

Smooth Sailing: Market Integration, Agglomeration, and Productivity Growth in Interwar Brazil¹

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Abstract

Leveraging an original dataset on coastal shipping and invoking a new economic geography framework, we study the effects of domestic and international trade costs on industrial concentration and productivity growth in interwar Brazil. In the great wave of globalization before 1914, international trade costs were low and domestic costs high. Economic activity was dispersed along the coastline. The interwar period saw a reversal: international costs surged and domestic costs declined. Economic activity was increasingly concentrated in São Paulo. Agglomeration economies enabled productivity growth in the 1930s, mostly in durable and capital goods.

1. Introduction: New economic geography in an open-economy framework

The relationship between international exposure and the spatial location of economic activity has proven to be a vexing problem for historians and economists. In their survey of 100 years of European regional economic development, Rosés and Wolf (2019) observed that the great wave of globalization before 1914 favored the dispersion of economic activity within countries and the convergence of regional incomes; in contrast, the surge in globalization after

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1980 precipitated the concentration of activity and the divergence of regional incomes. Along the same lines, Latin American economic historians (Badia-Miró *et al.* 2018; Tirado-Fabregat *et al.* 2020) found an ambiguous relationship between regional inequality and international exposure. From a different perspective, New Economic Geography (NEG) models in an open-economy setting have similarly yielded conflicting outcomes (Brühlhart 2011). Whether or not trade liberalization promotes or hinders the concentration of economic activity depends on modeling assumptions about the degree of connection between foreign producers and the domestic market, and between domestic centers of industrial production and the hinterland. Behrens *et al.* (2007, p. 1280) summarized the state of research: “...[W]hereas lower international costs promote regional dispersion when intranational transport costs are high enough, lower intranational trade costs foster regional agglomeration when international trade costs are high enough.”

In this paper, we introduce a NEG model in an open-economy framework to cast light on the spatial concentration of manufacturing in interwar Brazil. Our narrative builds on shifts in domestic and international trade costs. In the decades after the First World War international trade costs between Brazil and its major trading partners spiked. Concurrently, domestic trade costs contracted. We refer to these opposing movements as the trade-cost reversal. The increase in trans-Atlantic costs loosened trade channels between Brazilian and foreign ports. In their place, domestic linkages between the industrial core in the southeast and northern regions strengthened. We find that market integration went hand in hand with the agglomeration of economic activity and the development of a core-periphery structure centered on São Paulo.

Our account of market integration and the concentration of domestic manufacture conforms to the benchmark NEG model of Krugman and Livas (1996). In this model, the adoption of international trade barriers triggers the agglomeration of domestic economic activity only after the favorable movement in trade costs exceeds a threshold. In Brazil, the trade-cost reversal traversed a threshold beginning in the 1920s. In the shadow of the Great Depression industrial concentration accelerated. São Paulo emerged as the hub of activity because of its initial advantages, including a large and robust home market, access to suppliers, and abundant labour. Paulista firms exported diverse and increasingly complex products and capital goods to all corners of Brazil, and, in return, imported raw materials and intermediate goods from domestic and foreign sources.

We give special attention to the forces of domestic market integration, agglomeration, and productivity growth in the 1930s. Stein (1957) and Haber (1992) claimed that the cotton-textile industry, a leading manufacturing sector, suffered from increased technological obsolescence and weak management. In a similar vein, Weinstein (1996) observed that the shortage of skilled workers was a brake on adopting new machinery. Nonetheless, in comparison with the modest recovery of the industrial leaders in Europe and North America after the Depression, Brazil's aggregate performance was exceptional.⁵ In the words of Bulmer-Thomas (2010, p. 230), the 1930s was anything but "a lost decade."

Our main findings rely on a new dataset of coastal shipping (*cabotagem*) we have assembled of product level import and export data for São Paulo.⁶ During the period, the mass of the country's population resided in close proximity to the seaboard and coastal transport was the principal channel of moving goods between domestic markets. Consequently, the type, number, value, and distance of goods shipped serve as proxies for the scale of domestic manufacturing and the scope of market integration. We have also collected information on international trade by product and by state. Since domestic and international transporters exploited the same ports, we are able to evaluate the degree of face-to-face competition between Brazilian and foreign goods.

There is no shortage of explanations of the emergence and expansion of the domestic market. In a classic statement, Furtado (1959) claimed that the "main dynamic of the 1930s" was the expansion of a market for local manufacturing, a process that took shape after coffee exports crested and the exchange rate depreciated. Fishlow (1980, p. 104) wrote that "the rapid growth in manufactures during the decade [the 1930s] was underwritten by a massive substitution of imports," the outcome of the "joint isolation of the domestic market—reinforced by the Tariff of 1934—and its reflation (Fishlow 1972, p. 33)." Along these lines, Dean (1969) and Hilton (1975) attributed a prominent role to Getúlio Vargas's first mandate (1934-1945) whose policies of reducing interstate trade barriers and promoting the development of a national transportation network boosted domestic manufacturing. But others are less sanguine about the role of state policy and locate the origins of market integration in earlier decades. The late

⁵ Haddad (1975, p. 14) estimated annual growth rates of output (output per capita) of 4.04 (1.95) percent for 1920/22-1930/32 and 4.71 (2.56) percent for 1930/32-1940/42. Using different sources and methodology, Duran *et al.* (2017) reported that industrial GDP grew at an annual rate of 10.0 percent and labor productivity at 5.6 percent between 1930 and 1943, approximately double that of the average of Britain, Germany, Japan, and the United States

⁶ The appendix gives a complete list of official sources consulted.

nineteenth century coffee export boom generated rising levels of income and expanded demand for domestic manufactures (Dean 1969; Nicol 1974; Suzigan 1986). Summerhill (2003) highlighted the contributions of the rail network in delivering goods to port and in demarcating the outlines of the domestic market. A boon to local demand, the rail system promoted investment in related transport infrastructure and attracted immigrants (Hanley 2018). Stein (1957) described a “golden period” of cotton-textile manufacturing serving the home market before 1914. Centered in São Paulo, Brazil’s *Belle Époque* was extended into the 1920s (Cano 2007). The improvement in the terms of trade in the 1920s financed the imports of foreign machinery and other inputs and underwrote the expansion in demand for domestic goods (Versiani 1971; Aldrichi and Colistete 2015). These accounts aside, our findings lend support to Furtado’s and Fishlow’s claims of deepening market integration in the 1930s—but for a different set of reasons. We give weight to foreign trade costs. Nonetheless, our intention is not to confirm or reject these and other interpretations of Brazilian economic history. Our aim is to introduce a spatial dimension to these explanations.

Figure 1 - International Imports and Coastline Exports of São Paulo, 1913-1937

Notes and sources: Values in 1913 milréis deflated by Haddad’s (1975) price index. The vertical axis is the distance in km from São Paulo. Positive distances refer to locations north of São Paulo and negative distances refer to locations south of São Paulo. International trade from Brazil, *Comércio exterior*, various years. Coastline shipping from Brazil, *Comércio do cabotagem pelo porto do Santos*, various years.

Figure 1 foreshadows our sources, research strategy, and results. We contrast the destination of Brazilian international imports (top panel) and manufacturing exports of São Paulo to these same locations (bottom panel) on the eve of First World War and subsequent decades.⁷ Circle sizes represent per capita values of trade (in inflation adjusted contos de réis); they are comparable across panels. The vertical axis gives the distance from each state’s principal coastal harbor to Santos, São Paulo’s main port. Because of favorable trade costs, international transporters in 1913 had a discrete advantage (top panel). Foreign goods were delivered directly

⁷ Unless otherwise stated, we adjust nominal values throughout the paper using Haddad’s (1975) GDP price deflator (1913 = 100). Negative distances in Figure 1 are ports located south of São Paulo; positive figures refer to locations north of São Paulo.

to coastline destinations. After the Depression, international trade increasingly concentrated in the southeast. As for internal trade, the progress of São Paulo's exports was unbroken (bottom panel). Before the war, domestic exports of manufacturing goods were generally restricted to markets within a radius of 500 km or less; between 1913 and 1929 the distance had doubled; and in the 1930s the number of km doubled again. Our claim is that the extension of the market and the agglomeration of industry enabled productivity growth in the 1930s—and vice versa.

2. Industrial concentration and market integration: Unresolved issues

Cano (2007, p. 183) presented the stylized facts of industrial concentration in Brazil's southeast, market integration, and productivity growth.⁸ Between 1919 and 1939, São Paulo's share of textile output increased from 38.6 to 51.2 percent and transport equipment from 48.8 to 85.4 percent; overall, the state's share of output increased from 33.8 to 40.7 percent. The flipside of industrial concentration was market integration. Cano (2007, p. 55) calculated a ratio of domestic to international trade of 25 percent in 1920 and 50 percent by the end of the Second World War. As for productivity, São Paulo's initial head start widened considerably. To give one example, productivity in the manufacture of transport equipment was double the national average in 1919, and more than ninefold in 1939.

These figures are widely accepted. There is less agreement in the literature, however, on periodization and the drivers of industrial concentration and market integration. In many accounts, São Paulo's leadership was inevitable, the culmination of strong growth during the coffee export boom of the late nineteenth century. To others, the war was an inflection point, although investment in new plant and equipment was postponed until after the conflict (Dean 1969; Luna and Klein 2018). According to Cano (2007), São Paulo's position was consolidated in the industrial expansion of the 1920s, an outcome of declining opportunities in the coffee sector. Cotton textiles led the decade's expansion.⁹ These differences aside, historians concur that the rapid growth of São Paulo was an internal phenomenon. In this narrative, the development of Brazilian manufacture was independent of the trade shocks of the Great Depression and the spike in international transport costs.

⁸ Cano's (2007) figures are from the industrial census of Brazil ("*Valor de transformação Industrial*"). The figures we report later in the paper are from the industrial censuses of São Paulo. All values in this paper refer to the state of São Paulo, unless otherwise noted.

⁹ The industry relied on European migrants who had abandoned the capricious export sector to run and supervise the mills (Sánchez-Alonso 2019). Paulista factories had the advantage of access to local supplies of cotton (Huberman 2013); as the terms of trade improved in the 1920s, the industry purchased state of the art equipment.

Historians further agree that coastal shipping was an important vehicle of domestic market integration (Marcondes 2012). Railway construction peaked before the war, although the network continued to be the principal means of connecting the coast to the hinterland. Until a national road grid was fully developed in the 1950s, manufacturers depended on the interconnected coastal shipping and rail networks to serve regional markets.¹⁰ The presumption is that coastal shipping accommodated the increase in demand for goods.¹¹

Cano (2007), like others (Dean 1969; Hilton 1975; Fishlow 1980), maintained that state intervention lowered trade costs and encouraged market integration.¹² During the war period, the state had assisted coastal transport companies to meet demand by seizing German boats and replacing outstanding Brazilian sailing ships with steam-powered vessels, many of which were refurbished U.S. Navy boats and remaindered merchant carriers (Dean 1989, p. 232). Upon assuming power in 1930, Vargas reduced interstate taxes, assisted regional governments in port-infrastructure investments, and initiated the construction of highways linking the northeast and the southeast and São Paulo and the Atlantic Coast, the *Rodovia Anchieta*. His regime extended privileges to coastal shipping companies and overall state support increased (Musacchio and Lazzarini 2014; Lautert 2012).¹³ To complement these policies, Vargas introduced a system of multiple exchange rates and stringent tariffs that sheltered local markets from foreign competition (Fishlow 1972; Malan *et al.* 1977; Suzigan 1986; Versiani 1971).

These explanations of industrial concentration and market integration raise several concerns. To begin, São Paulo's early hegemony was not uncontested. In 1900, the population of metropolitan São Paulo was about a third of Rio's. In 1907, the state accounted for only 15 percent of the country's output, whereas the combined states of Rio de Janeiro and Capital Federal contributed about 40 percent (Luna and Klein 2018, p. 298). The city's development was both nurtured and hindered by its location. While the metropole's success was dependent on its connection to local interior markets and the state's abundant resources, São Paulo had no direct access to the Atlantic. In fact, the distance between the São Paulo and Santos, its main

¹⁰ Competition between transportation by rail and coastline shipping was unimportant since no major railroad followed the coastline. For Summerhill (2003) and Herranz-Loncán (2014), rail and coastline services were complementary.

¹¹ Table A1 in the appendix summarizes alternative means of internal transport in the interwar decades.

¹² Cano (2007) referred to state intervention in the 1930s as a policy of informal import substitution. The *Estado Novo* (1937-1945) formalised state intervention.

¹³ In 1921, the Federal government's subsidies of transporters amounted to two percent of their revenues; by 1937, the figure was 10 percent (Brazil, *Resumo de varias estatísticas*, 1924, p. 76; Brazil, *Anuário estatístico do Brasil*, 1941, p. 309).

port, was about 80 km of rough terrain. Coffee planters had invested in a rail line to the coast during the export boom, but the connection was poor into the 1920s (Duran *et al.* 2017). Despite Vargas's intervention, a functional road to the port was unavailable until the mid-twentieth century (Luna and Klein 2018, p. 247). In any event, the port of Santos was not ideally located.¹⁴ Recife had the deepest 'natural' harbor and, along with Salvador, had the more favorable wind and sea currents. For these and other reasons, Cano (2007) claimed their market integration was incomplete.

As for the contribution of coastal shipping to market integration and agglomeration, the evidence is mixed. After the adoption of steam power at the war's end, technical change was slow and unimpressive. Barriers to entry in the industry remained high. Even though the fleet was heavily subsidized, several companies failed, and others eventually merged into Lloyd's Brasileiro, the largest transporter. The numbers of companies and vessels engaged in coastal trade were unchanged, although the average capacity of ships expanded in the 1930s (Brazil, *Anuário estatístico do Brasil*, 1936, p. 159). Aside from improvements in ports and related infrastructure, the shipping sector cannot be described as dynamic.

More controversial is Vargas's makeshift response to external exposure. As ever, tariff changes, often arbitrary and uneven, rarely met the expectations of lobbies and their constituents.¹⁵ Custom duties were a major source of revenue, and the federal government was reluctant to choke off imports completely. Because the tariff also covered intermediate inputs, effective rates of protection diverged from ad valorem duties. Moreover, duties were specific and any increase in prices of imported goods eroded the tariff's bite (Suzigan 1986, pp. 204-05).¹⁶ Seizing the occasion, Vargas would not hesitate to use commercial policy in an impulsive and improvised manner to reward supporters and discipline detractors. Between 1923 and 1933, tariff rates ratcheted up, but declined after Vargas assumed power. Exchange rate policy was similarly complex, multiple exchange rates being adopted in an ad hoc manner. Duran's *et al.*

¹⁴ The shoreline length and harbor depth of Santos were roughly the average of coastline ports (Brazil, *Anuário estatístico do Brasil*, 1941, p. 309).

¹⁵ Consider the case of cotton textiles. Haber (1992, 2006, p. 569) observed that the industry's tariff structure in the 1920s was the result of the long-term relationship between special interest groups and an accommodating state. But Stein (1957, pp. 135-64) maintained that Vargas pushed back on demands for higher duties and restrictions on machinery imports in the late 1930s, because he sought to hold down prices for consumers, a constituency whom he wanted to indulge, even as inequality under Vargas's stewardship widened (Gómez-León 2019).

¹⁶ Absell and Tena-Junguito (2017) claimed that the incidence of tariff rates was actually lower than reported because of the manner import prices were recorded.

(2017) real distorted import-price index provides a summary measure of macroeconomic policy.¹⁷ After an increase in the early 1920s, the index declines and stabilizes until the late 1930s, confirming a loosening of controls on foreign competition. Altogether, Vargas's actions in defending the interests of domestic industry seem to have been symbolic, their real effects were at best uncertain—if not harmful.¹⁸

Assume that we can reject these concerns about the geography of São Paulo, the dynamism of the coastal shipping sector, and the effectiveness of Vargas's policies. We still cannot be certain that domestic factors alone drove the concentration of industry in São Paulo and market integration. The nub of the problem is that international trade costs outside the purview of the Brazilian state also mattered. Curiously, the literature elides this point. If international trade costs fell faster than domestic ones, Brazilian industry would have remained dispersed and São Paulo's growth would have stalled; if international costs increased relative to domestic ones, domestic market integration and industrial concentration in the southeast would have resulted, even in the absence of domestic policy interventions.

The trajectory in international transport costs before and after the war is well known. In the late nineteenth century great wave of globalization, the steep fall in oceanic shipping costs and railway freight charges enabled the integration of Brazil in the international economy. Foreign transporters served coastline ports directly, exchanging manufactures for raw material (mainly coffee and sugar). Regional centers of economic activity along the seaboard, such as Salvador and Recife, thrived. The post war period saw a reversal in trade costs. Estevadeordal *et al.* (2003) maintained that technical change in shipping in the 1920s lagged economy wide improvements. Others (Hynes *et al.* 2012; Irwin 2012) have attributed the reversal to the adoption of protectionist trade and exchange rate policies by large and rich countries in the wake of the Depression. Jacks *et al.* (2011) estimated that trade costs fell modestly between 1921 and 1928, but rose 21 percentage points between 1929 and 1932, the most significant increase in the twentieth century.

To be sure, the contributions of internal and external trade costs in promoting or discouraging the concentration of economic activity are difficult to disentangle. Both domestic and foreign trades would have shared in the benefits of improvements in transport

¹⁷ The index measures prices of foreign goods as import prices multiplied by the average tariff and the exchange rate.

¹⁸ A classic example was Vargas's burning of the Brazilian state flags in November 1937 to mark the centralization of power in the *Estado Novo* (Wolfe 1994, p. 78)

infrastructure, such as ports. And foreign transporters would have welcomed lower domestic costs, like reaching new markets in the hinterland, while domestic manufacturers would have benefitted from cheaper inputs from abroad. To sort out the separate and combined effects of internal and external trade costs on the spatial location of economic activity, we frame discussion using a bare-bones NEG model.

3. Domestic and foreign trade costs in a new economic geography model

Did the trade-cost reversal precipitate forces of agglomeration or dispersion in interwar Brazil? Krugman and Livas (1996) is the model of reference in this line of inquiry.¹⁹ Interestingly, these authors refer to the adoption of ISI policies in Mexico to motivate their discussion. We opt for a heuristic presentation, since we are more interested in the mechanisms underlying the spatial location of economic activity than in deriving the model's multiple equilibria. The model assumes monopolistic competition and economies of scale in one representative industry located in two centers of domestic production of roughly equal size and one foreign center. Labor, which is the only factor of production, is mobile between domestic centers, but not across international borders.

The model pivots on the tension between pull or centripetal and push or centrifugal forces. The strength of forward and backward linkages determines the pull of agglomeration. In the presence of iceberg transport costs, consumers exhibiting a taste for variety tend to locate in proximity to the largest concentration of producers because of abundant and low-priced goods, whereas monopolistically-competitive firms seek to locate their single plant as close as feasible to suppliers and other producers because they can save on transport, storage, and input costs. As for push factors, higher rents and commuting costs lower eventually the real wages of workers who have the choice of moving elsewhere. At some point, these costs offset the benefits of employment and cheap goods, and the process of agglomeration slows.

Now consider a decline in external trade costs, or trade liberalization. Suppose that internal trade costs remain unchanged. As international costs decline, pull forces weaken relative to push ones because lower costs strengthen linkages with overseas markets while those with

¹⁹ For a review of these models, see Brühlhart (2011). The models are sensitive to initial assumptions. Krugman and Livas (1996) turns on the assumption that domestic congestion costs are independent of foreign trade costs. For different sets of assumptions and outcomes, see Behrens *et al.* (2007). Rosés (2003) for Spain, Klein and Crafts (2012) for the United States, and Wolf (2007) for Poland have applied a core-periphery framework in historical perspective.

the domestic market weaken. The scaling down of external trade costs induces the typical manufacturer to sell in export markets and to rely on imported inputs. Under these circumstances, consumers and producers are indifferent between one metropolitan center or another. They are both unattractive places. On balance, higher congestion costs overwhelm any benefits associated with domestic linkages.

Next consider an increase in trade costs with the rest of the world. At high external trade costs, the location choices of firms and consumers become decoupled from foreign trade. Instead, domestic forward and backward linkages affect their choices. Under conditions of strong agglomeration effects and scale economies, once the reduction of trade costs traverses a certain threshold labor will tend to concentrate in the metropolitan center that has a head start or some initial small advantage. Buffered from international competition, domestic industry thrives as market integration deepens and agglomeration accelerates. A fall in internal trade costs can produce a similar outcome.

Several of the model's assumptions merit discussion in a historical case study like ours. The model assumes uniform internal trade costs, as if one size fits all. Goods arrive in ports and are dispatched seamlessly to the hinterland which is assumed to be flat. In actual fact, Brazilian geography was rugged. Transports costs varied by source, destination, as well as by product and sector. As a result, the emergence of the core-periphery system would have been patchy and uneven. Some sectors and regions saw rapid agglomeration, whereas in others development was gradual. Because of this heterogeneity, the magnitude of the fall in domestic trade costs (or the rise in external costs) would have had to be significant to initiate market integration and agglomeration. The Krugman-Livas specification actually generates a range of outcomes that have no effect on the regional concentration of industry. The trade-cost reversal only becomes effective after a threshold is crossed. Finally, because of regional and sectoral differences, aggregate data can mask the process of agglomeration. We correct for this below using regional, sectoral, and product level information.

4. Data and Hypotheses

4.1 Coastal shipping and international trade

Figure 2 plots values of coastal shipments alongside that of international trade. In 1921 the value of domestic trade was about 60 percent of foreign trade. A period of sustained growth followed. The Depression was a break point. The decline of coastal activity was sharp, but the

subsequent recovery was equally swift. Between 1921 and 1937, tonnage grew at an annual rate of 9.1 percent; the annual number of voyages, days of service, and cumulative shipping distances increased by about 50 percent (Brazil, *Resumo de varias estatísticas* 1924, pp. 76-77; Brazil, *Anuário estatístico do Brasil*, 1940, p. 307). On average, the value of coastline trade represented about 10-15 percent of GDP during the period.

Figure 2 – International and Coastline Trade, 1921-1939

Notes and sources: All values in 1921 contos de réis ('000) deflated by Haddad's (1975) price index. Weight in metric tons ('000). International trade from MOXLAD (2011). Coastal trade from Brazil, *Comércio do cabotagem*, various years.

We go beyond aggregate figures because they mask important changes at the product level and in the nature of bilateral trade between states. We have compiled two new datasets on coastal shipping.²⁰ The first relates to state level traffic. The data are unique and informative since we have few direct measures of internal trade for Brazil or, for that matter, elsewhere. Coastline shipping comprised, almost exclusively, domestically produced goods Figure 3 presents the value of *cabotagem* by state. The internal trade boom was widespread. Exceptionally, São Paulo's share of Brazilian trade progressed from 11.0 to 16.8 percent between 1921 and 1939. The north saw its share increase from 13.1 to 16.5 percent. We confirm below that the north began trading more with other regions than with foreign countries. We supplement the state-level data with granular information on bilateral flows between Santos and coastline ports for four sub-periods, 1912-1914, 1929-1930, 1933-1934, and 1936-1937. We restrict ourselves to industrial or manufacturing products amounting to about 80 percent of the value of coastal shipments

Figure 3 - Coastline Shipping: Regional Shares, 1921-1939

Sources: Brazil, *Comércio do cabotagem*, various years.

We match coastline trade with international imports. Returning to Figure 2, foreign imports expanded in the 1920s at the same cadence as coastal trade. The shock of the

²⁰ The Appendix gives details on sources and methodology (see appendix 1 and table A2).

Depression was severe. By 1932 the value of coastal trade was about 50 percent higher than of imports. In due course international trade recovered, and in 1939 once again exceeded the value of coastal trade. The resurgence of foreign imports is a puzzle we will return to below. Figure 4 depicts international imports by state. São Paulo's share climbed from 28.7 to 40 percent; the share of Rio was unchanged, while that of all other states declined.

Figure 4 - International Imports: Regional Destinations, 1919-1939

Sources: Brazil, *Comércio exterior*, various years.

4.2 Censuses of employment and production

We match granular data of São Paulo's coastal trade with information on employment, production, and the number of firms applying the classification system of the industrial censuses. For 1920 and 1940 we use regional information from the national censuses; for 1930 and 1937 we rely on the São Paulo state's censuses.

4.3 Fitting the data to the model

Our task is to fit the granular evidence on coastal and international trade to the main propositions of the Krugman-Livas model. To fix ideas, consider the counterfactual: the trade-cost reversal was partial and ineffective. The pace of agglomeration would have moderated and the spatial location of industry more polycentric and balanced as a result; internal trade would have been anchored by poles of regional specialization as in the United States; international trade would have been spread out over the coastline. To counter these claims, our presentation proceeds in several steps: (1) We provide supporting evidence of the trade-cost reversal leveraging bilateral coastal trade data. The turning point in domestic market integration was the Depression. (2) The concentration of activity in São Paulo was not inevitable, although it was not fortuitous either. Along the lines of the NEG model, the city held a slight advantage over its main rival, Rio de Janeiro. Agglomeration snowballed and the city's industrial structure diversified. (3) The core-periphery structure was consolidated in the 1930s. The number and range of São Paulo's exports and imports swelled and the average distances of shipments lengthened. São Paulo's negative balance of trade with other states regions turned positive after the Depression. (4) Despite the period's international trade barriers foreign imports increased steadily beginning in the mid-1930s. Imports of intermediate and final goods rebounded because

foreign and domestic transporters shared in the benefits of investments in port infrastructure and economies of scale. In the penultimate section, we study the contribution of the trade-cost reversal to the growth in productivity.

5. The effects of the trade-cost reversal on domestic and international trade

5.1 *The trade-cost reversal: A closer look*

Our claim is that the turn in trade costs in Brazil's favor was the catalyst of market integration and agglomeration. Because direct measures of freight and related transport costs are spotty, we estimate trade costs following Jacks *et al.* (2011). Figure 5 contrasts the costs of foreign and domestic trade in the interwar period. For France, Britain and the United States, we present Jacks *et al.* (2011) index of trade costs. In their setup, which relies on a gravity model framework, trade costs are estimated indirectly. They are residual values that capture all obstacles to trade: tariffs, transport costs, border effects, marketing and beachhead costs, and language and cultural differences. Using the same method and exploiting our new database on São Paulo's bilateral flows with Brazilian states, we calculate domestic trade costs. We use states' shares of GDP (IBGE 1970; Bucciferro and Ferreira 2020) as a proxy for regional incomes. We have indexed the trade-cost measures to 100 in 1921.²¹

Figure 5 - International and Domestic Trade Costs

Notes and sources: France, U.K., and U.S. from Jacks *et al.* (2011). For domestic trade costs, see text and Appendix.

The figure tells a compelling story of trade-cost reversal. The inflection points of our trade-cost indices mirror the actual flows of international imports and coastal shipping in Figure 2.²² International costs jumped during and after the war, stabilized, and then turned higher again after 1929. Trade costs with the United States dipped in the mid-1930s. Domestic costs moved in the other direction. They fell after the war and then plateaued in the 1920s, perhaps an indication of stubborn obstacles to domestic trade. Domestic costs declined steeply after the Depression. In sum, international costs increased by about 20 percent while domestic ones contracted by the same amount. To be sure, these changes in trade costs were not necessarily

²¹ See the Appendix for details on sources and methodology.

²² To be clear, the data underlying Figures 2 and 5 are from different sources.

independent. It may be the case that improvements in domestic transport and port infrastructure responded to the spike in international trade costs. But at the same time, these improvements would have had a mitigating effect on international transport costs, causing the rebound in imports of the mid- 1930s. We explore these possibilities below.

5.2 The trade-cost reversal, initial advantages, and agglomeration effects

Rio and São Paulo were both candidates to emerge as Brazil's core. On the one hand, metropolitan Rio had a larger population than São Paulo and benefitted from long-established connections with regional ports along the seaboard. But as international trade costs ratcheted up, the advantages of Rio's coastline location diminished. On the other hand, São Paulo was tightly connected to its local hinterland. The state had a diversified local economy based on the availability of rich agricultural land ideal for coffee and food production. The population of the state of São Paulo was about twice the combined population of the states of Rio and the Capital Federal. Manufacturers could lean on a strong home market as a springboard for export success. In the spirit of Krugman-Livas, the trade-cost reversal tipped the rivalry in favor of São Paulo because it afforded manufacturers the opportunity to expand their reach and benefit from the economies of a large domestic market. In this sense, while the emergence of São Paulo as Brazil's industrial hub was not preordained, the reversal magnified any slight initial advantage it may have had.

Beginning in the 1920s, manufacturers began to cluster in the city to be close to a sizeable home market, financial intermediaries, intermediate inputs, and energy sources.²³ They were assured of an ample supply of locally educated workers and internal and foreign migrants attracted by the city's employment opportunities. Between 1920 and 1940, the metropolis's population multiplied nearly threefold and had closed the gap with Rio.²⁴ The city had higher housing costs than elsewhere, but low prices of consumer goods cushioned welfare ratios.²⁵

²³ Fiat was the first mover. The company arrived in São Paulo in 1907. Ford established its first Brazilian plant in the state in 1919; General Motors followed in 1925. The budding auto sector was attracted by the new road construction, the network of ancillary firms, lower energy costs, and an immigrant labour supply (Downes 1992, pp. 570-79).

²⁴ The growth in the São Paulo's (state) population was in the order of 60 percent between 1920 to 1939. During the period, the city's share of the state's (Brazil's) population increased from 12.7 (1.9) to 18.1 (2.9) percent. On internal and foreign immigration, see Sánchez-Alonso (2019). On human capital and levels of education, see de Carvalho and Colistete (2010).

²⁵ Pereira (2019) estimated welfare ratios for factory workers. They increased in the early 1920s and declined moderately in mid-decade. By the mid-1930s, welfare ratios stood at the same level as the early 1920s. Ball (2018) observed that consumer prices were lower in São Paulo than Rio.

Reversing the status quo in 1900, by the eve of the Second World War, São Paulo contributed 40 percent of national output and Rio 15 percent (Luna and Klein 2014, pp. 68-69; Luna and Klein 2018, pp. 184-224).

Table 1 – Workers and Workers per Firm in São Paulo, 1920-1937

	1920	1930	1937	1920	1920	1930	1937	1930-37	1930-37
	Workers	Workers	Workers	Workers / firm	Workers / firm (+100cr firms)	Workers / firm	Workers / firm	Workers/firm growth	Output growth
Industry	83,272	113,365	245,902	20.36	83.7	23.96	32.33	34.9%	98.9%
Textiles	34,825	49,015	89,358	141.0	211.2	108.9	147.0	34.9%	56%
Leather	1,104	2,169	3,072	12.8	25.5	8.0	7.9	-1.9%	187%
Wood	2,089	3,475	15,401	11.4	28.4	9.3	14.3	53.8%	242%
Metal	5,484	10,585	31,718	38.8	86.7	17.4	20.2	15.6%	414%
Ceramics	9,360	3,220	11,340	13.4	141.6	51.9	50.0	-3.8%	135%
Chemicals	4,748	10,028	18,162	17.9	64.2	18.2	25.7	40.7%	63%
Food	11,213	7,158	10,767	8.9	32.9	13.2	17.0	28.2%	28%
Clothing	10,494	10,828	16,158	14.3	57.1	18.5	19.3	4.4%	260%
Furniture	2,030	4,459	11,847	9.8	35.9	10.9	70.1	544.6%	175%
Vehicles	1,458	3,773	14,528	6.1	56.5	15.4	34.2	122.0%	134%
Electrical equip. and machinery	94	2,202	11,847	5.8	18.0	14.2	70.1	393.4%	75%
Other	373	6,453	11,704	33.9	154.0	13.3	14.8	11.0%	98%

Notes: Output in 1921 milreis. Nominal values deflated by Haddad's (1975) price index. Figures for 1920 are from the Brazilian census. Figures for 1930 and 1937 are from the censuses of São Paulo. We adopt the industrial classification of the censuses of São Paulo. See Appendix for details and sources.

As we anticipated, the incidence of agglomeration was heterogeneous because the trade-cost reversal was uneven. Regional industries catering to local demand curbed the expansion of São Paulo firms, and technical change and related economies of scale were restricted to a narrow set of activities. Table 1 presents data from the São Paulo census on employment, firm size, and output growth between 1920 and 1937. Agglomeration economies, identified by the numbers of workers and workers per firm or firm size, were most apparent in the durable and capital goods sector. In budding sectors of activity, such as electrical equipment and machinery, vehicles, and chemical, the increase in average firm size ranged between of 40 and 400 percent. In established sectors of activity, like leather, food, and clothing, growth in employment and

firms was more moderate, if not stagnant. In the 1920s, for instance, the size of firms in ceramics was above average, but average firm size actually contracted between 1930 and 1937.

5.3 The making of the core-periphery structure

The arc of coastal shipping traces the development of the core-periphery system. Beginning with colonial period and into the heyday of the resource boom, the coastal trade was dominated by European imports, Brazilian exports (sugar, cotton, tobacco, and coffee), and unfinished and cheap goods for domestic consumption.²⁶ The regions served by transporters were restricted to Rio, Pernambuco, Bahia, and Rio Grande do Sul (Marcondes 2012). The contours of the trading system began to take shape during the post-war expansion. To see this, we consider in turn the number and diversity of products exported, the average distance of shipments, and the trade balance between São Paulo and regional ports.

In the 1920s, the leading domestic export item was cotton textiles (20.1 percent of the value of all goods). Export diversification remained modest.²⁷ Consumers and producers imported sugar products (19.54 percent), raw cotton (9.64 percent), and industrial goods (6.6 percent). Despite the prominence of the textile sector, the city continued to import cotton yarn and finished materials (7.53 percent). Factories undertook the finishing stages in production and consumers sought out high-end goods from Rio and other centers. The persistence of regional industries is not incompatible with the core-periphery framework. Rather it underlines our contention about the uneven and variable evolution of market integration.

The lines of the core-periphery grid thickened in the 1930s. Between 1913 and 1929, the number of products delivered had increased gradually from 77 to 110 items; but in the next eight years, by 1937, the figure had doubled to 228. Cotton textiles (10.2 percent) remained the main item of export, although São Paulo's share of the country's textile output actually declined after the Depression (Stein 1957; Huberman 2013). In its place, exports of capital and durable goods, sectors of activity benefiting from scale economies, saw rapid growth.²⁸ Using the classification of manufacturing in the census, machinery and transport equipment represented 2.6 percent of exports in 1929; the figure was 16.1 percent in 1937. The share of textiles (cotton

²⁶ In order of importance, the main exports of São Paulo in 1913 were: cotton textiles (40.1 percent), hats (6.9), and shoes (6.3); imports: candles (13.8 percent), cotton textiles (11.5), and soap (10.6).

²⁷ Other major exports in the 1920s consisted of crude industrial products like shovels, hoes, and wire (11.28 percent), and paper products (6.17 percent).

²⁸ In the 1930s, automobiles and trucks (5.60 percent) and related accessories (3.3 percent) replaced exports of coarse cotton goods, wood and paper products, and rudimentary capital items.

and other fabrics) declined from 32.5 to 23.6 percent during the period. The number of coastal imports, about 220 in 1937, moved in tandem with exports. Based on demand of the manufacturing sector for intermediate goods and other inputs, imports of iron (1.85 percent), phosphorous (1.29 percent), and gasoline and oils (2.42 percent) supplanted purchases of final goods.²⁹

The extension of the market was the flipside of product diversification. Returning to Figure 1, manufacturers in 1929 goods shipped goods 800 km on average, roughly the distance from Santos to the northern border of the state of Rio de Janeiro. The types of products transported depended on value and volume. In the 1920s, manufacturers exported and imported over longer distances high-value items, like pharmaceuticals, textiles, and rubber products; and over shorter distances, bulkier items, for instance wood products, oils, and soaps.³⁰ After the Depression, agglomeration economies and improvements in transportation infrastructure benefitted all goods. The extension of the market was rapid, the radius of goods shipped was 1,200 km on average, or about the distance from Santos to San Salvador (Bahia). By 1937, capital and durable goods reached all corners of Brazil.

Figure 6 - Trade Balances by State, 1921-1939 (5-year averages)

Notes: Trade balance in 1921 contos de réis ('000) deflated by Haddad's (1975) price index. Rio de Janeiro is the sum of Rio de Janeiro state and Distrito Federal.

Source: Brazil, *Comércio do cabotagem*, various years.

Figure 6 displays trade balances in contos de réis by state. In principle, both deficits and surpluses may indicate economic prosperity. For our purposes, we use the evolving nature of the trade balance between São Paulo and the regions to cast attention on the making of the core-periphery system: the increasing concentration of manufacturing in the southeast and its

²⁹ We calculated the Herfindahl Index of São Paulo's exports at the SITC 1-digit level. In line with our claim of increasing diversification, the index declined by 50 percent from 1914 to 1937. The process accelerated after the shocks of the war and the Depression. Across destinations, machinery and transport equipment exhibited the largest decline in the index after 1929. Available upon request.

³⁰ On product weight and distance, see Tafunell's (2007) study of the regional cement industry. A gravity regression of São Paulo's bilateral exports at the SITC 1-digit level confirms that bulk items were sensitive to distance, but high-value items were less so. The dependent variable in this exercise is the value of shipments per product category by state; we control for population, area size, and railway density of individual states, as well if the state shares a border with São Paulo. Available upon request.

decline in the north and northeast.³¹ As with our other measures, the Depression was the break point. Between 1921-1929 and 1930-1939, Pernambuco's and Alagoas's surpluses narrowed, and the deficits of Rio Grande do Norte, Bahia, and others widened.³² These states exported mainly food and raw materials to the southeast in exchange for finished and intermediate goods. Ever exceptional, São Paulo's trade surplus exhibited the biggest positive increase. The strong export growth of capital and durable goods lay behind the improvement in the state's trade balance. By 1937, machinery, metals, transport equipment, and chemical products constituted 50 percent of exports. The Latin American structuralist school would not have been unfamiliar with this picture. In their studies of underdevelopment, they distinguished between a high-productivity and dynamic core manufacturing diverse complex goods and a low-productivity and static periphery specializing in light industries and commodities (Gala *et al.* 2018). It would not be incorrect to summarize the relation between São Paulo and other regions of Brazil in similar fashion.

Table 2 – Coastline Trade (Exports and Imports) as Share in Percent of
All Trade (Coastline and International) by Region

	1921-25	1926-30	1931-1935	1936-1939
North	46.64	50.31	56.77	40.02
Northeast	50.87	46.90	66.43	38.08
Northwest	80.70	54.00	77.65	56.86
South	37.90	39.27	45.17	31.01
Southeast	36.02	39.37	41.80	31.65
Total	41.93	41.25	49.22	33.39

Notes: All figures are five-year averages in percent. Original values in contos de réis. North: Pará and Piauí; northeast: Alagoas, Bahia, Ceará, Paraíba, Sergipe, Pernambuco, and Rio Grande do Norte; northwest: Amazonas, Maranhão, and Território Federal; southeast: Distrito Federal,

³¹ It would be inaccurate to describe the process as deindustrialization. The absolute value of industrial output increased in the northeast, but regional shares of production declined.

³² At the SITC 1-digit level, we constructed Lafay indexes of revealed comparative advantage of São Paulo. Between 1912/1913 and 1929/1930, the index increased for machinery and transport equipment, chemicals, and miscellaneous manufacturing goods, and declined for food, live animals, and animal and vegetable oils. Available upon request.

Espirito Santo, Mato Grosso, Rio de Janeiro, and São Paulo; south: Paraná, Santa Catarina, and Rio Grande do Norte.

Sources: Brazil, *Comércio do cabotagem*; Brazil *Comércio exterior*, various years.

Can other explanations make sense of the trade pattern in Figure 6? An alternative is that the growing imbalances of the north and northeast with the southeast represented the loss of foreign markets caused by the shock of the Depression. But this does not seem to have been the case. Foreign markets did not collapse entirely. In absolute terms exports of the north were constant in the interwar decades, although their makeup changed. While cotton remained important, sugar was replaced by cocoa exports. What did change was the increased dependence on coastal trade as linkages between the core and periphery strengthened. Table 2 reports the values of *cabotagem* (exports and imports) as a share of total trade (coastal and international) by region.³³ In the northern regions the share of coastal rose from 1921-1924 to 1930-1934. The decline in the share after 1935 was due to the regain of international trade in all regions which we now turn to.

5.4 The international sector: The unintended consequences of agglomeration

In the familiar narrative of Brazilian economic history, the state sought to insulate domestic manufacturing using a combination of tariff and exchange rate policies, even as certain industries remained dependent on imports of intermediate goods and other inputs. But the strong recovery of international imports in the mid to late 1930s puts paid to the claim of effective state policy. In this section, we draw on granular trade data and the NEG framework to reconcile domestic market integration and the rebound in imports.

To begin, consider the changes in the direction and nature of imports. In 1920 Santos received roughly 25 percent of Brazilian imports; by 1940 the figure was close to 40 percent (Figures 1 and 4). Despite the period's imposing obstacles to international trade, the number of foreign import items actually climbed from 326 to 573 between 1929 and 1936. In the same period, the number of trade partners increased from 44 to 71 countries, European import sources expanding from 20 to 28.

³³ Table A3 presents coastal trade by state (imports and exports) and Table A4 the number of products by categories.

Paradoxically, São Paulo's investments in public goods contributed to the expansion of international imports and trade partners. Even as the coffee boom crested, the state invested in extending the length of piers, building new storage facilities, purchasing additional cranes, and improving railway line access. By the mid-1930s, Santos had the briefest mooring times.³⁴ All transporters, foreign and domestic, would have shared the upgraded port facilities. They all would have benefitted from the clustering of suppliers and skilled workers attached to these operations.³⁵ For instance, coffee shipments had long dominated international trade. With the expansion of domestic trade, Santos accumulated expertise in handling and shipping a diverse range of items.³⁶ Foreign companies accessed this knowledge along with information on regional markets that São Paulo firms had accumulated (MacLachlan 2003). For these reasons, the benefits accruing to foreign transporters of moving goods in and out of Santos would have offset to some extent the period's trade obstacles, like tariff and exchange rate policies.

To evaluate these claims, take a closer look at the relative importance of imports of intermediate and final goods of São Paulo and Rio as recorded in the trade statistics of 1929 and 1936. The contrast between the two centers is revealing. São Paulo's share of intermediate goods was higher and that of final goods lower than Rio's. This pattern would appear to give comfort to the claim that foreign inputs unavailable from domestic sources sustained the expansion of São Paulo as an industrial hub, but that state intervention succeeded in holding back imports of final goods (Villela and Suzigan 1975, pp. 196-97). That said, the heterogeneity of imports was striking. The decline in final goods was mainly the outcome of the sharp fall in imports of cotton textiles during the 1930s. In contrast, the share of imported final goods, machinery, utensils, and tools, increased, as did the share of paper products, paints, and dyes. The rub was that São Paulo manufactured and exported these same final goods to other Brazilian states. In these sectors, domestic goods would appear to have competed against international ones into the 1930s. On balance, foreign imports were both substitutes for and complements

³⁴ Brazil, *Anuário estatístico do Brasil*, 1936, pp. 153-45; 1939/40, pp. 294-97).

³⁵ For the main coastal ports in the 1930s, the correlation coefficient of the values of coastline shipping and international trade is 0.78.

³⁶ The direct evidence on international freight costs, although limited, confirms the relative efficiency of moving goods in and out of Santos. Taking the difference between CIF and FOB values of foreign imports, Santos had lower trade costs than Rio (by about 15 percent) and Pernambuco (30 percent), although the difference narrowed between ports in the late 1930s. To give one example, the cost of transporting sugar from U.S. ports to Rio was 60 percent higher than to Santos after the war (Sanderson 1926). Freight costs peaked in 1931 and then descended gradually in the mid-1930s. The implication is that the benefits of moving goods in and out of Santos offset to some extent the period's trade obstacles, like tariff policy and exchange rate movements.

of domestic manufactures. The binary nature of São Paulo's trade, imports of foreign intermediate goods and domestic exports of final goods, was in fact blurred.³⁷

The relationship between agglomeration economies and foreign trade illustrates a special outcome in international trade. External economies, like those we have described, increase productivity of domestic *and* foreign firms. As a result, a country with some innate or specialized sectoral advantage may be threatened by foreign competition. Under these circumstances, international trade would be harmful and countries may in fact benefit from protectionist policies. From this perspective, market integration and the spatial concentration of industry in São Paulo was as much the result of ISI-like policies as a harbinger of their adoption.

6. Agglomeration, market integration, and productivity

So far, we have proposed that the trade-cost reversal exceeded a threshold after the Depression, and, along the lines of Krugman-Livas, accelerated market integration and the clustering of economic activity in São Paulo. Did the reversal contribute to the productivity upswing in the 1930s? In this section, we link evidence on *cabotagem* and information on production and employment from the censuses. We exploit variation at the sectoral level to pin down the relationship between the trade costs, market integration, and productivity.

In international trade models based on comparative advantage and perfect competition, a decline in trade costs and the extension of the market promotes increased specialization. In models of intraindustry trade and monopolistic competition, the building blocks of NEG models, the effect of a decline in trade costs is mediated by the distribution of firm sizes and the degree of product differentiation (Chaney 2008). The decline in trade costs generates productivity increases in sectors of activity dominated by large firms and that exhibit scale economies. This result is magnified in the case of differentiated goods. As the degree of substitution decreases, firms have the opportunity to sell more goods in distant markets (Huberman *et al.* 2017). We evaluate these mediating factors on productivity and export expansion in Brazil.

Table 3 matches evidence at the sectoral level from the Brazilian and São Paulo censuses between 1920 and 1937 on industrial organization and labor productivity, with coastal export data on the degree of trade openness and the average distance of shipments.³⁸ In these years,

³⁷ For a detailed information of top eight foreign imports of Rio de Janeiro and São Paulo by Item in 1929 and 1936, see appendix table A5a. For a complete information by product class see appendix table A5b.

³⁸ For sources and methodology, see the Appendix.

average trade exposure, measured as domestic exports as a share of output (weighted by sectoral employment), bounded from 2.8 percent in 1920 to 9.8 percent in 1930, and 13.8 percent in 1937. Average productivity moved in lockstep. In real terms, productivity increased by 36.8 percent between 1920 and 1940, the bulk of the change occurring after 1930. The last two columns confirm that the average distance of shipments increased across the board, indicating that all industries benefitted from the reversal in trade costs, although this did not imply that all sectors shared in the growth of productivity.

Table 3 – Number of Firms, Output per Worker, Export Shares, and Shipping Distances by Sector: São Paulo, 1920-1937

Sector	Number of firms	Output per worker (1921 milréis)			Export share of output (%)		Average distance (km)	
	1930	1920	1930	1937	1930	1937	1930	1937
Industry	5,388	10.73	10.07	14.53	9.8	13.8		
Textiles	450	7.93	7.77	16.16	10	12	768.7	1,053.7
Leather	270	16.97	13.20	8.34	12.1	2.9	371.3	1,189.5
Wood	373	9.26	8.17	7.25	4	11.4	776.6	1,269.6
Metal	607	7.80	7.71	10.09	4.1	18	648.3	1,065.7
Ceramics	718	4.39	5.50	6.85	3.9	7.3	837.2	1,133.6
Chemicals	550	13.28	14.71	17.21	15.6	17.3	724.7	1,074.7
Food	541	28.00	15.82	20.30	14.1	23.7	1,052.6	
Clothing	585	8.13	18.98	10.67	8	13.8	877.0	1,186.6
Furniture	410	4.99	7.52	4.73	33.7	3.2	1,038.0	1,186.6
Vehicles	245	15.15	6.14	63.43	1.5	60.9	778.8	1,175.5
Electrical equip. and machinery	155	6.96	23.48	31.16	n.d.	n.d.	n.d.	n.d.
Other	484	10.53	8.77	7.51	4	6.9	798.0	1,203.6

Notes: See table 2. Export share, calculated at state level, is the ratio of domestic exports to industrial production. Distance refers to average distance goods shipped in 1930 and 1937, weighted by distance from Santos to main port of each state. Figures for 1920 are from the Brazilian census. Figures for 1930 and 1937 are from the censuses of São Paulo. See Appendix for details and sources.

There was significant heterogeneity in trade exposure and productivity performance (Villela and Suzigan 1975). Consider three types of industries of varying firm sizes and facing different degrees of competition: the stagnant leather industry, the lacklustre cotton textiles,

and the dynamic transport industry. The leather industry was composed of small firms and economies of scale were limited. The number of workers per firm actually contracted in the 1930s. The Paulista industry faced competition from other Brazilian regions producing similar goods. Overall export exposure narrowed in the 1930s and productivity growth collapsed. In cotton textiles, international competition was weak; in fact, the Brazilian industry began exporting to Argentina by the end of the decade (Huberman 2013). Under these circumstances, the industry attracted new firms, but many new entrants were small. Productivity growth was modest as a result.³⁹ The transport industry, comprising automobiles, trucks, and engines, was a new dynamic sector in which firms specialized in highly differentiated goods. Foreign competition was limited, with the exception of autos. The growth in firm sizes was impressive and goods were delivered long distances. The sector's productivity and export share swelled in the 1930s.

Figure 7 - Openness, Productivity Growth, and Firm Size, 1930-1940

Notes and sources: See Appendix.

Figure 7 charts the connection between the trade-cost reversal, trade exposure, scale economies, and productivity. In line with the decade's decline in trade costs, the first panel confirms that openness in 1930 and 1937 are positively related. It would appear that firms benefitting initially from trade channeled these gains into greater export exposure. The second panel indicates a correspondence between openness in 1930 and productivity ten years later. That said, attributing causality is hazardous because of feedback loops. In the third panel, we divide our sample into three groups: sectors exhibiting a decrease in exports between 1930 and 1937, those with growth of exports of less than 20 percent, and sectors above 40 percent. In sectors of low export growth, productivity was higher in 1930 than 1937; but sectors with strong export performance had considerable productivity gains after the Depression, supporting our main claim of a robust relationship between market integration and economic prosperity. Finally,

³⁹ The advantages São Paulo held over other domestic producers in cotton textiles faded during the 1930s. The share of integrated (spinning and weaving) firms in the industry, generally considered to be on the forefront of technological advance, diminished between 1932 (57 percent) and 1936 (25 percent). Many of the new mills established in São Paulo were small and had poor productivity records (Versiani 1971; Cano 1977). When international trade recovered post-1945, the uncompetitive Brazilian industry lost access to foreign markets (Badia-Miró *et al.* 2018).

we unpack the relationship between agglomeration, export expansion, and productivity growth. The fourth panel displays a positive correlation between scale economies, proxied by firm size in 1930, and openness in 1937. This relation was stronger in durable and capital good industries than in textiles, ceramics, and wood.

7. The defining moment: The long-term effects of the 1930s trade-cost reversal

In this paper we provide an explanation of productivity performance in Brazil during the interwar period. Invoking a NEG framework and drawing on granular information on coastal shipping and international trade, we have attributed the period's impressive economic record to the dual process of market integration and regional industrial concentration. The trade-cost reversal weakened links with external markets and strengthened domestic networks instead. Did the rise in international trade costs matter more than the decline in domestic ones? It is difficult to separate the two. While the spike in foreign trade costs may have been Brazil's "defining moment" of the Great Depression, local governments responded with improvements in port and related infrastructure, although at the federal level Vargas's policies in encouraging domestic industry seem to have offset each other. Brazilian manufacturers would have certainly welcomed these developments. In their eyes, de-globalization in the 1930s had a silver lining.

Owing to slight initial advantages, economic activity concentrated to a greater extent in São Paulo than Rio. However, the development of the metropolis as a manufacturing and transport hub was not certain in the absence of the trade-cost reversal that turned economic development inward and away from the coast. A core-periphery structure emerged in which São Paulo firms exported manufacturing items and imported raw materials and intermediate goods. By the 1930s, trade costs had crossed a threshold and regional concentration, especially in durable and capital goods. The virtuous circle of market integration and productivity growth was joined. In this fashion, São Paulo made trade, but trade also made São Paulo.

Economic historians would not be unfamiliar with this process. By 1940, Brazil was well on the way to achieving what Allen (2011, p. 2) has referred to as "standard set" of actions pursued by countries to promote catch-up with industrial leaders, including policies unifying the domestic market by eliminating internal tariffs and building infrastructure, and others aimed to blunt the competitiveness of imported manufactured goods.⁴⁰ There was a fundamental

⁴⁰ Allen (2011, p. 2) continues: "Some Latin American countries adopted these policies incompletely and without great success."

difference, however, between first-wave industrializers, like France, Prussia, and the U.K., and latecomer Brazil. In Europe, market integration preceded the development of domestic industry; in Brazil, they progressed together. Lyons, Solingen, and Manchester developed as specialized centers of production, but São Paulo's industrial base was diversified, leaving the country with a decidedly unbalanced spatial location of industry.⁴¹ This drawback aside, or because of it, the scale and scope of agglomeration showed up in Brazil's exceptional productivity record in the 1930s.

While these observations remain tentative, they point to several potential directions in future research. An unfailing question in Brazilian economic history concerns the origins and persistence of regional income inequality (Bucciferro and Ferreira 2020). To some, inequality in the twentieth century was an extension of the earlier resource boom. The spatial concentration of economic activity can be considered an additional source of inequality superimposed on the old. A related puzzle concerns the adoption of formal import-substitution policies of the *Estado Novo* in 1937. Was the trade-cost reversal a preliminary, but necessary phase of ISI? Or was ISI conceivable in the absence of market integration and agglomeration during the interwar period? In either case, the hold of geography seems to have had long-lasting effects on Brazilian economic history.

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⁴¹ Bear in mind that diversified cities like São Paulo have their advantages. They generate more innovation and have less exposure to sectoral shocks than specialized cities.

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