*(1), 37-78.
- Panda, P. (2020). Does trade reduce infant mortality? Evidence from sub-Saharan Africa. *World Development*, *128*, 104851.
- Pierce, J. R., & Schott, P. K. (2020). Trade liberalization and mortality: evidence from US counties. *American Economic Review: Insights*, *2*(1), 47-64.
- Rodrik, D. (2016). Premature deindustrialization. *Journal of economic growth*, *21*(1), 1-33.
- Ukil, P. (2019). *Parental Economic Shocks and Infant Health: The Effect of Import Competition in the US* (No. 2019-18).
- Weissman, R. (2003). The US meets defeat: thwarted in the FTAA negotiations, the US looks to smaller trade deals. *Multinational Monitor*, *24*(12), 26-29.