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ABSTRACT

This study uses a broad cross-section of countries to identify a link between financial market development and mortality rates. Our research is motivated by the idea that robust financial markets can facilitate innovation by efficiently channelling essential capital to the entities responsible for health-related advancements, resulting in improved overall health outcomes. Consistent with this conjecture, our findings reveal that countries with better-developed credit markets have markedly lower infant and maternal mortality rates. These results are robust to controls for time-series variation in mortality rates, country-specific determinants such as GDP per capita and other measures of wealth, and potential simultaneity bias.

KEYWORDS

Infant mortality; maternal mortality; pharmaceutical innovation; banks; credit markets

JEL CLASSIFICATION



G10; G15; G20; O30; I10; I15

I. Introduction

The subject of financial development has consistently piqued the interest of researchers, with extensive studies in both finance and economics underscoring the crucial role that banks and credit markets play in enhancing the quality of life within society. As an example, King and Levine (1993) discovered that diverse indicators of financial development, such as the strength of the banking sector, typically result in enhancements in economic growth, capital accumulation, and overall economic efficiency.¹ Furthermore, financial development has been associated with a heightened level of innovation in a particular economy (Hsu, Tian, and Xu 2014; Xiao and Zhao 2012).² A plausible explanation for the advantages tied to the development of capital markets can be found in the principles that underpin the theory of endogenous growth (Romer 1990). This theory posits that economic expansion is inherently connected to the accumulation of human capital and the rate of innovation. Schumpeter (1911) was among the first to propose that robust financial markets can

stimulate innovation by mobilizing savings and efficiently allocating capital. Consistent with this conjecture, Hsu, Tian, and Xu (2014) provide empirical evidence that financial market development leads to higher rates of innovation in technology by transferring capital to the most innovative firms.

The purpose of this paper is to formulate and examine the hypothesis that the development of financial markets may also lead to improved health outcomes. The main objective of this study is to establish a link between a robust financial sector and decreased mortality rates. Our hypothesis draws motivation from both cross-sectional and time-series variations in mortality rates across different countries. For instance, we observe a considerable range in infant mortality rates per 1,000 live births, with an average of 2.62 for Luxembourg and 112.67 for Sierra Leone.³ Notably, the Federal Reserve Bank of St. Louis reports a decline in the annual infant mortality rate in the U.S. from 2.59% in 1960 to 0.54% in 2020.⁴ Understanding and

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¹Certain studies propose that the correlation between finance and economic growth can be attributed to the easing of credit constraints, as demonstrated by Rajan and Zingales (1998). Meanwhile, other research emphasizes the pivotal role finance plays in enhancing productivity growth, as exemplified by the works of King and Levine (1993), Levine and Zervos (1998), Beck, Levine, and Loayza (2000), Guiso, Sapienza, and Zingales (2004), and Jeong and Townsend (2007).

²Other studies have explored the influence of financial development and credit accessibility on the dynamics of inequality (see e.g. Beck, Demirgüç-Kunt, and Levine 2009; Claessens and Perotti 2007; Clarke, Xu, and Zou 2006; Demirgüç-Kunt and Levine 2009) and poverty (see e.g. Boukhatem 2016; Burgess and Pande 2005; Donou-Adonsou and Sylwester 2016; Jalilian and Kirkpatrick 2005; Jeanneney and Kpodar 2011; Perez-Moreno 2011; Uddin et al. 2014).

³Table A1 reports time series averages for each country. Table 1 reports statistics across the entire panel (yearly observations).

⁴The economic data is available through the Federal Reserve Bank of St. Louis at <https://fred.stlouisfed.org/series/SPDYNIMRTINUSA>.

Table 1. Summary statistics.

	Mean [1]	Std. Dev. [2]	Minimum [3]	25 th Perc. [4]	Median [5]	75 th Perc. [6]	Maximum [7]
Panel A. Summary Statistics for Variables of Interest							
<i>Infant</i>	49.20	45.27	1.00	13.70	33.70	72.70	273.80
<i>Maternal</i>	226.74	329.37	1.00	17.00	70.00	335.00	2,900.00
<i>Banks</i>	36.99	36.86	8.1E-4	12.99	24.93	48.75	448.17
<i>Finance</i>	50.73	55.06	-114.69	19.44	36.59	63.54	2,066.18
<i>Private</i>	39.25	39.36	8.2E-4	13.82	25.82	50.51	448.25
Panel B. Summary Statistics for Control Variables							
<i>GDP/CAP</i>	9,173.66	17,624.24	37.52	585.21	2,154.79	8,953.36	234,317.08
Δ <i>GDP</i>	3.67	6.13	-64.05	1.33	3.80	6.30	106.28
Δ <i>Capform</i>	8.40	193.92	-2,562.38	-3.12	4.58	12.66	15,135.41
<i>SAVE/GDP</i>	18.31	16.82	-167.61	10.09	19.40	26.79	151.11
<i>Govspend</i>	0.23	1.12	1.8E-5	3.0E-3	0.01	0.08	24.18
<i>Netex</i>	1.03	37.05	-861.71	-1.02	-0.12	0.26	576.66

The table presents statistics that summarize the data used throughout the analysis. Panel A presents the summary statistics for the main variables, while Panel B shows the results for the control variables used in the multivariate tests. *Infant* is infant mortality per 1,000 live births. *Maternal* is the maternal mortality rate per 100,000 live births. *Banks* is the amount of domestic credit offered by banks as a percent of GDP. *Finance* is the amount of domestic credit offered by the financial sector as a percent of GDP. *Private* is the total amount of domestic credit offered to the private sector as a percent of GDP. *GDP/CAP* is the amount of gross domestic product per capita. Δ *GDP* is the growth rate in *GDP/CAP* for each country in each year. Δ *Capform* is the growth rate in capital formation. *SAVE/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports.

elucidating the factors influencing infant mortality rates are among the most critical and valuable inquiries within the realm of social sciences. In our research, we investigate whether the field of finance can account for some of the observed cross-country disparities in mortality rates.

Our hypothesis, suggesting that robust financial sectors can lead to reduced mortality rates, can be directly derived from the existing literature. For instance, several studies attribute much of the observed variation in mortality rates to economic development (see e.g. Birchenall 2007; O'Hare et al. 2013; Pritchett and Summers 1993; Schell et al. 2007; Sen 1993). Similarly, Baird, Friedman, and Schady (2011) demonstrate that variations in aggregate income have a significant impact on infant mortality rates, especially in developing countries.⁵ Another line of research documents a robust and direct relationship between pharmaceutical innovation and mortality rates. For example, Schnittker and Karandinos (2010) discover that pharmaceutical innovation results in increased longevity in the U.S., particularly among younger Americans.

Similar findings are shown in Lichtenberg (2012) when examining data in Germany and France.

Prior research also establishes that pharmaceutical innovation contributes to improved health outcomes. A 2001 report from the Pharmaceutical Research and Manufacturers of America suggests that, since 1920, innovations in the pharmaceutical sector, such as antibiotics and vaccines, are associated with an 85% reduction in mortality rates from influenza and pneumonia.⁶ Lichtenberg (2007) documents that innovations in cancer research have increased the life expectancy (from 1978 to 2004) of the entire U.S. population by nearly 9%. In another study, Lichtenberg (2010) finds that each new drug that is approved saves over 11,000 life-years.⁷ In the context of our study, we propose that well-functioning capital markets within a specific country may foster increased pharmaceutical innovation due to improved access to capital (see e.g. Blau et al. 2022). This, in turn, can ultimately contribute to improved health outcomes and reduced mortality rates.

⁵Other research has highlighted additional factors that contribute to mortality rates. These factors include environmental concerns, such as pollution, rising temperatures, and environmental quality (Banerjee and Maharaj 2020; Chay and Greenstone 2003; Do, Joshi, and Stolper 2018; Foster, Gutierrez, and Kumar 2009; Greenstone and Hanna 2014) and resource scarcity (Gamper-Rabindran, Khan, and Timmins 2010; Mettetal 2019).

⁶Cutler et al. (1998) show that pharmaceutical innovations, such as H2 blockers, proton pump inhibitors, and bronchodilators, have lowered death rates from ulcers, emphysema, and heart attacks by 60%, 31%, and 55%, respectively.

⁷Prior research also shows that pharmaceutical innovation leads to lower health-care costs and less hospital visits. Specifically, Lichtenberg (2000) shows that for every 100 new drugs produced, aggregate hospital visits decrease by 16.3 days. Additionally, for every \$1 increase in pharmaceutical innovation, hospital-care expenditures decrease by \$3.65.

To proxy for credit market development, we follow Levine and Zervos (1998) and use the following three measures: (1) the amount of domestic credit offered by banks, (2) the amount of domestic credit offered by the financial sector generally, and (3) the total amount of domestic credit offered to the private sector. In our first set of tests, we document a remarkably strong, negative contemporaneous association between all three credit market development indicators and both infant and maternal mortality rates. We use panel data techniques to control for time-series variation in mortality rates and country-specific determinants. Although these initial results demonstrate a strong association between credit market development and mortality rates, the endogenous nature of this relation does not allow us to draw causal inferences. In our next set of tests, we attempt to account for this potential endogeneity using an instrumental variable approach. More specifically, we follow Beck, Levine, and Loayza (2000) and instrument credit market development with the origin of the countries' legal systems. Legal origin explains cross-country differences in financial development and is arguably exogenous in this setting (countries typically obtained their legal systems through occupation or colonization long before our sample period). After controlling for the potential endogeneity bias, we continue to find that credit market development significantly reduces country-level mortality rates.

The findings of this study offer several significant contributions to the existing literature. Prior research has established that financial market development leads to various societal improvements, including economic growth (see, for example, King and Levine 1993; Levine and Zervos 1998), enhanced income equality (see, for example, Claessens and Perotti 2007; Clarke, Xu, and Zou 2006; Demirgüç-Kunt and Levine 2009), and reduced levels of poverty (see, for example, Boukhatem 2016; Donou-Adonsou and Sylwester 2016; Jalilian and Kirkpatrick 2005; Jeanneney and Kpodar 2011; Perez-Moreno 2011). Our contribution lies in demonstrating that financial development can also lead to a reduction in mortality rates. In another branch of literature, studies have highlighted factors influencing mortality rates, such as income levels (as discussed by Baird, Friedman,

and Schady 2011) and pharmaceutical innovation (as shown by Schnittker and Karandinos 2010). Our unique contribution is revealing that mortality rates are also influenced by access to credit markets.

The results from our study also have important policy implications. Given that pharmaceutical innovation may serve as the driving mechanism behind the correlation between credit market development and mortality rates, the role of innovation in the pharmaceutical industry becomes pivotal. However, empirical evidence suggests that pharmaceutical innovation is decreasing over time at an alarming rate. For instance, Scannell et al. (2012) document that, since the 1950s, the number of new and approved pharmaceuticals has been cut in half every nine years. As an anecdote, during the 1950s, every \$1 billion (inflation-adjusted) spent on pharmaceutical R&D resulted in the production of 40 new drugs. In contrast, during the early 2000s, every \$1 billion in spending resulted in only 0.7 new drugs. Furthermore, Kesselheim (2010) finds that in the 1990s, about 40 new pharmaceuticals were approved per year. That number declined by more than 40% during the 2000s. These trends emphasize the pressing need for policymakers and industry stakeholders to address the challenges inhibiting pharmaceutical innovation, such as stringent regulatory hurdles, intellectual property and patent challenges, research and development concentration, and pricing pressures. The future health and well-being of society hinge on the collective efforts of industry professionals and regulators to revitalize and sustain this critical component of the healthcare system.

The rest of the paper follows. Section II describes the data used throughout the analysis. Section III presents the results of our empirical tests. In the final section, we offer some concluding remarks.

II. Data description

The data used in the empirical analysis come from two sources. From the World Bank (World Development Indicators Database), we gather macroeconomic information including infant and maternal mortality rates, GDP per capita (GDP), total exports and imports, gross savings, government expenditures, capital

formation, and domestic credit provided by banks and other financial institutions. These latter variables are used to measure credit market development. From the UN Comtrade Database, we gather data on pharmaceutical exports. Because not all of the countries observed in the analysis have available data in each year of the sample period, which ranges from 1960 to 2022, we carefully denote the number of observations that are included in each of the model specifications. Table 1 provides statistics that summarize the sample.⁸In addition, we have provided a full list of the countries used in the analysis as well as some summary statistics for the variables of interest in the Appendix.

The mortality variables used throughout the analysis are *Infant*, which is the annual infant mortality per 1,000 live births, and *Maternal*, which is the annual maternal mortality per 100,000 live births. We find that the average annual infant mortality rate for the sample countries is 49.20 per 1,000 live births, with a standard deviation of 45.27. We also show that the average annual maternal mortality rate for the sample countries is 226.74 per 100,000 live births, with a standard deviation of 329.37. Furthermore, the minimum annual infant (maternal) mortality rate for the sample countries is 1.00 per 1,000 live births (1.00 per 100,000 live births), while the maximum is 273.80 per 1,000 live births (2,900 per 100,000 live births). These statistics highlight substantial variation in mortality rates across countries during our sample period.

We proxy for credit market development using three measures. *Banks* is the amount of domestic credit offered by banks as a percent of GDP. *Finance* is the amount of domestic credit offered by the financial sector as a percent of GDP. *Private* is the amount of domestic credit offered to the private sector as a percent of GDP. The average amount of domestic credit offered by banks for our sample countries, as a percent of GDP, is 36.99. Also, the average amount of domestic credit offered by the finance sector for our sample of countries, as a percent of GDP, is 50.73 with a standard deviation of 55.06. Furthermore, the total amount of credit

offered to the private sector, as a percent of GDP, is 39.25 with a standard deviation of 39.36.

Throughout the analysis, we include several country-specific control measures. *GDP/CAP* is the amount of gross domestic product per capita. ΔGDP is the annual growth rate in *GDP/CAP* for each country. $\Delta Capform$ is the annual growth rate in capital formation. *SAVE/GDP* is the amount of annual gross savings scaled by GDP. *Govspend* is the annual amount (in trillions of USD) of national expenditures. *Netex* is the annual difference (in billions of USD) between total exports and total imports. The mean per capita GDP for the sample countries is \$9,173.66 with a standard deviation of \$17,624.24. The average annual growth rate in per capita GDP for the sample countries is 3.67%. While the annual growth rate in capital formation for our sample countries is 8.40%, the average ratio of gross savings to GDP is 18.31. The average annual amount of government spending for the sample countries is \$0.23 million, and the average annual amount of net exports is \$1.03 million.

To further describe our sample, we report correlation coefficients between the variables used in the analysis in Table 2. Column [1] shows that the correlation coefficient between infant mortality rates and maternal mortality rates is 0.8839. In addition, we find that the correlation coefficient between infant mortality rates and credit offered by banks (the finance sector) is -0.5397 (-0.3994). Furthermore, the correlation coefficient between infant mortality rates and total credit offered to the private sector is -0.5386 . These correlation coefficients are significant at the 0.01 level and indicate a negative relation between credit market development and mortality rates. Consistent with prior research (see e.g. Ruhm 2015), we find that the correlation between infant mortality rates and the annual growth rate in GDP is 0.0604. This seems to suggest a procyclical relation between economic growth and mortality rates described in Ruhm (2000). In Column [2], we find that the correlation coefficients between maternal mortality rates and *Banks*, *Finance*, and *Private* are -0.4605 , -0.2729 , and -0.4578 , respectively. These correlation coefficients are all significant at the 0.01 level. The correlation between maternal mortality

⁸While infant mortality rates and our credit market development measures extend from 1960 to 2022, maternal mortality rates are only available from 1990 to 2022.

Table 2. Correlation matrix.

	Infant	Maternal	Banks	Finance	Private	GDP/CAP	Δ GDP	Δ CAPFM	SAV/GDP	Govspend	Netex
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
<i>Infant</i>	1.0000										
<i>Maternal</i>	0.8839	1.0000									
	[<.0001]										
<i>Banks</i>	-0.5397	-0.4605	1.0000								
	[<.0001]	[<.0001]									
<i>Finance</i>	-0.3994	-0.2729	0.7379	1.0000							
	[<.0001]	[<.0001]	[<.0001]								
<i>Private</i>	-0.5386	-0.4578	0.9688	0.7828	1.0000						
	[<.0001]	[<.0001]	[<.0001]	[<.0001]							
<i>GDP/CAP</i>	-0.4198	-0.3643	0.6283	0.5308	0.6408	1.0000					
	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]						
Δ GDP	0.0604	0.0359	-0.1096	-0.1118	-0.1157	-0.0813	1.0000				
	[<.0001]	[0.009]	[<.0001]	[<.0001]	[<.0001]	[<.0001]					
Δ Capform	-0.0006	-0.0042	-0.0187	-0.0353	-0.0189	-0.0109	0.0276	1.0000			
	[0.965]	[0.788]	[0.165]	[0.013]	[0.161]	[0.379]	[0.025]				
SAV/GDP	-0.2991	-0.3406	0.2659	0.1320	0.2586	0.3265	0.0894	0.0110	1.0000		
	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[0.378]			
Govspend	-0.1686	-0.1322	0.2352	0.4376	0.4107	0.2823	-0.0300	-0.0047	0.0847	1.0000	
	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[0.027]	[0.707]	[<.0001]		
Netex	-0.0305	-0.0295	0.1192	-0.0895	-0.0346	0.0602	0.0130	0.0042	0.1391	-0.4509	1.0000
	[0.005]	[0.034]	[<.0001]	[<.0001]	[0.003]	[<.0001]	[0.219]	[0.733]	[<.0001]	[<.0001]	

The table presents the Pearson correlation matrix for the variables used throughout the study. *Infant* is infant mortality per 1,000 live births. *Maternal* is the maternal mortality rate per 100,000 live births. *Banks* is the amount of domestic credit offered by banks as a percent of GDP. *Finance* is the amount of domestic credit offered by the financial sector as a percent of GDP. *Private* is the total amount of domestic credit offered to the private sector as a percent of GDP. *GDP/CAP* is the amount of gross domestic product per capita. Δ GDP is the growth rate in *GDP/CAP* for each country in each year. Δ Capform is the growth rate in capital formation. *SAV/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports. In brackets, we report p-values.

rates and Δ GDP is 0.0359, which is statistically significant with a p-value of 0.009. Not surprisingly, in Columns [3] through [5], we find strong positive correlations between the three measures of credit market development. Specifically, the correlation between *Banks* and *Finance* is 0.7379, the correlation between *Banks* and *Private* is 0.9688, and the correlation between *Finance* and *Private* is 0.7828. These correlation coefficients are significant at the 0.01 level. In Columns [6] through [11], we only find two correlation coefficients greater than 0.30 between the control variables. For instance, Column [6] shows a correlation between *GDP/CAP* and *SAV/GDP* of 0.3265, and Column [10] shows a correlation between *Govspend* and *Netex* is -0.4509. This provides a certain level of confidence that our later regressions are not exposed to multicollinearity bias.⁹

III. Empirical results

Credit market development and mortality rates: OLS regressions

We begin our empirical analysis by regressing infant mortality rates on credit market development. We

estimate the following regression equation using country-year observations:

$$\ln(\text{Infant}_{it} \text{ or } \text{Maternal}_{it}) = \beta_1 \ln(\text{Credit}_{it}) + \beta_2 \text{GDP/Cap}_{it} + \beta_3 \Delta \text{GDP}_{it} + \beta_4 \Delta \text{Capform}_{it} + \beta_5 \text{Save/GDP}_{it} + \beta_6 \text{Govspend}_{it} + \beta_7 \text{Netex}_{it} + \alpha + \gamma + \varepsilon_{it}, \quad (1)$$

where the dependent variable is the natural log of either infant mortality rates (*Infant*) or maternal mortality rates (*Maternal*) for country *i* in year *t*. The independent variable of interest is the natural log of one of the three measures of credit market development: *Banks*, *Finance*, or *Private*. Since there are a variety of other factors that are likely to influence infant mortality, we include several country-specific determinants, which have previously been defined.

Table 3 reports the results from Equation 1 where the dependent variable is the natural log of infant mortality rates. Columns [1] and [2] report estimates when *Bank* capital is included in the regression as the independent variable of interest. Columns [3] and [4] report the results for *Finance* capital. Columns [5] and [6] report the results for

⁹We also estimate variance inflation factors (VIFs) between the independent variables in the multivariate regressions and find no indication of multicollinearity.

Table 3. Regression analysis: infant mortality and Credit Market Development.

	[1]	[2]	[3]	[4]	[5]	[6]
<i>Banks</i>	-0.6433*** (-27.89)	-0.4165*** (-12.83)				
<i>Finance</i>			-0.5881*** (-22.71)	-0.3981*** (-11.88)		
<i>Private</i>					-0.6477*** (-27.55)	-0.4182*** (-12.69)
Adj. R ²	0.6093	0.7238	0.5295	0.7101	0.6100	0.7238
Controls	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	7,718	5,218	6,892	4,655	7,664	5,185

The table reports the results from estimating the following regression equation using pooled country-year data.

$$\ln(\text{Infant}_{it}) = \beta_1 \ln(\text{Credit}_{it}) + \beta_2 \text{GDP}/\text{CAP}_{it} + \beta_3 \Delta \text{GDP}_{it} + \beta_4 \Delta \text{Capform}_{it} \\ + \beta_5 \text{SAVE}/\text{GDP}_{it} + \beta_6 \text{Govspend}_{it} + \beta_7 \text{Netex}_{it} + \alpha + \gamma + \varepsilon_{it}$$

The dependent variable is the natural log of the infant mortality rate ($\ln(\text{Infant})$) of each country in each year. The independent variable of interest is the natural log of our three measures of credit market development. We note that we include the natural log of *Banks*, the natural log of *Finance*, and the natural log of *Private* in the three specifications. The control variables include the following: *GDP/CAP* is the amount of gross domestic product per capita. ΔGDP is the growth rate in *GDP/CAP* for each country in each year. $\Delta \text{Capform}$ is the growth rate in capital formation. *SAVE/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports. We also include year fixed effects (γ) in each of the specifications. In columns [1], [3], and [5], we do not include the control variables in the analysis. Columns [2], [4], and [6] report the results when including the control variables in the specifications. In parentheses, we report *t*-statistics that are obtained from standard errors that are clustered across both countries and years. *** denotes statistical significance at the 0.01 level.

Private capital. Columns [1], [3], and [5] do not include the other control variables but do include year fixed effects. Columns [2], [4], and [6] include the control variables and year fixed effects. It is worth noting that the number of observations in each specification is different because of missing data for certain variables. We report *t*-statistics in parentheses that account for clustering across both countries and years.

In each model specification in Table 3, we see negative coefficients that are statistically and economically significant. As expected, both the magnitude and the significance of the estimates decrease when we include the control variables. Therefore, for brevity, we will focus our discussions on the full model specifications. Estimates range from -0.3981 (*t*-statistic = -11.88) for $\ln(\text{Finance})$ to -0.4182 (*t*-statistic = -12.69) for $\ln(\text{Private})$. These coefficients can be interpreted as elasticities. For example, the coefficient on $\ln(\text{Banks})$ is -0.4165, which suggests that a one percent increase in bank capital as a percent of GDP equates to a 0.4165% reduction in infant mortality rates. Since the average infant mortality rate across our sample is 49.20 per 1,000 live births, a 5% increase in bank financing relative to GDP in a country corresponds to approximately one less infant death per year. Alternatively, a one standard deviation increase in bank financing scaled by

GDP would equate to an approximate 15% reduction in infant mortality rates. On average, this type of increase would result in nearly seven fewer infant deaths per year. These results indicate a strong relation between credit market development and infant mortality, in that greater access to capital in a given country is associated with significantly lower infant mortality rates.

Table 4 is analogous to Table 3 but inserts the log of the maternal mortality rate, $\ln(\text{Maternal})$, as the dependent variable in Equation 1. Once again, for each independent variable of interest, some of the specifications include control variables (Columns [2], [4], and [6]) and other specifications do not include control variables (Columns [1], [3], and [5]). Each specification includes year fixed effects and uses standard errors that are clustered across both countries and years. For brevity, we will focus our attention on the full model specifications, although we can draw similar inferences throughout. Similar to our findings for infant mortality, maternal mortality is also negatively related to the availability of credit capital. In Column [2], the coefficient on $\ln(\text{Banks})$ is -0.6367 (*t*-statistic = -10.40). The coefficient on $\ln(\text{Finance})$ in Column [4] is -0.6068 (*t*-statistic = -9.45) and the coefficient on $\ln(\text{Private})$ in Column [6] is -0.6405 (*t*-statistic = -10.29), which is the

Table 4. Regression analysis: maternal mortality and Credit Market Development.

	[1]	[2]	[3]	[4]	[5]	[6]
<i>Banks</i>	-1.0287*** (-19.79)	-0.6367*** (-10.40)				
<i>Finance</i>			-0.9265*** (-16.95)	-0.6068*** (-9.45)		
<i>Private</i>					-1.0219*** (-19.82)	-0.6405*** (-10.29)
Adj. R ²	0.4600	0.5853	0.3699	0.5631	0.4592	0.5876
Controls	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	4,692	3,535	4,081	3,077	4,667	3,514

The table reports the results from estimating the following regression using pooled country-year data.

$$\ln(\text{Maternal}_{it}) = \beta_1 \ln(\text{Credit}_{it}) + \beta_2 \text{GDP/CAP}_{it} + \beta_3 \Delta \text{GDP}_{it} + \beta_4 \Delta \text{Capform}_{it} \\ + \beta_5 \text{SAVE/GDP}_{it} + \beta_6 \text{Govspend}_{it} + \beta_7 \text{Netex}_{it} + \alpha + \gamma + \varepsilon_{it}$$

The dependent variable is the natural log of the maternal mortality rate ($\ln(\text{Maternal})$) of each country in each year. The independent variable of interest is the natural log of our three measures of credit market development. We note that we include the natural log of *Banks*, the natural log of *Finance*, and the natural log of *Private* in the three specifications. The control variables include the following: *GDP/CAP* is the amount of gross domestic product per capita. ΔGDP is the growth rate in *GDP/CAP* for each country in each year. $\Delta \text{Capform}$ is the growth rate in capital formation. *SAVE/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports. In columns [1], [3], and [5], we do not include the control variables in the analysis. Columns [2], [4], and [6] report the results when including the control variables in the specifications. We also include year fixed effects (γ) in each of the specifications. In parentheses, we report *t*-statistics that are obtained from standard errors that are clustered across both countries and years. *** denotes statistical significance at the 0.01 level.

largest of the three. A one percent increase in the amount of private capital relative to GDP available results in a decrease in maternal mortality by 0.64%. Given that the average level of private capital relative to GDP is 39.25, the 0.64% decrease equates to almost 1.5 fewer deaths per 100,000 live births.

Since we observe a strong negative association between credit markets and mortality rates, it is important that we also discuss the broader implications. Increased access to capital could alleviate a variety of problems by assisting organizations that improve health-related outcomes. In theory, more access to capital by financial institutions allows those institutions to lend more to individuals and do so less expensively. Thus, individuals with increased access to capital could obtain health benefits in a variety of ways that could lead to better health-related outcomes and subsequently lower mortality rates.

Credit market development and mortality rates: 2SLS regressions

Although our results in the previous subsection demonstrate a strong negative relation between the availability of capital and mortality rates, the endogenous nature of the relation does not

allow us to draw strong causal conclusions. Does increased access to capital lower mortality rates, or do lower mortality rates attract more capital? Our next tests are designed to try and draw inferences about the causal nature of the documented relation between credit markets and mortality rates.

To address the potential simultaneity bias, we estimate a 2SLS model using country-year observations. Similar to Beck, Levine, and Loayza (2000), we use legal origin as an instrumental variable for financial credit market development. Legal origin theory claims that historic legal traditions (civil law and common law) have shaped and influenced current lawmaking and dispute resolution in many countries. Legal origin serves as a valid instrument since it (arguably) meets the following two criteria. First, legal origin is likely to be related to credit market development (as we will show below in our first-stage results). Second, legal origin is also likely to be exogenous to (conditional) infant mortality during our sample period because countries typically established their legal origin (common law or civil law) through occupation or colonization, which often occurred hundreds of years ago. Thus, we assume the legal origin of a country is a relatively exogenous instrument and is unrelated to conditional current mortality

rates. La Porta et al. (1997, 1998) argue that legal origin helps explain cross-country differences in (1) creditor rights, (2) systems for enforcing debt contracts, and (3) standards for corporate information disclosure, all of which are related to financial intermediary development (Beck, Levine, and Loayza 2000; Levine 1999).

Because legal origin appears to satisfy the two requirements for instrument validity, we estimate the following first-stage regression equation:

$$\begin{aligned} \ln(Credit_{it}) = & \delta_1 LegalOrigin_i + \delta_2 GDP/Cap_{it} \\ & + \delta_3 \Delta GDP_{it} + \delta_4 \Delta Capform_{it} + \delta_5 Save/GDP_{it} \\ & + \delta_6 Govspend_{it} + \delta_7 Netex_{it} + \alpha + \gamma + \tau_{it}, \quad (2) \end{aligned}$$

where the dependent variable, *Credit*, has previously been defined. *Legal Origin* is equal to one if the country has a common (or English) law background and zero otherwise. An effective instrument will be correlated with the accessibility to capital and uncorrelated with the error term from our initial model detailed in Equation 1. We posit that the coefficient on δ_1 will be positive and significant in each of the first-stage model specifications of Equation 3.

Using the predicted values for each of the respective credit variables from the estimation of Equation 3, we then estimate our second stage equation to isolate the change to mortality rates that can be attributed to credit markets. If effective, using the predicted values from the first-stage regression with the instrument alleviates the endogeneity stemming from any omitted variable bias since the influence of the omitted variable will remain in the error term from the first stage and thus does not influence the predicted values. Accordingly, we estimate the second stage of the 2SLS as follows:

$$\begin{aligned} \ln(Infant_{it} \text{ or } Maternal_{it}) = & \beta_1 P[\ln(Credit_{it})] \\ & + \beta_2 GDP/CAP_{it} \\ & + \beta_3 \Delta GDP_{it} + \beta_4 \Delta Capform_{it} + \beta_5 SAVE/GDP_{it} \\ & + \beta_6 Govspend_{it} + \beta_7 Netex_{it} + \alpha + \gamma + \varepsilon_{it} \quad (3) \end{aligned}$$

where $P[\ln(Credit)]$ is the predicted value for each of the previously identified measures of credit availability from the estimation of Equation 3. For

each credit measure, we report both the first and second stages of the analysis and note that each specification includes control variables and year fixed effects. Tables 5 and 6 report the results from our 2SLS regressions.

Column [1] of Table 5 reports the first stage where $\ln(Banks)$ is the variable of interest. The coefficient on *Legal Origin* is 0.3952 and is highly significant with a *t*-statistic of 11.98. Column [2] reports results from our second stage where we include $P[\ln(Banks)]$ as the independent variable of interest. Similar to our previous findings in Table 3, we find a negative and significant relation between the amount of bank capital relative to GDP available in the country and infant mortality. The coefficient on $P[\ln(Bank)]$ is -0.5111 (*t*-statistic = -7.60). Once again, we have designed our tests so that the results of our regression can be interpreted as elasticities. A one percent increase in predicted bank capital relative to GDP results in a 0.51% reduction in infant mortality. The second stage regressions are reported for *Finance* and *Private* in Columns [4] and [6], respectively. The coefficient on $P[Finance]$ in Column [4] is -0.5750 (*t*-statistic = -9.55) and the coefficient on $P[Private]$ in Column [6] is -0.5613 (*t*-statistic = -7.53). The robustness of our findings is highlighted by the magnitude and statistical significance of our 2SLS results. For instance, a one percent increase in the amount of private capital relative to GDP decreases infant mortality by 0.56%.

Table 6 summarizes our 2SLS analysis performed using the log of maternal mortality as the dependent variable. Results, which are admittedly weaker, are presented in a similar fashion with the first-stage regressions reported in Columns [1], [3], and [5] and the second-stage regressions reported in Columns [2], [4], and [6]. In Column [2], the coefficient from the second stage regression for $\ln(Banks)$ is -0.1978 (*t*-statistic = -1.67). We note that this coefficient is only significant at the 0.10 level. Similar results can be seen for $\ln(Finance)$ and $\ln(Private)$ with coefficients of -0.3114 and -0.2077 , respectively. While the coefficient in Column [4] is reliably different from zero, the coefficient in Column (6) is only significant at the 0.10 level and should be interpreted with

Table 5. Instrumental variable analysis: infant mortality and credit market development.

	BANKS		FINANCE		PRIVATE	
	1 st Stage [1]	2 nd Stage [2]	1 st Stage [3]	2 nd Stage [4]	1 st Stage [5]	2 nd Stage [6]
<i>Legal Origin</i>	0.3952*** (11.98)		0.4658*** (13.92)		0.3602*** (10.92)	
<i>Banks</i>		-0.5111*** (-7.60)				
<i>Finance</i>				-0.5750*** (-9.55)		
<i>Private</i>						-0.5613*** (-7.53)
Adj. R ²	0.3418	0.6620	0.3372	0.6507	0.3555	0.6584
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	5,218	5,218	4,655	4,655	5,185	5,185

The table reports the results from estimating the following two-stage least squares (2SLS) regression using pooled country-year data. In the first-stage regression, we instrument credit market development with an indicator variable *Legal Origin*, which equals one if the country has a common law background and zero if it has a civil law background.

$$\ln(\text{Credit}_{it}) = \delta_1 \text{LegalOrigin}_i + \delta_2 \text{GDP/CAP}_{it} + \delta_3 \Delta \text{GDP}_{it} + \delta_4 \Delta \text{Capform}_{it} + \delta_5 \text{SAVE/GDP}_{it} + \delta_6 \text{Govspend}_{it} + \delta_7 \text{Netex}_{it} + \alpha + \gamma + \tau_{it}$$

The dependent variable in the first stage is the natural log of our three measures of credit market development ($\ln(\text{Credit})$). We use the predicted values ($P[\ln(\text{Credit}_{it})]$) from the first stage as our independent variable of interest in the following second-stage regression.

$$\ln(\text{Infant}_{it}) = \beta_1 P[\ln(\text{Credit}_{it})] + \beta_2 \text{GDP/CAP}_{it} + \beta_3 \Delta \text{GDP}_{it} + \beta_4 \Delta \text{Capform}_{it} + \beta_5 \text{SAVE/GDP}_{it} + \beta_6 \text{Govspend}_{it} + \beta_7 \text{Netex}_{it} + \alpha + \gamma + \varepsilon_{it}$$

The dependent variable in the second stage is the natural log of our measure of infant mortality ($\ln(\text{Infant})$) of each country in each year. The independent variable of interest is the predicted values from the first stage ($P[\ln(\text{Credit})]$). As before, we include the natural log of *Banks*, the natural log of *Finance*, and the natural log of *Private* in the three specifications. The control variables include the following: *GDP/CAP* is the amount of gross domestic product per capita. ΔGDP is the growth rate in *GDP/CAP* for each country in each year. $\Delta \text{Capform}$ is the growth rate in capital formation. *SAVE/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports. We also include year fixed effects (γ) in each of the specifications. In columns [1], [3], and [5], we report the main results from the first stage. Columns [2], [4], and [6] report the results from the second stage. In parentheses, we report *t*-statistics that are obtained from standard errors that are clustered across both countries and years. *** denotes statistical significance at the 0.01 level.

caution. Thus, after controlling for potential endogeneity, we find that credit market development still leads to a reduction in both infant mortality rates and, to a lesser extent, maternal mortality rates.

IV. Concluding remarks

In conclusion, our study underscores the paramount importance of considering the health and well-being of human capital when assessing the benefits of economic development (Sen 1993), a facet often overlooked in conventional research. The considerable variations in mortality rates, a reliable health proxy (Ruhm 2015), both across countries and over time, have been predominantly attributed to economic development. As countries expand economically, mortality rates decline. Endogenous growth theory suggests that technological progress, or innovation, is an important and endogenous factor influencing economic growth. Furthermore, innovation requires capital investment and capital allocation to the firms

and individuals that are responsible for the advancements.

This research examines the connection between economic development, financial innovation, and health outcomes. Our hypothesis, anchored in the notion that innovation demands capital allocation, posits that financial development plays a pivotal role in facilitating health-related innovation and, consequently, reducing mortality rates. The results of this study show a strong negative association between credit market development and both infant and maternal mortality rates. These results are robust to controls for various country characteristics and time-series variation. In additional tests, we account for potential simultaneity bias by instrumenting credit market development with legal origin as in Beck, Levine, and Loayza (2000). Our results support our initial findings and allow us to begin to draw stronger causal inferences.

Thus, perhaps the dramatic decrease in mortality rates for some countries over time can be explained by higher rates of innovation,

Table 6. Instrumental variable analysis: maternal mortality and credit market development.

	1 st Stage	2 nd Stage	1 st Stage	2 nd Stage	1 st Stage	2 nd Stage
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Legal Origin</i>	0.5235*** (11.50)		0.5612*** (12.14)		0.5048*** (11.09)	
<i>Banks</i>		-0.1978* (-1.67)				
<i>Finance</i>				-0.3114*** (-2.69)		
<i>Private</i>						-0.2077* (-1.70)
Adj. R ²	0.3409	0.5034	0.3552	0.5028	0.3591	0.5062
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	3,535	3,535	3,077	3,077	3,514	3,514

The table reports the results from estimating the following two-stage least squares (2SLS) regression using pooled country-year data. In the first-stage regression, we instrument credit market development with an indicator variable *Legal Origin*, which equals one if the country has a common law background and zero if it has a civil law background.

$$\ln(\text{Credit}_{it}) = \delta_1 \text{LegalOrigin}_{it} + \delta_2 \text{GDP/CAP}_{it} + \delta_3 \Delta \text{GDP}_{it} + \delta_4 \Delta \text{Capform}_{it} + \delta_5 \text{SAVE/GDP}_{it} + \delta_6 \text{Govspend}_{it} + \delta_7 \text{Netex}_{it} + a + \gamma + \tau_{it}$$

The dependent variable in the first stage is the natural log of our three measures of credit market development ($\ln(\text{Credit}_{it})$). We use the predicted values ($P[\ln(\text{Credit}_{it})]$) from the first stage as our independent variable of interest in the following second-stage regression.

$$\ln(\text{Maternal}_{it}) = \beta_1 P[\ln(\text{Credit}_{it})] + \beta_2 \text{GDP/CAP}_{it} + \beta_3 \Delta \text{GDP}_{it} + \beta_4 \Delta \text{Capform}_{it} + \beta_5 \text{SAVE/GDP}_{it} + \beta_6 \text{Govspend}_{it} + \beta_7 \text{Netex}_{it} + a + \gamma + \varepsilon_{it}$$

The dependent variable in the second stage is the natural log of our measure of maternal mortality ($\ln(\text{Maternal}_{it})$) of each country in each year. The independent variable of interest is the predicted values from the first stage ($P[\ln(\text{Credit}_{it})]$). As before, we include the natural log of *Banks*, the natural log of *Finance*, and the natural log of *Private* in the three specifications. The control variables include the following: *GDP/CAP* is the amount of gross domestic product per capita. ΔGDP is the growth rate in *GDP/CAP* for each country in each year. $\Delta \text{Capform}$ is the growth rate in capital formation. *SAVE/GDP* is the amount of gross savings scaled by GDP. *Govspend* is the amount (in trillions of USD) of national expenditures. *Netex* is the difference (in billions of USD) between total exports and total imports. We also include year fixed effects (γ) in each of the specifications. In columns [1], [3], and [5], we report the main results from the first stage. Columns [2], [4], and [6] report the results from the second stage. In parentheses, we report *t*-statistics that are obtained from standard errors that are clustered across both countries and years. *** denotes statistical significance at the 0.01 level.

particularly in the pharmaceutical sector (see e.g. Lichtenberg 2007, 2010). Our findings highlight the interconnectedness of financial development, innovation, and public health. We provide valuable insights for policymakers, researchers, and industry professionals as they grapple with the challenges that may impede the formation and allocation of capital, and by extension, hinder innovation.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Table A1. The table shows the means of variables of interest used throughout the study. *infant* is infant mortality per 1,000 live births. *maternal* is the maternal mortality rate per 100,000 live births. *banks* is the amount of domestic credit offered by banks as a percent of GDP. *Finance* is the amount of domestic credit offered by the financial sector as a percent of GDP. *Private* is the total amount of domestic credit offered to the private sector as a percent of GDP.

Country	[1] Infant	[2] Maternal	[3] Banks	[4] Finance	[5] Private
Afghanistan	64.89	570.30	6.346	0.264	6.435
Albania	16.50	29.42	23.986	59.216	24.499
Algeria	30.69	166.37	13.835	25.367	13.853
Angola	51.23	234.00	14.109	28.454	15.250
Argentina	16.74	59.85	15.680	32.197	16.052
Armenia	21.60	38.17	23.625	28.116	24.352
Australia	4.97	7.44	97.543	114.498	97.543
Austria	3.76	4.25	92.119	126.245	92.477
Azerbaijan	49.55	43.59	11.039	16.713	11.278
Bahamas	13.51	66.74	59.464	77.604	62.696
Bahrain	7.35	16.20	66.660	69.159	66.660
Bangladesh	59.25	358.63	27.924	40.810	28.099
Belarus	6.56	13.93	18.398	28.101	19.782
Belgium	3.86	7.81	60.980	114.924	60.981
Belize	20.18	45.96	48.915	54.385	48.969
Benin	83.71	509.22	13.831	12.266	13.892
Bhutan	39.39	253.50	29.580	32.006	29.598
Bolivia	50.58	303.23	45.536	55.743	47.869
Bosnia and Herzegovina	5.74	10.64	53.238	54.967	54.364
Brazil	29.22	72.37	48.748	87.010	48.952
Brunei Darussalam	9.21	31.05	40.266	26.227	40.517
Bulgaria	9.94	13.31	50.929	51.000	51.042
Burkina Faso	82.09	521.11	13.866	14.396	13.950
Burundi	72.68	853.32	16.406	24.893	16.613
Cabo Verde	21.85	51.00	60.402	77.720	61.074
Cambodia	57.74	373.87	18.712	16.166	18.748
Cameroon	84.57	711.11	10.922	14.697	10.932
Canada	5.55	8.70	97.083	144.893	121.632
Chad	96.07	1236.38	4.609	9.960	4.620
Chile	6.58	17.50	82.654	132.338	116.453
China	24.50	52.73	110.559	125.665	110.973
Colombia	20.19	88.67	31.063	47.796	35.248
Comoros	72.53	476.57	12.382	17.276	14.109
Congo, Dem. Rep.	92.91	802.11	2.906	3.914	2.947
Congo, Rep.	58.44	583.50	8.191	8.008	8.204
Costa Rica	8.62	24.20	48.914	70.294	49.704
Cote d'Ivoire	74.20	696.71	17.683	26.347	17.766
Croatia	5.24	10.19	59.510	73.944	59.521
Cyprus	3.04	8.00	218.591	269.233	218.711
Czech Rep.	3.15	5.27	39.763	56.121	39.881
Denmark	3.76	7.88	171.510	206.793	171.522
Djibouti	80.54	414.69	33.266	38.298	33.398
Dominican Rep.	32.56	118.90	23.301	35.782	24.239
Ecuador	25.81	97.32	23.198	25.454	23.589
Egypt	36.14	61.07	38.374	85.215	38.374
El Salvador	23.85	81.00	39.337	57.718	40.720
Eritrea	52.88	715.18	25.329	115.639	26.689
Estonia	4.04	11.15	76.249	82.014	76.294
Finland	2.73	3.44	78.206	120.574	78.257
France	3.66	9.81	88.158	129.947	88.182
Gabon	49.62	369.37	10.454	14.786	10.461
Gambia	49.38	763.10	13.552	35.462	13.791
Georgia	10.06	32.00	52.378	58.756	55.822
Germany	3.68	7.00	95.449	137.315	95.450
Ghana	49.03	328.00	15.960	30.303	16.532
Greece	3.66	3.00	88.277	119.249	88.436
Guatemala	36.62	138.94	24.284	34.076	24.661
Guinea-Bissau	79.13	643.77	5.318	11.347	5.631
Haiti	66.61	442.32	14.910	29.012	15.610
Honduras	26.92	148.03	42.374	44.180	42.706
Hungary	5.84	15.06	47.486	66.850	47.524

(Continued)

Table A1. (Continued).

Country	[1] Infant	[2] Maternal	[3] Banks	[4] Finance	[5] Private
Iceland	2.97	4.70	118.158	141.022	118.187
India	61.11	337.30	36.783	59.985	36.783
Indonesia	36.39	238.42	32.763	45.757	34.699
Iran	24.88	48.46	35.160	46.573	35.160
Ireland	4.01	7.81	116.478	176.975	116.480
Israel	5.40	7.63	66.995	82.499	66.996
Italy	3.58	4.19	80.512	135.200	80.712
Jamaica	15.10	91.89	28.930	53.575	28.930
Japan	2.97	8.00	128.597	302.892	180.659
Jordan	23.57	78.86	72.655	92.051	72.821
Kazakhstan	26.39	43.57	28.436	32.899	29.173
Kenya	54.50	675.11	25.318	37.644	25.419
Korea, Rep.	6.30	15.67	99.146	108.579	100.247
Kuwait	8.18	4.00	68.491	62.648	68.491
Kyrgyz Rep.	34.22	82.23	9.907	14.231	10.095
Lao PDR	68.72	405.10	9.531	12.038	9.923
Latvia	5.45	18.67	66.103	67.727	66.103
Lebanon	13.22	30.76	76.081	164.941	79.098
Liberia	77.40	931.27	11.330	119.637	11.587
Lithuania	4.22	10.00	46.695	52.686	46.704
Luxembourg	2.62	11.25	86.032	165.186	86.032
Macedonia	13.93	10.17	33.007	38.960	33.211
Madagascar	62.91	536.30	11.395	16.314	11.427
Malawi	59.51	644.79	9.214	17.204	9.214
Malaysia	8.85	56.56	114.602	126.788	115.870
Maldives	6.28	50.50	33.107	80.119	37.080
Mali	101.94	775.56	13.634	13.469	13.737
Malta	5.98	10.83	110.070	142.563	110.160
Mauritania	65.20	752.80	23.848	38.952	24.737
Mauritius	15.76	52.41	66.874	85.501	66.903
Mexico	20.39	62.87	20.150	40.288	23.522
Moldova	18.34	34.48	24.716	33.170	26.021
Mongolia	18.02	50.00	52.022	50.751	52.651
Montenegro	5.68	7.56	64.386	68.563	64.479
Morocco	36.83	189.32	47.159	82.530	50.805
Mozambique	106.53	869.37	15.173	13.001	15.776
Namibia	42.35	318.90	44.264	50.657	46.315
Nepal	40.89	377.57	44.907	57.458	45.318
Netherlands	4.09	9.44	114.495	186.932	114.497
New Zealand	6.05	12.81	113.444	121.297	115.444
Nicaragua	28.60	172.10	24.513	76.081	25.877
Niger	61.57	635.20	11.617	11.046	11.739
Nigeria	101.59	1049.33	15.576	21.563	15.653
Norway	3.51	5.84	90.431	102.741	100.477
Oman	10.66	18.94	40.298	37.004	40.310
Pakistan	84.74	284.37	23.254	47.577	23.297
Panama	20.24	92.07	70.153	73.045	76.100
Papua New Guinea	59.46	369.87	17.822	30.764	17.907
Paraguay	25.24	149.92	27.499	27.844	28.273
Peru	31.00	151.52	20.131	18.593	20.826
Philippines	28.35	120.74	35.192	55.418	35.207
Poland	5.76	4.56	38.772	54.957	38.774
Portugal	3.52	11.19	137.185	168.220	137.272
Qatar	8.01	16.69	42.369	66.137	42.377
Romania	14.04	39.95	23.627	29.553	23.627
Russia	9.59	31.29	38.983	40.116	38.988
Rwanda	81.08	798.85	11.485	12.582	11.651
Samoa	15.15	60.50	47.585	75.826	82.366
Saudi Arabi	14.46	15.81	37.130	13.925	37.130
Senegal	57.96	444.22	21.915	26.601	21.987
Serbia	8.25	15.95	34.693	38.347	34.733
Sierra Leone	112.67	1771.43	4.924	17.389	4.987
Singapore	3.07	13.78	98.673	77.437	98.676
Slovak Rep.	5.77	6.09	44.284	60.867	44.304
Slovenia	2.72	9.38	64.332	75.749	64.335
Solomon Islands	17.40	127.25	19.985	25.672	31.807
South Africa	27.58	125.75	60.583	146.489	118.082
Spain	3.46	5.06	142.315	192.506	142.322
Sri Lanka	13.33	49.93	27.909	42.967	27.962
Sudan	62.90	497.11	6.776	13.895	6.776

(Continued)

Table A1. (Continued).

Country	[1] Infant	[2] Maternal	[3] Banks	[4] Finance	[5] Private
Swaziland	65.42	527.58	16.851	12.635	16.969
Sweden	2.76	4.69	113.451	135.055	113.454
Switzerland	4.63	6.67	152.667	164.718	152.673
Syria	21.83	80.56	10.341	39.498	10.341
Tajikistan	56.59	49.19	11.637	16.362	15.650
Tanzania	70.40	723.04	9.192	15.967	9.401
Thailand	17.12	25.68	108.310	138.238	120.777
Togo	70.71	467.22	20.827	25.601	20.970
Trinidad and Tobago	22.60	68.30	32.895	40.023	38.515
Tunisia	25.23	85.46	56.737	69.292	63.818
Turkey	29.16	58.78	27.891	45.313	28.917
Uganda	71.30	501.69	9.559	13.275	9.932
Ukraine	12.42	30.66	31.664	54.829	37.233
United Arab	7.74	6.13	58.602	68.108	58.609
United Kingdom	5.36	10.74	134.983	143.717	135.316
United States	6.91	13.80	50.594	207.618	168.586
Uruguay	13.64	27.07	30.589	40.632	30.744
Vanuatu	24.16	96.80	58.480	58.118	58.852
Venezuela	18.34	94.80	16.040	25.458	18.078
Vietnam	22.36	73.67	60.883	65.972	60.883
West Bank	23.22	66.73	22.983	25.209	22.985
Afghanistan	64.89	570.30	6.346	0.264	6.435