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Male Organ and Economic Growth: Does Size Matter?*

Abstract

This study explores the link between economic growth and penile length between 1960 and 1985. It estimates an augmented Solow model utilizing the Mankiw-Romer-Weil 121 country dataset. The size of male organ is found to have an inverse U-shaped relationship with the level of GDP in 1985. Economic development between 1960 and 1985 is negatively associated with the size of male organ. With considerable reservations it is also found to be a more important determinant of GDP growth than country's political regime type. Two interpretations for the patterns between male organ and economic growth are discussed briefly: the link between penile length, testosterone and risk-taking, and self-esteem production. Despite the robust statistical links, until more rigorous treatments on the subject the proposed `male organ hypothesis' should be taken with reservations.

JEL Classification: O10, O47

Keywords: economic growth, development, penile length, Solow model.

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1 Introduction

Economic growth has sparked intellectual endeavours for decades. The convergence hypothesis put forward in Solow (1956), in particular, has received considerable attention. It posits an inverse relationship between the level and growth of GDP. As poor countries are scarce in capital but abundant in labor, marginal products of investments are high. Injections of capital result in higher growth rates in developing countries and convergence should ensue. Literature has established limited empirical support for the convergence hypothesis (Mankiw et al., 1992; Barro, 1991). The inverse relationship is robust especially after human capital has been controlled for. Regarding GDP growth in general, Barro found evidence that government consumption and political instability inhibit economic development. Focusing on the role of political institutions Helliwell (1994) concluded that democracy does not seem to contribute to economic growth but is associated with higher levels of GDP. In another strand of literature Jones & Schneider (2006) show that IQ can explain a substantial part of the cross-country differentials in GDPs. However, as the authors point out, IQ is likely to be influenced by education, health and literacy, making it highly endogenous.

The studies cited above are well established and generally achieve high predictive power. Yet as they concentrate on economic, social and political factors, these and many related treatments largely abstain from biological and/or sexual considerations. The absence of the last perspective from the growth literature is somewhat surprising, given the very crucial role sex plays in many facets of life. If the endless strive for sexual activities – even without any reproductive intentions – does not show up in economic outcomes and indeed humanity's long-term development, then what does? The objective of this study is to initiate this discourse, and to introduce to the growth literature a perspective quite novel. The question is, namely, whether and how strongly the average sizes of male organs are associated with GDPs between 1960 and 1985? It is argued here that the penile length in population has a strong statistical association with economic development during the period. The existence and channel of causality remains obscure at this point but the correlations are robust.

To facilitate comparison with earlier research, this study utilizes a widely-used cross-country dataset originally published in Summers & Heston (1988) and further augmented in Mankiw et al. (1992) [henceforth MRW]. In total the dataset contains 121 countries of which a sub-sample of 76 observations is utilized. Results in MRW form the baseline against which the findings in this paper are contrasted. However, no attempt to augment the Solow model beyond MRW has been made. In order to control for political conditions, Polity IV data is utilized. This well-known score is used to assess whether the 'male organ hypothesis' is robust to countries' political regime type on autocracy–democracy spectrum.

The contribution of this paper is to show that the level and growth of the per capita GDP between 1960 and 1985 is not invariant to the average size of male organ in population. Indeed the 'male organ hypothesis' put forward here suggests that penile lengths could carry economic significance. The key findings of this paper are as follows.

First, the GDP in 1985 is found to experience an inverted U-shaped relationship with the male organ. One result is the collapse in GDP after male organ exceeds the length of 16 centimetres. It is also noteworthy that countries with below 12 centimetre male organs are generally less developed. Penile length alone can explain over 15% of the between-country variation in 1985 GDP. Startlingly the male organ coefficients are statistically significant at the 1% level in all model specifications.

Second, the average growth rates from 1960 to 1985 are found to be negatively correlated with penile lengths: a unit centimetre increase in its physical dimension is found to reduce GDP growth by 5 to 7% between 1960 and 1985. Quite remarkable is the finding that male organ alone can explain 20% of the between-country variation in GDP growth rates between 1960 and 1985. Regarding the relative importance of political institutions in shaping economic development, it seems that male organ is more strongly associated with GDP growth than country's political regime type. Male organ diminishes the negative effect of population growth on the level of GDP in 1985 compared to MRW. Moreover, controlling for penile length slightly slows the rate of convergence between rich and poor countries. As intriguing as both of these effects are, they are arguably within the margins of error.

Since this paper has merely discovered statistical associations and not causalities, only stylized interpretations are discussed. The first discussed explanation is biological. Penile length is related to testosterone (Boas et al., 2006), which in turn has been shown to influence risk-taking (Apicella et al., 2008). If this link holds within-population, then the interpretation could be that for some yet unknown reason the moderate risk-taking countries – those with average penile lengths and hence testosterone levels – would have the highest GDPs. The second explanation, a more Freudian in tone, revolves around the self-esteem. As is discussed in Wylie & Eardley (2007) and Winter (1989), men with larger penises possess a feeling of greater sexual competence. The essence of the argument is, without elaborating any further at this stage, that the marginal utility of income would be lower in countries with large male organs. These countries would then end up with lower working hours and GDPs. However intriguing, it is somewhat questionable whether these effects would manifest themselves in a highly aggregated, cross-country context.

This paper proceeds as follows. Section 2 describes the data and estimated model. Section 3 presents the results. Section 4 discusses and section 5 concludes. Tables, figures and data are in the Appendix.

2 Data and estimation

2.1 Data

The dataset originates from MRW, and includes income, investment, schooling and population statistics from 1960 to 1985. It covers 121 countries but a subsample of 76 from a total of 98 non-oil producing economies is used here. This dataset is well-known and extensively used in the growth literature. Detailed descriptions of the data and its limitations are provided in previous studies (Mankiw et al., 1992; Summers & Heston, 1988; Barro, 1991).

Sample statistics are given in Table (1)[1]. As in MRW, GDPs are in per

[1]The dataset used in this study is included in the Appendix. It is a subset of the original MRW dataset extended with additional variables relevant to this study.

Table 1: Descriptive statistics

Mean and s.d. values for the sample of 98 non-oil producing countries.		
Variable	Mean	S.d.
GDP1960	2994	2862
GDP1985	5309	5277
I/Y	17.6	7.9
SCHOOL	5.3	3.4
ORGAN	14.5	1.9
POLITY1980	-0.1	7.7
Growth rates 1960–1985		
GDP	3.9	1.8
Working age population	2.2	0.8

Notes: GDP is in per capita. I/Y and SCHOOL are in percentages and averaged over the period. ORGAN is in centimetres. Growth rates are in percent per year.

capita terms. I/Y represents investments as a share of GDP and SCHOOL the percentage of working-age population in secondary school. Both are averaged over the period from 1960 to 1985.

Political data comes from the Polity IV Project, which scores countries on scale $-10, \ldots, +10$ according to their regime type[2]. Authoritarian regimes are assigned more negative, democratic more positive values. In estimation POLITY2 score for 1980 is used. To alleviate potential endogeneity issues an earlier date would have been preferable. However, as many formerly colonial countries became independent between 1960 and 1985, data was not available for some observations on earlier years. As pointed out in Barro (1996) political regime types interplay with economic development considerably. Endogeneity may thus be severe. However, even given this reservation it is still interesting to see whether the 'male organ hypothesis' is robust to countries' position on the autocracy–democracy axis.

In accordance with much of the growth literature, a region dummy for African countries is included in the regressions. Here it refers to all countries on the continent, not only on sub-Saharan Africa. It is admittedly dubious to combine one billion people, some 250 Bantu languages and hundreds of diverse cultures into a single binary variable. Yet this convention is in accordance with the literature's canons.

The data regarding the physical dimensions of male organs is openly available online and has been compiled [by an unknown party] from an extensive number of sources[3]. Large part of the data has been collected by health authorities but some observations are self-reported. Due to the sensitive nature of the subject

[2]See http://www.systemicpeace.org/polity/polity4.htm for indicators and references therein.

[3]See http://www.everyoneweb.com/worldpenissize/ for the list of penis lengths and references therein.

matter, self-reported data might be biased. Without elaborating further, it seems that the observations fit anticipated patterns. Still, measurement errors can not be ruled out.

The physical dimension of male organ varies considerably across countries, the average being 14.5 centimetres. For example, South Korea and Zaire [now Dem. Rep. of the Congo] have average sizes of 9.66 and 17.93 centimetres, respectively. This high between-country variation is desirable, as it entails smaller variance in the estimated coefficient. Currently the data does not include length observations for all of the 98 non-oil producing countries, and hence the subset is reduced to a sample of 76 countries.

Male organ can be considered quite convenient a variable for two particular reasons. First, body parts are well defined and relatively easy to measure. Regarding the latter point, the erect length of male organ is used. Second, as is explained in Wylie & Eardley (2007), unarguably penile length might entail certain cultural connotations. However, they might be less severe than those pertaining to, for example, economic freedom or corruption. Hence male organ has many advantages over more contentious variables such as political regime types, IQ, social or economic indicators each of which might be subject to biases of various sorts. It is not unreasonable to conclude that, even allowing for some measurement errors, of all variables used in the study the male organ is actually one of the least problematic.

2.2 Estimation

The study uses Mankiw et al. (1992) as its starting point, and in each estimation the corresponding figures from that study are provided. Hence in each table Model (1) replicates MRW results up to parameter accuracy, and Model (2) presents the same estimations with the 76 country sub-sample. This allows for direct comparison of estimates and fosters transparency. Regressions are made using OLS with the following functional form

$$\ln GDP_i = \beta_0 + \ln \mathbf{X}_i \beta + \mathbf{D}_i \delta + \mu_i \tag{1}$$

where $\mathbf{X}_i$ includes investment [I/GDP], working-age population $[n + g + \delta]$ and human capital [SCHOOL] variables. Vector β contains coefficients and $i \in \{1, ..., N\}$ denotes the number of the observation. Depending on the model, the explained GDP variable can either represent the level in 1985 or the average growth between 1960 and 1985. Furthermore, in order to identify convergence patterns, Y1960 is included in $\mathbf{X}_i$ in some specifications.

Following MRW, $\mathbf{X}_i$ includes the advancement of technology g and depreciation rate δ. Their sum at 0.05 is assumed equal across countries. Together with the average population growth n the former factors constitute an important determinant of the Solow model: namely, the prediction that population growth is inversely related to per capita GDP growth. $\mathbf{D}_i$ contains POLITY1980 and AFRICA variables and ORGAN in linear or quadratic forms. The first represents Polity IV [POLITY2] score for 1980, and the second the respective region dummies.

As Equation (1) indicates, the estimated model here is the original MRW Solow model with additional male organ, political regime type and Africa controls. No economic interpretation is given for the male organ. Richer, potentially micro-founded models would clearly be needed to fully account the peculiar role it may have played in the course of economic development. Moreover, present-day economic theory does not provide much intuition in this respect. For these reasons even the *a priori* sign of the male organ coefficient is an open question.

Unbiasedness of Equation (1) requires that ORGAN must not be correlated with the error term μ in the regression model. In particular, GDP ought not to affect the size of male organ. For reasons stated below, this can not be ruled out entirely. As human anatomy evolves rather slowly, the genetic part of the between-population variation in penile lengths should date back to pre-historic times. Hence much of the variation does not result from the developments in recent centuries, and can be considered exogenous to 20th century GDPs. However, improved living standards have increased body height and hence, potentially, male organ size. As is shown in Vogel (1994), average heights did increase between 1750 and 1875 among European populations because of improvements in diets and increases in intakes of calories. However, this is not a sufficient condition for endogeneity as height and penile length might be unrelated. Indeed the evidence that dimensions of body parts and penile lengths are correlated, is mixed. Siminoski & Bain (1993) show that height and penile length are positively albeit weakly correlated. On the other hand, according to Shah & Christopher (2002) shoe size and penile length are unrelated. Taking the conservative stance that the physical dimension of male organ is related to body size, endogeneity might result as higher GDPs increase statures over time.

If standard of living and penile length covary positively, the latter's coefficient would be biased upwards. Namely, richer countries should evidence larger male organs because of higher GDPs. Hence in the regressions the male organ coefficients are likely to represent upper-bound estimates. However, as penile length is here found to be negatively correlated with GDP – especially growth – the reverse causality should in fact make the proposed 'male organ hypothesis' stronger. In other words, in the absence of any welfare-induced increase in body stature the inverse relationship between male organ and GDP would be further accentuated. However, the between-population variation in the penile lengths is so substantial that any reverse causation should most likely have only minor detrimental effects on the results.

3 Results

3.1 GDP in 1985

The OLS estimates indicate that the size of male organ has a marked effect on the 1985 per capita GDP. This can be seen in Model (3) in Tables (2) and (3) which show how ORGAN affects the 1985 GDP. The latter, augmented model, has more controls, while the former represents the textbook case. Estimates with both sets of controls suggest that an inverse U-shaped relationship exists between GDP and the physical dimension of male organ. Hence countries with average-sized male organs tend to be developed, while those at the extremes of the penile length spectrum are relatively poor. All ORGAN coefficients are significant at least at the 5% level irrespective of the controls.

Comparing the coefficients in the augmented model of Table (3) suggests that the negative impact of population growth $[n + g + \delta]$ on GDP is lower when ORGAN is controlled for. Without male organ 1% increase in population growth decreases the 1985 GDP by 1.65%. However, with male organ this decrease drops to 1.07%. Although this finding falls within the margin of error, it is still noteworthy as it suggests that population growth rates and male organ sizes are interrelated. In fact it seems that population growth is slightly higher at the extremes of the male organ spectrum. Furthermore, the negative effect of population growth on 1985 GDP decreases with more controls.

The inclusion of male organ does not materially change the results with respect to investment ratio [I/GDP] or human capital [SCHOOL]. However, as can be seen from Model (4), political regime type [POLITY1980] does not seem to alter the role of male organ. Quite interestingly it also suggests that from the GDP perspective male organs dwarf political institutions in importance – yet this result must be taken with reservations. Model (5) indicates that male organ is significant even after controlling for Africa [AFRICA]. This is encouraging since it suggests that the results are not driven by Africa's high ORGAN/GDP ratio.

Figure (1) plots the relationship between 1985 GDP and male organ. In this OLS regression the only explanatory variable is ORGAN in the quadratic form. It is noteworthy that the male organ can alone explain over 15% of the variation in GDPs. The inverted U-shaped relationship also shows how the GDPs collapse when the average penile length exceeds 16 centimetres. Most of these countries are found in Africa and Latin America. However, at the lower-end a similar pattern is found: the majority of countries with male organs smaller than 12 centimetres are relatively poor. These are often Asian countries.

In conclusion, the inverted U-shaped link between the 1985 GDP and male organ seems robust. Interestingly it remains highly significant even with the full set of controls.

3.2 GDP growth between 1960 and 1985

The effect of male organ on GDP growth between 1960 and 1985 is presented in Tables (4) and (5). The former represents the textbook case, while the latter includes the full set of controls. As can be seen from Model (3), it has a statistically significant effect on the average GDP growth between 1960 and 1985. Without controlling for human capital, every incremental centimetre in ORGAN reduces GDP growth during the period by 7%. Comparison of Models (2) and (3) in Table (4) indicates that male organ does not have material impact on other coefficients, and hence that the original MRW results are robust in this respect.

Model (4) implies that Africa decreases the negative coefficient of ORGAN from -0.07 to -0.05. Although this shift is not statistically significant, it suggests that part of male organ's negative effect is due to Africa's combination of poor economic performance and large male organs. Yet interestingly it can only explain away part of the male organ's negative effect.

Table (5) shows how human capital [SCHOOL] and political regime type [POLITY1980] affect the results. The effect of ORGAN is again significant. However, more interesting is the pattern concerning convergence. As can be seen, the inclusion of male organ affects the coefficient of GDP in 1960 [Y1960]. The difference of Y1960 coefficients between Model (2) and (3) falls within the margins of error, but it is still possible that male organ could slow the convergence slightly. Some of the interaction probably takes place through Africa. Comparison of the Y1960 coefficients in Model (4) and (5) hints to this direction since with AFRICA the convergence quickens slightly.

Models (4) and (5) of Table (5) highlight an interesting finding of this paper, namely that male organ seems to be more important than political regime as a determinant of GDP growth. This result is robust to the full set of controls. Striking as it sound, caution should be exercised when interpreting this result – political regime type is likely to be a highly endogenous variable.

Figure (2) plots the ratio of per capita GDP between 1960 and 1985 against the size of male organ. In this OLS regression the only explanatory variable is ORGAN in the linear form, while the dependent variable is the ratio of GDP between 1960 and 1985. The pattern suggests that male organ is negatively associated with GDP growth. In fact the male organ alone can explain some 20% of the variation in GDP growth. This is quite a startling finding, since *a priori* the two variables could be considered unrelated.

In conclusion, these results show that male organ is significant in all specifications. It is especially noteworthy that it remains significant at the 10% level even when political regime type and Africa is controlled for.

4 Discussion

Taken at face value, the results presented here suggest that economic development is not invariant to the physical dimension of male organ in non-oil producing countries between 1960 and 1985. However, the exact channel through which these effects could take place remains unclear. Two very speculative explanations – the first biological and the second behavioral or sexual – are discussed below.

First, Boas et al. (2006) show that penile lengths and testosterone levels are related in infant boys. Furthermore, as indicated in Apicella et al. (2008) salivary testosterone levels have been shown to be positively associated with risk-taking behavior. Assuming these links hold it would suggest that male organ acts as a proxy for risk-taking. Given the inverted U-shaped pattern in 1985 GDP, a logical conclusion would then be that an intermediate level of risk-taking in population yields the highest level of economic development. Countries with particularly low or high levels of risk-taking would evidence lower GDPs. What could cause this perplexing pattern is ambiguous, however. Since the finding is very tentative, it is not elaborated in further detail. More sophisticated methods would probably be needed to seriously analyse the issue. Furthermore, the result somewhat contradicts with the evidence of GDP development between 1960 and 1985 which would actually suggest a negative relationship between risk-taking and economic growth.

Second, in an evidently Freudian line of thought the notion of self-esteem might be at play. There is evidence that men with larger penises possess a feeling of greater sexual competence (Wylie & Eardley, 2007; Winter, 1989). To bring this finding into an economic context, male organ size s and income y are considered factors in an aggregate 'self-esteem production function' f which then affects utility u. Assuming the following functional form and decreasing returns of self-esteem, namely $u = f(y + s)$ and $f'(\cdot) > 0$, $f''(\cdot) < 0$, the 'small male organ' countries would have higher marginal utility of income than the 'large male organ' countries. In what follows s_s and s_l represent average penile lengths in 'small male organ' and 'large male organ' countries, respectively. Expressed a little more formally and abusing the notation, evaluated at given penile lengths s_s and s_l, $\frac{du}{dy}(s = s_s) > \frac{du}{dy}(s = s_l)$. Assuming similar labor productivities, the equilibrium should evidence an inverse relationship between GDPs and penile lengths, namely $y_s > y_l$. Labor and leisure would vary accordingly. Hence the world would be characterized by two kinds of countries or, to put it more succinctly, representative maleholds. One group would constitute of leisure-poor, high-GDP countries with small male organs; the other of leisure-rich but low-GDP countries with large male organs. At a very stylized level – and noting that the within-region male organ variation is substantial – the former would correspond to Asia, the latter to Latin America and Africa, with Europe somewhere in-between. However, this theoretizing is conspicuously masculine and omits the role of women altogether. Nevertheless, it can elegantly account for certain stylized empirical regularities and is hence noteworthy.

Establishing the potential causalities is a futile attempt within the framework adopted here. More nuanced methods would clearly be needed. It is arguably likely that the penile lengths just capture some latent country characteristics. Nevertheless, notwithstanding their external validity the interpretations proposed here are novel, and probably worth pursuing in subsequent work.

5 Conclusions

This paper identifies and estimates the link between economic development and the physical dimension of male organ in population. It shows that the relationship between 1985 per capita GDP and penile length evidences an inverse U-shaped pattern. A strongly negative association between GDP growth from 1960 to 1985 and male organ is also identified. Somewhat surprisingly, penile length was a stronger determinant of economic development than country's political regime type at the Polity IV autocracy–democracy spectrum. However, political institutions are notoriously endogenous, and hence the result must be taken with reservations. Encouragingly, the results were robust to Africa controls. With minor exceptions the original coefficients in Mankiw et al. (1992) remain largely unchanged, which evidently speaks to MRW's robustness. To vaguely interpret these perplexing patterns, the roles of testosterone and self-esteem are proposed. For obvious reasons the male organ narrative yields little in terms of feasible policy recommendations and hence further discussion is omitted.

This study has made three contributions. First, it reveals the somewhat perplexing link between the size of male organ and economic growth. Second, it provides some rudimentary interpretations which state that macroeconomic growth might be related to populations' risk-taking and/or self-esteem. Third, for the best of author's knowledge the interplay between sex and macroeconomic outcomes is novel, and has not been discussed in the literature before. Obviously the proposed 'male organ hypothesis' should be tested with more elaborate methods and data. Until then it remains an intriguing statistical artefact.

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Appendix

Figure 1: GDP in 1985 and the size of male organ in 76 countries, ORGAN in linear and quadratic form, $\bar{R}^2$=0.15

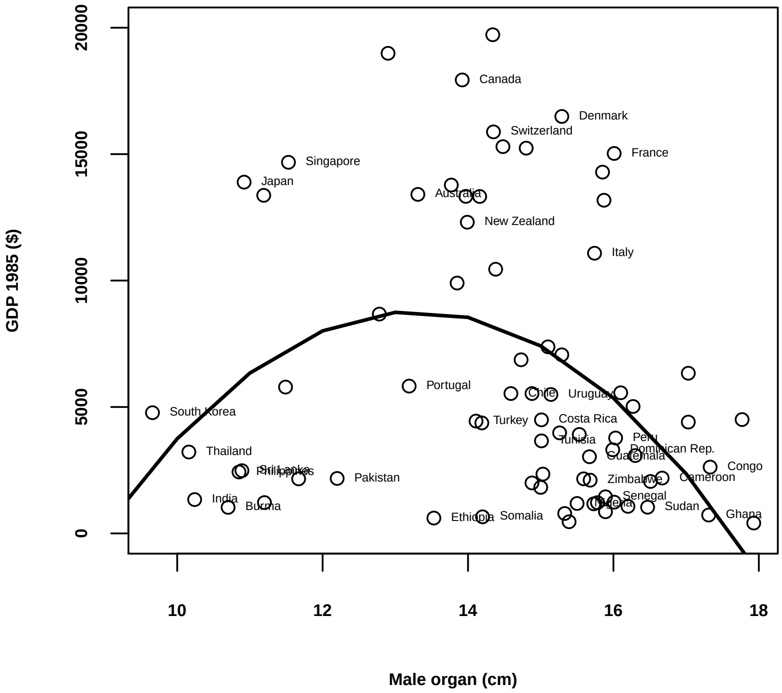

Figure 2: GDP ratio between 1985 and 1960 and the size of male organ in 76 countries, ORGAN in linear form, $\bar{R}^2$=0.20

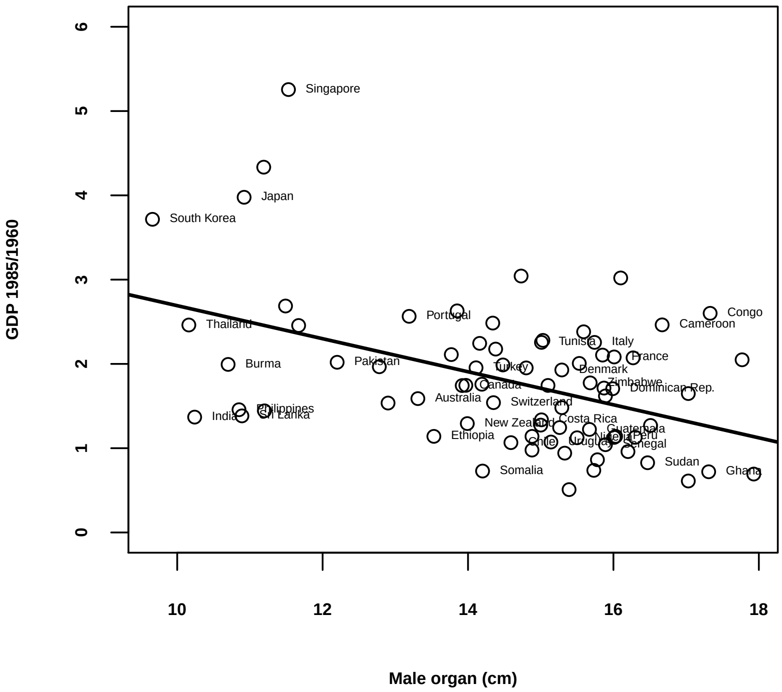

Table 2: Textbook Solow Model

Dependent variable: log GDP per working-age person in 1985, non-oil countries				
Model	(1)	(2)	(3)	(4)
CONSTANT	5.42***	6.79***	0.34	-0.60
	-1.58	-1.65	(3.30)	(2.68)
ln(I/GDP)	1.42***	1.52***	1.47***	1.17***
	-0.14	-0.16	(0.16)	(0.14)
$\ln(n+g+\delta)$	-1.98***	-1.57**	-1.15.	-0.94.
	-0.56	-0.57	(0.58)	(0.48)
ORGAN			1.14*	1.25**
			(0.49)	(0.15)
ORGAN sq.			-0.04*	-0.04**
			(0.01)	(0.40)
AFRICA				-0.93***
				(0.01)
$\bar{R}^2$	0.60	0.62	0.65	0.77
Observations	98	76	76	76

Notes: Standard errors in parentheses. Significance levels in all regressions: *** 0.1%, ** 1%, * 5% and . 10%. Model (1) replicates the estimates in MRW Table I. Model (2) shows (1) with a sub-sample of 76 countries for which ORGAN is available. As in MRW, $g+\delta$ is assumed 0.05.

Table 3: Augmented Solow Model

Dependent variable: log GDP per working-age person in 1985, non-oil countries					
Model	(1)	(2)	(3)	(4)	(5)
CONSTANT	6.84***	7.43**	-1.51	-1.41	-1.57
	(1.17)	(1.29)	(2.42)	(2.31)	(2.22)
ln(I/GDP)	0.69***	0.78***	0.70***	0.65***	0.70***
	(0.13)	(0.16)	(0.15)	(0.14)	(0.14)
$\ln(n+g+\delta)$	-1.74***	-1.65***	-1.07*	-0.91*	-0.89*
	(0.41)	(0.45)	(0.43)	(0.42)	(0.40)
ln(SCHOOL)	0.65***	0.71***	0.77***	0.68***	0.53***
	(0.07)	(0.10)	(0.09)	(0.09)	(0.11)
ORGAN			1.55***	1.54***	1.51***
			(0.36)	(0.34)	(0.33)
ORGAN sq.			-0.05***	-0.05***	-0.05***
			(0.01)	(0.01)	(0.01)
POLITY1980				0.01*	0.01.
				(0.008)	(0.008)
AFRICA					-0.40*
					(0.15)
$\bar{R}^2$	0.78	0.77	0.81	0.84	0.85
Observations	98	76	76	75	75

Notes: Standard errors in parentheses. Significance levels in all regressions: *** 0.1%, ** 1%, * 5% and . 10%. Model (1) replicates the estimates in MRW Table II. Model (2) shows (1) with a sub-sample of 76 countries for which ORGAN is available. As in MRW, $g+\delta$ is assumed 0.05.

Table 4: Convergence, Textbook Model

Dependent variable: log difference GDP per working-age person in 1960–1985, non-oil countries				
Model	(1)	(2)	(3)	(4)
CONSTANT	1.91*	2.33*	2.99**	3.19***
	(0.83)	(1.00)	(0.94)	(0.92)
ln(Y1960)	-0.14**	-0.18**	-0.14*	-0.22**
	(0.05)	(0.06)	(0.06)	(0.07)
ln(I/GDP)	0.64***	0.73***	0.64***	0.64***
	(0.08)	(0.11)	(0.10)	(0.10)
$\ln(n+g+\delta)$	-0.30	-0.32	-0.32	-0.39
	(0.30)	(0.34)	(0.31)	(0.30)
ORGAN			-0.07***	-0.05*
			(0.02)	(0.02)
AFRICA				-0.25*
				(0.11)
$\bar{R}^2$	0.40	0.40	0.49	0.52
Observations	98	76	76	76

Notes: Standard errors in parentheses. Significance levels in all regressions: *** 0.1%, ** 1%, * 5% and . 10%. Model (1) replicates the estimates in MRW Table IV. Model (2) shows (1) with a sub-sample of 76 countries for which ORGAN is available. As in MRW, $g+\delta$ is assumed 0.05.

Table 5: Convergence, Augmented Model

Dependent variable: log difference GDP per working-age person in 1960–1985, non-oil countries					
Model	(1)	(2)	(3)	(4)	(5)
CONSTANT	3.02***	3.37***	3.68***	3.13**	3.11**
	(0.82)	(0.94)	(0.90)	(0.94)	(0.94)
ln(Y1960)	-0.28***	-0.32***	-0.26***	-0.26***	-0.28***
	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
ln(I/GDP)	0.52***	0.54***	0.51***	0.51***	0.53***
	(0.08)	(0.11)	(0.10)	(0.10)	(0.10)
$\ln(n+g+\delta)$	-0.50.	-0.57.	-0.52.	-0.68*	-0.69*
	(0.28)	(0.31)	(0.30)	(0.30)	(0.30)
ln(SCHOOL)	0.23***	0.31***	0.25**	0.27***	0.23**
	(0.05)	(0.08)	(0.07)	(0.07)	(0.08)
ORGAN			-0.05**	-0.04*	-0.03.
			(0.01)	(0.01)	(0.02)
POLITY1980				-0.004	-0.004
				(0.006)	(0.006)
AFRICA					-0.13
					(0.11)
$\bar{R}^2$	0.48	0.51	0.56	0.57	0.58
Observations	98	76	76	75	75

Notes: Standard errors in parentheses. Significance levels in all regressions: *** 0.1%, ** 1%, * 5% and . 10%. Model (1) replicates the estimates in MRW Table V. Model (2) shows (1) with a sub-sample of 76 countries for which ORGAN is available. As in MRW, $g+\delta$ is assumed 0.05.

Table 6: Data 1/2

Number	Country	GDP 1960	GDP 1985	Work pop.	I/Y	School	Male organ	Polity 1980	Africa
1	Algeria	2485	4371	2.6	24.1	4.5	14.19	-9	1
2	Angola	1588	1171	2.1	5.8	1.8	15.73	-7	1
3	Benin	1116	1071	2.4	10.8	1.8	16.2	-7	1
4	Botswana	959	3671	3.2	28.3	2.9		6	1
5	Burkina Faso	529	857	0.9	12.7	0.4	15.89	-7	1
6	Burundi	755	663	1.7	5.1	0.4		-7	1
7	Cameroon	889	2190	2.1	12.8	3.4	16.67	-8	1
8	Central Africa	838	789	1.7	10.5	1.4	15.33	-7	1
9	Chad	908	462	1.9	6.9	0.4	15.39	0	1
10	Congo	1009	2624	2.4	28.8	3.8	17.33	-8	1
11	Egypt	907	2160	2.5	16.3	7	15.59	-6	1
12	Ethiopia	533	608	2.3	5.4	1.1	13.53	-7	1
15	Ghana	1009	727	2.3	9.1	4.7	17.31	6	1
17	Ivory Coast	1386	1704	4.3	12.4	2.3		-9	1
18	Kenya	944	1329	3.4	17.4	2.4		-6	1
20	Liberia	863	944	3	21.5	2.5		-7	1
21	Madagascar	1194	975	2.2	7.1	2.6		-6	1
22	Malawi	455	823	2.4	13.2	0.6		-9	1
23	Mali	737	710	2.2	7.3	1		-7	1
24	Mauritania	777	1038	2.2	25.6	1		-7	1
25	Mauritius	1973	2967	2.6	17.1	7.3		9	1
26	Morocco	1030	2348	2.5	8.3	3.6	15.03	-8	1
27	Mozambique	1420	1035	2.7	6.1	0.7		-8	1
28	Niger	539	841	2.6	10.3	0.5		-7	1
29	Nigeria	1055	1186	2.4	12	2.3	15.5	7	1
30	Rwanda	460	696	2.8	7.9	0.4		-7	1
31	Senegal	1392	1450	2.3	9.6	1.7	15.89	-2	1
32	Sierra Leone	511	805	1.6	10.9	1.7		-7	1
33	Somalia	901	657	3.1	13.8	1.1	14.2	-7	1
34	South Africa	4768	7064	2.3	21.6	3	15.29	4	1
35	Sudan	1254	1038	2.6	13.2	2	16.47	-7	1
37	Tanzania	383	710	2.9	18	0.5		-6	1
38	Togo	777	978	2.5	15.5	2.9		-7	1
39	Tunisia	1623	3661	2.4	13.8	4.3	15.01	-9	1
40	Uganda	601	667	3.1	4.1	1.1		3	1
41	Zaire	594	412	2.4	6.5	3.6	17.93	-9	1
42	Zambia	1410	1217	2.7	31.7	2.4	15.78	-9	1
43	Zimbabwe	1187	2107	2.8	21.1	4.4	15.68	4	1
46	Bangladesh	846	1221	2.6	6.8	3.2	11.2	-4	0
47	Burma	517	1031	1.7	11.4	3.5	10.7	-8	0
48	Hong Kong	3085	13372	3	19.9	7.2	11.19		0
49	India	978	1339	2.4	16.8	5.1	10.24	8	0
52	Israel	4802	10450	2.8	28.5	9.5	14.38	9	0
53	Japan	3493	13893	1.2	36	10.9	10.92	10	0
54	Jordan	2183	4312	2.7	17.6	10.8		-10	0
55	South Korea	1285	4775	2.7	22.3	10.2	9.66	-8	0
57	Malaysia	2154	5788	3.2	23.2	7.3	11.49	4	0
58	Nepal	833	974	2	5.9	2.3		-9	0
60	Pakistan	1077	2175	3	12.2	3	12.2	-7	0

Notes: Number denotes reference to MRW data. GDP is in per capita. I/Y and school are in percentages and averaged over the period. Working age population growth rates are in percent per year. Male organ size in centimetres.

Table 7: Data 2/2

Number	Country	GDP 1960	GDP 1985	Work pop.	I/Y	School	Male organ	Polity 1980	Africa
61	Philippines	1668	2430	3	14.9	10.6	10.85	-9	0
63	Singapore	2793	14678	2.6	32.2	9	11.53	-2	0
64	Sri Lanka	1794	2482	2.4	14.8	8.3	10.89	6	0
65	Syrian Arab Rep.	2382	6042	3	15.9	8.8		-9	0
67	Thailand	1308	3220	3.1	18	4.4	10.16	2	0
70	Austria	5939	13327	0.4	23.4	8	14.16	10	0
71	Belgium	6789	14290	0.5	23.4	9.3	15.85	10	0
73	Denmark	8551	16491	0.6	26.6	10.7	15.29	10	0
74	Finland	6527	13779	0.7	36.9	11.5	13.77	10	0
75	France	7215	15027	1	26.2	8.9	16.01	8	0
76	Germany F. Rep.	7695	15297	0.5	28.5	8.4	14.48	10	0
77	Greece	2257	6868	0.7	29.3	7.9	14.73	8	0
79	Ireland	4411	8675	1.1	25.9	11.4	12.78	10	0
80	Italy	4913	11082	0.6	24.9	7.1	15.74	10	0
83	Netherlands	7689	13177	1.4	25.8	10.7	15.87	10	0
84	Norway	7938	19723	0.7	29.1	10	14.34	10	0
85	Portugal	2272	5827	0.6	22.5	5.8	13.19	9	0
86	Spain	3766	9903	1	17.7	8	13.85	9	0
87	Sweden	7802	15237	0.4	24.5	7.9	14.8	10	0
88	Switzerland	10308	15881	0.8	29.7	4.8	14.35	10	0
89	Turkey	2274	4444	2.5	20.2	5.5	14.11	-5	0
90	UK	7634	13331	0.3	18.4	8.9	13.97	10	0
92	Canada	10286	17935	2	23.3	10.6	13.92	10	0
93	Costa Rica	3360	4492	3.5	14.7	7	15.01	10	0
94	Dominican Rep.	1939	3308	2.9	17.1	5.8	15.99	6	0
95	El Salvador	2042	1997	3.3	8	3.9	14.88	-2	0
96	Guatemala	2481	3034	3.1	8.8	2.4	15.67	-5	0
97	Haiti	1096	1237	1.3	7.1	1.9	16.01	-9	0
98	Honduras	1430	1822	3.1	13.8	3.7	15	1	0
99	Jamaica	2726	3080	1.6	20.6	11.2	16.3	10	0
100	Mexico	4229	7380	3.3	19.5	6.6	15.1	-3	0
101	Nicaragua	3195	3978	3.3	14.5	5.8	15.26	0	0
102	Panama	2423	5021	3	26.1	11.6	16.27	-6	0
103	Trinidad & Tob.	9253	11285	1.9	20.4	8.8		8	0
104	US	12362	18988	1.5	21.1	11.9	12.9	10	0
105	Argentina	4852	5533	1.5	25.3	5	14.88	-9	0
106	Bolivia	1618	2055	2.4	13.3	4.9	16.51	-7	0
107	Brazil	1842	5563	2.9	23.2	4.7	16.1	-4	0
108	Chile	5189	5533	2.3	29.7	7.7	14.59	-7	0
109	Colombia	2672	4405	3	18	6.1	17.03	8	0
110	Ecuador	2198	4504	2.8	24.4	7.2	17.77	9	0
112	Paraguay	1951	3914	2.7	11.7	4.4	15.53	-8	0
113	Peru	3310	3775	2.9	12	8	16.03	7	0
115	Uruguay	5119	5495	0.6	11.8	7	15.14	-7	0
116	Venezuela	10367	6336	3.8	11.4	7	17.03	9	0
117	Australia	8440	13409	2	31.5	9.8	13.31	10	0
119	Indonesia	879	2159	1.9	13.9	4.1	11.67	-7	0
120	New Zealand	9523	12308	1.7	22.5	11.9	13.99	10	0
121	Papua N. G.	1781	2544	2.1	16.2	1.5		4	0

Notes: Number denotes reference to MRW data. GDP is in per capita. I/Y and school are in percentages and averaged over the period. Working age population growth rates are in percent per year. Male organ size in centimetres.