

Liberalization, Endogenous Institutions, and Growth: A Comparative Analysis of Agricultural Reforms in Africa, Asia, and Europe

Johan F.M. Swinnen, Anneleen Vandeplass, and Miet Maertens

Thirty years ago, a vast share of low- and middle-income countries was heavily state controlled. The liberalizations of the 1980s and 1990s had greatly different effects on growth in countries in Africa, Asia, and Europe. A comparative framework is used to document these differences, and a model is developed to formally analyze how liberalization affects production and income distribution when the institutions that govern production and exchange are also affected. Hypotheses are derived for how endogenous institutional adjustments affect the growth response to liberalization. These insights motivate a series of explanations for the differences in performance across regions and commodities following liberalization. JEL codes: O13, O43, O57, Q12

Thirty years ago, many low- and middle-income countries were heavily state controlled. Although most extreme in the Communist world from Central Europe to East Asia, state economic intervention was also common in many African, Latin American, and South Asian countries.

Indonesia was the first country to embark on major liberalization, beginning in 1968. Other Asian countries, such as China, Sri Lanka, and Vietnam, followed. The impact was dramatic. The reforms in China and Vietnam lifted

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THE WORLD BANK ECONOMIC REVIEW, VOL. 24, NO. 3, pp. 412–445
Advance Access Publication December 23, 2010

doi:10.1093/wber/lhq017

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hundreds of millions of people out of poverty. Countries in Sub-Saharan Africa, Central and Eastern Europe, and the former Soviet Union introduced reforms in the 1980s and 1990s. Trade, prices, exchange rates, and state control of commodity chains were liberalized to improve incentives to farmers and to boost growth, thereby raising incomes and reducing poverty (Timmer 1986; Krueger, Schiff, and Valdés 1988; Commander 1989).

However, the reforms had very different effects in these regions than in Asia. In Central and Eastern Europe and the former Soviet Union, output and incomes declined dramatically (Rozelle and Swinnen 2004). In Sub-Saharan Africa, the effects of liberalizations—often imbedded in structural adjustment programs—were also disappointing. While there has been some progress, the consensus is that market reforms have not met expectations (Kherallah and others 2002).

Despite these differences, there have been almost no comparisons of liberalizations across regions.¹ In addition, the analyses of the unexpectedly poor effects of liberalization in Sub-Saharan Africa on the one hand and Central and Eastern Europe and the former Soviet Union on the other have evolved as different strands in the literature, with little cross-fertilization.

Most analyses of the impact of liberalization in Africa are empirical studies (for example, Barrett 1997; Jayne and others 2003; Kherallah and others 2002) of how various factors helped explain the (lack of) supply response to market reforms.² In contrast, the poor performance of the Eastern European and Soviet reforms has sparked an extensive theoretical literature on the role of institutions in reform (for example, Blanchard 1997; Blanchard and Kremer 1997; Dries and Swinnen 2002; Gow, Streeter, and Swinnen 2000; Roland 2000; Roland and Verdier 1999; Swinnen, Dries, and Macours 2005; Swinnen and Rozelle 2006) in addition to empirical studies on the causes of decline. Insights from this theoretical literature appear highly relevant for understanding the effects of liberalization and reform processes in Sub-Saharan Africa as well, especially for understanding change in institutions for governing exchange in the postreform economy. Empirical studies that have considered the role of the institutional organization of the African economy have not formally modeled this interaction and drawn implications from it.

This article seeks to address this gap in the literature. It compares reform performance across Africa, Asia, and Europe using indicators of output and productivity. Then it develops a model of liberalization that integrates key

1. Reforms have been compared within Asia (Green and Vokes 1998), Africa (Kherallah and others 2002), and Europe (Lerman, Csaki, and Feder 2004; Macours and Swinnen 2000) and between Europe and Asia (de Melo and Gelb 1996; de Melo and others 2001; Macours and Swinnen 2002; Rozelle and Swinnen 2004). A large number of studies have compared China and the Russian Federation and Eastern Europe (such as Dewatripont and Roland 1995; Fischer 1994; Qian, Roland, and Xu 1999; Sachs and Woo 1994; and Swinnen and Rozelle 2006). Ravallion (2008) appears to be the only one to include Africa in such comparisons.

2. A notable exception is de Janvry, Fafchamps, and Sadoulet (1991).

institutional and structural characteristics of developing and transition economies, using the model insights to develop hypotheses and explain empirical observations on postreform performance.

The article is organized as follows. Sections I and II compare postreform agricultural performance and the institutional characteristics of the preliberalization economy and the liberalization process. Despite differences among countries and regions, there are important commonalities in initial conditions and in the liberalization processes. Section III develops a model of liberalization and explains how supply responses may be affected by several factors. The theoretical model integrates common institutional characteristics of both the preliberalization economy and the liberalization process. In particular, it analyzes how factor market constraints and imperfect contract enforcement affect the impact of price and market liberalization—and how these outcomes are conditional on several factors, including the change in relative taxation with the reforms, the required inputs in the production process, and the value of the commodity. Section IV relates these theoretical predictions to empirical observations on institutional and commodity characteristics in various countries, and section V uses this framework to interpret the observed differences in postreform performance. Section VI discusses the limitations of the approach and identifies areas for further research and data collection to refine the empirical analysis.

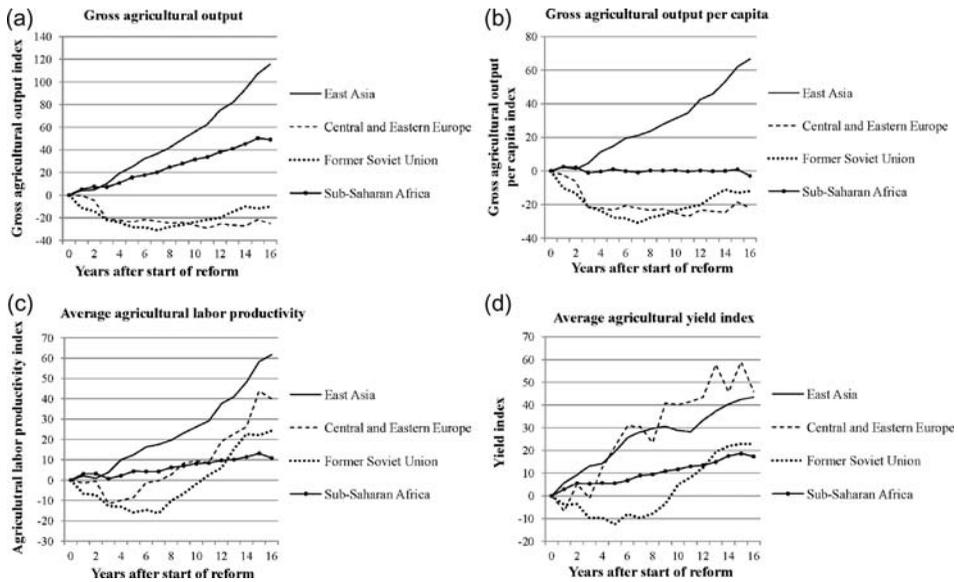
I. REGIONAL TRENDS IN POSTREFORM AGRICULTURAL PERFORMANCE

Although there are important differences within each region, the focus is on the conditions and reform choices that are characteristic of these regions; the limits of this approach and the importance of taking the approach further at the country level are discussed later. (The countries included in the analysis are listed in table A1 in the appendix and in the figures.)

Figures 1 and 2 summarize the performance of agriculture in four transition and developing regions in the years after implementation of agricultural reforms and structural adjustment programs. The analysis considers several performance indicators, including output indicators (gross agricultural output and gross agricultural output per capita), and partial productivity indicators (land yields and labor productivity) for a 16-year period after the start of reforms.³ As explained, the focus is on comparing the relative reform performances of countries across Africa, Europe, and Asia, in particular the differences

3. Partial productivity measures are used because data and methodological problems limit the availability of comparative and reliable estimates of total factor productivity (TFP), the most comprehensive indicator of productivity. The literature shows that TFP trends move largely in the same direction as partial productivity measures; see, for example, [Huang and Rozelle \(1996\)](#), [Fan \(1997\)](#), and [Jin and others \(2002\)](#) for China; [Benjamin and Brandt \(2001\)](#) and [Pingali and Xuan \(1992\)](#) for Vietnam; [Macours and Swinnen \(2000\)](#) for Central and Eastern Europe; and [Nin Pratt and Yu \(2008\)](#) for Sub-Saharan Africa.

FIGURE 1. Postreform Performance of Agriculture, RSSAP Indicator



Note: Overall yields are calculated as simple averages of yields of cereals, fibers, fruits, milk, nuts, pulses, roots and tubers, rubber, spices, sugar crops, tobacco, and vegetables. See table A1 in the appendix for the starting year of the reform and for countries in each region for the RSSAP indicator.

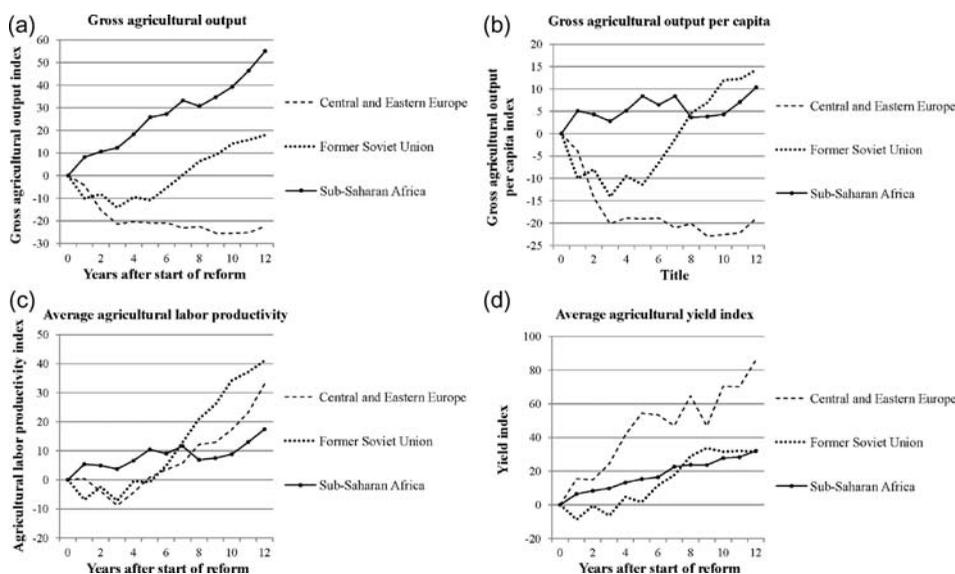
Source: Authors' calculations based on Food and Agriculture Organization data and RSSAP indicator from Rozelle and Swinnen (2004).

in reform experiences between Sub-Saharan Africa and Central and Eastern Europe, the former Soviet Union, and East Asia.

Two indicators are used to identify the start of reform (year 0): the Sachs and Warner (1995) indicator, as updated by Wacziarg and Welch (2008) (SWWW) and a new indicator (RSSAP), which combines Rozelle and Swinnen's (2004) indicator for countries in Central and Eastern Europe, the former Soviet Union, and East Asia and the start of structural adjustment programs (SAP) for countries in Sub-Saharan Africa.⁴ The use of the first year of a structural adjustment program as the start of reforms is consistent with the Rozelle and Swinnen approach. The RSSAP indicator does not always reflect lasting reforms and continuous openness—countries sometimes did not implement promised reforms or reversed liberalization policies after some years. There were cases of reversal and gradual reform in all regions. However, most countries that received structural adjustment loans did implement basic reforms, including macroeconomic, market, and agricultural reforms. Macroeconomic reforms, such as interest rate liberalization and exchange rate devaluation, were very important in reducing

4. The year the country first received a structural adjustment loan from the World Bank is used to establish the start of structural adjustment programs; see table A1 in appendix for details.

FIGURE 2. Postreform Performance of Agriculture, SWWW Indicator



Note: Overall yields are calculated as simple averages of yields of cereals, fibers, fruits, milk, nuts, pulses, roots and tubers, rubber, spices, sugar crops, tobacco, and vegetables. See table A1 in the appendix for the starting year of the reform and for countries in each region for the SWWW indicator.

Source: Authors' calculations based on Food and Agriculture Organization data and SWWW indicator from [Sachs and Warner \(1995\)](#) and [Wacziarg and Welch \(2008\)](#).

indirect taxation of agriculture, the main component of agricultural taxation in developing countries, according to [Schiff and Valdés \(1991\)](#). In addition, reforms in domestic agricultural markets were an important component of early structural adjustment programs.

Gross agricultural output rose rapidly after the start of reform and liberalization programs in East Asian transition economies, especially in China and Vietnam. In Central and Eastern Europe and the former Soviet Union, however, agricultural output fell sharply in the initial years of transition, before stagnating and then recovering slightly in later years.⁵ On average in countries in Central and Eastern Europe and the former Soviet Union, agricultural output was 20 percent lower after a decade of reform than at the start of transition; over the same time span, countries in East Asia increased agricultural output by almost 60 percent over its prereform level. In per capita terms, output fell sharply in Central and Eastern Europe and especially in the former Soviet Union and increased sharply in East Asia.

5. While the general trend of output decline is the same for Central and Eastern European and former Soviet Union countries, there are differences in the time from the start of reform to the bottom of the time trend and in the extent of output recovery across subregions and countries (see [Rozelle and Swinnen 2004](#)).

The performance of Sub-Saharan African countries that embarked on structural adjustment and agricultural liberalization falls between that of reformers in East Asia and Europe. On average, output grew in Sub-Saharan African countries but slower than in East Asia: Sub-Saharan African output was 35 percent above its prereform level after a decade of reform. However, in per capita terms, output growth in Sub-Saharan Africa disappears. Its flat time trend contrasts sharply with the positive trend in East Asia (figure 1b).⁶ It is still much better than the negative trend in Central and Eastern European and former Soviet Union countries, however.

Comparing productivity indicators further nuances the story. In line with East Asian countries' sharp output growth were their strong increases in agricultural labor productivity and land productivity (yields). In Central and Eastern European countries, after an initial period of decline averaging three years, labor productivity and yields rose strongly. The productivity decline (and stagnation) persisted longer for former Soviet Union countries (averaging 5–7 years), and the decline was deeper than in Central and Eastern Europe. These countries seemed to follow the same path of productivity growth as in East Asia and Central and Eastern Europe, but with a lag.

Average productivity has increased in Sub-Saharan Africa since the start of the reforms, but much more slowly than in East Asia. Although productivity growth in Africa initially outperformed that in Central and Eastern Europe and the former Soviet Union, once agriculture rebounded in those two regions, productivity growth outpaced that in Sub-Saharan Africa. Agricultural output growth in Sub-Saharan Africa can be attributed mainly to acreage expansion (about 30 percent over 12 years), with only moderate improvements in labor and land productivity. In contrast, East Asia's sharp growth in agricultural output was due largely to strong productivity growth and only modest increases (around 15 percent) in agricultural area.

A second indicator for the start of reforms is the [Sachs and Warner \(1995\)](#) indicator, as updated by [Wacziarg and Welch \(2008\)](#). The SWWW is an indicator of uninterrupted openness that uses tariffs, nontariff barriers, the exchange rate black market premium, and the existence of state monopolies and socialist economic systems to determine whether a country is open and liberalized. The SWWW focuses on openness to external trade. While acknowledged as a good overall indicator of economic reforms ([Hausman, Pritchett, and Rodrik 2006](#)), it is much more restrictive than the RSSAP indicator. By its standards, China, Estonia (one of the most liberal economies in Central and Eastern Europe in the 1990s), and Vietnam had not yet started their reforms by 2004—the year Estonia entered the European Union and three years after China concluded entry negotiations to the World Trade Organization (see table A1 in appendix A).

6. Differences in time trends between output and per capita output growth are explained by differences in population growth, which have been much higher in Sub-Saharan Africa than elsewhere.

The SWWW indicator has a maximum of 12 years of postreform data because the indicator shows reforms starting later than the RSSAP does. For that reason, the results for the two performance indicators cannot be compared for East Asia because reforms in China and Vietnam had not yet started in 2004 according to the SWWW indicator. A comparison for the other regions shows that all indices perform somewhat better for Sub-Saharan Africa using the SWWW indicator (see figure 2) than the RSSAP indicator (see figure 1). This is because the SWWW indicator includes only the most advanced reformers, which perform better than slower reformers. The same is true for countries of the former Soviet Union. And because the SWWW indicator puts the start of the reforms 3–4 years later than the RSSAP does, the period of initial decline is shorter, at 3–5 years postreform with the SWWW compared with 6–8 years with the RSSAP. For Central and Eastern Europe, there is not much difference in performance between the two indicators because there is not much difference in the number of countries included and in starting year of reform (see table A1).

Despite the differences, the most important patterns of performance are consistent with both indicators, in particular for productivity indicators: an initial decline and then a recovery in Central and Eastern Europe and the former Soviet Union, a shorter decline and faster recovery in Central and Eastern Europe than in the former Soviet Union, no average decline in Sub-Saharan Africa, and once the recovery starts considerably higher growth rates in Central and Eastern Europe and the former Soviet Union than in Sub-Saharan Africa. These observations and stylized facts are robust across the indicators and are the focus of the rest of this article.

II. INSTITUTIONAL CHARACTERISTICS

The four regions had some common institutional characteristics in the preliberalization economy and during the liberalization process, along with some key differences.

The Preliberalization Economy

Countries in the four regions engaged in similar governance of commodity chains before liberalization.⁷ Government institutions were monopoly buyers of agricultural products. This was most extreme in Communist countries, where the entire agri-food system was under state control. Governments in most Sub-Saharan African countries also regulated production, marketing, and processing in the decades after independence through marketing boards, government-controlled cooperatives, and government-owned companies.

7. For details, see Kherallah and others (2002); Rozelle and Swinnen (2004); and Swinnen and Maertens (2007).

TABLE 1. Regional Comparison of Reforms and Initial Conditions

Characteristic	Central and Eastern Europe	Former Soviet Union	East Asia	Sub-Saharan Africa
<i>Initial conditions</i>				
Collectivized agriculture	Yes	Yes	Yes	No
Income per capita (purchasing power parity in 2000 US dollars)	10,069	4,364	674	1,429
Agricultural price distortions	Subsidized	Subsidized	Taxed	Taxed
<i>Reform approach</i>	Big bang	Big bang	Gradual	Mixed

Source: World Bank 2006.

Interlinked contracting was widespread. Again, this practice was most extreme in the Communist system, which had fully integrated and completely state-controlled agricultural supply chains. Production, processing, marketing, input and credit provision, retailing, and other links in the supply chain were all government controlled. Government control and interlinked food supply chains were also widespread in Sub-Saharan Africa. Many state-controlled organizations provided inputs to farmers (often as the only source) and purchased their outputs (Bauman 2000; Poulton and others 1998). The dominant pattern was seasonal input and credit provision by state-controlled organizations to small farmers in return for supplies of primary produce.

These systems did manage to provide inputs and credit to farms—an important achievement. The monopoly control contributed to enforcement of the interlinked contracts, but costs were high and there were sometimes problems with buyers paying late and farmers not repaying credit or inputs.⁸

Control of the supply chains also enabled governments to set prices. Price setting was motivated by political objectives, such as providing cheap food for urban markets. While price distortions were present everywhere, the distortions differed. Indicators of agricultural protection show that farmers in Central and Eastern Europe and the former Soviet Union were highly subsidized before the reforms (40–80 percent, depending on the indicator), while farmers in China and Sub-Saharan Africa were heavily taxed (averaging 30 percent in Africa and 50 percent or more in China).

There were also important differences between regions, especially in production structure and income level at the time of liberalization (table 1). Collective farms prevailed in East Asia, the former Soviet Union, and Central and Eastern Europe but not in Sub-Saharan Africa, where land cultivation was individual and based on private user rights (in most cases without individual land rights).⁹ Per capita incomes were much higher in Central and Eastern

8. Several studies conclude that state-controlled outgrower schemes were inefficient and poorly managed, while others point to the successes of these systems (Bauman 2000; Johnson and Brooks 1983; Poulton and others 1998; Warning and Key 2002).

9. The exception in Sub-Saharan Africa was Ethiopia, which had a Chinese-style communal agricultural production system from 1975 to 1987.

Europe (\$10,069) and the former Soviet Union (\$4,364) than in Sub-Saharan Africa (\$1,429) and China (\$674). These income differences are correlated with commodity value chains. With higher incomes, consumers shift from staple foods to higher value foods (such as fruits, vegetables, fish, and meat) and demand higher quality and safety standards. In Central and Eastern Europe and the former Soviet Union, more than 70 percent of the value of agricultural production on average consisted of higher value food products; in Sub-Saharan Africa and East Asia, less than 50 percent did. Moreover, in Sub-Saharan Africa and East Asia an average of 10–20 percent of agricultural production was in very low-value staple crops such as roots, tubers, and pulses, a much larger share than in the former Soviet Union or Central and Eastern Europe.¹⁰

The Liberalization Process

During liberalization, governments across the four regions reduced their interventions in price setting, thereby reducing price distortions caused by taxes and subsidies. Private traders were allowed to engage in trade, and the monopoly position of government marketing boards and government-owned processing companies ended.

There were differences in the timing and extent of reforms across regions. Countries in Central and Eastern Europe and the former Soviet Union took a “big-bang” approach to reform, liberalizing prices and markets simultaneously, allowing private competition, and privatizing land rights and farms.¹¹ In contrast, China sequenced its reforms, reducing control over farm prices while maintaining control over the institutions that supplied farm inputs and purchased outputs (mostly rice).¹² China first transferred land rights to farmers and later administratively increased prices to reduce taxation on farmers. Only afterwards, and only gradually, did it allow competition in food markets. Reform strategies were mixed in Sub-Saharan Africa.¹³ In most countries, the lifting of state control was not as sequenced as in China, but few countries took a big-bang approach.¹⁴ Reforms often started in basic food sectors, moving on only later to export sectors (such as coffee, cocoa, and cotton).

10. Authors’ calculations based on Food and Agriculture Organization data.

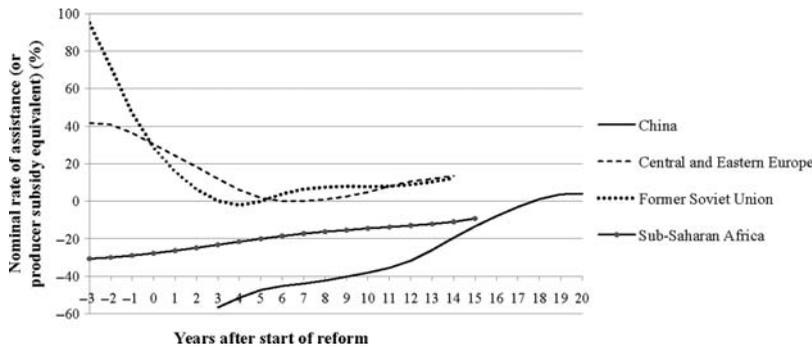
11. There was considerable variation among countries; see [Swinnen and Rozelle \(2006\)](#) for details.

12. Implementation of reforms was more nuanced than the usual summaries of a “gradual process.” China’s initial approach did not differ much from that of countries in Eastern European and the former Soviet Union as it liberalized markets and allowed private traders. However, the resulting market turmoil and the threat of reduced rice supplies for cities induced Chinese leaders to reestablish control over supply chains. See [Rozelle \(1996\)](#) for a review of these policy changes and their effects.

13. For details, see [Akiyama and others \(2003\)](#); [Kherralah and others \(2002\)](#); [World Bank \(1994\)](#).

14. For example, Nigeria launched a big bang reform approach in 1987, simultaneously removing price controls, trade restrictions, and state crop procurement and input provision. Cameroon and Tanzania took a sequential approach similar to China’s in first liberalizing prices and only subsequently did they gradually end the state monopoly in the coffee sector; Cameroon did the same in the cocoa sector, as did several Eastern African countries in the cotton sector.

FIGURE 3. Agricultural Protection by Region (%), RSSAP Indicator



Note: See table A1 in the appendix for the starting year of the reform. Because of gaps in the data, two measures are used. The producer subsidy equivalent (PSE) and the nominal rate of assistance (NRA) are calculated differently but are comparable as general indicators of government support to agriculture. PSE measures how much of gross farm income is due to government measures. NRA measures distortions in farm prices and revenues due to government interventions. See OECD (2008) and Anderson (2009) for details. Central and Eastern Europe includes Bulgaria, the Czech Republic, Hungary, Poland, Romania, and the Slovak Republic. East Asia includes China and Vietnam, the former Soviet Union includes the Russian Federation and Ukraine; Sub-Saharan Africa includes Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Mozambique, Nigeria, Senegal, Sudan, Uganda, Zambia, and Zimbabwe.

Source: Authors' analysis based on data from OECD (2008) and Anderson (2009) and RSSAP indicator from Rozelle and Swinnen (2004).

Basic food sectors were often completely liberalized, while many export sectors remained under some state control.¹⁵

Despite these differences, the liberalization process in the four regions shared two crucial, interrelated aspects: price and market liberalization. As governments stopped setting prices, price distortions decreased, as shown in figure 3 by the movement of the assistance indicators toward zero (no distortions) across all regions. Markets were liberalized as state control over the structure of commodity chains was lifted; governments began to allow competition in the chain and no longer dictated trade. In all four regions, the share of the private sector increased strongly in the two decades following reform, with some variation.

The theoretical model described in the next section integrates these common institutional characteristics of the preliberalization economy and the liberalization process.¹⁶ Later, in interpreting the empirical observations, additional variations (as discussed above) are integrated to complement the hypotheses

15. State monopolies still exist, especially in the cotton sector in Western Africa.

16. The effects of privatization are not discussed independently but are implicit in the model. If privatization leads to more efficient management, and thus to a reduction in excess marketing costs (t_m), farm prices will rise, with effects similar to those for a decrease in taxes. This effect should lead to higher output and farm incomes. However, privatization may not lead to lower marketing costs if it induces monopolistic/monopsonistic pricing. The key element is competition, which is analyzed explicitly.

based on the theoretical model and to better understand the overall reform effects and economic performances.¹⁷

III. A MODEL OF LIBERALIZATION WITH ENDOGENOUS INSTITUTIONS

Consider the situation in which a local household or farming company (“the farmer”) can choose to produce a crop with low value added for the local market or a crop with high value added that the farmer can sell to a trader or a retailing or processing company (“the buyer”). The buyer sells the product (possibly after processing) to consumers either domestically or internationally. Define p_l and p_h as the unit consumer price of the low- and high-value products. Let m be the unit “efficient” processing and marketing costs (the extra costs involved in producing the high-value product and delivering it to consumers through an efficient market system). Let t_m be the excess processing and marketing costs due to inefficiencies in the marketing chain, and let t_x be the applicable government taxes or subsidies (tax for $t_x > 0$ and subsidy for $t_x < 0$).¹⁸

Producing high-value commodities requires some (specific) input use (such as fertilizers, credit, seeds, and technology). Assume that to produce one unit of high-value output, the farmer requires specific inputs with a value of I in addition to basic production cost C (labor and land) to produce the low-value good. Assume further that these specific inputs are not available to the farmer because of factor market imperfections. The buyer can act as an intermediary in the input market and provide (sell or lend) the inputs to the farmer. The buyer considers offering a contract to the farmer promising to provide inputs and laying out the conditions (time, amount, and price) for purchasing the farmer’s product. The buyer either provides the farmer with the full amount of inputs I per unit of production or provides no inputs.¹⁹ If the buyer and the farmer decide to contract, they can realize a joint surplus G , with $G = p_h - m - I - C - t$ and $t = t_x + t_m$.

The farmer’s disagreement payoff (income when the contract does not materialize) is $Y_l = p_a - C$, with $p_a \geq 0$ an indicator of alternative opportunities. If the farmer’s only ex ante outside option is to produce low-value products for the local market, $p_a = p_l$. Hence $p_a \geq p_l$ and p_a increases if the farmer has

17. Parts of the model are related to the approach of Kranton and Swamy (2008). The model extends the approach of Swinnen and Vandeplas (2009) to capture liberalization effects.

18. It is assumed that the government does not impose taxes on low-value products. This is a realistic assumption since such taxation may not be possible if low-value products are important for household or local village consumption. It is also consistent with evidence that distortions are much more important in tradable commodities than in nontradable commodities and that government policy has an antitrade bias (Anderson 2009; Krueger, Schiff, and Valdés 1988).

19. This implies that using any amount of inputs below the optimal amount I results in a lack of marketable surplus.

other opportunities.²⁰ The buyer’s payoff under disagreement is Π_b ,²¹ where $\Pi_b \geq 0$ is an indicator that reflects the buyer’s alternative investment options. The achievable net surplus is $S_t = G - Y_l - \Pi_b$, where $S_t = \theta - I - t$, with θ an indicator of the value of the product (relative to alternative activities):

$$\theta = p_b - p_a - \Pi_b - m. \tag{1}$$

In a setting of perfect enforcement, joint profits can be divided according to a simple Nash bargaining process with sharing rule β , such that the respective incomes of the supplier and the buyer under perfect enforcement are $Y_{pf} = Y_l + \beta S_t$ and $\Pi_{pf} = \Pi_b + (1 - \beta)S_t$.²² More relevant here is when enforcement is costly. Consider the extreme situation of no external enforcement—equivalent to assuming that external enforcement is prohibitively costly.

First, the farmer can divert the inputs received to other uses, selling them or applying them to other production activities (such as subsistence crops). This way, the farmer can always earn at least an income $Y_d = p_a - C + I - \phi^f$, where $p_a - C$ represents the farmer’s income from producing the low-value product, I the revenue from reselling the inputs, and ϕ^f the reputation cost.²³ In this case, the buyer earns a payoff $\Pi_d = -I$ (assuming that the buyer cannot find alternative suppliers ex post).

Second, the farmer can apply the inputs, as agreed in the contract, but then sell the high-value output to another buyer. The competing buyer may not value the product as much as the contract buyer does. Define p_s as the price offered by competing buyers.²⁴ The farmer’s payoff is now $Y_s = p_s - C - \phi^f$, and the buyer’s payoff is $\Pi_s = -I$.

The contract (Y, Π) that satisfies the farmer’s participation and incentive compatibility constraints²⁵ can then be written as:

$$Y = p_a - C + \max[\beta(\theta - I - t), I - \phi^f, p_s - p_a - \phi^f] \tag{2}$$

$$\Pi = p_b - m - I - C - t - Y. \tag{3}$$

For the buyer to agree on the contract, condition $\Pi \geq \Pi_b$ must be fulfilled. This implies that contracts can be enforced only for a range of parameter values,

20. More generally, p_a increases with supplier concentration, decreases with buyer concentration (Inderst and Mazzarotto 2008), and increases if the supplier’s bargaining partner is not the “gatekeeper” to the high-value market (Mazzarotto 2004).

21. $\Pi_b > 0$ decreases with supplier concentration and increases with buyer concentration (see Inderst and Mazzarotto 2008).

22. Nash (1953) proposes that the sharing rule be fifty-fifty, but this article takes a more general view.

23. This can be interpreted in a broad sense not only as a pure loss of reputation, but also as a social capital cost, a moral loss, or loss of future trade opportunities.

24. The price p_s reflects the degree of buyer specificity of production standards (the higher the specificity of the product or quality standards or the higher the transaction costs of switching, the lower p_s is). If quality characteristics are more observable (or cheaper to observe), then p_s will increase.

25. The relevant incentive compatibility constraints are $Y \geq Y_d$ and $Y \geq Y_s$.

which is summarized in the following restriction on θ :

$$\theta \geq \theta_{min} = \max(I + t, 2I + t - \varphi^f, I + t + p_s - p_a - \varphi^f). \quad (4)$$

This condition captures several reasons for potential contract failure. If θ is smaller than $I + t$, the net surplus of the transaction will be negative and there is no incentive for contract formation. This can arise for two reasons. If $\theta \leq I$, there is no surplus to be created. This situation is referred to as *efficient separation*. If $I < \theta < I + t$, there would be a surplus under nondistorted conditions, but either taxation or inefficiencies in the chain prevent an effective surplus; this situation is referred to as *distorted separation*. If $\theta \geq I + t$ but smaller than $2I + t - \varphi$, or than $I + t + p_s - p_a - \varphi^f$, no price offered by the buyer can make the supplier comply with the contract. In other words, the premium²⁶ that the buyer has to pay the supplier not to breach the contract is larger than the buyer's gross revenues: the buyer cannot afford this. Under these conditions, the contract will not be realized, even if it would be socially efficient to do so. This is referred to as *inefficient separation*.

Figure 4 illustrates these separation effects. Line S^* represents the surplus that could be created without distortions ($t = 0$) and with perfect enforcement. Line S_t represents surplus with distortions ($S_t = S^* - t$), and the kink in the S_t function reflects the hold-up effect—the inability to enforce the contract for $I + t \leq \theta < \theta_{min}$.

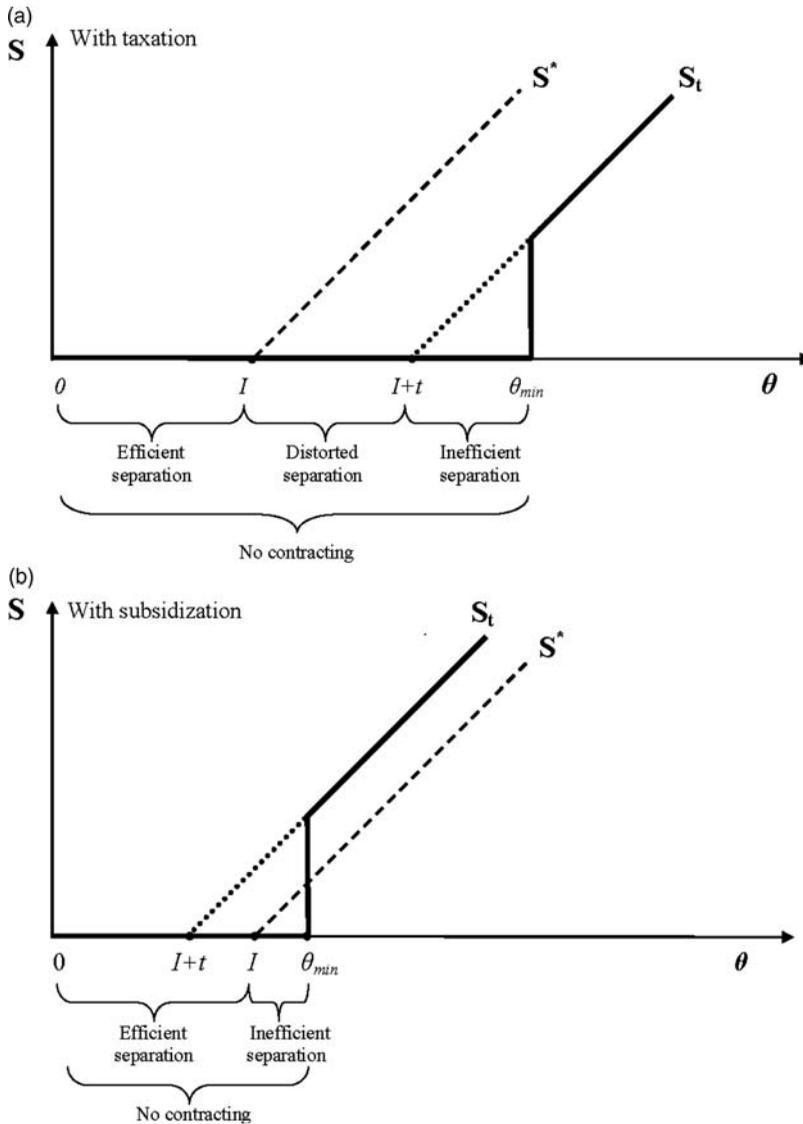
Condition (4) implies that several factors are crucial for contracting to be sustainable. The relative value in the chain (θ) needs to be high enough to realize a net surplus and to overcome enforcement problems. From equation (1) it follows that θ will be higher when the consumer price (p_b) is higher, when processing and marketing costs (m) are lower, and when there are fewer alternatives for suppliers and buyers (p_a and Π_l low). Higher specific input costs (I) also reduce contract feasibility by reducing the surplus and increasing incentives for breaching the contract. Government taxes or subsidies (t_x) will affect contracting, as a higher θ will be required for contract formation when farmers are taxed ($t_x > 0$), and a lower θ will be required when farmers are subsidized ($t_x < 0$). Inefficiencies in processing and marketing (t_m) also reduce the likelihood of contracting. If the buyer-specificity of the product is high (low p_s), contracts are sustainable for a wider range of θ , as θ_{min} will be lower. Finally, a higher reputation cost of the farmer (φ^f) makes contract breach less likely.

In summary, if the relative value in the chain (θ) is sufficiently high, opportunistic behavior can be overcome by paying a higher price to the supplier. Inefficient separation is thus more likely to occur if the value of θ is low, if the value of required inputs I is high, if farm reputation costs φ^f are low, and if there are more alternative buyers for high-value products (p_s high).²⁷

26. This premium (ϵ) can be derived as $\epsilon = \max[\beta(\theta - I - t), I - \varphi^f, p_s - p_a - \varphi^f] - \beta(\theta - I - t)$.

27. Another way to enforce contracts is to invest in supervision (or engage third-party enforcement), if it is not prohibitively costly.

FIGURE 4. Contracting and Surplus Creation



Source: Authors' analysis.

Aggregate Output

Consider next what happens if there is more than one supplier (N suppliers) and each can at most produce one unit of high-value product. The transaction costs of dealing with suppliers differ, because of differences in landholdings, experience or skill level, distance from the contracted processor, and other reasons. More specifically, assume that a processor faces transaction cost τ_i in dealing with supplier i . This transaction cost is assumed to be borne by the

processor on conclusion of the agreement or at delivery of the inputs. The supplier associated with the lowest transaction cost has $\tau_i = 0$, the supplier with the highest transaction cost has $\tau_i = \mathcal{T}$. In between, transaction costs τ_i are distributed according to a uniform distribution: $\tau_i \sim U(0, \mathcal{T})$. In all other characteristics, suppliers are assumed to be identical. This derivation applies for the supplier with the lowest transaction cost. For suppliers with higher transaction costs, conditions (2), (3), and (4) will translate into the following conditions:

$$Y_i = p_a - C + \max[\beta(\theta - I - t), I - \varphi^f, p_s - p_a - \varphi^f] \quad (5)$$

$$\Pi = \sum_i (p_b - m - I - C - t - \tau_i - Y_i) \quad (6)$$

$$\begin{aligned} \theta &\geq \theta_{min,i} = \theta_{min} + \tau_i \\ &= \max(I + t + \tau_i, 2I + t - \varphi^f + \tau_i, p_s - p_a - \varphi^f + t + \tau_i). \end{aligned} \quad (7)$$

Total supply, $Q(\theta)$, can now be derived at each level of value θ . If $\tau^*(\theta)$ is defined as the value of τ for which condition (7) is binding (hence $\tau^*(\theta) = \theta - \theta_{min}$), suppliers with $\tau_i > \tau^*(\theta)$ will not be able to produce high-value products, while suppliers with $\tau_i \leq \tau^*(\theta)$ will. The total supply of high-value products can then be calculated as:²⁸

$$Q(\theta) = \frac{\tau^*(\theta)}{\mathcal{T}} N = \frac{\theta - \theta_{min}}{\mathcal{T}} N. \quad (8)$$

The same factors identified above will now determine the supply of high-value products: total output is expected to increase if the value θ increases or t decreases, if the value of required inputs I is lower, if farm reputation costs φ^f are higher, and if there are fewer alternative buyers for high-value products (p_s low).

Contract enforcement differs under state control and under a market system. Monopolistic state control makes contract enforcement more likely because of the absence of competition (hence low p_a as well as low p_s) and high reputation costs for farmers (high φ^f).²⁹ Excess marketing costs $t_m > 0$ make enforcement more difficult, while the impact of price distortions depends on the tax regime.

As previously explained, the focus is on two crucial, interrelated aspects of liberalization: price liberalization (an end to government determination of prices) and market liberalization (an end to state control over the structure of commodity chains by allowing private trade and competition). Define T as the governments' price policy and Z as the market policy. Price liberalization

28. Assume that $\tau^* \leq \mathcal{T}$, implying that θ will never increase sufficiently to enable the supplier with the highest transaction cost to produce.

29. An alternative argument is that centrally imposed conditions to source from all farmers (for political objectives) may imply lower reputation costs for farmers.

is represented by $\Delta T > 0$, with $\partial t_x / \partial T > 0$ for $t_x < 0$ and $\partial t_x / \partial T < 0$ for $t_x > 0$. Market liberalization is represented by $\Delta Z > 0$.

Price Liberalization

In the model, price liberalization (ΔT) will affect farms through the effect on output prices. Equation (4) implies that $\partial \theta_{min} / \partial t_x > 0$. Hence, it follows that price liberalization will improve contract feasibility by reducing θ_{min} where farmers were previously taxed. There will be less distorted separation, and contracting will be possible over a larger domain of θ . Output would therefore be expected to increase for the high-value production activities. However, when price liberalization involves a cut in agricultural subsidies, the reduced subsidies can make contracting no longer feasible. In that case, the model predicts an output decline. In summary, $\partial Q / \partial T < 0$ for $t_x < 0$ and $\partial Q / \partial T > 0$ for $t_x > 0$.

Market Liberalization

Market liberalization (ΔZ) is implemented by allowing private traders and buyers to enter the market and by privatizing and removing the monopoly status of state companies. As long as contracting is enforced, competition enlarges the farmer’s alternative income opportunities (through p_a and p_s) and share of the contract value. However, with (increasing) competition between buyers, contracting might break down, although that would be socially inefficient. Several subeffects of increased (ex ante as well as ex post) competition ($\Delta Z > 0$) on high quality output can be derived:

$$\begin{aligned} \frac{\partial Q(\theta)}{\partial Z} = \frac{N}{T} \frac{\partial[\theta - \theta_{min}]}{\partial Z} = & \left[\frac{\partial \theta}{\partial p_a} - \frac{\partial \theta_{min}}{\partial p_a} \right] \cdot \frac{\partial p_a}{\partial Z} - \frac{\partial \theta_{min}}{\partial p_s} \cdot \frac{\partial p_s}{\partial Z} \\ & - \frac{\partial \theta_{min}}{\partial t_m} \cdot \frac{\partial t_m}{\partial Z} - \frac{\partial \theta_{min}}{\partial \varphi^f} \cdot \frac{\partial \varphi^f}{\partial Z} \end{aligned} \tag{9}$$

where $\partial \theta / \partial p_a < 0$, $\partial \theta_{min} / \partial p_a \leq 0$, $\partial \theta_{min} / \partial p_s \geq 0$, $\partial \theta_{min} / \partial t_m > 0$, $\partial \theta_{min} / \partial \varphi^f \leq 0$ (in each case the effect is zero when the constraint is not binding and either positive or negative when the constraint is binding).

The first effect of competition between private buyers is to increase the ex ante outside option farmers face at the time of contract negotiation. In the model, this implies an increase in p_a ($\partial p_a / \partial Z > 0$), which benefits farmers. To assess the effect of p_a on contract enforcement, the impact of p_a on both θ and on θ_{min} must be considered. The first term of equation (9) will be zero if the last term of equation (4) is binding on θ_{min} ; otherwise, it will be negative.

Second, competition also increases the ex post outside option of the farmer, p_s ($\partial p_s / \partial Z > 0$). With a higher p_s , farm profits rise, but contracting is more difficult.

Third, competition improves company management. There is an extensive literature on how competition (and privatization) changed manager and firm behavior in transition economies (Roland 2000; Konings and Walsh 1999). A manager's incentive for innovation and profit maximization will be stronger in a competitive environment without soft budget constraints. Improved management reduces excess processing and marketing costs t_m ($\partial t_m / \partial Z < 0$), enhancing both farmer profits and contract enforcement.

Fourth, competition reduces the farmer's reputation cost φ^f from breach of contract ($\partial \varphi^f / \partial Z < 0$) because the availability of alternative buyers is expected to negatively affect the penalty for contract breach (Eswaran and Kotwal 1985; Hoff and Stiglitz 1998) and because coordination and information sharing are less likely with a greater number of agents (Zanardi 2004). This effect also enhances farmer profits but makes contracting more difficult.

In summary, from equation (9) it follows that market liberalization implies several subeffects, some that make contracting more feasible and some that make it less feasible. Three of the four effects on the right side of equation (9) are negative.³⁰ Only the reduction in excess processing and marketing costs (term 3) will improve contract feasibility, *ceteris paribus*. While the net effect is an empirical question that depends on the size of the various components, the theoretical results suggest that important constraints on output growth may be expected with market liberalization if the endogenous impact on the emergence and enforcement of contracting is taken into account.

Finally, the analysis has assumed perfect information and focuses only on output. In reality, there is likely to be considerable uncertainty, and the reforms themselves may affect this uncertainty.³¹ That will affect the behavior of agents, depending on their expectations and risk aversion. These effects may reinforce or mitigate some of the findings here.³² However, as shown above, even with the assumption of perfect information, important contract failures may occur.

Implications

The theoretical results have major implications for understanding the effects of liberalization. The output effects of price liberalization may be positive or negative. If liberalization increases prices, the provision of specific inputs will improve as private enforcement grows; the opposite occurs for price declines.

30. More specifically, each term is strictly negative or zero depending on whether the respective constraints are binding.

31. Both Krueger, Schiff, and Valdés (1991) for developing countries and Rozelle and Swinnen (2004) for transition economies have explained that the liberalization process increased price volatility. Barrett (1998) analyzes output responses (and welfare) effects under uncertainty; Fafchamps (2004) and Gow, Streeter, and Swinnen (2000) show how volatility may lead to more frequent contracting failures.

32. In an extension of the model used in this article integrating risk and uncertainty, Swinnen, Vandemoortele, and Vandeplass (2009) show that these effects are conditional on the nature of the price volatility and the distribution of expectations and risk aversion across agents in the chain.

With competition, direct and indirect effects may counteract each other. Increased competition will stimulate output by increasing benefits for farmers but may constrain or reduce growth by making enforcement more difficult. Hence the two effects may be opposite, but this depends on the nature of the commodity and the supply chain.

The next section relates these theoretical findings to country and commodity characteristics, focusing on three key indicators: the change in relative subsidies/taxes during transition, required inputs in the production process, and the value of the commodity. From the model, it follows that these factors will affect contracting and output. For example, in sectors and countries where price liberalization led to a decrease in relative prices (t_x), contracting will be more difficult.

In addition, input requirements (I) and value (θ) play an important role. Consider three types of commodities: low-value products that require no external inputs and medium- and high-value products that require external inputs. Low-value products will not face contract enforcement problems, since there is no interlinked contracting, but they will face the direct effects of price and competition reforms. When production requires external inputs, the theory predicts that following liberalization, interlinked contracting by the private sector will be easier to sustain in higher value commodity chains. Therefore, for commodities that require substantive inputs, the supply response would be expected to be positively related to commodity value. These arguments have important implications for the regional comparisons since the value and input requirements of the key commodities are likely to vary considerably with a country's income level and trade structure. Both input requirements and value will typically be higher in richer countries than in poorer countries. However, for specific commodities, poor countries may reach rich country consumers through exports, which typically implies higher value and higher input requirements for specific sectors. In the next section, these insights are used to interpret performance.

IV. AN EXPLANATION OF DIFFERENT LIBERALIZATION PERFORMANCES

This section combines insights from the theoretical model and from the analysis of differences in initial conditions and reform choices to develop a set of hypotheses explaining the differences in reform performances across regions.

Central and Eastern Europe and the Former Soviet Union

In Central and Eastern Europe and the former Soviet Union, where farmers were subsidized under the state-controlled system, price liberalization involved a dramatic reduction in farm support and led to a strong decline in the terms of trade for farmers. Together with privatization of farms and industry, this caused a complete collapse of the state-controlled contracting system and, with it, the provision of inputs to farmers (Gow and Swinnen 1998; Cungu and others 2008). The effect was strong because farms used (external) inputs

intensively, making them dependent on exchange with companies for their inputs. Agricultural output and productivity declined sharply, as reflected in the performance indicators in figures 1 and 2.

This initial effect was reinforced by the land reforms, as gains from improved incentives in individual farms were initially more than offset by losses in scale economies because of the capital-intensive production structure.³³

However, consistent reforms in a region with relatively high incomes also induced large inflows of investments in the food chain. These investments, in turn, stimulated rapid expansion of privately organized contracting, with major farm spillovers (Gow, Streeter, and Swinnen 2000; Dries and Swinnen 2004; World Bank 2005). Observed contracting varies. It can be formal or informal, written or oral, and simple interlinked provision of basic inputs and trade credit or sophisticated investment loans and triangular contracting structures, with written contracts between farms and processors serving as collateral for farm loans from banks.³⁴

While indicators of contracting are not available on a representative basis across sectors or regions, there are a few cases where survey data have been collected that are comparable across several countries.

Figure 5 documents the extent of endogenous private sector contracting between farms and dairy processors in several European transition economies. The figure clearly shows a positive correlation between the share of dairy processors that provide interlinked contracts with farm assistance programs³⁵ to their suppliers and both the income level of the countries (panel a) and progress in the reform process (panel b).

Several studies have shown that these investments and contracts, together with stabilization of real prices in the mid-1990s, caused a flow of inputs, capital, and technology to the farm sector—as explained by the model—and contributed to strong productivity increases in later years of reform (Dries and Swinnen 2004, 2010). This process started earlier and more intensively in Central and Eastern European countries, where incomes and commodity chain values were higher and where liberalization progressed faster, and later and slower in former Soviet Union countries, which were poorer and where liberalization progressed more slowly.³⁶

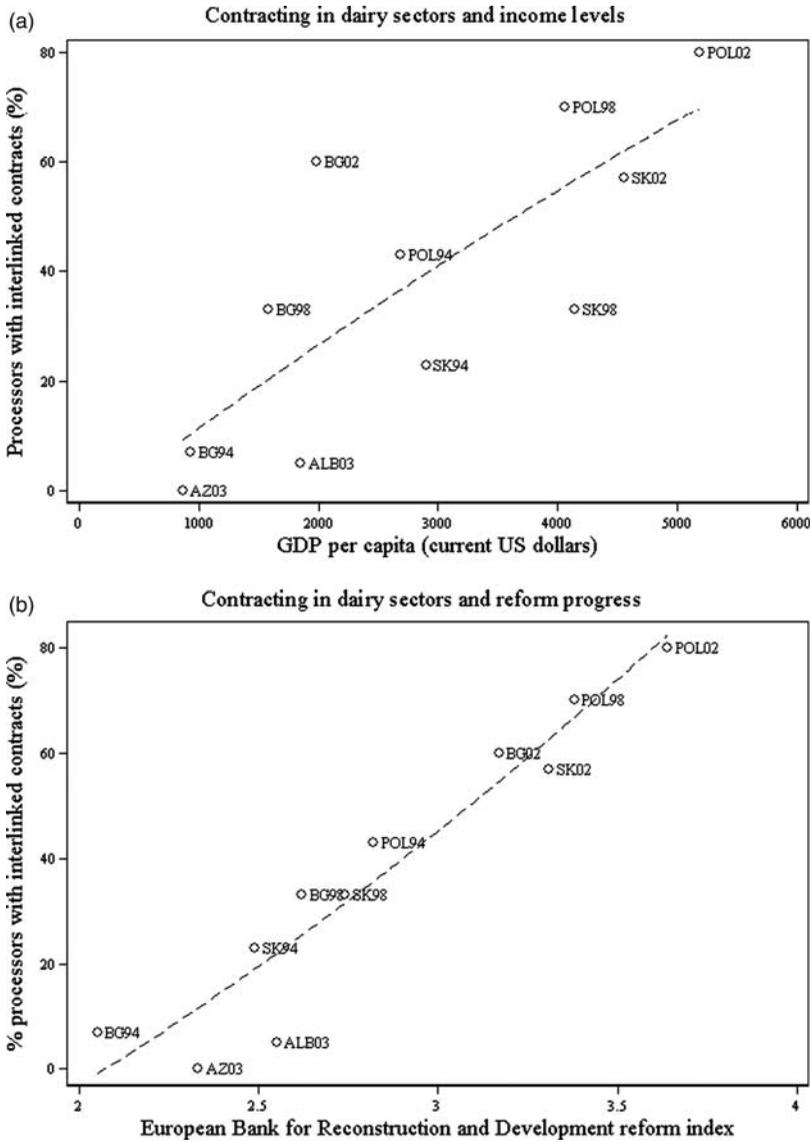
33. See Macours and Swinnen (2000) for estimations of the contributions of the various reform elements to the decline in agricultural output in Central and Eastern Europe.

34. For case studies and reviews of evidence, see World Bank (2005) and Swinnen (2006, 2007).

35. These are programs that provide inputs, credit, advisory services, and sometimes investment support and bank loan guarantees.

36. Indicators of foreign direct investment are available only at the aggregate level for all regions discussed here. Only for Central and Eastern Europe are there data series on foreign direct investment specific to agri-food sectors. The aggregate indicators show that the inflows of foreign direct investment after the reforms were much higher in Central and Eastern Europe than in other regions.

FIGURE 5. Contracting, Income Levels, and Reform Progress in Central and Eastern Europe



Note: Correlation (R^2) is 0.77 in figure 5a and 0.95 in figure 5b.

Source: For incidence of interlinking, authors' analysis based on data from Dries and others (2009); GDP per capita from IMF (2010); for European Bank for Reconstruction and Development (EBRD) reform index, authors' calculation of simple averages of 14 EBRD transition indicators.

East Asia

In East Asia, growth during the first five years sprang from giving land rights to rural households. Unlike farms in Central and Eastern Europe and the former Soviet Union, farms in East Asia were labor intensive, with few external inputs,

and hence output and productivity responded strongly to the enhanced incentives effect.³⁷

In a second phase, governments in East Asia gradually adjusted prices toward market levels, thereby reducing taxes and benefiting farmers. In addition, there was much less disruption in exchange since the government remained firmly in control of the agencies providing inputs and buying commodities. In line with the analytically derived results in the model, this reduction in taxes combined with the initial retention of state-controlled inter-linking and input provision caused a positive supply response.

The subsequent gradual introduction of competition in the food chain (by allowing trader competition at the margin) led to a further positive supply response. It removed inefficiencies and improved farmers' bargaining power and income in the chains without leading to contract breaches.

In summary, the success of East Asian liberalization is due to a combination of initial conditions (labor intensive and low input farming) and carefully sequenced reforms, which together contributed to strong growth during the first 15 years of the reform era.

Sub-Saharan Africa

There are several possible explanations for why growth has been lower in Sub-Saharan Africa than in East Asia and why growth was higher in Sub-Saharan Africa than in Central and Eastern Europe and the former Soviet Union in the initial reform years and slower in the later stages.

Growth was slower, in aggregate, in Sub-Saharan Africa than in East Asia for three reasons. First, Sub-Saharan Africa did not benefit from an initial boost from property rights reform within a labor-intensive farming system because farming was never collectivized in Sub-Saharan Africa. Second, liberalization resulted in more market disruptions in Sub-Saharan Africa than in East Asia. African reform strategies included simultaneously ending state monopolies and liberalizing prices. Introducing competition led to break-downs in some supply chains, reducing access to inputs for farmers and impeding output and productivity growth. Third, the average reduction in farm taxation in Sub-Saharan Africa was only a third that in East Asia: from around -30 percent to around -10 percent in Africa compared with from more than -50 percent to above zero in East Asia (see figure 3).

There are also three reasons why growth was initially stronger in Sub-Saharan Africa than in Central and Eastern Europe and the former Soviet Union. First, Sub-Saharan Africa did not have a capital-intensive farming system before reform, so it did not experience the decline in output and productivity that accompanied land reform and privatization in Central and Eastern Europe and the former Soviet Union. Second, price incentives for farmers improved with liberalization in Sub-Saharan Africa and worsened in

37. See Lin (1992), deBrauw, Huang, and Rozelle (2000, 2004), and Pingali and Xuan (1992) for estimates of the growth contributions of the various reform components.

Central and Eastern Europe and the former Soviet Union (see figure 3). Third, on average, supply chain disruptions were less important in Sub-Saharan Africa than in Central and Eastern Europe and the former Soviet Union because a smaller share of production depended on external inputs and because market liberalization was more gradual and mixed. A substantial share of Sub-Saharan African production, especially of staple foods, did not rely on such formal input (and output) markets and hence suffered less from the disruptions.

These same three factors also help to explain why growth resumed at a faster pace after a few years in Central and Eastern Europe (and later in the former Soviet Union) than in Sub-Saharan Africa. Once the initial disruptions of land reforms and the one-off drop in output with the subsidy cuts were absorbed in Central and Eastern Europe, growth in supply chains was stimulated by a massive inflow of investment—often foreign direct investment—in agribusiness and the food industry, with strong spillover effects on farms through vertical coordination. These effects emerged much more slowly and less extensively in poorer countries with greater macroeconomic (and institutional) instability, explaining the slower recovery in the former Soviet Union than in Central and Eastern Europe and the even slower recovery in Sub-Saharan Africa. In the former Soviet Union and Sub-Saharan Africa, unlike in Central and Eastern Europe, private vertical coordination did not take over (or not to the same extent) after the collapse of state-controlled supply chains as foreign direct investment and private investment was much more limited in the early years after reforms (see figure 5). In addition to factors such as underdeveloped infrastructure and political and economic instability, low incomes and the low value in Sub-Saharan African food chains constrained the emergence of private sector vertical coordination and market interlinking and thereby growth in the entire chain.

V. AN EXPLANATION OF VARIATIONS IN COMMODITY SECTOR PERFORMANCE IN AFRICA

In further support of these arguments, average growth in Sub-Saharan Africa was disaggregated into four subgroups:³⁸ industrial crops (including coffee, cocoa, tea, rubber, oil crops, cotton, and tobacco), fruits and vegetables, and among staple food crops, roots, tubers, and pulses on the one hand and cereals on the other.³⁹ While these groups still include a mix of

38. The disaggregation is based on the commodity classification by Poulton, Kydd, and Dorward (2006), with a further disaggregation of staple crops.

39. The focus here is on Sub-Saharan Africa, because the difference between the commodities in input requirements and value is the most differentiated. In East Asia, for example, most initial production was in low-value staples since there was very little exporting; in Central and Eastern Europe, there was much less production of low-value commodities because of higher income levels. From this perspective, Sub-Saharan Africa is the most interesting case because of its large diversity of commodity characteristics.

products, the model predicts that performance will differ across the groups.

Industrial crops include mostly commodities produced for export, which were strongly dependent on interlinked input arrangements both before and after the liberalizations. In many cases, these production systems rely on extensive outgrower contracting schemes, with processors or traders providing inputs to smallholders in return for their crop output later (see Kherallah and others 2002; Poulton, Kydd, and Dorward 2006). However, contract enforcement is problematic in these markets because these are typically medium-value commodities (limiting the amount of surplus to be shared in the system) and because side-selling is relatively easy (compared to the case with high-value export crops), with many traders involved and with extensive trading systems and because at least some commodities are less perishable. In addition, the use of inputs provided under interlinked contracts is often widespread.

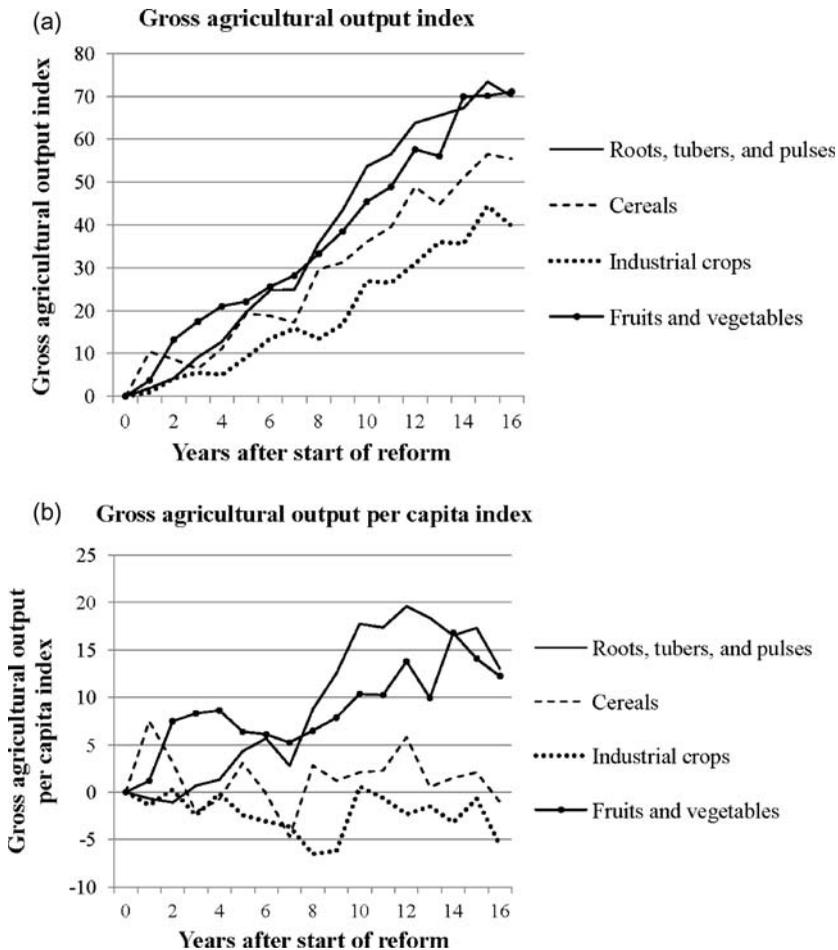
The fruits and vegetables group includes both low-value products for the local market and high-value products for export. The data do not allow distinguishing between the two groups, but the impact of the reforms is likely to be quite different. Low-value fruits and vegetables for the local market are produced with little or no external inputs, and the main input is often labor. Hence there is very little need of contracting, and production systems are affected mainly by price changes. In contrast, high-value fruits and vegetables for export typically require important external inputs (including pesticides and fertilizer) and are grown in vertically integrated production systems or through extensive contracting with smallholders, including the provision of technical assistance and inputs. These high-value products typically allow for adequate surplus to reward the producers sufficiently to refrain from breaching contracts or to allow for investment by processors and exporters in extensive supervision systems, which enhance contract enforcement. Hence, contracting is more likely to be successful in these commodities.

Third, the need for specific inputs is typically much lower in the production of staple crops such as roots, tubers, and pulses than of industrial crops or high-value fruits and vegetables, which makes contracting less necessary for increasing output if prices increase. Hence, staple crops would be expected to be less susceptible to market and contract disruptions as they are less dependent on external inputs.

Fourth, interlinked contracts in cereal production are typically difficult to enforce because cereals are low-value commodities, with relatively easy sales opportunities to multiple buyers (and thus high competition). Moreover, cereals are typically more easy to store than are more perishable commodities such as fruits and vegetables or some of the roots and tubers. This increases the options for opportunistic behavior by cereal farmers. Hence, one would expect contracting to be more difficult and more susceptible to disruptions.

There are substantial differences in performance among these groups, especially in the evolution of productivity (figure 6). Fruits and vegetables and roots, tubers, and pulses have performed better than industrial crops and cereals. After 16 years of reform, output was 70 percent higher for fruits and vegetables and roots, tubers, and pulses than before the reform. It was just 55 percent higher for cereals and 40 percent higher for industrial crops. The differences are even more striking on a per capita basis: per capita output rose 12 percent for fruits and vegetables and roots, tubers, and pulses, while it stagnated for cereals and even declined 5 percent for industrial crops. Hence, the

FIGURE 6. Postreform Performance of Commodity Types in Sub-Saharan Africa, RSSAP Indicator



Note: See table A1 in the appendix for the starting year of the reform and for countries in each region for the RSSAP indicator. Industrial crops include cocoa, coffee, gum, oil crops, rubber, tea, and tobacco.

Source: Authors' analysis based on data from Food and Agriculture Organization statistics and RSSAP indicator from Rozelle and Swinnen (2004).

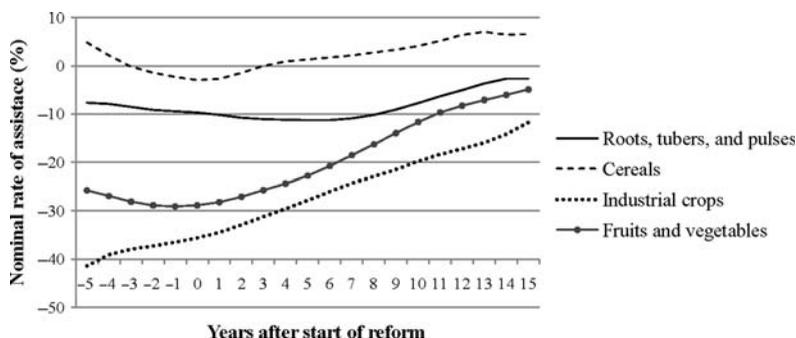
lagging performance in cereals and industrial crops reduced average growth in Sub-Saharan African agriculture.

The lack of output growth and productivity in industrial crops in Sub-Saharan Africa is often attributed to falling world prices for these commodities. Indeed, during the 1980s—when most Sub-Saharan Africa countries embarked on economic and agricultural reforms—prices for these commodities deteriorated sharply. However, according to a [World Bank \(1994\)](#) study, real producer prices for export crops rose during the 1980s in some Sub-Saharan African countries because the effects of price liberalization offset the effects of decreasing world market prices.

This argument is supported by new estimates of nominal rates of assistance ([Anderson and Masters 2009](#)) indicating that the effect of the liberalization on prices was most positive for industrial crops (figure 7). Taxation of industrial crops actually fell by around 30 percentage points (from -40 percent to -10 percent) over the decade and a half after the start of the reforms. The reduction in taxation—and hence the enhanced price incentive—was substantially lower for the other commodity groups: around 20 percentage points for fruits and vegetables and 5–10 percentage points for cereals and roots, tubers, and pulses. Hence, these price effects cannot explain the variation across commodity groups in Sub-Saharan Africa. If anything, they would predict the opposite in terms of relative performance.

These differences in performance are, however, consistent with the contracting model described above and support the hypotheses on postreform performance. Output and productivity increases for roots, tubers, and pulses were

FIGURE 7. Nominal Rates of Assistance per Commodity Group for Sub-Saharan Africa, RSSAP Indicator



Note: See table A1 in the appendix for the starting year of the reform. Sub-Saharan Africa includes Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Mali, Mozambique, Nigeria, Senegal, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. Fruits and vegetables include fruits, nuts, spices, and vegetables; industrial crops include fiber crops, gum, oil crops, rubber, stimulants, sugar crops, and tobacco. Source data do not distinguish between fruit and vegetable crops.

Source: Authors' calculations based on data from [Anderson and Masters \(2009\)](#) and RSSAP indicator from [Rozelle and Swinnen \(2004\)](#).

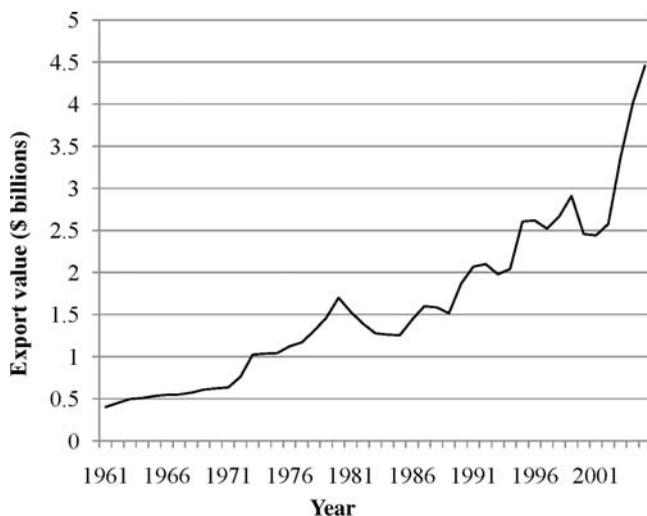
better than average. Input requirements in this sector are generally low, and therefore output growth has not been very dependent on contracting. Instead, the sector benefited from liberalized prices and enhanced competition in spot markets. The same forces hold for the cereal sector, but because input requirements are generally higher, the sector depends more on contracting for access to inputs. Growth in the cereal sector has been more limited since the reforms, as new forms of private interlinked contracting did not emerge in this sector because value in the staple food chains is generally too low and competition too high to sustain it. Marketing activities have been taken over by many small private traders and are based on spot market transactions (Coulter and Poulton 2001; Fafchamps and Minten 2001).

In contrast, in the Sub-Saharan African industrial crop sectors, the simultaneous lifting of price controls, introduction of competition, and associated collapse in state-controlled vertical coordination have caused major disruptions in input provision to farmers and led to below average output and productivity growth, despite a much stronger reduction in taxation than in other commodity groups. Input requirements are generally much higher in traditional export commodities than in staple food crops, and therefore the collapse of public input provision affected output and productivity much more—as in Central and Eastern Europe. Unlike in Central and Eastern Europe, however, massive private investments with contracting and input provision did not occur in the first decade of reform in African industrial crops, impeding a rapid recovery.

There was also strong growth in the Sub-Saharan Africa fruits and vegetables sector—much higher than in industrial crops. The model suggests that this sector grew because of two, quite different, mechanisms. First, production of low-value fruits and vegetables for the local market depended largely on labor inputs and thus benefited from the same effects as staple crops. Second, an important—and rising—part of the growth came from high-value fruits and vegetable chains for exports. This sector grew very rapidly after the reforms (figure 8). The high value in these chains sustained postreform private investments in the sector and encouraged private vertical coordination with quality upgrading, interlinking (with both large and small farms), and input provision to farmers. Several recent studies show how the vertical coordination mechanisms and their spillovers and productivity growth effects are similar to the growth mechanisms in Central and Eastern Europe (Maertens and Swinnen 2009; Minten, Randrianarison, and Swinnen 2009; Maertens, Colen, and Swinnen 2010).

In summary, the different experiences of these four subsectors in Sub-Saharan Africa—which are masked by the average growth rates—are consistent with the general arguments presented here that reliance on external inputs and value in the supply chains—which affect the endogenous emergence of exchange institutions in a liberalized environment—are crucially important for understanding performance in Sub-Saharan Africa and comparing it with performance in other regions.

FIGURE 8. Growth in Fruit and Vegetable Exports in Sub-Saharan Africa, 1961–2005



Source: Authors' analysis based on data from Food and Agriculture Organization statistics.

VI. CONCLUSION

This paper compares the performance of reforms in countries in Africa, Asia and Europe. Post-reform growth in Sub-Saharan Africa was lower than in East Asia, but initially stronger than in Central and Eastern Europe and the Former Soviet Union. However, after five (Central and Eastern Europe) and ten (Former Soviet Union) years of transition, growth in Europe and the Former Soviet Union has surpassed that in Sub-Saharan Africa. Within Sub-Saharan Africa, growth has been relatively strong in RTP and in F&V, while much slower in industrial crops and cereals.

To explain these relative performances, we have developed a model to formally analyze how liberalization affects production explicitly integrating the impact of liberalization on the institutions that govern production and exchange. Our analysis shows how these institutional characteristics have been affected by the liberalization process. Using the model, we derive hypotheses on how these characteristics affect the supply response to liberalization, and, consequently, on how to explain the poor performance of some countries after liberalization.

In the last part of the paper, we use these hypotheses to relate initial conditions and reform choices to performances. We offer a series of hypotheses to explain differences among commodities, and to explain that the supply effects and the governance of exchange in the post-liberalization economy also differ between commodities; and more particularly that there is a positive correlation

between supply response, contracting in vertically coordinated market organizations, and the value in the chain.

In particular, regarding the Sub-Saharan Africa reform performance, we offer several hypotheses to explain (a) why Sub-Saharan Africa growth is lower than that of East Asia (China and Vietnam); (b) why Sub-Saharan Africa growth was higher than that of Central and Eastern Europe and the Former Soviet Union in the initial reform years; (c) why growth in Sub-Saharan Africa was slower than in Central and Eastern Europe (and the Former Soviet Union) after the initial stage; and (d) why there are substantial differences across sectors in Sub-Saharan Africa.

Clearly, the analysis in this article is an imperfect attempt at applying empirical observations to a theoretical framework. The empirical analysis could be improved by more quantitative approaches if representative data or good indicator variables were available on the key parameters discussed here, including the need for specific inputs, the value of commodities, contract specifications, and breakdown of contracts. While some data are available on some of these variables, data on contracting remain especially scarce, not only for developing and emerging market economies but also for developed countries.⁴⁰

Using country-specific indicators in a statistical analysis would also improve the analysis. The article focused primarily on average differences across regions, while largely ignoring important variations across countries in these regions. Further work should try to remedy this by integrating country variations within this broader framework.

APPENDIX

TABLE A1. Date of Start of Agricultural Reform

Region	Country	Start of reform	
		RSSAP indicator ^a	SWWW indicator ^b
Central and Eastern Europe	Bulgaria	1989	1990
	Czech Republic	1989	1990
	Estonia	1991	
	Hungary	1989	1989
	Latvia	1991	1992
	Lithuania	1991	1992
	Poland	1989	1989
	Romania	1989	1991
	Slovakia	1989	1990
	Slovenia	1989	1990
East Asia	China	1978	

(Continued)

40. More specifically, at least 30–40 percent of the total value of agricultural production in the United States and Western Europe is under various types of contracts. Yet there is very little systematic evidence on this. The U.S. and the Canadian governments recently began initiatives to collect systematic information on these issues (World Bank 2005).

TABLE A1. Continued

Region	Country	Start of reform	
		RSSAP indicator ^a	SWWW indicator ^b
Former Soviet Union	Vietnam	1985	
	Armenia	1991	1994
	Azerbaijan	1991	1994
	Belarus	1991	
	Georgia	1991	1995
	Kazakhstan	1991	
	Kyrgyzstan	1991	1993
	Moldova	1991	1993
	Mongolia	1991	
	Russian Federation	1991	
	Tajikistan	1991	1995
	Turkmenistan	1991	
	Ukraine	1991	
	Uzbekistan	1991	
Sub-Saharan Africa	Benin	1989	1989
	Burkina Faso	1991	1997
	Burundi	1986	1998
	Cameroon	1989	1992
	Central African Republic	1986	
	Chad	1987	
	Congo, Rep.	1987	
	Congo, Dem. Rep.	1987	
	Côte d'Ivoire	1981	1993
	Equatorial Guinea	1988	
	Ethiopia	1992	1995
	Gabon	1988	
	Gambia	1986	1984
	Ghana	1983	1984
	Guinea	1986	1985
	Guinea-Bissau	1987	1986
	Kenya	1980	1992
	Lesotho	1988	
	Madagascar	1986	1995
	Malawi	1981	
	Mali	1988	1987
	Mauretania	1985	1994
	Mauritius	1981	1967
	Mozambique	1987	1994
	Niger	1986	1993
	Nigeria	1986	
	Rwanda	1991	
	São Tomé and Príncipe	1987	
Senegal	1980		
Sierra Leone	1984	2000	
Somalia	1986		
Sudan	1980		

(Continued)

TABLE A1. Continued

Region	Country	Start of reform	
		RSSAP indicator ^a	SWWW indicator ^b
	Tanzania	1981	1994
	Togo	1983	
	Uganda	1982	1987
	Zambia	1984	1992
	Zimbabwe	1992	

a. Start date is based on the indicator used by Rozelle and Swinnen (2004) for countries in Central and Eastern Europe, East Asia, and the former Soviet Union and on the first year of structural adjustment for countries in Sub-Saharan Africa (the year the country received its first structural adjustment loan from the World Bank).

b. Start date is based on the reform indicator developed by Sachs and Warner (1995) and updated by Wacziarg and Welch (2008). Start date is the year preceding continuous and uninterrupted openness of a country. Countries with missing values had not yet started reform in 2004 according to these criteria (Estonia, China, Vietnam, Belarus, Kazakhstan, Russian Federation, Turkmenistan, Ukraine, Uzbekistan, Central African Republic, Chad, Republic of Congo, Democratic Republic of Congo, Gabon, Lesotho, Malawi, Nigeria, Rwanda, Senegal, Somalia, Togo, and Zimbabwe) or were not included in the studies (Mongolia, Equatorial Guinea, São Tomé and Príncipe, and Sudan).

Source: For RSSAP indicator, Rozelle and Swinnen (2004); for SWWW indicator, Sachs and Warner (1995) and Wacziarg and Welch (2008).

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