

The forestry and cellulose sector in the Province of Concepción, Chile: Production linkages between the Secano Interior and industry in Greater Concepción, or an enclave economy?

Gonzalo Falabella and Francisco Gatica

ABSTRACT

This article deals with the interaction between supply chains and territory, identifying two types of development: the “enclave” type of the rain-fed farming economy in the inland area known as the Secano Interior, and the “potential linkage” between this enclave and the greater metropolitan area of Concepción. The benefits of the forestry and cellulose supply chain, which is of global importance, are not spreading through its territory, which remains underdeveloped. Greater Concepción, the country’s second most important industrial conurbation, has not succeeded in establishing a positive connection with its hinterland via its economic networks or with the forestry and cellulose chain of the Secano Interior. This article is based on economic flow data from the 2008 input-output matrix, on surveys carried out as part of a National Fund for Regional Development project (FNDR, 2008) and on studies of Chile and its development types (Falabella, 2000 and 2002). It argues for a need to create a territorial political platform for economic development to facilitate the restoration of production linkages.

KEYWORDS

Economic development, regional development, forestry industry, pulp and paper industry, industrial development, industrial statistics, input-output analysis, Chile

JEL CLASSIFICATION

O18, O38, O43

AUTHORS

Gonzalo Falabella is an academic with the Faculty of Social Sciences, Department of Sociology, University of Chile. mancomun@vtr.net

Francisco Gatica is an academic with the Department of Economics and Finance, Faculty of Business Sciences, University of Bio-Bio. fgatica@ubiobio.cl

I

Introduction¹

The descriptive title of this article is the question from which the present investigation starts out. It discusses the difference between, on the one hand, the combined hegemonic capacity for joint development of the greater metropolitan area and industry of Concepción and the forestry and cellulose chain; or, conversely, the breaking of this link. The implication of the latter is enclave development in the forestry and cellulose industry, with all its consequences for the Secano Interior of the Bío-Bío Region, and a lack of positive linkages between this enclave and the industrial development of the conurbation. This is a central issue for regional development and, by analogy, that of the whole country.

Prior to 1973, the forestry and cellulose chain had not attained the higher economic level that would come later with the help of privatization, export orientation and production development (reforestation and forestry outsourcing without collective bargaining rights, among other things).² These public policies did not, however, bring about the kind of synergistic regional development that could nurture basic industry (coal, oil, steel and cellulose) and domestic consumption (textiles, metallurgy, glass and cement) and the exploitation of low-cost natural resources (forestry, fisheries and agriculture) in a manner combining State and private ownership.³

The upheaval after 1973 led in the territory to a shift away from a situation of linked development in a number of sectors to one of rapid growth in the forestry and cellulose chain, in the so-called productive restructuring process (Rojas, 1995), which drastically altered the region's economic geography.

The immediate prospect is for the development, successful as far as it goes, of the forestry and cellulose sectors. However, this leaves open the question as to whether what is taking place is development tied via positive production linkages to the greater metropolitan area, or rather the diagnosis must once again be of an "enclave" where the chain tends to outsource routine work locally or purchase low-complexity inputs, creating few positive spillovers for the surrounding area.

Regional actors are unable to "think regionally" (Rojas, 2002), which limits the scope for joint development. Why? Because of the shift from a developmentalist State and actors to one that is more concerned with the success of each chain, in a new liberal export-led model.

The failure in the process has been the inability of the greater metropolitan area to exploit opportunities to develop its many well-consolidated forward, backward and sideways linkages. This is especially so as regards the Hualpencillo-Talcahuano steel and metallurgy sector and the potential for the region's universities and State public policy to provide science and technology support, even though funding from the Production Development Corporation (CORFO) and the National Fund for Regional Development (FNDR)⁴ was brought under exclusive regional control, by contrast with the situation in the rest of the country. Examples are Innova Bío-Bío and the Regional Council for Science and Technology (CORECYT), which have served as models for the rest of the country (OECD, 2010).

Later studies have highlighted the expansion and "Chilenization" of the forestry and cellulose chain exporting chips and timber for building, but without the metallurgical production linkages of the Brazilian cellulose industry, although Bercovich and Katz (2003) state in their study that the Chilean chain is the next most dynamic in the Latin America region.

Why is Chile presented as being second only to Brazil in regional development, but far from having the continuous linkages of the Brazilian forestry sector?

This question and its analysis point to two factors influencing Chilean forestry development: (i) State encouragement for privatization and exporting, combined with an expanding global market, and (ii) the absence

□ The authors are grateful for the valuable comments of an anonymous *CEPAL Review* referee.

¹ The authors of this article are academics conducting research on National Fund for Scientific and Technological Development (FONDECYT) project No. 1130296, 2013-2016.

² Nacimiento has a world-class forestry complex, but is relatively underdeveloped. See Galdames, Menéndez and Yévenes (2001).

³ An interesting review of the different models of industrialization and a century of Chilean public policy can be found in Meller (1998). There is a type of urban and social development that is directly linked to the import substitution model. The paradigmatic case of "production hubs" is that of the Huachipato Steel Company and its network of interconnected firms. This structure changes significantly with the shift from an industrialization model to an export-centred one. In this context, the emergence of export fishery and forestry activities in the Bío-Bío Region entailed the destruction of import substitution firms, enmeshed as they were in the local economic fabric (Rojas, 1995).

⁴ See FNDR (2008).

in Chile, unlike Brazil, of encouragement for import substitution subsequent to the military coup. In addition, the binomial political system in operation since the dictatorship creates deadlock between the Government and the opposition in Congress, with the result that it has been possible to expand external trade liberalization under numerous free trade treaties, but governance has become more and more fragile.

In summary: an economy that has been almost entirely export-led, resulting in the destruction of import substitution industry and a failure to achieve more complex and varied development of a national forestry industry, and a “deadlocked” political system that has entrenched the current growth model.

The study by Bercovich and Katz (2003) gives preference to Brazil over Chile because of the absence in the latter of a cellulose industry with its own industrial base, something that was developed in Brazil. In Chile, the primary forestry chain was expanded with the development of a light wood construction industry (boards, panels, laminates, etc.) and a cellulose industry. But this is an imported industrial base rather than a locally developed one as in Brazil, and is furthermore serviced from abroad.

The contention of the present study, which goes beyond the scope of this report in terms of the data dealt with, is that between the principal chains of the greater metropolitan area and the forestry-cellulose-light wood manufacturing chain, notwithstanding the existence of well-developed universities and a regional government with resources of its own (Falabella, 2002), the situation is not so much one of joint development as one of parallel growth with few positive regional development partnerships between chains, government and universities.

The political authorities in the territory where the forestry sector is located have organized into the Association of Municipalities for Local Economic Development (AMDEL), with a membership of six communes. These are seeking to approach the region on a territorial basis, and need to link up with Greater Concepción, their immediate neighbour, to achieve their own development (Gatica, 2008). However, this requires a matching commitment from the regional government, the universities and the industrial conurbation of Greater Concepción and a willingness by the two leading firms in the forestry and cellulose sectors to move away from their enclave situation.

This article highlights the gap in the development required in a major industrial sector in Chile (exemplified by the case of the Bío-Bío Region) if it is to transcend its enclave development of natural resources. New processes based on information and communication technologies (ICTs), which are mainly concentrated in the Metropolitan Region, point up the lack of similar economic linkages.⁵ Otherwise, there have only been initial advances with export value added (Muñoz, 2002), something that has historical roots (Cardoso and Faletto, 1979; Fanjzylber, 1990) and is still widespread in Latin America (ECLAC, 2012; Ocampo, 2013).

⁵ Current hypothesis of the authors: FONDECYT project No. 1130296 on the still weak associated development of information and communication technology (ICT) sectors with the other chains in the Metropolitan Region, on the basis of preliminary data from 70 firms and the input-output matrix, particularly the total intermediate use quadrant.

II

Is the development of the Bío-Bío Region being led by Greater Concepción?

1. Exports

Overall, the Bío-Bío Region has a highly concentrated exporting structure, one in which innovation has focused on bringing increased efficiency to existing chains by achieving greater economies of scale, without there being any significant diversification of the export basket.

In 2010, the forestry sector accounted for 77% of the main products exported by the region's industry. Other products were not exported in significant volumes and only accounted for 23% of the total. This reflects a sectorally concentrated export structure, a situation that has remained structurally unchanged for the last 20 years.

Again, although the Bío-Bío Region has been losing competitiveness, as it accounts for just 7.2% of the country's gross domestic product (GDP) while the Metropolitan Region generates 43.6%, a number of diagnoses have confirmed the existence of several science and technology hubs in the region, which also has advanced human capital (CEUR, 2010). However, this knowledge has not shifted the region's natural resource-intensive production towards an economic structure with greater innovation and knowledge that is capable of stimulating higher growth and lowering the unemployment rate.

If consumption of logs is taken (see table 1), the forestry sector of the Bío-Bío Region accounts for 57.2% of the national total, with 76% of regional volume being generated by cellulose pulp (40%) and sawn timber (36%). When the percentages are compared with the 2004 figures, pulp turns out to have increased its share while sawn timber has undergone a substantial 16 percentage point drop. Thus, a "productive reorganization" has been taking place in the sector, with the production of cellulose, chips (deriving from pulp production and including high-quality native timber chips for making fine paper) and boards rising, while the shares of saw

and pulp logs for export, cases and posts and poles have been falling. The region's contribution to the country's production of cases and poles is smaller, being of the order of 18.8% and 33.6%, respectively.

Nonetheless, the forestry industry of the Bío-Bío Region increased its consumption by 1.3 million solid cubic metres between 2004 and 2010, which is evidence of its growth.

Meanwhile, export figures (see table 2) indicate that, taken all together, the forestry-cellulose-light wood industry sector still accounts for three quarters of the regional total, led by the cellulose sector (over 30%) since the 1990s. It is in this sector that Chile, after Brazil, is a Latin American leader, but the industrial component associated with it (machinery and equipment) is underdeveloped, even though it is the partner sector for the exports with the greatest potential for learning and technology diffusion (Gatica, 2010).

In summary, the forestry chain does not have strong production ties to Greater Concepción, even though its machines and tools make it a regionally important sector, and the most dynamic part of the chain, namely pulp and cellulose, uses technology that is wholly imported and serviced from abroad (Katz, Stumpo and Varela, 1999).

TABLE 1

Log consumption by location of industry, 2004-2010^a
(Solid cubic metres without bark)

	Bío-Bío Region 2004	Percentages	Bío-Bío Region 2010	Percentages	Whole country in 2010	Percentages	Region/country (percentages)
Pulp	5 649 869	30.6	7 857 973	39.7	12 759 465	36.9	61.6
Sawn timber	9 610 444	52.0	7 058 736	35.7	12 245 568	35.4	57.6
Boards	1 288 883	7.0	2 070 560	10.5	3 535 173	10.2	58.6
Chips ^b	1 585 436	8.6	2 669 226	13.5	5 656 021	16.4	47.2
Saw logs for export	63 061	0.3	1 894	0.0	2 760	0.0	68.6
Pulp logs for export	119 680	0.6	23 852	0.1	24 398	0.1	97.8
Cases ^c	68 674	0.4	19 800	0.1	105 600	0.3	18.8
Posts and poles ^d	86 739	0.5	77 579	0.4	230 630	0.7	33.6
Total Bío-Bío Region	18 472 786	100.0	19 779 620	100.0	34 559 616	100.0	57.2

Source: prepared by the authors on the basis of Central Bank of Chile, *Indicadores económicos y sociales regionales de Chile, 1980-2010*, Santiago, Chile, 2012.

^a Volumes of logs processed in the timber industry by region.

^b Pulpwood chips, including high-quality native timber chips for making fine paper.

^c Consumption by the case industry using logs exclusively for the production of cases (for winding machines, for example).

^d Consumption by manufacturers of poles and posts (impregnated and sulphated).

TABLE 2

Exports from the Bío-Bío Region, July 2011
(Values FOB in millions of dollars)

Product	July 2011	July 2010	Change (percentages)	July 2011 total (percentages)	
Cellulose	178.4	147.4	21.0	37.0	
Sawn timber	52.6	57.4	-8.3	11.1	
Plywood	32.4	31.4	6.8	6.8	
Fibreboard	29.6	20.4	44.8	6.2	
Woodchips	26.7	18.3	46.3	5.6	
Wood moulding profiles	16.4	18.2	-9.6	3.5	
Fishmeal	14.2	40.3	-64.9	3.0	
Roll paper	12.7	13.8	-7.9	2.7	
Frozen whole jack mackerel	8.0	4.0	101.9	1.7	
Raspberries, blackberries, mulberries	6.9	4.0	73.5	1.5	
Condensed milk	5.6	5.8	-2.3	1.2	
Polyethylene	5.3	0.0	-	1.1	
Tinned jack mackerel	5.0	3.1	61.0	1.1	
Petrol	4.8	0.0	-	1.0	
Wooden doors	4.6	2.7	60.8	1.0	
Subtotal	403.2	366.7	9.9	85.1	
Other (plastic, rubber, etc.)	70.5	57.4	22.9	14.9	
Total	473.6	424.1	11.7	100.0	
	China 73.7	United States 37.3	Japan 39.9	Netherlands 32.3	Italy 31.5

Source: National Institute of Statistics (INE), *Boletín Regional Exportaciones*, year 20, issue 201, July 2011.

2. The isolation of the Secano Interior and the policy response

The membership of the Association of Municipalities for Local Economic Development (AMDEL) (see box 1) currently consists of six municipalities in the Secano Interior, these being Santa Juana, San Rosendo, Hualqui, Florida, Yumbel and Cabrero. Its origins lie in a productive development product and predate the Bío-Bío Regional Development Strategy of 2000, which established nine planning territories as an FNDR prioritization methodology.

The heterogeneity of population growth can be contrasted by taking the demographic situation in 1992 and projections for 2020. Greater Concepción is clearly a gainer when it comes to population (see figure 1). In 1992, it had some 669,000 inhabitants, while projections for 2020 put the figure at about 872,000. The opposite applies in the Secano Interior (comprising the six municipalities of AMDEL), whose population was about 85,000 in 1992 and is projected at 105,000 for 2020.

The population pyramid for the Secano Interior shows a “regressive structure”, with heavy migration of the young (20- to 45-year-olds) and a contraction in the number of children and young people aged under 15, in accordance with the national trend. Population

BOX 1

The emergence of the Association of Municipalities for Local Economic Development (AMDEL)

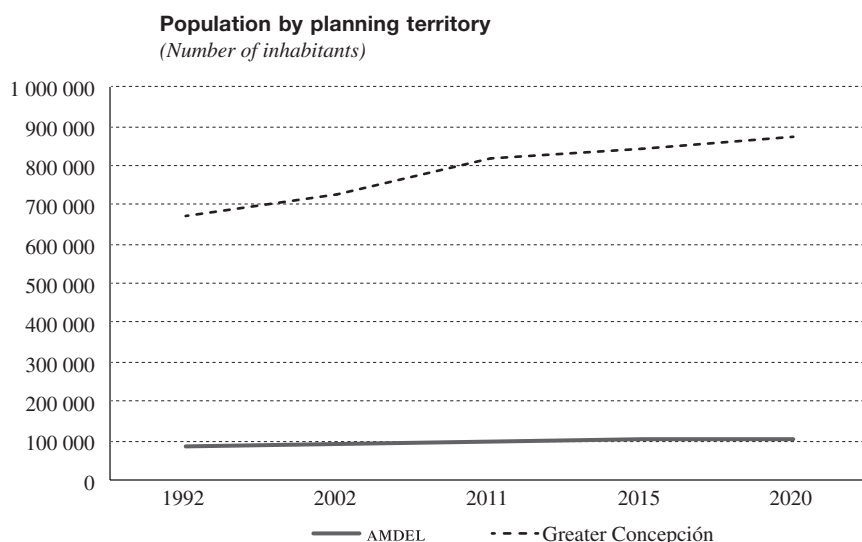
In 1995, the Technical Cooperation Service (SERCOTEC) of the VIII Region implemented the Programme of Support for Municipal Management of Productive Development, focusing on capacity-building for territorial administrations (municipalities) to stimulate local economic activity by generating the right local conditions.

As a result of the initiative, in July 1998 the Municipal Support Project for Local Economic Development (PROFO Municipios) was created with the support of the Office for the Under-Secretary for Regional and Administrative Development (SUBDERE), comprising the municipalities of Coelemu, Laja, Penco, Tomé and Yumbel.

A new PROFO Municipios was set up in 2001, this time with a membership of eight municipalities: Cabrero, Florida, Hualqui, Nacimiento, Penco, San Rosendo, Santa Juana and Yumbel. Following internal restructuring, in 2006 Penco and Nacimiento left the Association of Municipalities for Local Economic Development (AMDEL), leaving it with the membership it has today.

Source: prepared by the authors on the basis of [online] www.amdel.cl.

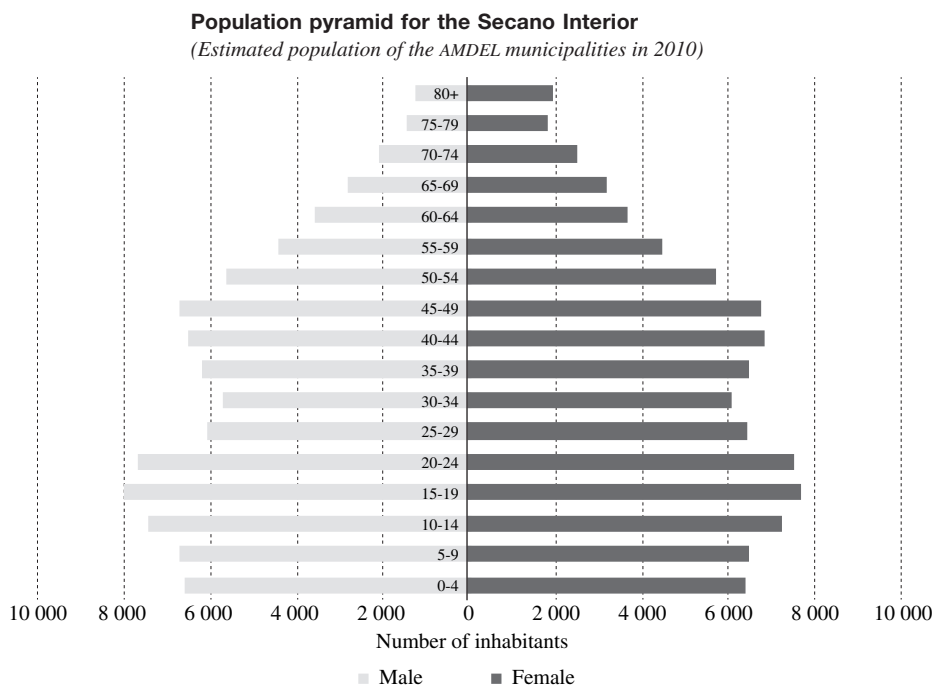
FIGURE 1



Source: prepared by the authors on the basis of data from the National Institute of Statistics (INE) and F. Gatica and A. Yévenes, “Planificación económica territorial y empleo: Análisis de las relaciones existentes entre rubros económicos priorizados en el Programa de Desarrollo Territorial y las potencialidades en la generación de empleo en la Región del Bío-Bío”, *Taller de Empleo Regional*, No. 22, Concepción, University of Bio-Bio, 2005.

AMDEL: Association of Municipalities for Local Economic Development.

FIGURE 2



Source: prepared by the authors on the basis of population pyramids, data from the National Institute of Statistics (INE) and F. Gatica and A. Yévenes, “Planificación económica territorial y empleo: Análisis de las relaciones existentes entre rubros económicos priorizados en el Programa de Desarrollo Territorial y las potencialidades en la generación de empleo en la Región del Bío-Bío”, *Taller de Empleo Regional*, No. 22, Concepción, University of Bio-Bio, 2005.

AMDEL: Association of Municipalities for Local Economic Development.

growth is lower, and there is a ratio of one inhabitant in the Secano Interior to every nine in Greater Concepción. This has been an unbalancing factor when it comes to prioritizing intraregional public investment projects.

Thus, the data support the diagnosis that the Pencopolitan⁶ area or Greater Concepción is better positioned. Its autonomous income (before State subsidies) is 41% higher than the regional average, and it has a lower proportion of indigent people. In the communes of the Secano Interior, dominated by forestry, autonomous income is a third lower than in Greater Concepción, and the proportion of indigent people is far above the regional average, as shown by different reports of the Territorial Information Management Unit (UGIT, n/d).

⁶ This is referred to as the Pencopolitan area because the city originally founded in what is now known as Concepción was built in the city now known as Penco, on the shore of the Pacific Ocean, and was moved to the current site following the 1570 tsunami. Nevertheless, the adjective Pencopolitan has subsisted for the initial site.

III

Methodology

The aim is to identify economic networks around the forestry sector and, in parallel with this, visualize economic flows between Greater Concepción and the Secano Interior.

1. First item: the input-output matrix around the forestry sector

To identify the degree of productive connection around the forestry sector with all other supply chains, use is made of the input-output matrix constructed by the Central Bank of Chile (2008), and particularly the national intermediate use quadrant (user prices).

It is important to note that the national matrix is being used and there are differences in purchasing profiles that may vary from region to region. There is currently no up-to-date regionalized matrix available.⁷

⁷ What is currently available is a regional input-output matrix that is a projection employing the RAS method, allowing a rough picture to be formed of a region's trade flows from the national matrix generated in 1996 (Pino and Parra, 2011). Here, innovation processes may explain the emergence of new product and activity lines. In summary, although the matrix is not regionalized, its value lies in it being an up-to-date snapshot of an activity concentrated in regions VII, VIII and IX of the country.

Given this asymmetry, it can be deduced that the wealth of the conurbation has not stimulated the development of the Secano Interior, where the forestry-cellulose export chain is concentrated. The connections are not strong enough, and the result has been "dual development" in the territory (forestry sector/greater metropolitan area).

This "dual development" is even found within AMDEL, and more specifically in the commune of Nacimiento, where the Santa Fe forestry industrial complex of the Compañía Manufacturera de Papeles y Cartones (CMPC) operates. This commune had unemployment rates of 15.3% in 2000, 11.5% in 2003, 11.6% in 2006 and 15.2% in 2009, according to the National Socioeconomic Survey (CASEN). This is indicative "of a depressed labour market and the impact of the global crisis" (Municipality of Nacimiento, 2012), particularly the negative effects on production linkages and employment in the cellulose industry concentrated there (Galdames, Menéndez and Yévenes, 2001).

As mentioned, however, the forestry sector of the Bío-Bío Region accounts for 57% of the country's log consumption. There should therefore be no significant difference between the national input-output matrix and the regional one (to be constructed), except for some diversion of purchases from the regional forestry industry to specialized suppliers in the country's capital.

The following are analysed:

- The percentage of purchases made by each forestry subsector. The aim is to identify which subsector has the highest level of backward linkages, and this is done on the basis of purchase volumes, irrespective of linkage type in terms of value added.
- The distribution of forestry sector purchases and the level of sales specialization. The main inputs sold to the forestry sector are identified, together with the percentage of sales wholly dedicated to meeting the needs of this sector. This approach makes it possible to deduce what type of relationship there is with the surrounding economy.
- The distribution of purchases by activity. The aim, essentially, is to identify the "main backward linkage" by forestry subsector. This makes it possible to visualize the production fabric

developed around each subsector, identifying the relationship between value added and the type of purchase made.

2. Second item: economic flows between Greater Concepción and the Secano Interior

With FNDP financing, origin and destination surveys were conducted among agricultural units, families, micro, small and medium-sized enterprises, and different landscape units⁸ within the AMDEL communes⁹ to identify local economic circuits. The findings are used to analyse the main forward linkages for each landscape unit. It should be noted that this analysis does not follow a traditional sectoral logic but rather a territorial approach, identifying the geographical patterns of particular product networks.

⁸ A “landscape unit” means everything presenting itself to view as a homogeneous whole. It is basically a subcommunal division, instrumental for the purposes of analysis, that is used to identify areas which for geographical, historical, productive and identity reasons, among others, have a homogeneous internal unity setting them apart from others.

⁹ See Gatica (2008).

The analysis is carried out on two levels:

- A graphic representation is generated from the main economic flows of the Secano Interior, on the basis of which three types of networks are identified: (i) the tree type, where all economic flows go to the regional capital; (ii) the axis type, structured around roads; (iii) the star type, where an activity in the territory is the focus for economic flows. Identifying these patterns serves as a guide for orienting public policies in the territory.
- For each commune, the main product purchased by Greater Concepción is identified. The main flows of labour, forestry products, agricultural products and tourism services are identified. A line of development and a public policy to pursue it is suggested for each case.

This is a preliminary approach, since the full information needed to gauge the whole relationship between supply chains and territory is not available. Consequently, the final overlay between the two dimensions will be analytical and oriented towards generating public policies to restore linkages in production fabrics.

IV

The field study

1. Input-output ratios around the forestry chain

Reviewing the 2008 input-output matrix (see table 3) for what can be classified as forestry sectors shows that cellulose production is the activity employing the largest quantity of Chilean-sourced inputs, accounting for 29% of purchases, mainly of energy. At a second level of importance are wood planing and sawmills, which account for 20% of purchases, mainly of unprocessed wood. At a third level are silviculture, with 17% of purchases, and the manufacture of wood products, which takes 15% of Chilean-sourced inputs; in this last case, 28.5% of purchases are by-products from the chain itself.

The demand for inputs from sectors with greater value added is sharply lower, and this is directly associated with the volume of activity. Thus, paper and cardboard packaging, other paper items and furniture each account for 6% of Chilean-sourced purchases. For this last activity, the main purchases are of general services and by-products from the chain.

TABLE 3

Purchases by each subsector (Percentages of the total)

Activity	Share
Silviculture and timber extraction	17
Wood sawing and planing	20
Manufacture of wood products	16
Manufacture of cellulose	29
Manufacture of paper and cardboard packaging	6
Manufacture of other paper and cardboard items	6
Manufacture of furniture	6
Total intrasectoral purchases	100
Sectoral purchases as a share of all purchases of products involved in the chain	5.1

Source: prepared by the authors on the basis of Central Bank of Chile, “Matriz de insumo-producto de 2008” [online] www.bcentral.cl.

Note: prepared from the national intermediate use quadrant (user prices).

In conclusion, there is a disparity in the demand for Chilean-sourced inputs between industries producing industrial commodities and those with a higher level of differentiation, and this is connected to the volume of activity, affecting the linkages forged between the sector concerned and the rest of the local economy.

Lastly, forestry sector purchases nationwide represent 5.1% of the total. There is a flow of inputs within the vertically integrated chain that is not valued. These intra-chain transactions are particularly strong in forestry complexes, where firms try to reduce operating risks by internalizing processes from the forest to the final point of sale.

The most important inputs are natural resources, which account for 30.9% of the sector's purchases (see table 4). These inputs are quite highly dedicated or specialized, with 68.3% of sales being to the forestry industry. Ranking next behind these are intra-chain by-products or transactions, with 16.3% of sales

going to the forestry sector and a lesser degree of specialization (33.5%).

In summary, natural resource and intra-chain transactions account for 47.2% of forestry sector purchases. This is also a complexity indicator, and what it reveals is a type of activity that tends to create production networks of low complexity around it.

This diagnosis is consistent with the concentration of activity in two major business groups with a high degree of vertical integration, Celulosa Arauco y Constitución (CELCO) and Compañía Manufacturera de Papeles y Cartones (CMPC). Because the operations of these two groups take place essentially in the Bío-Bío Region, it is appropriate to use the national input-output matrix to deduce the main linkages at the regional level. The forestry industry in the VII, IX and X regions follows the same pattern, with homogeneity being more in evidence than any likelihood that an emerging activity might appear.

TABLE 4

Distribution of forestry sector purchases and degree of sales specialization
(Percentages)

Main products sold to the forestry industry	Forestry sector purchases	Specialization (sales to the forestry industry as a share of the economy-wide total)
Primary inputs: conifers, eucalyptus, other silvicultural products	30.9	68.3
Intra-chain by-products or transactions: sawn timber, chipboard, cellulose, packaging	16.3	33.5
Energy: petrol, gas, electricity	14.7	5.5
Chemicals: pesticides, plastics, other chemicals	5.5	9.6
Iron and steel products and installation of machinery and equipment	3.9	5.5
Cargo transport, railways, ports and storage	10.7	8.2
General services: financial, insurance, real estate, rental, information technology, legal and accountancy, engineering, other	14.8	2.7
Other inputs, goods and services	3.2	0.4
Total forestry chain inputs	100.0	5.1

Source: prepared by the authors on the basis of Central Bank of Chile, "Matriz de insumo-producto de 2008" [online] www.bcentral.cl.

Note: prepared on the basis of the national intermediate use quadrant (user prices).

At a second level of importance are energy, which accounts for 14.7% of inputs, and general services, representing 14.8%. A large group can be identified here: finance, insurance, real estate, rental, information technology, legal, accounting and engineering. The degree of specialization in the forestry industry is relatively low for these products, ranging from 5.5% in the case of energy to 2.7% in that of services.

Lastly, there are inputs whose importance for the chain is low, including chemicals, iron and steel, and

other products, whose sales shares are 5.0%, 3.9% and 3.2%, respectively.

A low degree of sales specialization in a specific sector limits the scope for generating interactive learning processes by shaping the development of the production cluster on the basis of a main or critical chain. There is thus a need to investigate the subclassifications of the matrix to a higher level of detail and identify the degree of specialization, as this information does not exist at present.

Table 5 shows the main purchases for each activity within the forestry chain. It is interesting for the analysis to identify the main backward link. Broadly, the following are identified:

- **Silviculture:** 82.6% of purchases are primary inputs such as conifers and eucalyptus, and this makes it the activity with the highest concentration of inputs. This is the production situation of almost all the communes analysed in this study.
- **Sawmills:** the main backward linkage is to primary inputs (46.3%). Purchases are more diverse, however, and include in particular intra-chain by-products (19.1%), transport services (14.3%) and general services (12.8%).
- **Manufacture of wood products:** the main backward linkages are to by-products in the same chain (28.5%), followed by general services, which account for 22.7% of purchases.
- **Cellulose manufacturing:** a change can be seen here, with the main backward linkages being to energy first (32.9%) and the primary input second (20%). This production activity has higher levels of backward vertical integration, with production

being highly concentrated in two large business groups, CELCO and CMPC.

- **Manufacture of paper and cardboard packaging:** here once again there is a concentrated structure, with 49.6% of purchases being accounted for by the main backward linkage, to chain by-products, followed a long way behind by general services, with 20.2% of purchases.
- **Manufacture of other paper products:** this is an “atypical” activity whose main purchases are of general services. This activity as a whole accounts for just 6% of the sector’s total purchases.
- **Furniture manufacturing:** this accounts for a small share (6%) of total transactions and its main backward linkage is to general services, which account for 26.4% of purchases. Its higher value added means that the other inputs, goods and services item accounts for 16.1% of purchases, making it an outlier relative to the other activities.

From these preliminary data, it can be seen that the siting and development of the forestry chain do not present linkages. Three features determine the development of the chain-territory nexus in this case.

TABLE 5

Distribution of purchases by activity
(Percentages)

	Silviculture and timber extraction	Wood sawing and planing	Manufacture of wood products	Manufacture of cellulose	Manufacture of paper and cardboard packaging	Manufacture of other paper and cardboard items	Manufacture of furniture
Primary inputs: conifers, eucalyptus, other silvicultural products	82.6	46.3	12.8	20.0	0.0	0.0	1.3
Intra-chain by-products or transactions: sawn timber, chipboard, cellulose, packaging	0.3	19.1	28.5	9.4	49.6	16.2	20.3
Energy: petrol, gas, electricity	5.0	4.8	10.7	32.9	6.6	16.7	3.3
Chemicals: pesticides, plastics, other chemicals	3.8	0.3	6.9	6.8	10.0	6.0	12.2
Iron and steel products and installation of machinery and equipment	3.3	0.5	2.6	4.3	1.7	11.2	12.3
Cargo transport, railways, ports and storage		14.3	14.2	13.9	7.3	10.1	7.9
General services: financial, insurance, real estate, rental, information technology, legal and accountancy, engineering, other	2.9	12.8	22.7	10.6	20.2	36.0	26.4
Other inputs, goods and services	2.1	2.0	1.7	2.0	4.7	3.9	16.1
Total forestry chain inputs	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: prepared by the authors on the basis of Central Bank of Chile, “Matriz de insumo-producto de 2008” [online] www.bcentral.cl.

Note: prepared on the basis of the national intermediate use quadrant (user prices). The main backward linkages (over 20%) are shaded in grey.

- Concentration in two companies and reduced production variety. One factor shaping development prospects is the high concentration of land ownership in two large companies (over 2 million hectares). This is a hindrance to diversification (the furniture industry, for example). The current incentive framework encourages concentric backward development of the value chain, permitting greater control of forest ownership. This yields economies of scale with low operating risks. The chain has extended into the energy sector (Colbún) and the forestry sector abroad, rather than into industrial linkages with greater demand for locally developed technology.
- The remoteness of dialogue forums. The high ownership concentration of the forestry business makes territorial actors more remote from corporate management located in the national capital. This makes it less likely that public-private linkages will be generated at the territorial level.
- Asymmetries in strategic positions, determined by familiarity with one part of the value chain or another. Each inhabitant's perception is shaped by everyday familiarity with a particular "part" or link in the chain. The consequence is that there is no systemic overview when policies for the sector in the territory come to be implemented. Interventions usually ignore the communes' differing roles in a higher accumulation circuit, which is what makes it hard to connect global territories and territorial negotiating dynamics.

For a single territory and activity, then, four types of development can be identified: (i) there are "enclaves" with a very low capacity for diffusion in the territory; (ii) processes of "delinkage" can be identified in the old agricultural networks as a result of forestry expansion (Guerrero, 2012); (iii) there has been "dual development" dividing large businesses belonging to the CMPC and CELCO groups from small independent sawmills; (iv) there is scope for developing a "potential centre" that uses innovation to generate new networks connecting these enclaves with the local production fabric.

2. The gravitational pull of Greater Concepción on economic networks in the Secano Interior of the Bío-Bío Region

(a) *The gravitational pull on the Secano Interior*

Greater Concepción is a structured urban system that has a clear division of labour within it (Hernández, 1982) as a result of its history, which has left its mark on

the forces structuring its development.¹⁰ Two processes stand out in recent decades:

- Productive restructuring, in the terms set out in the first part of this study, which meant that the same space contained cities with so-called "emerging" (export-oriented) industries and others containing so-called "declining" industries, oriented mainly towards domestic consumption (Rojas, 1995). It should be recalled that the conurbation became home to production hubs of national importance. Specifically, the facilities of the Petrox petrochemical complex and the Huachipato steel company are sited in Talcahuano-Hualpén. These industries generated a network of suppliers in the metallurgy and industrial maintenance sector, and urban developments were implemented for workers' housing and social services (sports clubs and so on). The 1980s were a time of "easy exporting" (based on a weak exchange rate and low-cost natural resources) and in the 1990s the export model was intensified by the signing of numerous free trade agreements. Thus, the original diagnosis of the 1970s (Hernández, 1982) became entrenched in the conurbation, with some communes now having unemployment rates well in excess of the national average, particularly Coronel with unemployment of 10.4%, Lota with 9.8% and Talcahuano with 8.9% in the three-month period from May to July 2011 (INE, 2011b). The national unemployment rate is 7.5%,¹¹ and the communes named have had persistent structural unemployment for almost two decades.
- There has been a change in economic specializations, with a restructuring of the role played by towns within the greater metropolitan area: (i) Penco, Coronel and Lota have been changing from industrial communes with import substitution factories into "dormitory towns"; (ii) Concepción remains the decision-making centre; (iii) San Pedro de la Paz, although a new commune, has been developing a mixed role as a dormitory town and services platform.

¹⁰ Historically, the construction of the urban system has had some elements of the evolutionary approach (see Fischer, 2009), with today's systems being the outcome of a combination between variety and selection of the best routine generated in the course of history. A biological approach to the territorial structure provides a way of understanding reconstruction processes, the setting of boundaries or borders, and network analysis, among other things.

¹¹ See INE (2011b).

Nonetheless, the greater metropolitan area of Concepción, which runs from Lota in the south to Tomé on the northern coastline, is a relevant unit of analysis that calls for a different way of understanding the public policies acting in this territory. A metropolitan government whose sphere exceeds that of an individual commune without encompassing a whole region has become increasingly necessary, with institutions at this level having a key role to play in areas such as the transport network, territorial planning and the health and education systems.

The goal at this point is to identify how the gravitational pull exerted by Greater Concepción is attracting economic flows from the communes, especially the forestry communes of the Secano Interior grouped into AMDEL, and how the incorporation of these may be relevant to the design of public policies in the territory.

Ultimately, the gravitational pull of Greater Concepción will also shape the territory of AMDEL and affect economic flows, generating positive and negative externalities in processes such as the changing viability of certain businesses, perhaps because of proximity to markets; increased pressure on some factors of production such as land or natural resources; the forced relocation of some firms because of location costs;¹² the growing phenomenon of “second homes” and the floating population that results; and an increased tendency towards migration from countryside to city, among other processes.

(b) *Creating economic networks to spread development*¹³

The study of local economic circuits for the Secano Interior used family, farm, micro and small enterprise and origin-destination surveys to identify the main flows. The study was carried out at the level of intracommunal spaces (landscape units) and the questions concerned annual flows with some commercial value.

Broadly, charting the main economic flows of the Secano Interior (AMDEL) reveals the influence of Greater Concepción on sales generated in this territory.

The zone experiencing the greatest gravitational pull from the conurbation is identified. This covers a large part of the communes of Santa Juana and Hualqui, with the commune of Florida also partially affected.

Greater geographical proximity to Greater Concepción generates externalities associated with the opening of new markets and labour mobility.

It is possible to find communes that are not so directly influenced by Greater Concepción, such as Yumbel, San Rosendo and Cabrero. In these cases, there are economic networks centred on the conurbation, but the major flows go in a different direction.

Greater abstraction of the flows linking the two territories allows three major network types to be identified:

(i) Tree type networks: those which converge on Greater Concepción and where, in spatial terms, the links in the chain may be located at different geographical points of the territory with a value adding logic. An example is the flow of honey that may be produced in the rural part of some commune in the Secano Interior but packaged in the communal capital and ultimately sold in Greater Concepción.

Here, public policy can operate by transferring technology and organization to encourage the forging of chains in the territory with their different links, so that products reach the conurbation with greater value added. The wealth of a territory can always be spread by improving the competitiveness of local production, not merely by redirecting sales to other sectors, something that is known as “trickle-down theory”.

(ii) Star type networks: with these, economic flows in the territory have a clear centre, without intermediate nodes. This is the case with the economic networks that have been arising around urban Cabrero. In their territorial dimension they can be likened to the example of the company town.

Such hubs must be used to develop “production pyramids” (Scott, 1998), where new production fabrics are generated from the parent business (such as the forestry complex) with firms that supply the main sector, so that valuable interactive learning processes arise. In addition, though, selling relationships can be established with other production sectors, giving rise to a sector that is “pivotal” in development.

(iii) Axis type networks: these arise or are structured around roads, acting as a force linking together the agricultural chains within the Secano Interior. Thus, public-sector initiatives can help provide outlets for products by siting sales points that have an identity and can attract passing trade.

However, labour also travels along these axes every day, especially workers from the Florida, Hualqui and Santa Juana area. The territory takes on a role

¹² These are cost-intensive businesses that begin to have increasing difficulty expanding their plants as they grow, which affects their economies of scale. This is compounded by increased pressure (because of greater traffic and pollution) to relocate businesses to certain outlying areas (Méndez, 1999).

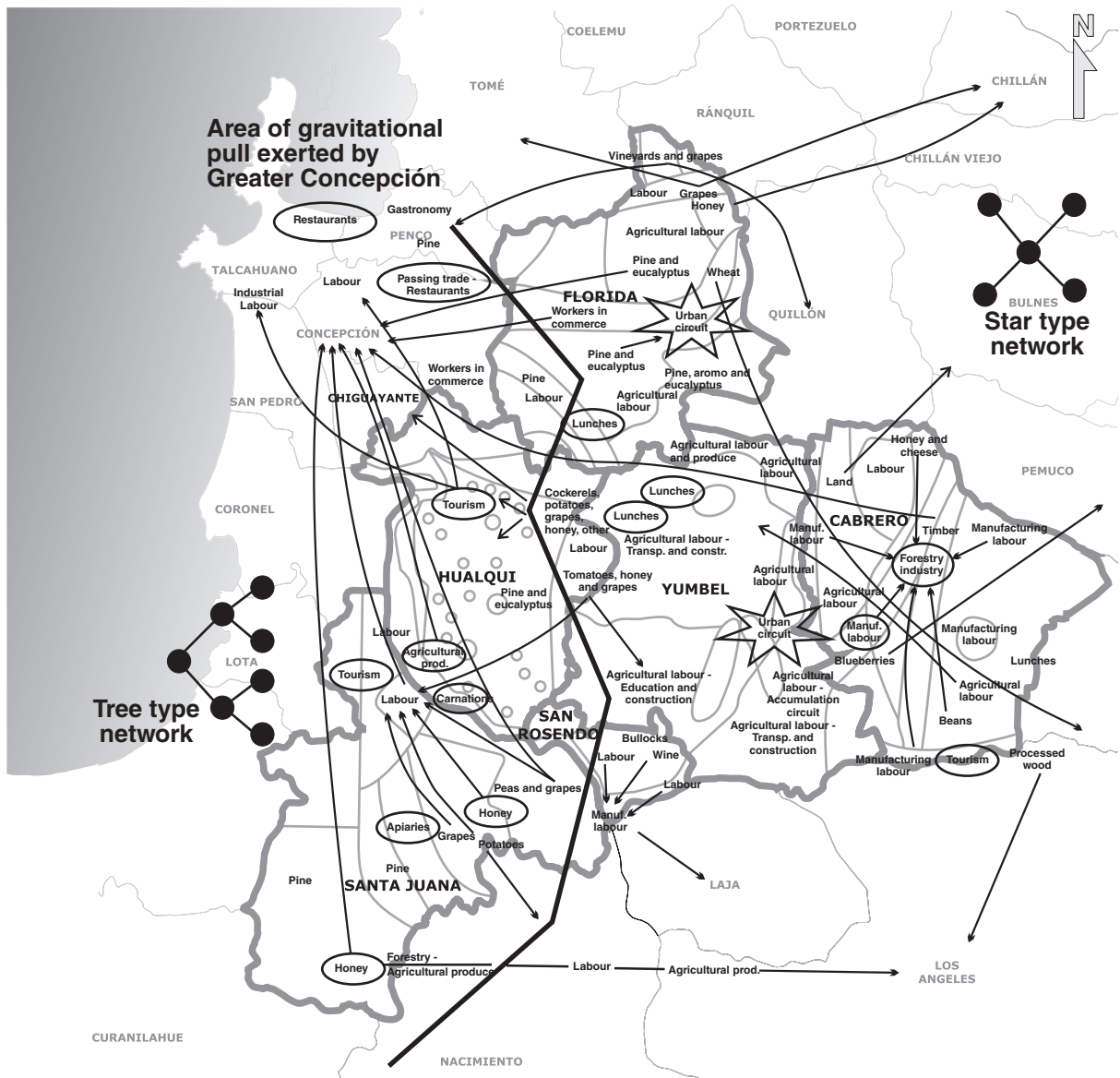
¹³ An extract from the findings of FNDR (2008) is being worked with here.

as a supplier of (low-skilled) labour for Greater Concepción. These are workers who continue to live in the communes of the Secano Interior but do some of their family shopping at local retail outlets. Accordingly, a public policy initiative is to use targeted instruments to enable this local workforce to increase its working skills so that rising wages stimulate local demand.

A more precise picture of the networks in the two territories is provided by table 6. The first thing that comes out is the importance of the flow of labour. Almost all the communes of the Secano Interior are suppliers of labour to Greater Concepción. The great variety of sectors also emerges clearly, with workers employed variously on personal services, commercial activity, transport and, lastly, manufacturing.

MAP 1

Principal economic networks at the landscape unit level
(Territories forming part of AMDEL)



Source: prepared by the authors from the findings of the National Fund for Regional Development (FNDR) project “Estudio Básico de los Circuitos Económicos Locales BIP 20179020-0”, Regional Government of the Bío-Bío Region.

AMDEL: Association of Municipalities for Local Economic Development.

Tree, star and axis type networks provide orientation for public policies in the territory. They are guides enabling the supply of products or services to be better connected with the interior of the AMDEL territory and with demand from Greater Concepción in categories such as labour, forestry, agriculture and tourism. This is

a more “micro” view of the economy, allowing the links in production fabrics to be restored in order to provide a corrective to “dual development”.

In conclusion, the communes of the Secano Interior are not just suppliers of agricultural produce to Greater Concepción but also provide labour, despite the distances

TABLE 6

Principal economic flows from the AMDEL communes to Greater Concepción

Product	Commune of origin	Main flow	Line of development from a public policy perspective
Labour	Florida	Workers in commerce	Improvements to AMDEL local circuits with a view to enhancing the employment skills and incomes of local workers who travel to work in Greater Concepción, activating local purchases.
	Hualqui	Workers in commerce	
	Hualqui	Workers providing personal services (domestic workers and cleaning services)	
	Santa Juana	Workers providing personal services	
	San Rosendo	Transport workers	
Forestry	Yumbel	Transport workers	Need for Greater Concepción to be an innovation hub in the forestry chain. Coexistence with forest-friendly activities. Cabrero is currently becoming an industrial hub.
	Florida	Workers providing personal and commercial services	
	Hualqui	Manufacturing workers	
Agricultural produce	Florida	Monterey pine and eucalyptus	Linkage of agricultural chains so that products reach Greater Concepción with greater value added. Exploitation of “passing trade” around roads to forge agricultural chains.
	Hualqui	Monterey pine and eucalyptus	
	Cabrero	Monterey pine, eucalyptus and processed wood (including dried and treated)	
	Santa Juana	Agricultural produce (peas, grapes, potatoes and honey)	
	San Rosendo	Agricultural produce (quince, plum, peach)	
Tourism	Florida	Agricultural produce (white grapes)	Organization and improvement of local businesses. Ability to generate competitive tourism circuits.
	Hualqui	Agricultural produce (red and white grapes, honey, hens, carnations)	
	Yumbel	Agricultural produce (red wine)	
Tourism	Hualqui	Tourist activities (swimming pools)	
	Santa Juana	Tourist activities (camping on the River Lía)	

Source: prepared by the authors from the findings of the National Fund for Regional Development (FNDR) project “Estudio Básico de los Circuitos Económicos Locales BIP 20179020-0”, Regional Government of the Bío-Bío Region.

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between the communal capitals and the regional capital (a one or two hour journey on public transport).

A second type of economic flow is associated with the forestry chain in its silvicultural and manufacturing phases. Monterey pine and eucalyptus currently move from Hualqui and Florida to Greater Concepción.

More highly processed production takes place in Cabrero, with remanufacturing that produces boards, chipboard, veneer and doors, among other things. Most in evidence is the sale of treated wood to Greater Concepción for building purposes. Much of the output of the Cabrero forestry complex is exported.

There is obviously a need for an active policy to link the forestry chain with the territory. Inland in the Secano Interior, perceptions of the forestry chain depend on the

type of activity specifically located in the commune. The perceptions of inhabitants in areas where forestry plant is installed are different from the perceptions of those in areas where only silvicultural activity goes on (forestry and trucking). Consequently, it is vital to link up the forestry chain in all its heterogeneity with the different territories.

One key to the development of the Secano Interior is for Greater Concepción to exercise a competitive leadership role within a possible forestry cluster. The priority should be to create a cellulose industry with a Chilean industrial base or a joint venture with foreign capital. At present, this industry depends wholly on imports and servicing from abroad. Paradoxically, the initial development of production capacities in Nacimiento fell off over time as

inputs and spare parts were imported for cellulose plants (Galdames, Menéndez and Yévenes, 2001).

In the case of agricultural production, products and origins show a high level of dispersion; the exception is Cabrero, where there are no major agricultural flows going to Greater Concepción. The kind of products usually identified are white grapes, red grapes, fruit, honey and carnations, among others. Their importance lies in the fact that they feed part of the population of the conurbation (poorer inhabitants who do not buy in supermarkets but at informal markets), but they are also a vital component of family incomes, especially in the traditional agricultural zone where soil is depleted and technology use lags greatly.

In short, there is scope for technology transfer in the Secano Interior, but even more important is the ability to organize the supply chain centred on Greater Concepción.

Lastly, there is the tourism and recreational activity around Greater Concepción, where the Secano Interior receives visitors. The main focus here is Hualqui, where there are swimming pools and various campsites that actually operate as a development project. There is also the commune of Santa Juana, with camping facilities along the Lía river and swimming pools in the vicinity of the communal capital. Public policy should be aimed at organizing local businesses and improving quality standards, identifying different tourism circuits connected with operators and institutional customers in Greater Concepción, examples being older adults, corporate welfare services and social welfare funds (*cajas de compensación*), among others.

3. A necessary “feedback loop”¹⁴ for territorial economic development

The Secano Interior can develop as and when Greater Concepción, and specifically the city at its heart, becomes a competitive, innovative and sustainable participant in global economic flows (and the city is an attractive location for more complex and inclusive investments), linking the forestry-cellulose-light wood manufacturing chain with the industrial machinery manufacturing industry, which favours accumulation circuits in the conurbation.

¹⁴ The concept of “feedback” is understood as a “closed cause-effect loop”. The idea comes from systems thinking where “all parts of a system are connected directly or indirectly so that changing a part the effect will spread to all others, which experience a change and in turn end up affecting the original part”. Thus, the influence returns modified to the original part, which generates feedback (see O’Connor and McDermott, 1997).

If this is achieved, the greater wealth of the provincial capital will spread to the territory of the Secano Interior via the different economic networks (of the tree, axis and star type), most of which rely on transactions involving agricultural produce, tourism, flows of labour or just passing vehicle trade.

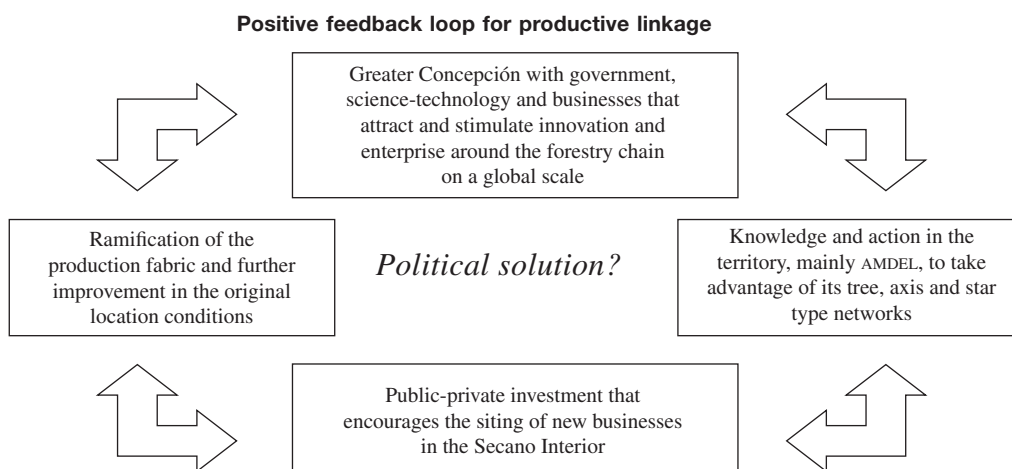
Thus, the spread of wealth will not just be driven by the existence of economic networks involving the communes of the Secano Interior, but will also be the result of an improvement in the technological, productive and organizational capabilities that enable this territory to connect virtuously with the conurbation.

There are two bottlenecks here that will have to be dealt with to even out capabilities and generate networks that can spread development to the territorial level:

- The marked intraregional centralization of public-sector action. Living in a conurbation means that policymakers have a blind spot when it comes to prioritizing projects, something that is accounted for by different electoral pressures (number of votes), lack of confidence in the capabilities of territorial teams, the presence of interest groups and the absence of any clear social oversight of investment “decision-makers and implementers”, among other problems (Lahera, 2008).
- The distance between managers of firms in the territory and the different municipal administrators and local social actors. This is not just a geographical factor but also involves divides in technological know-how and development logics, something that tends to make the Bío-Bío Region (where production plants are located) and its surrounding area remote from the central economic direction of the national capital.

If these “bottlenecks” in public- and private-sector intraregional centralism can be dealt with, there will be a virtuous and more competitive relationship with the conurbation, resulting in the siting of new firms in the Secano Interior on the basis of the tree, axis and star type networks arising from this and a productive ramification based on new products of growing complexity generated by different innovation processes (see diagram 1). This could be accompanied by encouragement from the regional government for the establishment of new businesses in the conurbation and a return by the universities to their old regional development activity. This process is a form of positive “feedback loop” requiring a systemic vision of development (O’Connor and McDermott, 1997), with focused but strategic public policy initiatives that can have a “leverage effect” which positively triggers linked development.

DIAGRAM 1



Source: prepared by the authors.

AMDEL: Association of Municipalities for Local Economic Development.

V

Conclusion: delinking and politics

In two territorial studies, Falabella (2000 and 2002) proposes a regional definition centring on the role of the Concepción-Talcahuano intercommune and its extension between Lota and Tomé as the axis of a “potential linkage” in the region. This highlights the gap discussed in this paper, but also provides the lineaments of a potential that likewise concerns it. Development is potential and as yet unachieved because of the abandonment of a pro-industry policy in Chile and the existence of three strong leading actors operating “in parallel” but as yet unconnectedly: (i) the country’s most autonomous regional government, (ii) robust exporting chains (with the forestry chain undoubtedly foremost) and (iii) a system of large regional universities that are considerable institutions but unconnected with one another (OECD/World Bank, 2010). The study emphasizes the regional industrial linkage gap as a possible manifestation of a national problem.

The contention of this study is that by developing the organization of economic civil society (on the basis of AMDEL), a start can be made on dealing with the lack of territorial linkages with Greater Concepción. This requires a greater political contribution (as necessary as political reform of the binomial system), participation and decentralization to bring the two leading business

groups into the mainstream of the country’s overall development; forestry-cellulose development in this case, and development of agroindustry, mining or salmon farming in others.

This study has identified the main flows connecting Greater Concepción with the territory of the Secano Interior. Consistently with this, public policies need to be designed to narrow the gaps between the two territories. The theoretical and empirical arguments put forward in this study clearly establish that market forces by themselves, with a State that implements orthodox neoliberal policies, result in a widening of territorial differences. Even the discretionary decision by the Chilean State to use Decree Law 701 to shore up a forestry sector made up principally of two large conglomerates exacerbated the disconnection from the local economic fabric and generated negative externalities which hindered the development of alternative production activities (one example being the rising prices of production factors such as land for agriculture, energy and infrastructure use).

In this context, AMDEL is becoming a political platform that can be used to exert pressure with a view to decentralizing decision-making power within the region and the country, bringing projects directly to ministerial decision-making circles. It is in this mesoeconomic

space that a comprehensive view is taken of processes that can affect a number of communes, with a need to work intersectorally and by implementing economies of scale and different public policy approaches. The election of regional councillors for the first time may produce a major ally, as may the change in the binomial electoral system that has produced deadlock in Parliament since the return to democracy in 1990. All this, together with greater citizen participation, decentralization and accountability, can make public policies more responsive to the challenges of the territory by bringing them closer to the problems and ensuring social oversight.

Hitherto, the relationship between the conurbation and the Secano Interior has been that of an ill-matched marriage. If they both forge competitive networks, however, the development of one territory can have knock-on effects on the other. The path followed by these communes will not be of the traditional agricultural type but one of renewed linkage that needs a different level of political organization if it is to be realized, as discussed in the public-private partnership literature (Devlin and Moguillansky, 2009).

For Greater Concepción to take part in global flows, there needs to be a metropolitan government that is not in thrall to the traditional division of region and province and the demands of the global forestry chain alone. This is even more important in the greater metropolitan area.

For this group of communes to develop, however, there needs to be a new space of influence. The inhabitants of the regional capital go to the communes of the Secano Interior, buy their products, have their second homes there and enjoy the peace and quiet of the countryside. All this can make the metropolis an attractive place for capturing skilled human capital and with it, new business projects.

AMDEL is a sociopolitical creation that offers a new kind of associative space; it has followed an evolution from economic and territorial diagnosis to a role as an instrument of change to achieve progress towards synergistic and harmonic development. Its way to development lies ahead, and progress will depend vitally on its regional and national political alliances and support from the technical know-how of the universities so that the delinking of the forestry-cellulose chain in the Secano Interior from industry in the conurbation of Greater Concepción can be reversed.

The industrialization gaps discussed in this article—the missing link in Chilean development since 1973— plus the subsequent natural resource export boom and the recent impetus given to chains rich in information and communication technologies (ICTs) are the central issue for regional development and require a national project that is constructed from the territories outward.

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