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Trade Openness and Fertility Rates in Africa: Panel-Data Evidence[*]

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August 30, 2018

Abstract

We study the effect of trade openness on fertility rates in fifty African countries during the 1970 - 2010 period. Allowing for country and time fixed effects, our results indicate that trade openness and imports of manufactured goods are related to lower fertility. Furthermore, trade with the former colonial powers and imports of high-skilled manufactured goods, which include television receivers and telecommunications equipment, are related to lower fertility too. Although Africa still export agricultural products and raw materials, and in contrast with the comparative-advantages prediction, our results suggest that the knowledge and gender norms emanating from imported high-skilled manufactured goods are affecting fertility choices and, ultimately, having a reinforcing effect on Africa's ongoing demographic transition.

Key words: openness, fertility, Africa
JEL classification: F6, J10, N37, O55

Introduction

Fertility rates in Africa have substantially decreased between 1970 and 2010. At the end of Africa's colonial period in the 1960s, Africa had fertility rates close to 7, but by 2010 fertility rates had decreased to 4.69 births per woman, a 40% decrease. And Africa's integration in the global economy has substantially increased during this period, with trade openness increasing from 41% in the 1960s to 74%, relative to GDP, in 2009, a 57% increase. Jones and Romer (2010) advance that globalization is one of the new Kaldor facts of growth, that is to say, globalization has increased the flows of goods, ideas, finance and people, and ultimately increased the extent of the market for all. It is therefore plausible that, by globalization, technologies, knowledge, and even gender norms, become widely available to developing countries, and some sort of learning takes place. In all, globalization, and the diffusion of knowledge and learning that comes with it, might well affect fertility. Figure 1 illustrates the reduction in fertility and the process of globalization (or trade openness) taking place in Africa.
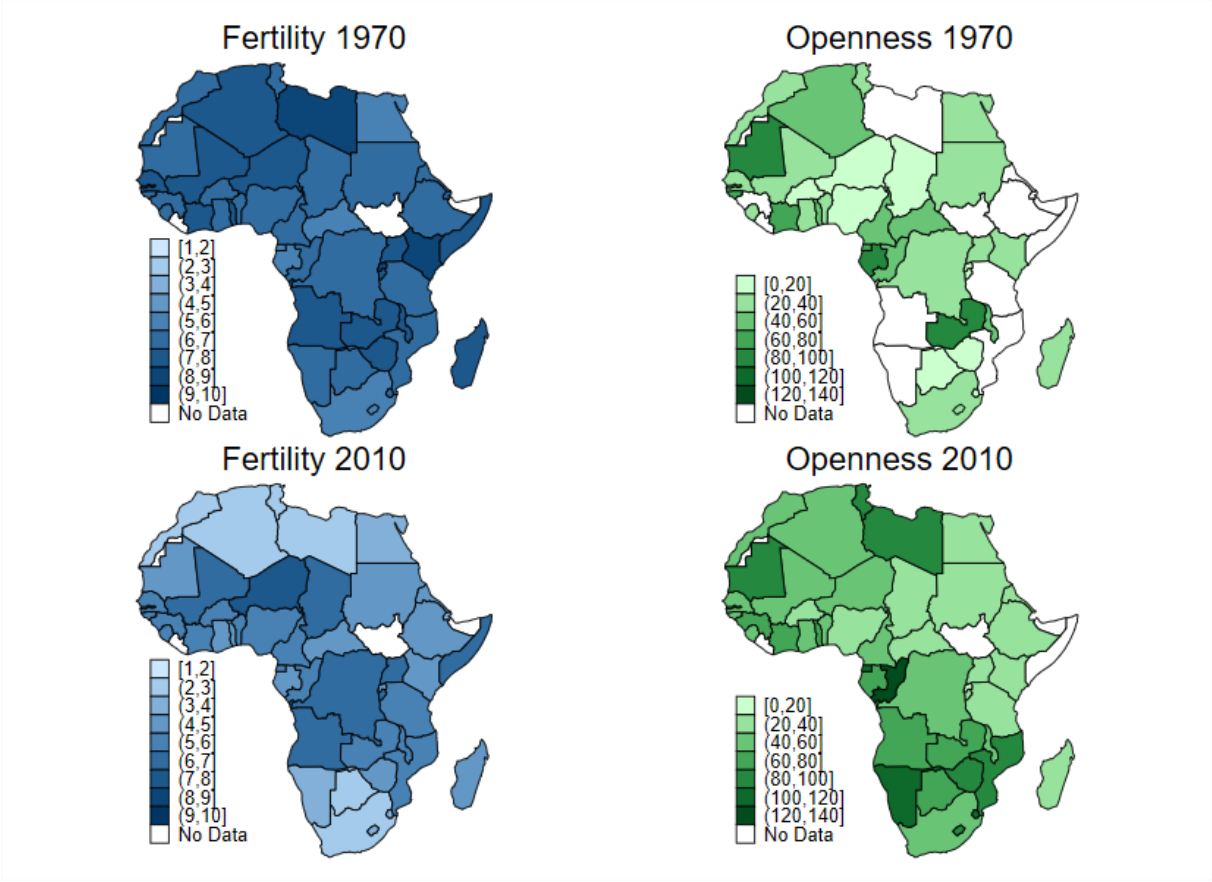

Figure 1: Fertility rates and trade openness, *exports* plus *imports* over *GDP*, 1970 and 2010. Sources: World Bank and World Integrated Trade Solutions (WITS).

Bearing the above facts in mind, we study the effect of trade openness on fertility rates in fifty African countries (basically the whole of Africa) during the 1970 - 2010 period. Allowing for

country and time fixed effects, our results indicate the following: first, trade openness is related to lower fertility; second, by disaggregating openness by export and import of manufactured goods, we find that imports of manufactured goods are related to lower fertility; third, we disaggregate openness by specific region/country (the former colonial powers, Belgium, France, Germany, Italy, Portugal, Spain and the United Kingdom, and the USA) and find that openness with the former colonial powers – Africa's largest trade partners, particularly in manufactured goods – is related to lower fertility as well. Lastly, we further disaggregate openness and find that imports of high-skilled manufactured goods, a trade category that includes television receivers, telecommunications equipment, electrical machinery and power generating equipment, is related to lower fertility as well.

Our results contrast with, for instance, Galor and Mountford (2008) and Gries and Grundmann (2014). Galor and Mountford (2008) study the effect of trade openness on fertility in developed and developing countries within the comparative-advantages framework. They advance that gains from openness in developed countries, given that they export high-skilled manufactured goods, creates demand for human capital which, in turn, decreases fertility. The gains from trade in developing countries, however, incentivizes higher fertility. This is because, given the nature of trade, developing countries end up specializing and exporting low-skilled agricultural products and raw materials. And Gries and Grundmann (2014) report evidence which supports Galor and Mountford (2008) prediction and results.

Our results, however, are in line with Coe and Helpman (1993), who advance that foreign technologies increase local productivity, and with Keller (2001) and Acharya and Keller (2008), who advance that foreign technologies and knowledge diffuse, and this diffusion leads to learning. More importantly, our results are in line with La Ferrara (2018), who uses data on TV ownership from some African countries to advance that foreign technologies such as TVs and everything that emanates from them, say, programmes, commercials and, above all, gender norms are related to lower fertility.

In addition to all trade data disaggregations that we do, what else do we add to the literature? Our sample covers the whole of Africa, with all its common factors and also idiosyncrasies and, as advanced by Papaioannou and Siourounis (2008), that in itself reduces the amount of contamination and endogeneity present in large samples of countries. In practical terms, we are interested in taking a better picture of the recent economic development in Africa and little is gained in using a large sample which includes developed countries that have already experienced their own demographic transitions. We are therefore able to take a more in depth picture of what is actually happening in Africa in terms of trade openness and fertility rates, which allows us to offer a better context of contemporaneous African development.

Method and Data

Given the dimension of the dataset, a panel of fifty African countries during the 1970 - 2010 period, we use the one- and two-way Fixed Effects (FE) estimator. African countries share economic and institutional characteristics such as fairly recent political independence, but also present different characteristics, for instance, climate, geography, ethnicity, economic systems during the cold war, legal origins, *etc.* In all, the FE estimator, with country and time fixed effects allows for heterogeneity and shocks, and it provides consistent estimates. Furthermore, in order to minimise economic endogeneity concerns we use lagged trade openness as an internal identifying instrument for trade openness.

We estimate equations with country and time fixed effects:

$$\begin{aligned}
\ln(fertility)_{it} &= \alpha_i + \gamma_t + \beta_1 \ln(Openness)_{it} + \beta_2 \ln(GDPpc)_{it} + \beta_3 ln(Mortality)_{it} \\
&\quad + \beta_4 ln(Sec.Educ.)_{it} + \beta_5 \ln(ManufactureX)_{it} + \beta_6 \ln(ManufactureM)_{it} + u_{it}
\end{aligned}$$

$$(1)$$

where α_i and γ_t are the country and time fixed effects. *Fertility* is the average number of children that a woman gives birth for each consecutive year, *openness* is total trade relative to GDP, *mortality* is average infant mortality defined as the number of deaths per 1000 live births under the age of one, *GDPpc* is real income per capita in 2005 USA dollars and *seceduc* is the gross enrollment ratio in secondary education.[1]

In addition, we use data from the World Integrated Trade Solution (WITS), reported at the five-digit Standard International Trade Classifications (SITC) level, to construct the manufactured-goods shares, that is to say, the shares of manufacturing (SITC 5-8 categories) exports and imports, *manufactureX* and *manufactureM* to total trade.[2]

We then disaggregate *openness* by origin for Africa, specifically, the former colonial powers, *opennessw/EU*, and the USA, *opennessw/USA*, and re-estimate equation 1 without *manufactureX* and *manufactureM*. We avoid double counting by removing general *openness* from equation 1 and include *openOthers* that is defined as openness with the rest of the world. This allows us to check if the set of countries that contribute the most to the share of manufactured-goods imports have an effect on fertility.

We further disaggregate the data to get information on imports of high-skilled manufactured goods, *HT*, which include, amongst others, imports of television receivers, telecommunications equipment, electrical machinery and power generating equipment. Lastly, we dig deeper and construct the variable *HTC1* that only includes imports of television receivers, telecommunications equipment,

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[1]Africa have some countries with intermittent data on education. The results are similar with and without interpolated *seceduc* data, so all results reported use non-interpolated data.

[2]For definition of SITC categories, see the United Nations Statistics Division website.

electrical machinery and power generating equipment (Lall 2000).[3]

Results and Discussion

In Table 1 we report baseline regressions using our general trade openness variable and then regressions using the shares of manufactured-goods exports and imports. The variable trade openness in columns 1 and 2 is significantly related to lower fertility. And in columns 3 and 4 manufactured-goods imports are also significantly related to lower fertility.

The control variables deserve comments as well. Income is related to lower fertility, which indicates that the income effect is already being offset by the substitution effect, or that Africa is not Malthusian anymore (Herzer, Strulik and Vollmer 2012). Infant mortality is related to higher fertility, which indicates that the replacement effect is still relevant to Africa (Angeles 2010, and Conley, McCord and Sachs 2007). Secondary education is related to higher fertility, which indicates that in developing countries more educated women first become healthier and with greater fecundity (Lehr 2009).

In all, the results are interesting for at least the following two reasons: first, given that Africa still export mostly agricultural products and raw materials, and import high-skilled manufactured goods, our results should be in line with the comparative-advantages framework advanced by Galor and Mountford (2008). Rather, our baseline trade openness estimates in columns 1 and 2 suggest that something else is taking place in Africa. Second, the results in columns 3 and 4 tentatively suggest that the knowledge embodied in imported manufactured goods is being diffused, learned and ultimately affecting fertility choices in Africa (Coe and Helpman 1993, Keller 2001, and Acharya and Keller 2008).

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[3]In this case our data covers the shorter 1976 - 2010 period.

Table 1: Trade Openness and Manufactured-Goods Share

	(1)	(2)	(3)	(4)
	Fertility	Fertility IV	Fertility	
ln(Openness)	−0.060***	−0.080***		−0.055***
	(0.011)	(0.014)		(0.011)
ln(GDPpc)	−0.040***	−0.043***	−0.010	−0.028**
	(0.012)	(0.012)	(0.012)	(0.013)
ln(Mortality)	0.479***	0.485***	0.484***	0.484***
	(0.026)	(0.025)	(0.027)	(0.027)
ln(Sec. Educ.)	0.059***	0.068***	0.045***	0.062***
	(0.012)	(0.012)	(0.013)	(0.012)
ln(Manufacture X)			0.012**	0.009*
			(0.005)	(0.005)
ln(Manufacture M)			−0.115***	−0.094***
			(0.029)	(0.027)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Fstat		173.47		
Adjusted R2	0.921	0.922	0.920	0.922
Obs	1167	1153	1167	1167

Robust standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$. Note: The lag of *Openness* is used as the instrumental variable in column 2.

In Table 2, we disaggregate trade openness by the former colonial powers and the USA. In columns 1 and 2 trade openness with the former colonial powers is related to lower fertility. In columns 3 and 4, trade openness with the USA is zero. Furthermore, in columns 5 and 6 the horse-race regressions indicate that trade openness with the former colonial powers is still related to lower fertility. Lastly, in columns 7 and 8 imports of high-skilled manufactured goods HT and high-skilled manufactured goods including only imports of television receivers, telecommunications equipment, electrical machinery and power generating equipment $HTC1$, are also related to lower fertility.

On one hand, the results in columns 1 to 6, openness with the developed former colonial powers, are yet again in contrast with the comparative-advantages framework. From those results, given the nature of the trade, we can tentatively suggest that knowledge, diffusion and learning are taking place in Africa (Coe and Helpman 1993, Keller 2001, and Acharya and Keller 2008). On the other hand, the results in columns 7 and 8 allow us to interpret the estimates in a compelling, and plausible, way. To be clear, the results are suggesting that the import of high-skilled goods such as television receivers and telecommunications equipment, and everything such as programmes and commercials emanating from them, are, as advanced by La Ferrara (2018), affecting and changing gender norms, and the new gender norms being adopted in Africa include lower fertility rates.[4]

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[4]We have additional results suggesting that medium-technology manufactures such as motor vehicles and agricultural machinery do not have the same effect on fertility. Available on request.

Table 2: Country and Hith-Tech Categories

	Former colonial powers		United States		Combined		High Tech.	
	1	2-IV	3	4-IV	5	6-IV	7	8
ln(Openness w/ EU)	−0.072***	−0.086***			−0.096***	−0.074***		
	(0.007)	(0.010)			(0.012)	(0.008)		
ln(Openness w/ USA)			−0.000	−0.002	0.003	−0.000		
			(0.005)	(0.006)	(0.008)	(0.005)		
ln(Openness w/o EU)	0.022**	0.030***						
	(0.009)	(0.009)						
ln(Openness w/o USA)			−0.064***	−0.065***				
			(0.011)	(0.010)				
ln(Open. w/o EU USA)					0.030***	0.024***		
					(0.006)	(0.006)		
ln(Openness HT)							−0.014**	
							(0.006)	
ln(Openness HT C1)								−0.009*
								(0.005)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.926	0.926	0.923	0.924	0.935	0.934	0.928	0.928
Obs	1166	1152	1162	1145	1017	1033	1029	1027

Robust standard errors in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$. Notes: Regressions include log GDP per capita, infant mortality, and secondary gross enrollment. The lag of *Openness w/ EU* or *Openness w/ USA* is used as the instrumental variable in column 2 and 4. The lag of *Openness w/ EU USA* is used as the instrumental variable in column 6.

Concluding Remarks

Although we do not claim causality, our FE estimates are robust and can be informative. We therefore argue that African countries are benefiting, by lower fertility, from the technologies, knowledge and even gender norms emanating from high-skilled manufactured goods, which include television receivers, telecommunications equipment, electrical machinery and power generating equipment. Such diffusion, learning and adoption of new gender norms reinforce other factors related to Africa's ongoing demographic transition.

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