Did Liberalization Start A Retail Revolution In Brazil?

Vries, Gaaitzen J. de

University of Groningen

RuG

Groningen Growth and Development Centre

Did Liberalization Start A Retail Revolution In Brazil?

Research Memorandum GD-105

Gaaitzen J. de Vries

RESEARCH MEMORANDUM

Did Liberalization Start A Retail Revolution In Brazil? ⋆

October 2008

Gaaitzen J. de Vries [a]

[a] *Faculty of Economics and Business and GGDC, University of Groningen, PO Box 800, 9700 AV Groningen, the Netherlands. E-mail: g.j.de.vries@rug.nl*

Abstract

In the 1990s, Brazil opened up its retail sector to foreign direct investment. It was expected that the entry and market expansion of retail chains would spur the development of a sector long characterized by small family-run stores. However, the effects on growth have been disappointing. Our results suggest that liberalization failed to deliver high growth because reallocation dynamics did not contribute to growth. For the period 1996-2004, we find little evidence that more-productive new establishments from retail chains replaced less-productive independent stores.

Key words: Structural reforms, Productivity growth, Retail sector, Latin America, Brazil
JEL: L81, O12, O47

⋆ This paper benefited greatly from discussions and comments by Marcel Timmer. I thank Eric Bartelsman and Ton van Moergastel for SAS code, Nanno Mulder for his help in the preparation stages of this project, and Dirk Bezemer and seminar participants at the University of Groningen for comments. I thank the team at IBGE, the national statistical office of Brazil, for their hospitality and providing access to the firm level data. IBGE ensures confidentiality of responses by requiring researchers to work on site at CDDI with output checked before leaving the premises.

1 Introduction

Brazil's poor growth performance and macroeconomic instability in the 1980s motivated the government to undertake profound structural reforms in the early and mid-1990s (Baer, 2008). The government adopted prudent macroeconomic policies, achieved stabilization after a long period of hyperinflation, and created a more liberal trade and investment climate. The retail sector was opened up in the World Trade Organization 1995 General Agreement on Trade in Services, but also within the MERCOSUL[1], and between the MERCOSUL members and the European Union. In addition, the participation of foreign capital in Brazilian retail firms was freed from restrictions in the Sixth Constitutional Amendment of 1995 (World Bank, 2004).

The reforms created very suitable conditions for investments by foreign chains. As a result, Foreign Direct Investment (FDI) in the retail sector increased rapidly.[2] The FDI stock in the retail sector increased sixfold from 1995 to 2000, and growth was above average FDI growth (Censo de Capitais Estrangeiros, available at www.bcb.gov.br). In turn, these investments created the perception that liberalization had started a retail revolution through the expansion of modern retail chains (Reardon and Berdegué, 2002).

The retail sector accounts for a large share of the Brazilian economy, both in terms of GDP and employment. During 1996-2004, the employment and value added share in the total economy was respectively about 11 percent and 5 percent (Timmer and de Vries, 2008). A revolution was considered necessary for the development of a sector long characterized by many small family-run stores operating alongside a few large modern retail chains. In the mid-1990s, various domestic (or partially foreign-owned) chains were active, but the sector mainly consisted of independent retailers, often operating their business in a traditional way at low productivity levels (McKinsey, 1998). The increasing presence of retail chains was expected to spur development by reducing waste

(many agricultural products rot before reaching the market), lowering prices for consumers, improving the quality of goods and assurance of its delivery, raising the productivity of supplying industries (Javorcik et al., 2006), and raising the sector's productivity level.[3]

So far, productivity growth of the retail sector has been disappointing under the structural reforms. While productivity growth of the total economy has been disappointing as well (Paus, 2004), available evidence suggests that productivity growth of the retail sector was below that of the total economy during the 1990s (Melo et al., 1998; Mulder, 1999; Timmer and de Vries, 2008). This experience contrasts with OECD countries, where growth of the retail sector was above productivity growth of the total economy during the past decades (Inklaar et al., 2008). Obviously, this raises the question what held back growth of Brazil's retail sector.

Recent studies have shown that productivity growth in the retail sector of OECD countries occurred through a process of creative destruction. That is, growth originated from reallocation dynamics through firm churning (the entry and exit of firms) and resource reallocation to more-productive retail chains. For example, new establishments from retail chains (including, but not only, Wal-Mart) displacing 'mom-and-pop' stores accounted for virtually all growth in the US in the past decades (Foster et al., 2006). Similar findings for the UK are presented by Haskel and Sadun (2007) and for Japan by Matsuura and Motohashi (2005).

We use similar decomposition methodologies as in these studies to understand the performance of Brazil's retail sector. While Brazil's retail sector is dynamic, our results suggest that liberalization failed to deliver high growth because a process of creative destruction did not take off. During 1996-2004, we find little evidence for a reallocation of productive inputs and outputs. New establishments from retail chains did not replace low-productive independent

stores at a large scale. Instead, large chains acquired other (smaller sized) chains. This contributed to a deepening of the dual structure in which low-productive independent stores continued to coexist with a declining number of retail chains.

The remainder of this paper is structured as follows. In the following section we present the data set and discuss the main characteristics of Brazil's retail sector. We describe our productivity decomposition method in section 3. Decomposition results are discussed in section 4. Conclusions and a discussion why the sector does not show patterns similar to the US are in section 5.

2 Brazil's Retail Sector

To examine the contribution of reallocation dynamics to growth, we use a census dataset of retail firms. Our principal data source is the annual survey of distributive trade firms (Pesquisa Anual de Comércio, PAC) from 1996 to 2004. Firms registered in the Cadastro Nacional da Pessoa Jurídica from the ministry of Economic Affairs and classified as distributive trade firms in the Cadastro Central de Empresas of the national statistical office are surveyed in PAC. The PAC dataset consists of two groups, namely a group of firms which surpass the threshold and are included by census and another group of firms which are below the threshold and are included by sample. Sampled firms are surveyed for a maximum of three consecutive years and fill in a simplified questionnaire. The empirical analysis focuses on firms included by census only.[4]

Firms in the dataset are linked using their identification numbers from the tax registry. Different national sector definitions are used in PAC over time, which are converted to the International Standard Industry Classification Revision 3.0. After firms are linked, observations of nominal output divided by nominal

input that fall into the first and the ninety-ninth percentile of the distribution at the most detailed industry classification are considered outliers and deleted. A detailed discussion of these steps is provided in appendix A.

Firms with more than 20 employees or firms with less than 20 employees but with establishments in more than one Federal State are included in PAC by census.[5] For 1996 this amounts to 14,445 firms included by census. In 2004 the number of firms included by census has risen to 17,366. While firms included by census constitute a fairly small share of the total population of retail firms, they represent the major part of the sector in terms of sales (about 60 percent). Furthermore, although our analysis excludes small (often informal) firms, the dataset mainly includes single-establishment stores with low productivity levels. For example, in 2004 about 69 percent of the firms in our dataset are single-establishment firms (see appendix table B.2). Therefore, results are considered representative for the sector.

Output and input variables are available to construct productivity measures. We measure labor productivity (LP) as the volume of sales divided by employment.[6] Because retail firms sell goods to consumers, we used the consumer price index to deflate output. We used the overall consumer price index to deflate output of retail firms. In some cases it was possible to use more detailed price series, for example for firms selling food and drinks.[7]

Figure 1 shows pie charts for the employment shares of firms (distinguished by the number of establishments a firm has) in 1996 and 2004. The employment share of single-establishment firms did not decline from 1996 to 2004. In fact, the employment share of independent stores increased from 22 percent to 29 percent in the retail sector. Nevertheless, we find an increasing presence of large-size chains (firms with >100 establishments) at the expense of small and medium-size chains as well. In particular, in food retailing (a sub-industry of the retail sector) the employment share of large-size retail chains increased

from 5 percent to 23 percent, reflecting the entry and market expansion of large international retail chains.[8] Thus, we find an increasingly dual market structure.

Table 1 shows productivity levels by size class. Clearly, productivity levels rise with size class. Across the retail sector, retail chains tend to be more efficient than single-store retailers because of technology and scale advantages.[9] These differences in productivity levels across size classes indicate the scope of resource reallocation for boosting productivity growth. That is, resource reallocation toward retail chains offers much potential for productivity growth.

What is puzzling, is the low aggregate productivity growth of the sector despite the combination of a higher productivity level across size classes and an increasing market share of large retail chains. In the remainder of this paper, we will use the census data set and our productivity decomposition method to understand why productivity growth was not higher. The next section presents the decomposition method, before turning to the results in section 4.

3 The Productivity Decomposition Method

Starting with the preliminaries of the productivity decomposition, aggregate productivity, LP^A, is the weighted geometric average of firm's productivity:

$$LP_t^A = \prod_i LP_{it}^{\theta_{it}}, \tag{1}$$

where subscripts i and t refer to firm and time respectively, θ is a firm-specific share in total employment, LP is labor productivity (sales per worker), and $\prod$ denotes multiplication. If we take the logarithm of productivity, the aggregate productivity level is defined as a weighted arithmetic mean:

$$\ln LP_t^A = \sum_i \theta_{it} \ln LP_{it}. \tag{2}$$

Aggregate productivity growth between two years is the percentage change measured by:

$$\Delta \ln LP^A = \ln LP_t^A - \ln LP_{t-1}^A. \tag{3}$$

For the decomposition, consider three types of firms. Continuing firms are denoted by C, entering firms are denoted by E, and exiting firms are denoted by X. Firms in the initial year (t-1) either continue or exit the market. So in year t-1, continuing and exiting firms are active. In the final year (t), only firms that continued or entered the market are present. Hence, in year t, continuing and entering firms are active.

Aggregate productivity growth between two periods can therefore be decomposed into:

$$\begin{aligned} \Delta \ln LP^A = \ln LP_t^A - \ln LP_{t-1}^A = (\sum_{i \in E} \theta_{it} \ln LP_{it} + \sum_{i \in C} \theta_{it} \ln LP_{it}) \\ -(\sum_{i \in X} \theta_{i,t-1} \ln LP_{i,t-1} + \sum_{i \in C} \theta_{i,t-1} \ln LP_{i,t-1}). \end{aligned} \tag{4}$$

Equation 4 is the basic decomposition of productivity growth. It shows that aggregate productivity can be decomposed into the contribution of entering, exiting, and continuing firms. Aggregate productivity growth between two periods is either due to within-firm improvements or reallocation dynamics. So far, however, equation 4 does not separate the contribution to growth from continuing firms into within-firm improvements and resource reallocation. Preferably, these contributions from continuing firms are to be separated. Several methods have been developed to distinguish between these two contributions from continuing firms (see Baldwin and Gu (2006) for the derivations). In this

paper we follow the decomposition method developed by Griliches and Regev (1995), hereafter denoted GR:[10]

$$\begin{aligned}\Delta \ln LP^A = & \sum_{i \in E} \theta_{it} \left(\ln LP_{it} - \overline{LP}^A \right) \quad \text{(entry)} \\ & + \sum_{i \in C} \left(\frac{\theta_{it} + \theta_{i,t-1}}{2} \right) (\ln LP_{it} - \ln LP_{i,t-1}) \quad \text{(within)} \\ & + \sum_{i \in C} (\theta_{it} - \theta_{i,t-1}) \left(\frac{\ln LP_{it} + \ln LP_{i,t-1}}{2} - \overline{LP}^A \right) \quad \text{(between)} \\ & - \sum_{i \in X} \theta_{i,t-1} \left(\ln LP_{i,t-1} - \overline{LP}^A \right), \quad \text{(exit)}\end{aligned} \tag{5}$$

where $\overline{LP}^A = \frac{\ln LP_t^A + \ln LP_{t-1}^A}{2}$ and the terms on the right-hand side of equation 5 are:

- The *entry* effect: the sum of differences between entering firms' productivity and average aggregate productivity, weighted by the firm's market share. This term measures the contribution of entering firms to growth.
- The *within-firm* effect: the sum of productivity change within continuing firms, weighted by the firm's average market share. This term reflects gains from productivity growth within firms.
- The *between-firm* effect: the sum of productivity change due to the expansion or contraction of continuing firms, where the firms' average productivity is measured in deviation from average aggregate productivity. This term captures productivity gains from the expansion of more-productive firms, or the contraction of less-productive firms.
- The *exit* effect: the sum of differences in the productivity of exiting firms and average aggregate productivity, weighted by initial market shares. Exiting firms have a positive effect on aggregate productivity growth if the firms exhibit productivity levels below average productivity.

If liberalization started a retail revolution through the entry and expansions of retail chains, this shows up from the decomposition as large reallocation

dynamics (the sum of *entry* effects, *between-firm* market-share changes, and *exit* effects). For OECD countries, these dynamics accounted for most growth. For example, for the US it was found that reallocation dynamics accounted for 83 percent of growth during 1987-1997 (Foster et al., 2002).

Table 2 shows descriptive statistics of the census data set we use. Output and input variables are reported by entering, exiting, and continuing firms. Continuing firms are on average the largest firms in terms of sales and employees, and they show the highest productivity (sales per employee) as well. Exiting and entering firms are less productive, with exiting firms marginally more productive than entering firms. Although surprising at first, below average productivity of entering firms is a common finding across countries (Bartelsman et al., 2005). It is generally interpreted as the result of market experimentation in which selection and learning effects eventually sort out the most competitive entrants.[11]

Entry and exit rates reveal substantial churning. Table 2 reports average annual entry rates of 25 percent and exit rates of 18 percent. In comparison to manufacturing industries in Latin America, there appears more churning in retailing (for instance, Eslava et al. (2006) reports average annual entry rates of 9 percent and exit rates of 10 percent for Colombian manufacturing industries). Firm turnover is higher in the retail sector because it has a much higher share of small businesses, which have a lower probability of survival than large businesses (Foster et al., 2002). Churning in Brazil's retail sector is comparable to that observed in the US retail sector, where Foster et al. (2002) describe the sector as having 'enormous rates of entry and exit' (p. 7) and Jarmin et al. (2004) find that 50 to 60 percent of retailers that exist one year disappear within five years.

4 Brazil: No Retail Revolution Here

We performed productivity decompositions at detailed industry levels using equation 5. However, in this section we report results for the total retail sector (industry 52) and for food retailing (industry 521), because we are mainly interested in the aggregate outcomes. To this end the detailed decomposition results were aggregated.[12] We decomposed growth annually and present period averages of the annual contributions.

Figure 2 shows the GR decomposition of labor productivity growth. Aggregate productivity growth averaged 1.1 percent for the retail sector during 1996-204. The within-firm contribution to productivity growth is larger than the contribution from reallocation dynamics in the various periods considered. In fact, the negative value for reallocation dynamics indicates that reallocation often exerts a drag on aggregate productivity growth. For example, the average annual 1.1 percent growth during 1996-2004 is due to a 2.8 percent productivity contribution from within-firm improvements and to a -1.7 contribution from reallocation dynamics.

Results are similar for food retailing, with the exception of the period 2000-2004. Productivity of food retailers declined during the 2000-2004 period, which might be due to the expansion in services offered (such as amenities and the breadth of assortment) not accounted for in the output measure we employed (Betancourt and Gautschi, 1993; Ratchford, 2003). However, for both the total retail sector and food retailing, the main finding from the decomposition analysis is that within-firm effects account for most growth. In addition, a comparison of the 1996-2000 period with 2000-2004 shows that despite increasing FDI flows during the period considered (Concha-Amin and Dias de Aguiar, 2006), the contribution of reallocation dynamics did not increase.

Reallocation dynamics consist of between-firm effects and the contributions

from firm entry and exit. The contributions of these different components are shown in the last columns of table 3. Between-firm effects were positive (with the exception of food retailing during 2000-2004), indicating that more-productive firms expanded their market share at the cost of less-productive firms. The between-effect is modest however, especially in food retailing (we discuss this below). Entry effects are negative reflecting that productivity of entering firms was below average productivity. Finally, the exit effect positively contributed to growth, because the productivity of exiting firms was below average productivity, which is consistent with the idea that competition drives the least competitive firms out of the market.

We examined the robustness of our results. First, we used alternative decomposition methods proposed by Foster et al. (2006), and Baldwin and Gu (2006). The relative contributions of decomposition components were comparable. Hence, our main conclusions are independent from the particular decomposition method used. Second, since there is a census threshold, entrant firms in our dataset may not be true entrants but simply firms that grow beyond the threshold. We addressed that limitation by artificially raising the threshold and examining changes in the decomposition results. Our findings suggested that raising the threshold leaves the relative contributions of the components unchanged. Similarly, Scarpetta et al. (2002) examined the sensitivity of decomposition results to a threshold for Finnish manufacturing industries. They find that results are insensitive to various artificially set thresholds as well. Third, note that we examine *firm* dynamics using firm-level data. Most studies examined firm dynamics this way (Bartelsman and Doms, 2000; Bartelsman et al., 2005). But some studies examined firm dynamics at the *establishment* level (Foster et al., 2006; Matsuura and Motohashi, 2005). The difference between the two concepts is that firm-level analysis does not distinguish between single-establishment firms and firms with multiple outlets whereas an establishment-level analysis does. Therefore an establishment-level

analysis is able to decompose movements in productivity into changes within establishments on the one hand and changes within firms on the other. The unit of analysis should be kept in mind when comparing decomposition results in this paper with other studies. New establishments from continuing firms are included in *between-firm* effects in our paper, whereas it is counted as an entering establishment from a continuing firm in Foster et al. (2006). This has no important implications for the interpretation of the results, since both effects are part of the reallocation dynamics. Therefore, our results are robust.

High within-firm effects and modest reallocation dynamics suggest that the reforms did not start a retail revolution through the entry and expansion of foreign and domestic retail chains. Although liberalization in the 1990s did result in the expansion of chains (see section 2), our findings question the extent to which retail chains have contributed to aggregate outcomes by entering the market or expanding their market shares. So far, it is more likely that if liberalization did result in productivity gains, they are reflected in within-firm improvements. That is, some firms started to adopt new Information and Communication Technologies (ICT) when the market for ICT goods was liberalized in the 1990s (Baer, 2008), reorganized their business as a result of increased competition, and benefited from cheaper imported goods for resale.[13] These gains, however, are largely temporary. The major gains should originate from a fundamental restructuring of the sector.

Our finding of limited reallocation dynamics correspond with several recent qualitative studies of the retail sector of Brazil (and Latin America in general). For example, Booz-Allen Hamilton (2003) claim that 'Small-scale retailers in Latin American markets have demonstrated remarkable resilience, and previous gains against [large retail chains] are tapering off or even reversing slightly in some cases. In Argentina and Brazil, small-scale retailers have been particularly successful in staving off the large chains' (p. 2-3). They argue that

small-scale retailers managed to retain their market share, because they are located close to consumers, offer the product assortment which their customers demand, sell products only at a small price-disadvantage, provide a 'personal touch', and offer special services such as selling on credit.

Further, our results for food retailing confirm concerns raised by Humphrey (2007) that the depth and implications of the food retail transformation in Latin America have been overstated in previous research (for example Reardon et al. (2003)). In particular, distinguishing the food retailing sector from the total retail sector shows that the between-firm market share changes are low in the former (see table 3). This corroborates Farina (2002), who analyzes the supermarket sector in Brazil and shows that the share of food sales by supermarket chains declined from 45.1 percent to 42.8 percent during 1994 to 2000. During this period, the share of independent stores grew from 40 percent to 44 percent (the remaining food sales are by traditional stores). Thus, single-establishment firms were not replaced by retail chains, and our decomposition analysis shows that the observed changes in market shares added little to productivity growth.

5 Concluding Remarks

Brazil undertook profound structural reforms during the 1990s. In combination with stabilization after a long period of hyperinflation, this resulted in increasing FDI inflows. In turn, these foreign investments by retail chains were expected to alter the sector which had long been characterized by independent stores operating their businesses in traditional ways with low productivity levels. That is, the opening up of the retail sector was expected to raise productivity growth through the entry and expansion of international retail chains. Thus, the main effects of the reforms were expected to work through

reallocation dynamics. However, growth of the sector has been low, averaging about 1.1 percent per annum, raising questions about the effects of the reforms.

This paper examined the effects of liberalization on productivity growth in Brazil's retail sector. We decomposed growth into the contribution from within-firm improvements and reallocation dynamics during 1996-2004. We found substantial churning, with average annual entry rates of 25 percent and exit rates of 18 percent. However, two findings suggested that reforms did not live up to expectations. First, we found no strong tendency of retail chains displacing independent stores. In fact, the employment share of single-establishment firms increased slightly. Second, the contribution of reallocation dynamics to growth was negative, averaging -1.7 percentage points per year, whereas within-firm improvements contributed 2.8 percentage points per year.

In the US, chains of convenience stores with bargaining power, centrally performed operations, and best-practice operations have been displacing single-shop convenience stores for several decades (Jarmin et al., 2004). For the US, this process explains virtually all growth (Foster et al., 2006) and has transformed the retail sector into a sector which leads the aggregate economy (Inklaar et al., 2008). Clearly, this development process is lagging in Brazil. At least three aspects deserve careful examination in future research to understand why the sector does not show patterns similar to the US.

First, business regulation is slowing down the expansion of retail chains. In particular, regulations concerning zoning and commercial real estate act as barriers to the development of the retail sector. For example, quantitative limits on retail floor space in particular geographical areas (often city centers) are set. This occurs even if national legislation puts little restrictions on floor space, because decisions are often taken at the local level (for instance by city *vereadores*) where choices can be influenced by local pressure groups (e.g.

small retailers). In addition, business regulation in other markets such as in transport and logistics limit the expansion of multi-establishment firms. Excessive business regulation distorts the functioning of the Brazilian economy. For example, Brazilians have the saying "to my friends: everything, to my enemies: the law". In fact, according to a World Bank study on doing business across countries, Brazil is one of the most regulated countries in the world (World Bank, 2006). Thus, zoning laws and excessive business regulation in other markets slow down the emergence of chains in Brazil.

Also, the quantity, quality, and orientation of rail and road networks is holding back the emergence of national distribution systems and thereby the expansion of chains. The physical gap in transport networks between Brazil and OECD countries is large (Calderón and Servén, 2004). In addition, only a small part (less than 20 percent) of the road network is paved and the provision of infrastructure did not grow during the past decade as a result of the retrenchment of the public sector in this area (Calderón and Servén, 2004). Furthermore, early investments in railways were meant to integrate Brazil in the international economy (that is, to export primary products) rather than to integrate the regions into a large domestic market (Baer, 2008).

Finally, demand factors influence the expansion of multi-establishment firms. Consumer patterns are culturally determined, and many Brazilians prefer to buy their goods at street markets and local stores instead of at supermarkets from chains with a fixed assortment, because of food preparation habits and the perceived freshness of the produce there (Zinkhan et al., 1999; Humphrey, 2007). Therefore, consumer preferences influence the cohabitation of modern and traditional forms of retailing. In addition, car penetration influences the attractiveness for retail chains to establish large supermarkets outside crowded residential areas. Thus, with lower car penetration, especially in the poorer Northern states, it has been less attractive for chains to invest in large new establishments there. However, other demand factors are slowly favoring modern

retail formats, such as the increasing female labor force participation (shifting demand to one-stop shopping), the recent improvements in the income distribution, and the growing middle class. This indicates that once supply constraints are eased, a revolution may be in the making.

Notes

[1]Mercado Comum do Sul, the regional trade block consisting of Argentina, Brazil, Paraguay, and Uruguay.

[2]See Santos and Gimenez (1999) and Concha-Amin and Dias de Aguiar (2006) for an overview of foreign retail chains which entered or expanded their market share. Concha-Amin and Dias de Aguiar (2006) concluded that during 1989-2002, 93 percent of all mergers and acquisitions by foreign firms took place after 1997.

[3]The beneficial effects of foreign retail chains are not undisputed. In particular, concerns about their effects on wages and employment have been raised (Basker, 2007). For example, Durand (2007) argues that FDI in Mexico's retail sector dampened retail wages by introducing higher competitive pressures.

[4]We discuss implications of excluding firms below the threshold in section 4. Registered firms with less than 20 employees are selected by means of a stratified random sampling procedure. The dataset has 12,402 sampled firms in 1996 and 10,596 sampled firms in 2004.

[5]Firms in several northern regions which are located outside the Federal States' capital are not included in the survey because of the high costs involved in collecting information for these firms. These regions are: Rondônia, Acre, Amazonas, Roraima, Pará, Amapá, and Tocantins.

[6]Since some retailers employ part-time workers and family workers, a preferable measure of labor input is hours worked. Data limitations force us to use employment. Productivity is therefore underestimated for retailers who employ relatively more part-time and or family workers.

[7]Further detail is provided in appendix A.

[8]We also computed concentration ratios. For the retail sector, the concentration ratio of the top ten firms by sales is 0.23 in 1996 and increased to 0.27 in 2004. In comparison to OECD countries, concentration ratios are still low (see for instance Boylaud and Nicoletti (2002); Haskel and Sadun (2007)).

[9]See Doms et al. (2004), and Foster et al. (2006) for further detail for the US.

[10]This method has the advantage that it avoids the mixing of Paasche-type measures with Laspeyres-type measures by using a symmetric decomposition method (Balk, 2001). In addition, by taking period averages, the influence of measurement error becomes smaller. The disadvantage of the GR method is that, because of taking averages, the *within-firm* effect is affected by changes in the market share, and the *between-firm* effect is affected by changes in productivity. In section 4 we consider alternative decomposition methods and find that our main conclusions are independent from the particular decomposition method used.

[11]In our decompositions of productivity growth (see section 4) we increased the time horizon to examine the selection and learning effect. We found that increasing the time horizon raises the contribution to growth from entering firms in line with selection and learning effects, but the additional contribution is small.

[12]The weights which were used to average across the industries are nominal gross output by industry averaged over the first and last year of the period for which the change is measured. These weights were kept constant across the decompositions. Hence, the results are within-industry decompositions and do not reflect changes in the composition of distributive trade industries over time.

[13]If price changes of inputs were taken into account, the lower price of purchased goods for resale would not be reflected in the productivity measure. We were unable to take price changes of inputs into account, and it is therefore reflected in productivity growth.

References

Baer, W. (2008). *The Brazilian Economy: Growth And Development.* U.S.: Lynne Rienner Publishers, sixth edition.

Baldwin, J. R. and W. Gu (2006). Plant Turnover And Productivity Growth In Canadian Manufacturing. *Industrial and Corporate Change 15*, 417–465.

Balk, B. (2001). The Residual: On Monitoring And Benchmarking Firms, Industries, And Economies With Respect To Productivity. *Inaugural Addresses Research in Management Series EIA-2001-07-MKT MKT, Erasmus University Rotterdam.*

Bartelsman, E., J. Haltiwanger, and S. Scaretta (2005). Microeconomic Evidence Of Creative Destruction In Industrial And Developing Countries. *mimeo World Bank.*

Bartelsman, E. J. and M. Doms (2000). Understanding Productivity: Lessons From Longitudinal Data. *Journal of Economic Literature 38*, 569–595.

Basker, E. (2007). The Causes And Consequences Of Wal-Mart's Growth. *Journal of Economic Perspectives 21*, 177–198.

Betancourt, R. and D. Gautschi (1993). The Outputs of Retail Activities: Concepts, Measurement, And Evidence From U.S. Census Data. *Review of*

Economics and Statistics 75.

Booz-Allen Hamilton (2003). Creating Value In Retailing For Emerging Consumers: Breaking the Myths About Emerging Consumers - Learning From Small-Scale Retailers. Technical report, Study Conducted for the Coca-Cola Retailing Research Council Latin America.

Boylaud, O. and G. Nicoletti (2002). Regulatory Reform In Retail Distribution. *OECD Economic Studies 32*, 253–274.

Calderón, C. and L. Servén (2004). Trends in Infrastructure in Latin America, 1980-2001. *World Bank Policy Research Working Paper 3401*.

Concha-Amin, M. and D. R. Dias de Aguiar (2006). Concentração Industrial, Fusões E Turnover No Setor Supermercadista Brasileiro. *Gestão e Produção 13*, 45–56.

Doms, M. E., R. S. Jarmin, and S. D. Klimek (2004). Information Technology Investment And Firm Performance In US Retail Trade. *Economics of Innovation and New Technology 13*, 595–614.

Durand, C. (2007). Externalities From Foreign Direct Investment In The Mexican Retailing Sector. *Cambridge Journal of Economics 31*, 393–411.

Eslava, M., J. Haltiwanger, A. Kugler, and M. Kugler (2006). Plant Turnover And Structural Reforms In Colombia. *IMF Staff Papers 53*, 58–75.

Farina, E. M. M. Q. (2002). Consolidation, Multinationalisation, and Competition in Brazil: Impacts on Horticulture and Dairy Product Systems. *Development Policy Review 20*, 441–457.

Foster, L., J. Haltiwanger, and C. J. Krizan (2002). The Link Between Aggregate And Micro Productivity Growth: Evidence From Retail Trade. *NBER Working Paper 9120*.

Foster, L., J. Haltiwanger, and C. J. Krizan (2006). Market Selection, Restructuring And Reallocation In The Retail Trade Sector In The 1990s. *Review of Economics and Statistics 88*, 748–758.

Griliches, Z. and H. Regev (1995). Firm Productivity In Israeli Industry, 1979-1988. *Journal of Econometrics 65*, 175–203.

Haskel, J. and R. Sadun (2007). Entry, Exit, And Labour Productivity In UK Retailing: Evidence From Micro Data. *mimeo University of London*.

Humphrey, J. (2007). The Supermarket Revolution in Developing Countries: Tidal Wave or Tough Competitive Struggle? *Journal of Economic Geography 7*, 433–450.

IBGE (2004). *Pesquisa Anual De Comércio*. Rio de Janeiro: IBGE.

Inklaar, R., M. P. Timmer, and B. van Ark (2008). Market Services Productivity Across Europe And The US. *Economic Policy 23*, 139–194.

Jarmin, R. S., S. Klimek, and J. Miranda (2004). Firm Entry and Exit in the U.S. Retail Sector, 1977-1997. *Center for Economic Studies working paper 04-17*.

Javorcik, B. S., W. Keller, and J. R. Tybout (2006). Openness And Industrial Response In A Wal-Mart World: A Case Study Of Mexican Soaps, Detergents, And Surfactant Producers. *NBER working paper 12457*.

Matsuura, T. and K. Motohashi (2005). Market Dynamics And Productivity In Japanese Retail Industry In The Late 1990s. *RIETI discussion paper series 05-E-001*.

McKinsey (1998). *Productivity: The Key To An Accelerated Development Path For Brazil*. São Paulo, Washington: McKinsey and Company.

Melo, H. P. d., F. Rocha, G. Ferraz, A. D. Sabbato, and R. Dweck (1998). O Setor Serviços No Brasil: Uma Visão Global - 1985/95. *IPEA Texto para discussão 549*.

Mulder, N. (1999). *The Economic Performance of the Service Sector in Brazil, Mexico, and the USA: A Comparative Historical Perspective*. Groningen: Groningen Growth and Development Center Monograph Series, No. 4.

Paus, E. A. (2004). Productivity Growth in Latin America: The Limits of Neoliberal Reforms. *World Development 32*, 427–445.

Ratchford, B. T. (2003). Has The Productivity Of Retail Food Stores Really Declined? *Journal of Retailing 79*, 171–182.

Reardon, T. and J. A. Berdegué (2002). The Rapid Rise of Supermarkets in

Latin America: Challenges and Opportunities for Development. *Development Policy Review 20*, 371–388.

Reardon, T., P. Timmer, C. Barrett, and J. Berdegué (2003). The Rise of Supermarkets in Africa, Asia, and Latin America. *American Journal of Agricultural Economics 85*, 1140–1146.

Santos, A. M. M. M. and L. C. P. Gimenez (1999). Restructuring Of The Retailing Sector And The Supermarket Segment. *mimeo BNDES, São Paulo*.

Scarpetta, S., P. Hemmings, T. Tressel, and J. Woo (2002). The Role Of Policy And Institutions For Productivity And Firm Dynamics: Evidence From Micro And Industry Data. *OECD Economics Department Working Papers 329*.

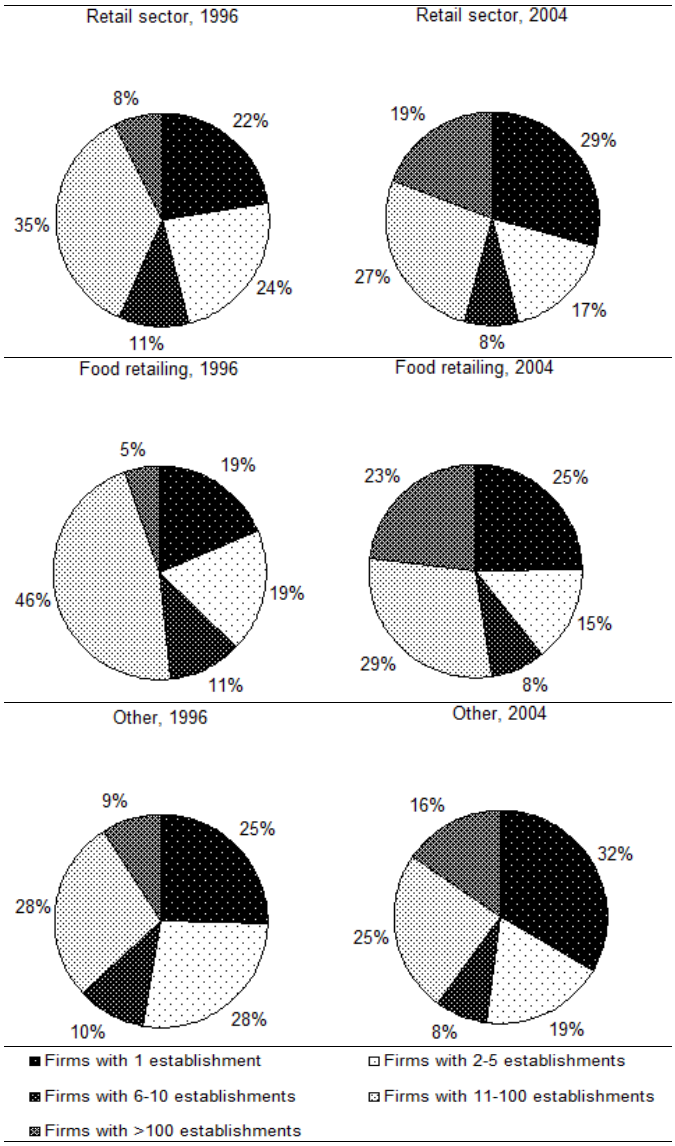
Timmer, M. P. and G. J. de Vries (2008). Structural Change and Growth Accelerations in Asia and Latin America: A New Sectoral Data Set. *Cliometrica, forthcoming*.

World Bank (2004). Brazil - Trade Policies To Improve Efficiency, Increase Growth, And Reduce Poverty. *World Bank report 24285-BR*.

World Bank (2006). Doing Business in Brazil. *Publication of the International Finance Corporation*.

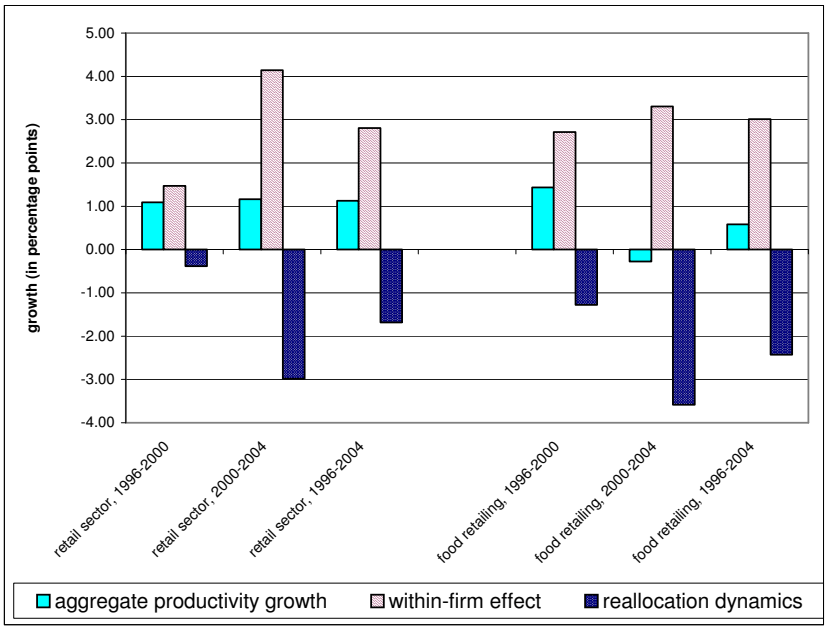
Zinkhan, G. M., S. M. Fontenelle, and A. L. Balazs (1999). The Structure of São Paulo Street Markets: Evolving Patterns of Retail Institutions. *Journal of Consumer Affairs 33*, 3–26.

Figure 1. Firms and employment shares in 1996 and 2004



Note: See appendix table B.1 for further detail.

Figure 2. Productivity growth decomposition



Note: See table 3 for further detail.

Table 1
Productivity levels, defined as sales divided by employment, by size class

Number of Employees	Productivity level 1996	Productivity level 2004
Retail sector		
20-49	100	100
50-99	104	102
100-249	107	105
250-499	106	106
500+	120	113

Note: Unweighted average productivity by size class. The productivity level for the size class 20-49 is set to 100.

Table 2
Averages of firms in the Brazilian retail sector

	Continuing firms	Entering firms	Exiting firms
Real Sales	16.05	14.29	14.08
Employment	4.62	3.44	3.18
Labor productivity	10.62	10.26	10.34
Entry rate		0.25	
Exit rate			0.18
Observations	84,101	25,403	18,329

Note: Sales is measured in Brazilian reais. Real sales, employment, and labor productivity are in natural logarithms. The entry (exit) rate is the average annual number of entrants (exiters) divided by the total number of firms. The values are averages for the period 1996 to 2004. Descriptive statistics are for firms included by census in PAC.

Table 3
Productivity growth decomposition

Industry	Average	Contribution from:				
Period	annual growth (in percentage points)	Within-firm effect (1)	Total reallocation effect ((3)+(4)+(5)) (2)	Between-firm effect (3)	Entry effect (4)	Exit effect (5)
Retail sector						
1996-2000	1.1	1.5	-0.4	1.5	-4.8	2.9
2000-2004	1.2	4.1	-3.0	1.0	-7.0	3.0
1996-2004	1.1	2.8	-1.7	1.3	-5.9	2.9
of which						
Food retailing						
1996-2000	*1.4*	*2.7*	*-1.3*	*0.4*	*-2.5*	*0.7*
2000-2004	*-0.3*	*3.3*	*-3.6*	*-0.7*	*-4.3*	*1.5*
1996-2004	*0.6*	*3.0*	*-2.4*	*-0.1*	*-3.4*	*1.1*

Note: Griliches and Regev (1995) decomposition of labor productivity growth. Decompositions are performed annually, average annual percentage points contributions to growth are presented. Total reallocation effect, (2) = (3) + (4) + (5).

A Data Appendix

A.1 Data Cleaning

IBGE has the policy to encrypt the identification number of firms (CNPJ) before giving researchers access to the data. The method which is used to encrypt identification numbers is equal across years. Therefore, a firm can be traced throughout the sample. We inspected the encrypted firm ID's and deleted firms with duplicate numbers.

We used the following procedure to detect outliers before the productivity decomposition. First, nominal output is divided by nominal input for each firm. Observations of nominal output divided by nominal input that fall into the first and the ninety-ninth percentile of the distribution at the most detailed industry classification (four digits) are identified as outliers. After two periods have been linked, firms with outlying productivity values or missing data in one of the two periods are deleted. Entrant and exiting firms are determined from the remaining data. We also decomposed productivity growth without the outlier procedure. Results from these decompositions are similar.

A.2 Price Deflators

Several industry-wide and economy-wide price indices are available for Brazil. Choices, however, are limited. We worked with price indices at fairly aggregated levels. Because retail firms sell goods to consumers, we used the consumer price index to deflate output. Consumer price indices (Índices Nacionais de Preços ao Consumidor - Amplo, INPC-A) are available at IBGE. We use the amplified consumer price index (INPC-A) to deflate output measures, where we use either Brazil's or the Federal states' price index for all goods or one of the following groups of goods: (1) clothing; (2) household equipment; (3)

food and beverages. Firms report economic numbers that refer to the calendar year of the survey. Firms whose business year differs from the calendar year are required to adjust their numbers accordingly. Therefore, we used annual (mid-year) price deflators to deflate output.

A.3 Conversion of CNAE to ISIC Revision 3.0

Different national sector definitions are used in PAC over time. We used data in PAC from 1996 to 2004. Two national classifications are therefore relevant. First, the CNAE classification (Classificacão Nacional de Atividaded Econômicas), which was adopted in 1995 and used until 2003. Second, from 2003 onwards, the CNAE 1.0 classification.

Our approach has been to first convert CNAE 1.0 in later surveys to CNAE. We followed this approach because only two years with the new classification are available. Next, we converted CNAE to the International Standard Industry Classification Revision 3.0 (ISIC Rev. 3.0). At the one and two digit level, the industry classifications CNAE, CNAE 1.0, and ISIC Rev. 3.0 are identical. Differences between the classifications only occur at the three and four digit level. Usually, more detail is offered in the CNAE/CNAE 1.0 classification and aggregation of CNAE/CNAE 1.0 to groups recomposes ISIC groups. We describe the conversion CNAE x CNAE 1.0 and CNAE x ISIC Rev. 3.0 below.

First, consider the conversion of CNAE 1.0 to CNAE for distributive trade firms. The difference between both classifications is not large. For 68 out of 72 (four digit) industry categories, an exact matching exists. The lack of unique correspondence between both classifications in the remaining 4 categories concerns wholesale of machinery, equipment and supplies and retail trade not in stores. Differences arise, because CNAE 1.0 does not distinguish between the different forms of commercialization. For example, whether sales take place via a store, TV, or Internet, is no longer separated in the new CNAE 1.0. This

distinction is made in CNAE (and it is made in ISIC Rev. 3.0). This implies that no strict correspondence between both classifications exists. Firms that belong to CNAE 1.0 industry code 51.64-0 and 51.65-9 all belong to a similar aggregate category in CNAE, namely 51.6 (CNAE). Firms in CNAE 1.0 51.64-0 are all converted to CNAE 51.62-4, and firms in CNAE 1.0 51.65-9 are converted to CNAE 51.63-2. Firms in CNAE 1.0 52.62-0 are converted to CNAE 52.69-8, but some firms in CNAE 52.69-8 are moved to CNAE 1.0 64.12-2. These firms can no longer be traced and artificially disappear from the data set. Firms in CNAE 52.61-2 and some firms in CNAE 52.69-8 are difficult to trace, because CNAE 1.0 does not distinguish between the various forms of commercialization. IBGE (2004) indicates that in the total population of retailers, only 5 retailers realized 100 percent of their sales via the Internet, 40 via the TV, and 584 via other forms of commercialization. In the total sample, this bias is unlikely to be large. Furthermore, we focus in the productivity decompositions on broader aggregates so to some extent these firms are possibly recomposed in an aggregate.

Second, we converted firms in four-digit CNAE sector classifications to four-digit ISIC Revision 3.0 classifications. In fact, since CNAE is based on ISIC Rev. 3, matching is unique. The only difference between both classifications stems from more detail in the CNAE classification. Hence more detailed categories in CNAE are recomposed in a broader ISIC category.

A.4 Firm Dynamics

To estimate the contribution of firm dynamics to growth, it is important to measure 'truly' entering and exiting firms. We use unique firm identification numbers to measure entrants, exiters and continuing firms. But some characteristics of PAC cloud the measurement of true entrants and exiters.

The structure of some firms change during the period analyzed. For example,

the structure of some firms change because of mergers, takeovers, and spin-offs. A firm that is taken over, continues operating. But the firm now has a different firm identification number (the same as the firm that has purchased her). Due to the takeover, the previous firm identification number disappears. Without additional information about changes in the structure of firms, we would count a "false" exit. Other studies solved this problem by including information from business registers. We are partly able to solve this problem, because PAC asks firms to report changes in legal and economic status (mudanças na estrutura da empresa). Furthermore, if a change in the legal or economic status of the firm occurs, the firm reports an additional tax number link (PAC provides two firm identification numbers in these cases). Therefore, the additional tax number link changes its meaning depending upon the change in legal or economic status.

Consider the possible changes in the structure of trade firms. First, if no change is reported, the firm can be linked directly. However, note that the industry classification of a firm could change. This happens with a change in its main economic activity. Firms that switched between industry classifications are dropped from the data set. Second, a new firm can emerge from a merger. The merged firm has 2 predecessors. Because we need two additional tax number links (in stead of one) and because the newly emerged firm is often restructured considerably, we consider it a new entrant. Likewise, if a firm emerges from a complete split-up, we considered it a new entrant. The argument for making these choices is that this firm now stands alone and gains experience on its own. Third, consider a partial spin-off. A new firm emerges from a parent firm. We considered it a new firm, again, on the assumption that this new firm stands alone and gains experience on its own. Fourth, if the firm reports that it is acquired by another firm or it has acquired another firm, output and input data are added to the purchasing firm. Fifth, a 'rest' category exists, where firms report other reasons for a change in its tax number link in 'observaçãos.'

Here, observations for old and new firm identification numbers were treated as one firm.

B Appendix tables

Table B.1
Firms, establishments and employment in 1996 and 2004

Sector	1 All firms	2 Firms with 1 establishment		3 Firms with 2-5 establishments		4 Firms with 6-10 establishments		5 Firms with 11-100 establishments		6 Firms with >100 establishments	
		number	share	number	share	number	share	number	share	number	share
Employment (1996)											
Retail sector	1,043,651	233,446	22%	247,032	24%	111,527	11%	372,837	36%	78,809	8%
Food retailing	*455,799*	*84,627*	*19%*	*83,890*	*18%*	*50,360*	*11%*	*209,395*	*46%*	*24,233*	*5%*
other	*587,852*	*148,819*	*25%*	*163,142*	*28%*	*61,167*	*10%*	*163,441*	*28%*	*54,576*	*9%*
Employment (2004)											
Retail sector	1,344,476	393,834	29%	226,010	17%	107,831	8%	360,578	27%	256,278	19%
Food retailing	*632,153*	*155,476*	*25%*	*91,934*	*15%*	*53,708*	*8%*	*185,563*	*29%*	*145,440*	*23%*
other	*712,323*	*238,358*	*33%*	*134,075*	*19%*	*54,124*	*8%*	*175,015*	*25%*	*110,838*	*16%*

Note: columns 2, 3, 4, 5, and 6 add up to column 1.

Table B.2
Firms, establishments and employment in 1996 and 2004

Sector	1 All firms	2 Firms with 1 establishment		3 Firms with 2-5 establishments		4 Firms with 6-10 establishments		5 Firms with 11-100 establishments		6 Firms with >100 establishments	
		number	share	number	share	number	share	number	share	number	share
Number of firms (1996)											
Retail sector	14,445	7,760	54%	5,314	37%	813	6%	541	4%	17	0%
Food retailing	*3,327*	*2,211*	*66%*	*897*	*27%*	*113*	*3%*	*103*	*3%*	*3*	*0%*
other	*11,118*	*5,549*	*50%*	*4,417*	*40%*	*700*	*6%*	*438*	*4%*	*14*	*0%*
Number of firms (2004)											
Retail sector	17,366	12,066	69%	4,119	24%	644	4%	507	3%	30	0%
Food retailing	*4,684*	*3,760*	*80%*	*716*	*15%*	*110*	*2%*	*88*	*2%*	*10*	*0%*
other	*12,682*	*8,306*	*65%*	*3,403*	*27%*	*534*	*4%*	*419*	*3%*	*20*	*0%*

Note: columns 2, 3, 4, 5, and 6 add up to column 1.

Papers issued in the series of the Groningen Growth and Development Centre

All papers are available in pdf-format on the internet: http://www.ggdc.net/

536 (GD-1) Maddison, Angus and Harry van Ooststroom, The International Comparison of Value Added, Productivity and Purchasing Power Parities in Agriculture (1993)

537 (GD-2) Mulder, Nanno and Angus Maddison, The International Comparison of Performance in Distribution: Value Added, Labour Productivity and PPPs in Mexican and US Wholesale and Retail Trade 1975/7 (1993)

538 (GD-3) Szirmai, Adam, Comparative Performance in Indonesian Manufacturing, 1975-90 (1993)

549 (GD-4) de Jong, Herman J., Prices, Real Value Added and Productivity in Dutch Manufacturing, 1921-1960 (1993)

550 (GD-5) Beintema, Nienke and Bart van Ark, Comparative Productivity in East and West German Manufacturing before Reunification (1993)

567 (GD-6) Maddison, Angus and Bart van Ark, The International Comparison of Real Product and Productivity (1994)

568 (GD-7) de Jong, Gjalt, An International Comparison of Real Output and Labour Productivity in Manufacturing in Ecuador and the United States, 1980 (1994)

569 (GD-8) van Ark, Bart and Angus Maddison, An International Comparison of Real Output, Purchasing Power and Labour Productivity in Manufacturing Industries: Brazil, Mexico and the USA in 1975 (1994) (second edition)

570 (GD-9) Maddison, Angus, Standardised Estimates of Fixed Capital Stock: A Six Country Comparison (1994)

571 (GD-10) van Ark, Bart and Remco D.J. Kouwenhoven, Productivity in French Manufacturing: An International Comparative Perspective (1994)

572 (GD-11) Gersbach, Hans and Bart van Ark, Micro Foundations for International Productivity Comparisons (1994)

573 (GD-12) Albers, Ronald, Adrian Clemens and Peter Groote, Can Growth Theory Contribute to Our Understanding of Nineteenth Century Economic Dynamics (1994)

574 (GD-13) de Jong, Herman J. and Ronald Albers, Industrial Output and Labour Productivity in the Netherlands, 1913-1929: Some Neglected Issues (1994)

575 (GD-14) Mulder, Nanno, New Perspectives on Service Output and Productivity: A Comparison of French and US Productivity in Transport, Communications Wholesale and Retail Trade (1994)

576 (GD-15) Maddison, Angus, Economic Growth and Standards of Living in the Twentieth Century (1994)

577 (GD-16) Gales, Ben, In Foreign Parts: Free-Standing Companies in the Netherlands around the First World War (1994)

578 (GD-17) Mulder, Nanno, Output and Productivity in Brazilian Distribution: A Comparative View (1994)

579 (GD-18) Mulder, Nanno, Transport and Communication in Mexico and the United States: Value Added, Purchasing Power Parities and Productivity (1994)

580 (GD-19) Mulder, Nanno, Transport and Communications Output and Productivity in Brazil and the USA, 1950-1990 (1995)

581 (GD-20) Szirmai, Adam and Ren Ruoen, China's Manufacturing Performance in Comparative Perspective, 1980-1992 (1995)

GD-21 Fremdling, Rainer, Anglo-German Rivalry on Coal Markets in France, the Netherlands and Germany, 1850-1913 (December 1995)

GD-22 Tassenaar, Vincent, Regional Differences in Standard of Living in the Netherlands, 1800-1875, A Study Based on Anthropometric Data (December 1995)

GD-23 van Ark, Bart, Sectoral Growth Accounting and Structural Change in Postwar Europe (December 1995)

GD-24 Groote, Peter, Jan Jacobs and Jan Egbert Sturm, Output Responses to Infrastructure in the Netherlands, 1850-1913 (December 1995)

GD-25 Groote, Peter, Ronald Albers and Herman de Jong, A Standardised Time Series of the Stock of Fixed Capital in the Netherlands, 1900-1995 (May 1996)

GD-26 van Ark, Bart and Herman de Jong, Accounting for Economic Growth in the Netherlands since 1913 (May 1996)

GD-27 Maddison, Angus and D.S. Prasada Rao, A Generalized Approach to International Comparisons of Agricultural Output and Productivity (May 1996)

GD-28 van Ark, Bart, Issues in Measurement and International Comparison of Productivity - An Overview (May 1996)

GD-29 Kouwenhoven, Remco, A Comparison of Soviet and US Industrial Performance, 1928-90 (May 1996)

GD-30 Fremdling, Rainer, Industrial Revolution and Scientific and Technological Progress (December 1996)

GD-31 Timmer, Marcel, On the Reliability of Unit Value Ratios in International Comparisons (December 1996)

GD-32 de Jong, Gjalt, Canada's Post-War Manufacturing Performance: A Comparison with the United States (December 1996)

GD-33 Lindlar, Ludger, “1968” and the German Economy (January 1997)

GD-34 Albers, Ronald, Human Capital and Economic Growth: Operationalising Growth Theory, with Special Reference to The Netherlands in the 19th Century (June 1997)

GD-35 Brinkman, Henk-Jan, J.W. Drukker and Brigitte Slot, GDP per Capita and the Biological Standard of Living in Contemporary Developing Countries (June 1997)

GD-36 de Jong, Herman, and Antoon Soete, Comparative Productivity and Structural Change in Belgian and Dutch Manufacturing, 1937-1987 (June 1997)

GD-37 Timmer, M.P., and A. Szirmai, Growth and Divergence in Manufacturing Performance in South and East Asia (June 1997)

GD-38 van Ark, B., and J. de Haan, The Delta-Model Revisited: Recent Trends in the Structural Performance of the Dutch Economy (December 1997)

GD-39 van der Eng, P., Economics Benefits from Colonial Assets: The Case of the Netherlands and Indonesia, 1870-1958 (June 1998)

GD-40 Timmer, Marcel P., Catch Up Patterns in Newly Industrializing Countries. An International Comparison of Manufacturing Productivity in Taiwan, 1961-1993 (July 1998)

GD-41 van Ark, Bart, Economic Growth and Labour Productivity in Europe: Half a Century of East-West Comparisons (October 1999)

GD-42 Smits, Jan Pieter, Herman de Jong and Bart van Ark, Three Phases of Dutch Economic Growth and Technological Change, 1815-1997 (October 1999)

GD-43 Fremdling, Rainer, Historical Precedents of Global Markets (October 1999)

GD-44 van Ark, Bart, Lourens Broersma and Gjalt de Jong, Innovation in Services. Overview of Data Sources and Analytical Structures (October 1999)

GD-45 Broersma, Lourens and Robert McGuckin, The Impact of Computers on Productivity in the Trade Sector: Explorations with Dutch Microdata (October 1999, Revised version June 2000)

GD-46 Sleifer, Jaap, Separated Unity: The East and West German Industrial Sector in 1936 (November 1999)

GD-47 Rao, D.S. Prasada and Marcel Timmer, Multilateralisation of Manufacturing Sector Comparisons: Issues, Methods and Empirical Results (July 2000)

GD-48 Vikström, Peter, Long term Patterns in Swedish Growth and Structural Change, 1870-1990 (July 2001)

GD-49 Wu, Harry X., Comparative labour productivity performance in Chinese manufacturing, 1952-1997: An ICOP PPP Approach (July 2001)

GD-50 Monnikhof, Erik and Bart van Ark, New Estimates of Labour Productivity in the Manufacturing Sectors of Czech Republic, Hungary and Poland, 1996 (January 2002)

GD-51 van Ark, Bart, Robert Inklaar and Marcel Timmer, The Canada-US Manufacturing Gap Revisited: New ICOP Results (January 2002)

GD-52 Mulder, Nanno, Sylvie Montout and Luis Peres Lopes, Brazil and Mexico's Manufacturing Performance in International Perspective, 1970-98 (January 2002)

GD-53 Szirmai, Adam, Francis Yamfwa and Chibwe Lwamba, Zambian Manufacturing Performance in Comparative Perspective (January 2002)

GD-54 Fremdling, Rainer, European Railways 1825-2001, an Overview (August 2002)

GD-55 Fremdling, Rainer, Foreign Trade-Transfer-Adaptation: The British Iron Making Technology on the Continent (Belgium and France) (August 2002)

GD-56 van Ark, Bart, Johanna Melka, Nanno Mulder, Marcel Timmer and Gerard Ypma, ICT Investments and Growth Accounts for the European Union 1980-2000 (September 2002)

GD-57 Sleifer, Jaap, A Benchmark Comparison of East and West German Industrial Labour Productivity in 1954 (October 2002)

GD-58 van Dijk, Michiel, South African Manufacturing Performance in International Perspective, 1970-1999 (November 2002)

GD-59 Szirmai, A., M. Prins and W. Schulte, Tanzanian Manufacturing Performance in Comparative Perspective (November 2002)

GD-60 van Ark, Bart, Robert Inklaar and Robert McGuckin, “Changing Gear” Productivity, ICT and Services: Europe and the United States (December 2002)

GD-61 Los, Bart and Timmer, Marcel, The ‘Appropriate Technology’ Explanation of Productivity Growth Differentials: An Empirical Approach (April 2003)

GD-62 Hill, Robert J., Constructing Price Indexes Across Space and Time: The Case of the European Union (May 2003)

GD-63 Stuivenwold, Edwin and Marcel P. Timmer, Manufacturing Performance in Indonesia, South Korea and Taiwan before and after the Crisis; An International Perspective, 1980-2000 (July 2003)

GD-64 Inklaar, Robert, Harry Wu and Bart van Ark, “Losing Ground”, Japanese Labour Productivity and Unit Labour Cost in Manufacturing in Comparison to the U.S. (July 2003)

GD-65 van Mulligen, Peter-Hein, Alternative Price Indices for Computers in the Netherlands using Scanner Data (July 2003)

GD-66 van Ark, Bart, The Productivity Problem of the Dutch Economy: Implications for Economic and Social Policies and Business Strategy (September 2003)

GD-67 Timmer, Marcel, Gerard Ypma and Bart van Ark, IT in the European Union, Driving Productivity Divergence?

GD-68 Inklaar, Robert, Mary O’Mahony and Marcel P. Timmer, ICT and Europe’s Productivity Performance, Industry-level Growth Accounts Comparisons with the United States (December 2003)

GD-69 van Ark, Bart and Marcin Piatkowski, Productivity, Innnovation and ICT in Old and New Europe (March 2004)

GD-70 Dietzenbacher, Erik, Alex Hoen, Bart Los and Jan Meist, International Convergence and Divergence of Material Input Structures: An Industry-level Perspective (April 2004)

GD-71 van Ark, Bart, Ewout Frankema and Hedwig Duteweerd, Productivity and Employment Growth: An Empirical Review of Long and Medium Run Evidence (May 2004)

GD-72 Edquist, Harald, The Swedish ICT Miracle: Myth or Reality? (May 2004)

GD-73 Hill, Robert and Marcel Timmer, Standard Errors as Weights in Multilateral Price Indices (November 2004)

GD-74 Inklaar, Robert, Cyclical productivity in Europe and the United States, Evaluating the evidence on returns to scale and input utilization (April 2005)

GD-75 van Ark, Bart, Does the European Union Need to Revive Productivity Growth? (April 2005)

GD-76 Timmer, Marcel and Robert Inklaar, Productivity Differentials in the US and EU Distributive Trade Sector: Statistical Myth or Reality? (April 2005)

GD-77 Fremdling, Rainer, The German Industrial Census of 1936: Statistics as Preparation for the War (August 2005)

GD-78 McGuckin, Robert and Bart van Ark, Productivity and Participation: An International Comparison (August 2005)

GD-79 Inklaar, Robert and Bart van Ark, Catching Up or Getting Stuck? Europe’s Troubles to Exploit ICT’s Productivity Potential (September 2005)

GD-80 van Ark, Bart, Edwin Stuivenwold and Gerard Ypma, Unit Labour Costs, Productivity and International Competitiveness (August 2005)

GD-81 Frankema, Ewout, The Colonial Origins of Inequality: Exploring the Causes and Consequences of Land Distribution (July 2006)

GD-82 Timmer, Marcel, Gerard Ypma and Bart van Ark, PPPs for Industry Output: A New Dataset for International Comparisons (March 2007)

GD-83 Timmer, Marcel and Gerard Ypma, Productivity Levels in Distributive Trades: A New ICOP Dataset for OECD Countries (April 2005)

GD-85 Ypma, Gerard, Productivity Levels in Transport, Storage and Communication: A New ICOP 1997 Data Set (July 2007)

GD-86 Frankema, Ewout, and Jutta Bolt, Measuring and Analysing Educational Inequality: The Distribution of Grade Enrolment Rates in Latin America and Sub-Saharan Africa (April 2006)

GD-87 Azeez Erumban, Abdul, Lifetimes of Machinery and Equipment. Evidence from Dutch Manufacturing (July 2006)

GD-88 Castaldi, Carolina and Sandro Sapio, The Properties of Sectoral Growth: Evidence from Four Large European Economies (October 2006)

GD-89 Inklaar, Robert, Marcel Timmer and Bart van Ark, Mind the Gap! International Comparisons of Productivity in Services and Goods Production (October 2006)

GD-90 Fremdling, Rainer, Herman de Jong and Marcel Timmer, Censuses compared. A New Benchmark for British and German Manufacturing 1935/1936 (April 2007)

GD-91 Akkermans, Dirk, Carolina Castaldi and Bart Los, Do 'Liberal Market Economies' Really Innovate More Radically than 'Coordinated Market Economies'? Hall & Soskice Reconsidered (March 2007)

GD-93 Frankema, Ewout and Daan Marks, Was It Really “Growth with Equity” under Soeharto? A Theil Analysis of Indonesian Income Inequality, 1961-2002 (July 2007)

GD-94a Fremdling, Rainer, (Re)Construction Site of German Historical National Accounts: Machine Building: A New Benchmark before World War I (July 2007)

GD-94b Fremdling, Rainer, (Re)Construction Site of German Historical National Accounts: German Industrial Employment 1925, 1933, 1936 and 1939: A New Benchmark for 1936 and a Note on Hoffmann's Tales (July 2007)

GD-95 Feenstra, Robert C., Alan Heston, Marcel P. Timmer and Haiyan Deng, Estimating Real Production and Expenditures Across Nations: A Proposal for Improving the Penn World Tables (July 2007)

GD-96 Erumban, Abdul A, Productivity and Unit Labor Cost in Indian Manufacturing A Comparative Perspective (October 2007)

GD-97 Wulfgramm, Melike, Solidarity as an Engine for Economic Change: The impact of Swedish and US political ideology on wage differentials and structural change (June 2007)

GD-98 Timmer, Marcel P. and Gaaitzen J. de Vries, A Cross-country Database For Sectoral Employment And Productivity in Asia and Latin America, 1950-2005 (August 2007)

GD-99 Wang, Lili and Adam Szirmai, Regional Capital Inputs in Chinese Industry and Manufacturing, 1978-2003 (April 2008)

GD-100 Inklaar, Robert and Michael Koetter, Financial dependence and industry growth in Europe: Better banks and higher productivity (April 2008)

GD-101 Broadberry, Stephen, Rainer Fremdling and Peter M. Solar, European Industry, 1700-1870 (April 2008)

GD-102 Basu, Susanto, Robert Inklaar and J. Christina Wang, The Value of Risk: Measuring the Service Output of U.S. Commercial Banks, (May 2008)

GD-103 Inklaar, Robert, The Sensitivity of Capital Services Measurement: Measure all assets and the cost of capital, (May 2008)

GD-104 Inklaar, Robert and Marcel P. Timmer, GGDC Productivity Level Database: International Comparisons of Output, Inputs and Productivity at the Industry Level (September 2008)