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The developmental state in Brazil: comparative and historical perspectives

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RESUMO: O registro de estados desenvolvimentistas bem-sucedidos na Ásia Oriental e os sucessos parciais de estados desenvolvimentistas na América Latina sugerem várias pré-condições comuns para a intervenção estatal eficaz, incluindo uma burocracia weberiana, acompanhamento da execução, reciprocidade (subsídios em troca de desempenho), e relações de colaboração entre o governo e empresários. Embora o Brasil não tenha conseguido desenvolver uma manufatureira de alta tecnologia e exportações que alimentaram o crescimento sustentado da Ásia Oriental, seu estado desenvolvimentista teve um número de êxitos importantes, e muitas vezes negligenciados, especialmente em aço, automóveis, mineração, etanol e fabricação de aeronaves. Onde o Estado desenvolvimentista do Brasil teve menos sucesso foi na promoção de setores como a tecnologia da informação e a energia nuclear, bem como a igualdade social e regional. Além disso, algumas iniciativas isoladas de governos estaduais também foram capazes de promover determinados segmentos locais da indústria e da agricultura. Comparações com a Ásia Oriental reaçam o papel central das empresas estatais no Brasil que, com efeito internalizaram o monitoramento e a reciprocidade, e evitaram a colaboração entre empresas e governo (que foi em geral mais rara no Brasil).
PALVARS-CHAVE: Estado desenvolvimentista; política industrial; empresas estatais; Brasil.

ABSTRACT: The record of successful developmental states in East Asia and the partial successes of developmental states in Latin America suggest several common preconditions for effective state intervention including a Weberian bureaucracy, monitoring of implementation, reciprocity (subsidies in exchange for performance), and collaborative relations between government and business. Although Brazil failed to develop the high technology manufacturing industry and exports that have fueled sustained growth in East Asia, its developmental state had a number of important, and often neglected, successes, especially in steel, automobiles, mining, ethanol, and aircraft manufacturing. Where Brazil's developmental state was less successful was in promoting sectors like information technology and nuclear energy, as well as overall social and regional equality. In addition, some isolated initiatives by state governments were also effective in promoting particular local segments

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of industry and agriculture. Comparisons with East Asia, highlight the central role of state enterprises in Brazil that in effect internalized monitoring and reciprocity and bypassed collaboration between business and government (that was overall rarer in Brazil).
KEYWORDS: Developmental state; industrial policy; state owned enterprise; Brazil.
JEL Classification: O14; O25; O54.

INTRODUCTION

By the late 1990s, the conventional wisdom had buried the developmental state in Brazil with little ceremony and less nostalgia. Yet, in most forums, Brazil's 20th century version of the developmental state never got its day in court, and few have taken an interest in the opportunity to assess, with the full benefit of hindsight, the significant successes and failures of its nearly six decades of operation (1930-90). The argument here is that the developmental state had more sector and regional 'home runs' than was evident at the time of early post-mortem analyses. Some major sectoral failures still belong in the minus column, including informatics, coffee, nuclear energy, and some misguided projects in transportation (such as the Transamazon highway). However, other industrial policies that were regularly reviled in the past subsequently turned into levers of high tech growth and advantage, such as steel, ethanol, oil, autos, mining in the Amazon, and aircraft manufacture. At the same time, and in comparison with the top benchmark developmental states of East Asia, the Brazilian version of the developmental state did not promote a vast reorientation of the economy toward high tech, high value added manufacturing. In fact, by the 2000s, the natural resource bonanza pushed the Brazilian economy back toward earlier levels of dependence on exports of raw materials, though with a more diversified basket of natural resources and agricultural exports.

A disaggregated, sectoral approach to assessing the results of Brazil's developmental state has advantages over a macro assessment. Brazil's overall rate of growth, industrial transformation, technological improvement, and export expansion has lagged behind the leaders from developing countries, Korea and Taiwan initially, and China and India more recently. Savings and investment rates in Brazil never stayed above 25 percent of GDP for sustained periods, as they did in the high growth Asian economies. However, a great number of other variables besides state promotion contribute to these macro outcomes – from background conditions like natural resources and ethnic heterogeneity to more contemporary problems like the debt crisis of the 1980s — so it is more difficult to apportion credit and blame. In contrast, the sectors considered below are ones that were subject to heavy and direct state intervention, so the outcomes can more easily to attributed largely to the quality of that intervention.

A disaggregated, sectoral analysis of developmental states gets beyond blunter categorizations of states as successes or failures. Even the most successful developmental states had limited impact on many areas of their respective economies. The archetypical developmental state in Japan, for example, let very inefficient agricul-

ture and service sectors languish while promoting dramatic industrial growth. Desegregating the Korean developmental state reveals one part that was extremely effective in promoting manufactured exports at the same time other parts were wasteful and corrupt (Kang, 2002). A sectoral approach also allows the analysis to move beyond the sui generis origins of developmental states in East Asia — including the Cold War, extreme threats to national security, Japanese colonial occupation – to look at the bureaucratic origins and political coalitions that underlay development successes in political contexts more common across developing countries.

The broad cross national literature has though helped to identify variables that, with some adjustment, are useful in sectoral analysis of middle range developmental states. As discussed in the second section, the four main preconditions for effective developmental promotion distilled from this literature are: Weberian bureaucracy, political support, reciprocity, and collaborative relations between business and government (Evans, 1995; Amsden, 2001; Kohli, 2004). Within Brazil, development policies and their sponsoring agencies varied greatly along these four dimensions. Many of the success stories below revolved around state owned enterprises (SOEs) where success depended more on the first two conditions and largely obviated the need to devise delicate schemes for reciprocity and collaboration between the public and private sectors.

Second section provides basic background on the historical trajectory and broad outlines of Brazil's developmental state and examines the main preconditions for effectiveness in more detail. Third section provides a selective overview of major successes — such as oil, aircraft, steel, ethanol, and mining. Key ingredients in most success stories were state owned enterprises and long term investment in human capital. Fourth section looks at some failures as in informatics, nuclear power, and transportation. Fifth section examines some less well-known policies of local level economic promotion. The sixth section considers briefly the return of the developmental state in the 21st century.

HISTORICAL BACKGROUND AND GENERAL CONDITIONS

As elsewhere in Latin America, Brazil's developmental state began haphazardly in response to economic crisis. In the wake of the Great Depression, various governments of Getulio Vargas (1930-45 and 1951-54) began to create the institutions and policies that would later be the core instruments of state-led development: tariff protection and managed trade (1930s), state owned steel firms (1940s and 1950s), a development bank (Banco Nacional de Desenvolvimento Econômico, BNDE, 1950s), a state-owned oil firm (Petrobras, 1953), and sectoral policies for the installation of an auto industry (1950s) (Skidmore, 1967; Draibe, 1985; Shapiro, 1994). In addition, Vargas created a new personnel agency (Departamento Administrativo do Serviço Público, DASP) designed to professionalize and de-politicize the bureaucracy of the core development institutions (Nunes, 1997).

As successive governments added new agencies, institutions, and policies to Brazil's increasingly complex developmental state, the motives and sources of political support also multiplied and diversified (for an overview, see Skidmore, 1967).

General nationalist, populist groups, including labor unions, mobilized around some policies and were especially evident in the nationalization of oil production and the creation of Petrobrás. Groups of economists, especially in the 1940s and 1950s, elaborated more coherent arguments for ISI and state intervention (Bielschowsky, 1988). Associations of industrialists established pro-developmentalist positions (Diniz, 1978; Leopoldi, 2000). Lastly, and most importantly for many of the sectoral stories to follow, the military formulated clear strategies of economic development designed to reduce security vulnerabilities, starting with steel and oil in the 1950s and later turning to higher technology sectors (aircraft, computers, and nuclear energy) in the 1960s and 1970s. However, these groups and their separate development goals and policies never coalesced into a single coherent coalition or development strategy.

Moreover, in comparative terms these political motivations were not overwhelming and had to contend with other political movements and claims on government resources. The more extreme cases of developmental states in East Asia — Japan, Korea, and Taiwan — emerged out of equally extreme or rare historical circumstances including war, Japanese occupation (in the cases of Taiwan and Korea), ongoing security threats during the Cold War, and an absence of raw material exports. These conditions favored the consolidation of power by a developmental, and usually authoritarian, political elite and subsequent delegation of authority for interventionist, export-oriented economic policy to professional and highly trained bureaucrats.

In the absence of such extreme pre-conditions, a situation that characterizes most of the rest of the developing world, what general lessons can be drawn from the East Asia experience? Four generic components merit special emphasis: 1) a Weberian bureaucracy, with 2) strong external political support and protection (outside particular development agencies in the government), 3) capable of monitoring economic performance and demanding reciprocity, with 4) close relations to private business (what Evans calls "embedded autonomy") to promote rapid and effectual implementation of policy priorities. In a rough sense the effectiveness of developmental states can be gauged along these four dimensions (see also Schneider, 1999).

Distinguishing between ambition and effectiveness is crucial for the comparative analysis of developmental states (Schneider, 1999). In terms of goals or ambition, what differentiates developmental states from other states — nearly all of which seek to promote growth — is that developmental states are designed to shift a country's global ranking rapidly and permanently. Ambition is more than just government discourse and campaign promises; developmental states demonstrate this ambition with extensive material and institutional investments. Although ambition and effectiveness are intertwined in practice (if the ambition is forceful enough it can lead states to invest more in the four elements of effectiveness), they should be separated analytically in order to better compare and explain the variable performance of developmental states. Moreover, the four elements of effectiveness can also be applied, with adaptations to states and policies with other ambitions, like welfare states.

The effectiveness of Brazil's developmental state is usually ranked in the middle or medium (Evans, 1995; Kohli, 2004; Haggard, 1990), and it ranges from middle to low on these four dimensions. On personnel, the Weberian bureaucracy was

restricted to certain agencies of the state (Evans and Rauch, 1999). Political support was also uneven, and occasionally countered by other political goals and movements (ranging from traditional clientelism to modern populism). Monitoring and reciprocity were generally weak, for both state and private firms, in part because performance was harder to measure (than for example in export industries) and because bureaucratic capacity was weak (even in BNDES, see Amsden 2001). Lastly, connections with business often did not meet the standard of a balanced relationship, with bureaucrats lacking either embeddedness or autonomy across various policy areas. The cases in third -fifthsections provide more detail on these variations.

In principle, the administrative reforms initiated by Vargas in the 1930s and 1940s were intended to extend ultimately throughout the bureaucracy. In practice though, the developmental state evolved more unevenly, with some agencies fully professionalized and Weberian and others more politicized and clientelist (Nunes, 1997). For the most part, new professional agencies were added alongside old, often clientelist line ministries in a form of institutional or bureaucratic "layering" (Streeck and Thelen, 2005). Many of the new state owned enterprises had independent, and Weberian personnel systems, with entry by competitive examination, long term career tracks, and promotion by merit. These semi-autonomous agencies and state enterprises came to be known as "pockets of efficiency" (*bolsões de eficiência*), or what Rodrik calls more generally "pockets of bureaucratic competence" (2007, p.150), and included the BNDE, Petrobras, Embrapa (Empresa Brasileira de Pesquisa Agropecuária), and other newer agencies (Evans, 1995).

Beyond depoliticizing the bureaucracy, the requirements for information collection and processing, in order to facilitate effective policy intervention, increase substantially as states extend their intervention into the economy. This increase is partly due to the basic demands of economic planning, but also for monitoring the implementation of the policies and plans selected. One of the most famous instances of well developed monitoring was the Korean Export council and associated Export Association. The association could monitor exports and port activity on an hourly basis, and the council met monthly (including in its early years with President Park himself) to evaluate progress and discuss policy measures to improve performance (Amsden, 1989).

Nothing comparable existed in Brazil. The BNDE developed a sophisticated research capability for various sectoral activities, as did several agencies responsible for regulating prices and imports, but had nothing as comprehensive evaluating overall programs of industrial promotion, in part because ISI is much harder to monitor, in terms of progress at the firm level, than is export growth (Schneider, 1998). Information and monitoring are not only crucial generally to the process of development planning but also specifically to the issue of reciprocity (Amsden, 1989; Amsden, 2001). That is, much of the intervention by developmental states involves promoting and subsidizing private firms, which in turn creates a principle-agent problem where government officials have difficulty monitoring firms (agents) to verify that subsidies have been used appropriately and sanctioning firms if the subsidies have not. Reciprocity is thus first an information problem and then a political one where officials must feel they have sufficient authority and political protection to impose sanctions on powerful firms.

Information is also central to close business-government collaboration, what Evans calls "embedded autonomy," that is associated with the most successful developmental states. For Evans the relationship is broader than an exchange one for exacting reciprocity, and affects the quality of implementation, as private industry endorses policy initiatives and invests in them, as well as the quality of policy, through feedback from the objects of government intervention. However, Evans provides little empirical detail on how and where these relations of embedded autonomy occur (Schneider, 1998).

Two further institutional arrangements can help fill in the details on embedding autonomy. The first is largely an Asian phenomenon: deliberation councils composed of representatives from government and from business associations, as well as other expert members (Campos and Root, 1996). Some of these councils dealt with broad multisectoral issues like planning, exports, or infrastructure, but others were focused more on particular sectors or industries. Although not open to the public, these forums allowed for reiterated interactions, ongoing information sharing, and impeded rent seeking by exposing possible side deals to scrutiny by other parties. The developmental state in Brazil included a bewildering array of councils, though membership in most was restricted to representatives from government agencies (Schneider, 1991). In cases where councils included representatives from the private sector, these representatives were often chosen as individuals rather than representatives of business associations, and often lacked capacity for effective participation (Vianna, 1987; Schneider, 2004; Doctor, 2007). A second, rarer institutional arrangement was largely in the private sector itself: developmental associations (Doner and Schneider, 2000; Maxfield and Schneider, 1997). In these instances, business associations essentially substitute for the state in disbursing public funds and subsequent information gathering, monitoring, and exacting reciprocity. Such arrangements are rare but include effective associations in coffee in Colombia as well as some specific programs in training in manufacturing, especially in Chile and Brazil (Schneider, 2004).

The history of Brazil's developmental state in the 20th century mostly conforms to the cross-national correlation between authoritarianism and developmentalism, especially during the military dictatorship. However, Brazil's developmental state evolved, and in some respects consolidated, under democratic governments from 1945 to 1964. In fact, many of the key policies of ISI (e.g., promotion of the auto industry) and crucial institutions such as SOEs like BNDES and Petrobras date from this more open political period. During democratic and non-democratic periods, Brazil's developmental state was subject to other channels of political participation, ranging from formal councils (popular initially with Vargas during the authoritarian Estado Novo (Diniz, 1978)), to informal consultations (known as "bureaucratic rings" during military rule (Cardoso, 1975)), to the openings provided by the porous appointive bureaucracy where many outsiders were nominated to run parts of the developmental state. What was though missing were structured means for promoting the participation of non-elites.

In sum, successive governments in Brazil constructed over the second half of the 20th century core elements of a developmental state including some Weberian agencies or "pockets of efficiency", and some effective institutional arrangements

for monitoring and planning. However, there was generally little effort to exact detailed reciprocity from subsidy recipients. In part for this reason, the developmental state scored more successes in projects it promoted more exclusively within the public sector, the focus of the next section, rather than with private sector partners.

SOME SUCCESSES OF BRAZILIAN DEVELOPMENTALISM

Some of the standout performers of the 1990s and 2000s were the major steel producers (Gerdau, CSN, Usiminas), Embraer (aircraft), Oi/Telemar (telecommunications), Vale (originally CVRD, mining), MNC auto producers, and Petrobras (oil). These were among the largest Brazilian firms in the country, the largest exporters, the most aggressive internationalizers, as well as technological leaders in their respective sectors. In addition, and most significantly for this discussion, they all (save the auto MNCs) began as state owned enterprises, though the press reports on their latest conquests rarely noted this supposedly dissolute past.

Embraer (Empresa Brasileira de Aeronáutica) is one of Brazil's national champions (see Goldstein, 2002). By 2009 it had 17,000 employees, up from 7,000 in 1998 and exported over $4 billion (embraer.com). It competes head to head with first world companies (Bombardier), exports 95 percent of its production, leads Brazil in manufactured exports, and leads the world market for unit sales of regional aircraft (Goldstein, 2008, p. 58). However, in the 1990s almost no one would have predicted that this "ugly duckling" would have become such champion. In fact, the first time the firm was put up for sale in a privatization auction in the early 1990s, it had to be taken off the block because there were no buyers. What saved the firm in the mid 1990s, and catapulted in on to a trajectory of long term growth, was the coincidental emergence of a rapidly growing market for regional jets (70-100 seat) in the United States. Since 1996, Embraer has shipped more than 1,000 aircraft to 20 countries (Goldstein, 2008, p. 58).

However, to be in a position to fill this new demand depended on several decades of prior institutional development after the firm's founding in 1969. Two key factors shaped these early decades. First, the firm was created by the Air Force, during military rule, with a clear connection to military goals for national defense, so the firm had strong backers and clear non-commercial goals. For most of its incarnation as a state enterprise, Embraer was subordinate to the Ministry of the Air Force (rather than the Ministry of Industry and Commerce or the Ministry of Mines and Energy, as with most state enterprises) as well as protected by it from intervention by politicians or outside civilian ministries.

Second, Embraer could draw on skilled personnel from the nearby Instituto Tecnológico da Aeronáutica (ITA) and Centro Técnico da Aeronáutica (CTA). In fact, the training of aeronautical engineers by ITA preceded the establishment of Embraer, and Embraer could also count on ITA later for collaboration in research and development (Goldstein, 2008, p. 59). This protection and assistance meant that Embraer could survive for many years on continued subsidies. By the 1980s, critics were even charging that Embraer in fact subtracted rather than added value in the planes it made in that the cost of the inputs was greater than the price of the

final product. However, the subsidies and opportunity for learning through trial and error allowed Embraer to develop its own models for regional, medium size jets that turned out by the 1990s to be highly competitive in world markets. And government support continued after privatization.

One of the main reasons Embraer has emerged as a *national* champion is that the government retained a small ownership stake (initially seven percent) and a golden share that granted it veto power over major ownership changes. Moreover, the government stipulated at the time of privatization in 1994 that foreign ownership could not exceed 40 percent. Without these protections, it is not hard to imagine Bombardier or another major foreign producer buying control of Embraer.

In terms of the four effectiveness factors, Embraer benefitted from professional, highly trained staff, and strong, sustained political support from the Air Force and the military generally. During its incarnation as an SOE, issues of embeddedness and reciprocity were of course internalized, as Embraer managers worked closely with other parts of government (from R&D to finance agencies) and were subject to direct government sanctions for not performing (more on this internalization later). After privatization, Embraer maintained close relations with the same government bodies (CTA, Finep, BNDES, and others) in what might be considered a narrow form of embedded autonomy, however, there is little evidence of reciprocity. The four effectiveness factors were similar, with some variations, in the other sectors and firms considered in this section that started out as SOEs and were privatized in the 1990s (though only partially in the case of Petrobras).

Vale, previously known as CVRD (Companhia Vale do Rio Doce, established in the 1940s), also had some rocky moments in its early decades, but by the 1980s it was a huge, well run mining firm, and there were no shortage of buyers when the government put it up for sale in the early 1990s. It grew up around the iron ore mines in the central state of Minas Gerais where it established efficient transportation networks. CVRD then replicated much of this experience in a series of new mining projects, both iron ore and other minerals, in the Amazon at the same time it entered into upstream joint ventures in steel and aluminium (Schneider, 1991).

Unlike Embraer, CVRD lacked strong, direct military backing. Iron ore production was linked to an earlier national security goal of producing steel domestically, but by the 1960s this was underway, and steel was no longer a pressing security concern. The other keys to CVRD's success were more idiosyncratic in that it enjoyed early political protection from the state government of Minas Gerais, and later benefited from the long tenure of several effective managers. In addition, it was not so challenging to be competitive in world markets, given the relatively low technology of production and the high quality of Brazil ore deposits. As in Embraer, the Brazilian government retained a golden share in Vale.

Steel. Brazil's steel industry also began in the 1940s with CSN (Companhia Siderúrgica Nacional), a state owned steel mill. Over the next several decades additional government owned steel firms were added (the largest, Usiminas and Açominas, in the state of Minas Gerais) and ultimately combined into a state holding company Siderbrás. Over the course of the expansion, especially in the 1950s and 1960s, the BNDES was crucial both in financing and planning, so much so that for some it came to be known informally as the "Steel Bank". Although steel output

expanded steadily, it was not until the recession of the 1980s and privatization of the 1990s that steel firms became highly productive and competitive internationally. Steel SOEs benefited from early political support from the military in the 1940s and 1950s (especially CSN), but after the 1960s steel SOEs became more politicized and less professionalized than other top performing SOEs (Schneider, 1991).

When the Collor government announced in 1990 an ambitious program for privatization, the government's large steel firms were at the top of the list, and, ironically, the BNDES, which had financed so much of the expansion of state enterprises, was put in charge of fixing the firms up and managing their sales. Between 1991 and 1993, the government sold off its 8 main steel firms, all to Brazilian buyers. By the mid 1990s, the privatized firms were profitable, much more productive, and exporting much of their output (Montero, 1998). One private steel company, Gerdau, capitalized on its expertise and the opportunities to buy up several smaller state firms and leveraged its domestic expansion to acquire steel firms throughout the Americas and become one of Brazil's largest private firms. By the 2000s, Brazilian steel makers had consolidated into four large firms, employment had dropped by almost two thirds, and productivity had more than tripled, and Brazil was one of the lowest cost steel producers in the world (Siekman, 2003). By 2003 Brazil was the world's 8th largest producer and exported nearly a third of total production of 30 million tons per year.

Petrobras was founded in 1953 in a popular political move that symbolized much of the nationalist and developmentalist surge of the 1950s. The last Vargas government created the firm and nationalized the sector in order to guarantee supplies that MNCs were supposedly not developing fast enough. In fact, Petrobras produced little oil in its first decades and served mostly to import and distribute petroleum.

By the 1970s, Petrobras had discovered large reserves off-shore, but mostly in deeper water than existing technologies could easily exploit. Over the 1980s and especially 1990s, Petrobras moved new wells into deeper and deeper waters. By 2006 two thirds of Petrobras' oil wells were deeper than 400 meters, the maximum depth at which divers can work, so much of the drilling had to be done with the help of deep water robots and submarines (*Veja*, 1 February 2006, p. 91). Two prior investments facilitated this process. First, Petrobras invested heavily in training engineers by both supporting university programs to train them initially and then financing ongoing training once they had entered Petrobras. Second, Petrobrás made a point, from the 1950s on, of purchasing capital goods from domestic suppliers (and helped found ABDIB in order to coordinate investments with the private sector). By the 2000s, Petrobras registered more patents than any other Brazilian institution (*Veja*, 1 February, 2006, p. 97).

Flex motor technology and ethanol. The impetus for government promotion in ethanol came initially in response to the OPEC oil crisis of 1973. In fact, the government had mandated ethanol additives in response to an earlier import crisis in the 1930s, but it was only in the 1970s that the government adopted an ambitious program of promoting sugar and alcohol production to power cars that would run exclusively on ethanol. The program known as Proálcool was an initial success in the sense that by the 1980s there were millions of cars on Brazilian roads that ran on pure ethanol. However, the program was never very efficient or cost effec-

tive in that the government had to inject massive subsidies in order to reduce the price of ethanol at the pumps to a point where it was competitive with gasoline.

The program took off fairly quickly in the 1970s. In 1975, the government created the Proálcool program to plan for the sector and administer subsidies (Nunberg, 1978; Barzelay, 1986). Generous subsidies — $30 billion dollars in the two decades following Proálcool's creation — flowed through the sector via subsidies for research and development, for modernizing sugar production, and for lowering the cost of ethanol at the pump (Goldemberg, 2007, p. 809). Later, the government also gave consumers incentives to buy alcohol powered cars (the first alcohol cars were developed in Brazil and first put on the market in 1979). However, by the 1980s and early 1990s, most of the parameters that had favored the move to alcohol powered cars changed — oil prices moved lower, Brazilian oil production increased, and the debt crisis of the 1980s bankrupted the state. In 1990, the government eliminated ethanol subsidies and closed down the promotion agencies. So auto producers shifted to producing mostly gasoline cars.

By the late 1990s oil prices started rising again, but consumers were still wary of buying alcohol powered cars, until auto producers came out with flex engine models that allowed them to put any mixture of gasoline and ethanol in the tank. The flex engine had originally been developed in Detroit in 1988, but the cost of the new technology (especially the sensors required to determine the mix of fuel) was prohibitive and the project was shelved. However, engineers at the subsidiary of the German firm Bosch, located near what is sometimes called Brazil's silicon valley in the area around Campinas (and the University of Campinas), assembled a team of 35 scientists and engineers to continue working with the technology and by 1994 had developed software that greatly reduced the cost (see *Veja*, 1 February 2006, pp. 97-8 and Gatti, 2011). And, in 2002, the government extended the same tax exemption to flex cars as to alcohol cars (and taxes sometimes amounted to more than a third of the sale price of a new car). In 2003, Volkswagen marketed the first flex car, and three years later nearly three quarters of cars sold were flex. By the late 2000s, 8 million flex cars were on the road (over a third of all cars), and nearly all new sales were flex cars.

The other half of the story is the development of ethanol production. Consumers have to be convinced that ethanol will be available throughout the country in sufficient quantity and at reasonable prices. Ethanol production in Brazil had been through several boom and bust cycles driven both by large swings in petroleum prices as well has shifting government policies. By the 2000s the logistics of ethanol distribution were settled, as half of Brazil's 30,000 service stations offered both gasoline and ethanol. Moreover, through research and development, much of it genetic engineering, alcohol yields from sugar cane were nearly double in the 2000s what they were in the 1970s (*Veja*, 1 February 2006, p. 100). By the late 2000s, ethanol production in Brazil was cost competitive even if petroleum were to drop to $35 a barrel (*Veja*, 19 March 2008, p. 107). By the mid 2000s, ethanol accounted for around 40 percent of total fuel consumption in transportation (Rubio, 2006, p. 67).

The success of the ethanol and flex cars is anomalous in this section both because the government did not create an SOE (though government intervention through Proálcool and other agencies was deep and pervasive) and because most

of the four factors for effectiveness were missing, weak, or volatile. Political support, for example, was overwhelming in the 1970s but evaporated in the 1990s. Because key developments were so dispersed (from cane growers to auto parts producers), there was no central Weberian bureaucracy but rather multiple, isolated pockets of efficiency. Lastly, episodes or arenas of embeddedness and reciprocity were hard to find. While the state set the parameters for alcohol production and distribution, and promoted alcohol only cars, the development of flex engines was later driven more by private and mostly multinational firms.

In sum, by the 2000s Brazil had highly competitive and rapidly increasing production and usually exports of steel, oil, minerals, ethanol, autos, and airplanes by some of Brazil's most innovative, aggressive, and efficient private firms. However, digging back to the 1970s and 1980s reveals a very different picture of largely uncompetitive sectors and subsidized state-owned enterprises. One conclusion might be that market reform and liberalization worked in forcing ex-SOEs to upgrade and compete, but this conclusion misses the point that none of these firms would have been able to thrive in the post-liberalization period had they not been nurtured for years before. Many others privatized firms in Brazil and elsewhere did not fare so well. Although the individual stories in Brazil vary greatly, the themes common to most include: attempts to substitute for imports, efforts to transfer and develop technology, early failures and missteps, and heavy government subsidy and protection. However, not all government projects that started poorly turned out well in the end. The next section considers a number of policies that did not end as well.

SOME FAILURES OF BRAZILIAN DEVELOPMENTALISM

When governments in the 1990s reduced protections, many domestic manufacturers closed plants, reduced production, shifted product lines, or sold out to MNCs (Palma, 2005). Industrial production and employment fell dramatically, confirming what critics had long argued, that much of Brazilian industry was inefficient and uncompetitive, particularly in the higher technology, higher value added production in informatics and electronics.

Information technology. Development planners and the military were also concerned about substituting for imports and developing local technological capacity in computers and information technology. One policy response was the common recourse to state ownership, and the government tried to replicate its model of state enterprises in high technology sectors with the creation of Cobra in 1974, planned initially as a manufacturer of mid sized, mini computers, the high growth segment in the 1970s (Evans, 1995, pp.136–4). Although a high cost, low scale producer, Cobra achieved some early successes in producing mini computers, before the company was overtaken by the advance of personal computers in the 1980s.

The other part of the IT strategy was protection and promotion of private firms, and the market for mini and personal computers was effectively restricted to local producers through the policy of "market reserve." However, as IT technologies evolved rapidly, it became clear that this strategy would not work as it had in steel or petrochemicals. The technologies advanced too rapidly and in in-

creasingly decentralized fashion (e.g., California's Silicon Valley), so that centralized and closed strategies were increasingly inappropriate. Moreover, since IT was a crucial input into other sectors and industries, higher costs and lower quality of local production had deleterious consequences throughout the productive sector, and reduced political support among IT consuming firms. Evans (1995, pp. 121-4) attributes the shortcomings of IT policies to the lack of public support, insufficient bureaucratic capacity to oversee a rapidly evolving high tech sector, an absence of effective embedded autonomy, and a consequent inability of state actors to exact reciprocity and impose performance standards on domestic firms. By the late 1980s, the government abandoned the market reserve, and most Brazilian hardware firms reduced or abandoned production.

Nuclear energy. The military in the 1960s and 1970s also promoted significant investment in nuclear training and technology, created state-owned enterprises (Nuclebras in 1961), and signed long term technology transfer programs with Westinghouse and later the German government and German firms. The program had military applications, but also strove to develop nuclear energy, and led to the construction of two nuclear power plants, known as Angra I and Angra II (because of their location in the seaside town of Angra dos Reis). Construction on Angra I (with US technology) began in 1971 but it was not connected to the electricity grid until 1982. Construction of Angra II was delayed because of the debt crisis in the 1980s and did not start generating until 2000. Delays and cost overruns inflated the total cost of Angra II to R$ 20 billion (about $11 billion) (Santos, 2008, p. A3). Even after Angra I went into service it continued to have problems, and by the 1990s, critics were calling it the "firefly" plant because it was so often shut down due to technical and operational problems. By 2006, nuclear energy was still a minor source of electricity generation (3 percent of total generation) (Cassio, 2008, p. 17).

Coffee. Ironically, government policy in the world's largest exporter did little to promote the sector. In particular, government policy did not favor higher quality production, and by the 1980s coffee consumption even in Brazil began to fall (Saes and Farina, 1999). Generally, the sector lacked all the preconditions: especially a professional bureaucracy with strong political backing and close ties with growers (for historical background, see Font, 1990). The contrast with the main agricultural success in ethanol is striking and highlights the core goal of substituting for imports rather than promoting exports. The ease with which private coffee associations promoted quality production once the government shut down the government regulatory agency, the IBC (Instituto Brasileiro de Café), suggest that such promotion was not demanding in terms of resources and personnel.

REGIONAL ECONOMIC PROMOTION

Regional economic development has been a constant in development planning throughout much of the post war period. The decision to move the capital into the interior to Brasília was largely motivated by the desire to develop the vast, sparsely inhabited interior. The creation in the 1960s of Sudene (Superintendência do

Desenvolvimento do Nordeste) gave expression to another long standing development issue, the vast economic gulf between the rapidly growing southeastern states and the poor stagnant northeastern region. In addition, military governments after 1964 promoted several policies to foster development in the Amazon region, including the Transamazon highway, Sudam (Superintendência do Desenvolvimento da Amazônia), and the creation of a export zone in Manaus in 1967 (and an agency to support it, Suframa (Superintendência da Zona Franca de Manaus).

After several decades, these programs and agencies had done little to redress regional inequalities or promote sustainable industrialization or development in the north and northeast. The loan and subsidy programs naturally drew a great deal of interest from powerful northeastern politicians (who for decades have exchanged crucial swing votes in Brasília for resources for patronage in the northeast), and scandal and mismanagement were common. Hopes for self-sustaining, high tech development in Manaus were never realized, in part because São Paulo and the southeast developed such advanced technology centers. Manaus in effect became an artificial maquila for São Paulo industry. In all instances, some or all of the four conditions mentioned in the second section were missing. The implementing bureaucracies were not Weberian or "pockets of efficiency". The political support for these agencies and their missions was weak at the federal level (certainly compared to those backed by the military), and local backers often based their support on clientelist benefits rather than developmental promise. And, these agencies generally lacked conditions for monitoring, reciprocity, or autonomy in relations with local business (Lyra, Pinheiro, and Sarmento, 1995, p. 13).

State governments were also major protagonists in promoting regional development, both by struggling to divert more federal resources to their states and through industrial promotion of their own. The government of Minas Gerais was one of the most successful at both activities, throughout most of the late 20th century (Montero, 2001, 2002). Several features of this developmental success stand out. First, the state government created regional equivalents of "pockets of efficiency" in state-level planning and promotion agencies. This gives a regional dimension to the uneven and partial quality of the Weberian bureaucracy in Brazil. Second, the developmental pressures were channeled in part through state owned enterprises, in two ways. The Minas Gerais developmentalists pressured the federal government, successfully, to locate or expand federally owned enterprises in Minas Gerais. And, the state government created enterprises of its own. One of the most notable was the state electricity company Cemig (Companhia Energética de Minas Gerais). Third, both the local and nationally owned state enterprises gave institutional homes for a growing local technocracy of economists, engineers, and scientists. This technocracy was also prominent in national level agencies and circulated back and forth between the state and federal governments.

Lastly, *mineiro* political elites were homogeneous and oligarchic (Hagopian, 1996). Yet, they were also modernizing elites, and historically fearful of being overshadowed and exploited by the leading economic state next door, São Paulo. While national elites in Brazil felt some national security concerns during the Cold War worries of the 1960s,

the threats were never as clear and present, and lasting, as those in Asia. However, mineiro elites may well have felt something akin to these threats in regional terms, and certainly the only effective response was to industrialize and harness as much of the national development strategy to the state economy as possible.

While Minas Gerais may have been the most prominent example of overall state-level developmentalism, other state governments scored narrower sectoral hits, though mostly in lower technology activities. The development of fresh fruit production (especially apples and mangoes) was a remarkable success for state governments and regional development agencies, and exceptional in the context of economic promotion in that it mitigated rather than exacerbated inequality by targeting smaller producers (Gomes, 2006). The story in apples started in the 1960s and 1970s as a classic case of ISI (or perhaps more appropriately import substituting agriculture), as government officials sought ways to substitute domestic production of imported apples. The problems were the usual: little credit and little know how, as well as long lead times for investment (several years before new trees bear marketable fruit). And, the government response was fairly traditional: subsidized credit, help acquiring land, extension services, and ongoing research. In addition the government helped smaller growers to organize in order to exchange information on best practices and pool resources for marketing. The story in mangoes is similar, though regional promoters offered access to irrigated land as well as credit. In addition, the story is revealing because success in mangoes was preceded by failure in tomatoes.

One of the best known successes at the state level is in the small, poor northeastern state of Ceará (Tendler, 1997). In the 1980s an incoming governor from a new party adopted a series of reforms in health care, small business promotion, public works, and agricultural extension. Although these are as much social policies as they are developmental, the keys to their success are not unlike the four listed in the second section. According to Tendler (1997, pp. 14-5), successful state intervention resulted from the dedication and status of new government workers, which is also one of the expected benefits of Weberian bureaucracy. And, similar to notions of embedded autonomy, the three way synergies among state government, local government, and civil society contributed to success in Ceará.

21ST CENTURY DEVELOPMENTALISM

After the 1990s, the Brazilian state had relinquished most of the previous instruments of promotion including state owned enterprises, trade protection (except selective restrictions through Mercosul), price and quota controls, and numerous sectoral and technological planning bodies. Most of this was the result of domestic policies for liberalization, but international commitments (especially WTO and Mercosul) further constrained the available options for promoting development (Gallagher, 2005). However, even through market reforms, the Brazilian government retained numerous other mechanisms for promoting specific development goals (Boschi, 2007; Rodrik, 2007, chapter 4). The government sold most of its

state firms. In fact Brazil was a world leader in the 1990s in terms of the value of state assets sold. However, the government held on to some of the largest, most strategic SOEs. For example, the government retained majority ownership of Petrobras which grew not only in absolute terms but also in terms of R&D, infrastructure, and total investment.

The BNDES, the state owned development bank that engineered the logistics of most privatizations, was itself never put on the auction block. Its lending portfolio grew dramatically in the 2000s, doubling from 2 percent of GDP in 2000 to over 4 percent in 2010 and came to outpace lending by the World Bank and IDB (Almeida, 2011, p. 9). The BNDES is still the principal source of long-term and export credit for the private sector. As a percent of all financing for industry and infrastructure (including retained earnings, international loans, bonds, and equity), BNDES credit ranged from 20 to 30 percent over the 2000s (though spiked in 2009 to 50 percent) (Ferraz, 2011, p. 25). By some estimates, subsidized long term credit from the BNDES has a fiscal cost of half a percent of GDP (Almeida, 2011, p. 16). As it had adjusted in earlier decades, after 1990 the BNDES reoriented its lending activities away from state enterprises and industry toward smaller firms, energy, and infrastructure. In 2007, for example, the BNDES expanded its lending to the sugar-ethanol chain to R$ 3.7 billion (about $1.8 billion) and expected lending to increase much more in 2008 (*Gazeta Mercantil* [electronic summary], 7 March, 2008, pp. 1 and C8). Moreover, through the process of privatization, in its efforts to finance and facilitate privatization sales by buying minority shares, the BNDES (through its shareholding subsidiary BNDESpar) became the largest institutional investor in Brazil (*papeis de renda variável*) (former Minister of Industry and Commerce, Luiz Furlan, in *Gazeta Mercantil*, 19 March 2008, p. A4).

Even in firms it sold off, the government often maintained golden shares. These shares did not give the government much direct influence over day to day management, but they did grant it veto power over major changes in strategy and ownership structure. This protection provided the breathing room for firms like Vale and Embraer to become leading international competitors without having to fear a take over by the many larger MNCs that were buying up local subsidiaries around the world. Lastly, parts of the management of ex-state enterprises and the ministries overseeing them moved fairly easily over to the new regulatory agencies designed to oversee the newly private firms. These regulatory agencies in turn often had substantial authority and funding to use their oversight in fairly developmental ways.

One of the keys to many of the successful sectoral stories was heavy and sustained investment in education and skills. As noted above, many successful sectors (steel, aircraft, and petroleum) were developed primarily by state enterprises. While state enterprises have fallen out of favor in most development thinking, the lesson of long term, consistent investment in human capital may be possible to separate out to promote on its own. Other countries that have leveraged education into long term development include Ireland, Singapore, parts of India, and Costa Rica. Considering how low Brazil and Latin America rank in terms of education, both basic and advanced, targeting education could be an effective development option (Schneider, 2013).

However, there are risks to using investment in human capital as development policy (as social policy it can be justified in its own terms) if highly trained workers do not get commensurate jobs, if they emigrate, or if individual returns exceed social returns (i.e., individuals gain higher salaries but do not add much to overall productivity). Moreover, subsidizing this human capital takes a long time and can be regressive; the Brazilian government already devotes an inordinate share of education spending to free public universities. Thus, complementary policies are required to generate jobs as quickly as possible to make use of skilled workers as they enter the job market. Guaranteeing this connection is just what state enterprises were so good at. Without more targeted, complementary policies to ensure labor market demand, for both university and technical secondary training, it will be difficult to induce investment by students and justify the public subsidy over other alternative development projects.

CONCLUSIONS

Most of the discussion of the developmental state has focused on a very small number of East Asian success stories. However, as research advanced on these cases, it identified an increasing number of particular background conditions and institutional configurations: Weberian bureaucracy (Johnson, 1982; Evans, 1995), reciprocity (Amsden,1989), exclusion of foreign capital (Amsden, 2009; Amsden 2001), Japanese colonial rule (Kohli 2004), land reform and prior socio-economic equality (Campos and Root, 1996), ethnic homogeneity, Confucian culture, potentially explosive distributional conflict (Doner, Ritchie, and Slater, 2005), and severe threats to national security (Woo-Cumings, 1999). The list goes on, but even this abbreviated list makes clear that very few other countries have any of these conditions or configurations, let alone the full complement, nor the capacity in the near term to create arrangements like reciprocity or deliberation councils. Therefore, the practical lessons to be drawn from these extreme cases for other countries are distinctly limited.

The same can be said for more recent, non-Asia cases of development successes like Botswana, Ireland, and Costa Rica (Ó'Riain, 2000; Paus, 2005). What limits the relevance of these experiences for most countries is not just particular institutional arrangements, such as incorporation into the European Union and social pacts in Ireland, but also the very small size of these countries that all have populations under 5 million. In small economies like that of Costa Rica, a major investment by a company like Intel can shift growth, exports, employment, and the overall orientation of the economy (World Bank, 2006). Comparable investments would have much less impact in larger economies.

Thus, in terms of conditions and institutions, a country like Brazil is much closer to the median for larger, middle income countries, and its experience with its version of the developmental state can be more instructive to a broader range of countries. For example, though the Brazilian state may be more fragmented than

most, many governments in developing countries lack centralized coherence. However, many of the success stories in Brazil grew out of isolated, disconnected experiments rather than parts of a central plan. In fact, given the politicization of many parts of the bureaucracy, a centralized government might even have been more vulnerable to political capture. Put differently, various developmental backers could protect or insulate small parts of the federal government (Embraer, BNDES, and other state enterprises) and leave much of the rest for less developmentally inclined politicians.

Many of the success stories in Brazil underscore the importance of prior failure. This is not to suggest that every failure will turn out all right in the end, but rather that failure can be an important stimulus to learning, as long as the original project is not completely abandoned at the first sign of trouble. From aircraft production to tomato cultivation, things went badly for many years before they worked out. Ethanol production was probably the most spectacular example, going from failure, or at least the widespread perception thereof, in the 1980s to leading sector in the 2000s. The difficult part is to distinguish, among the apparent failures, those policies with longer term potential, and those without.

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