

Dominican Republic, Jamaica, Trinidad and Tobago, and Puerto Rico

Carlos Ludeña and Mark Horridge

1. Introduction

Input-Output (I-O) or Supply-Use Tables for Jamaica, Trinidad & Tobago, Puerto Rico and Dominican Republic were collected by Carlos Ludeña over a number of years from various sources.¹ In the interest of including additional countries from Latin America and the Caribbean into the Global Trade Analysis Project (GTAP) database for economic analysis, the Inter-American Development Bank commissioned to include these four Caribbean countries to be included into version 9 of the GTAP database during the first half of 2013. Summary details of the data sources are shown in Table 1. The rest of the document describes the process of inclusion of these countries into the GTAP database.

2. Initial data formats

For Puerto Rico, the initial data was presented as an I-O Table showing usage at producer prices. There was a separate table for imports. Tax data was confined to a single row (which we treated as a production tax). The 2002 table showed only a single value-added row (factors + tax); proportions from an earlier 1992 table were used to split this into capital, labour and tax payments.

For the other three countries (Jamaica, Trinidad & Tobago, Dominican Republic), the initial data was presented as a supply-use table showing usage at purchasers prices, with no separate imports matrix. A supply table showed how imports, margins, and taxes could be subtracted from total demand (domestic and imported inputs at purchasers prices) to give output (at basic prices) of commodity. Some tables showed separate categories of Non-competing Imports, which we treated initially as separate commodities. Taking this into account, all 3 tables had more commodities than industries. Make (multiproduction) matrices were supplied, or could be deduced.

3. Stages of processing

3.1 Initial cleaning up

This comprised such operations as:

- creation of English labels,
- allocation of Agricultural services to other agricultural sectors,
- allocation of non-competing imports to other commodity groups,

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- removal of re-exports where distinguished or implied (eg, when exports exceed domestic production),
- distribution of any FISIM (Financial Intermediation Services Indirectly Measured) to industries GOS (Gross Operating Surplus),
- allocation of margins into direct use.

The result (except for Puerto Rico) was a commodity*industry USE table showing domestic and imported inputs at producer prices. For Puerto Rico we already had separate domestic and import tables, size commodity by commodity at basic prices. Hence the next two steps could be omitted.

Table 1: Summary details of data sources for Input Output Tables

| Country | Jamaica | Trinidad & Tobago | Puerto Rico | Dominican Republic |
|----------------------------|-----------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Data Year | 2007 | 2000 | 2002 | 2005 |
| Format | Supply-Use Table | Supply-Use Table | IO table -- separate Domestic + Imports | Supply-Use Table |
| No of original commodities | 53 | 89 | 93 | 67 |
| No of original industries | 53 | 54 | 93 | 37 |
| Units | J\$ Million | \$TT Million | thousands USD\$ | Thousands RD\$ |
| Tariff revenue | Yes | Yes | No | No |
| Import matrix | No | No | Yes | No |
| Source | Statistical Institute of Jamaica | Inter-American Institute for Cooperation on Agriculture (IICA) | Programa de Planificación Económica y Social, Junta de Planificación de Puerto Rico | Central Bank of Dominican Republic ISSN 1729-5513 (PDF) |
| XLS source | 2007-supply & use tables_1.xls | IICATTSAM temp.xls | Demanda Final y Resumen 2001-02.xls; Matriz de Transacciones Interindustriales 2001-02.xls | su2005.xls make2005.xls labscodes.xls |
| Notes | AgricSvc allocated to other agric | | AgricSvc allocated to other agric; VA split from 1992 | |
| HAR contribution file | jamaica.har | trinidad.har | puertorico.har | dominican.har |

(Files used have been archived in a zip at: www.monash.edu.au/policy/archivep.htm#tpmh0124; the zip contains a readme.txt file.)

3.2 Transformation to commodity-commodity "square" form

Tables for Jamaica, Trinidad & Tobago, and the Dominican Republic showed more commodities than industries, and included or implied Make (multiproduction) matrices. We used the Make matrices to expand the industry columns into corresponding commodity columns, assuming that each commodity was produced using the cost shares of the associated industry (or average of industries). The leftmost column of Tables 2-5 lists these "commodity" sectors.

An implication of the procedure is that if one industry "Cattle" had two outputs "Ctl" and "Rmk" we would end up with two sectors, "Ctl" and "Rmk" with different sales patterns (as in the original data) but the same cost structure (as the original industry "Cattle"). Quite often, other GTAP data (such as the "representative tables") might suggest different cost structures for "Ctl" and "Rmk". If we aggregated together "Ctl" and "Rmk" back into one sector "Cattle" we can allow the GTAP Center to split the two, using their representative table with different cost structures for "Ctl" and "Rmk" -- but we lose from the original data the different sales patterns of "Ctl" and "Rmk". A compromise must be struck, and Tables 2-5 contain instances where the middle set COM is apparently over-aggregated (eg, "Cattle" for Trinidad, see Table 3).

3.3 Other Adjustments

The original Tables for Trinidad & Tobago showed substantial household use of several raw agricultural products -- contrary to GTAP norms. These sales were re-routed through the corresponding processing industries. From this point on the same data manipulation programs were used for all four countries (except that Puerto Rico was omitted from the next step).

3.4 Splitting domestic and imported inputs, and basic/tax values from producers values

The supply-use Tables for Jamaica, Trinidad & Tobago, and the Dominican Republic included columns showing imports and taxes could be subtracted from total demand (domestic and imported inputs at producer prices) to give output (at basic prices) of each sector. We split each Use cell into 4 parts (dom/imp*basic/tax) in proportion to Use values and in proportion to row totals (dom,imp,basic,tax) from the Supply columns. The distribution is not quite pro rata, because:

- we stipulated that inventory flows must be untaxed
- we stipulated that export flows must be fully domestic
- in some cases several types of commodity tax were distinguished, which might bear differently on different users. For example, we expect that a VAT punishes households most, and exports least.

Because of this, initial estimates had to be scaled a few times, to meet both Use and Supply targets. After this step, we had Use matrices for both domestic and imported goods, each split between basic values and commodity taxes. Basic import values included tariff duty (which survived as a separate vector). Other production costs included capital (including depreciation), labour, and production taxes. We performed no "imputation" to convert "profits" into the "wages" of owner-operators.

3.5 Aggregation to remove unnecessary detail

The original data is presented at various levels of sectoral detail, while in the GTAP database every country has 57 sectors (here called GSEC). The original sectors (here called OSEC) may be related to the GTAP sectors GSEC in any of three ways:

- several OSEC may be contained in one GSEC
- several GSEC may be contained in one OSEC
- some GSEC and OSEC overlap

The solution is to define a 3rd set of sectors (here called COM) with as many sectors as possible², subject to the dual requirements that:

- each OSEC sector maps to (is contained within) just one COM.
- each GSEC sector maps to (is contained within) just one COM.

The first mapping allows us to cleanly aggregate original OSEC data to the COM level of aggregation. The GTAP project allows IO contributors to submit data in this form -- as long as they supply the second mapping, relating GSEC to COM.

The *intermapping* OSEC→COM←GSEC is shown for each country in the four Tables 2-5 below. Below, OSEC refers to the original sectors *after* initial rearrangement (for example, after allocation of Agricultural Services to other agricultural sectors).

The GTAP project asks that the mapping GSEC→COM not combine energy, food (except raw fish), and other sectors. Some small problems are highlighted in red, and noted under "Mandatory splits". They mostly relate to tiny sectors.

3.6 Conversion to GTAP contribution format

The final stage was to convert each data table (with COM sectors) into the special format required by GTAP. Final output files conformed to both of GTAP's "old" and "new" special formats. At the same time a number of basic diagnostic checks were performed.

² As mentioned earlier, we have in some cases combined sectors where the MAKE matrix did not allow us to distinguish independent cost structures, even though sales patterns are distinguished.

Table 2: Sectoral intermapping for Jamaica

| 52 OSEC | 35 COM | 57 GSEC |
|----------------------------------------------------|-----------|---------------------|
| SugarCane | SugarCane | c_b |
| Bananas Citrus | BanCitrus | v_f |
| CoffeeCocoa OtExprtCrops RootCrops CropsNec | OthCrops | pdr wht osd pfb ocr |
| VegCornPulse | CornEtc | gro |
| OthAnimals | OthAnimal | ctl rnk wol |
| PoultryEggs | Poultry | oap |
| ForestLogs | Forest | frs |
| Fishing | Fishing | fsh |
| Bauxite | Bauxite | omn |
| OtherMining | OthMining | coa oil gas |
| MeatProducts | MeatPrd | cmt omt |
| FruitVegProc GrainMills AnimalFeeds Bakery FoodNEC | FoodNEC | vol pcr ofd |
| Dairy | Dairy | mil |
| SugarMolasse | Sugar | sgr |
| Beverages TobaccoPrds | BevTobac | b_t |
| TextilesWAP | TextWAP | tex wap |
| ShoesLeather | Shoes | lea |
| WoodFurniture | WoodPrd | lum |
| Paper PrintPublish | PapPrnt | ppp |
| ChemProds | ChemPrd | p_c |
| RubbrPlasPrd | RubbrPlas | crp |
| NMetalMinPrd | NMetalMin | nmm |
| BasicFabMetl | Metals | i_s nfm fmp |
| MachnEqp | MachnEqp | mvh otn ele ome |
| OthManufact | OthManuf | omf |
| ElecWater | ElecWater | ely gdt wtr |
| Construction | Construc | cns |
| Trade Repairs Hotels Restaurant | Trade | trd |
| Transport | Transport | otp wtp atp |
| Communicatns | Communcat | cmn |
| FinanceInsur | FinInsur | ofi isr |
| Dwellings | Dwelling | dwe |
| RentVehEqp OthBusSrvces | OthBusSvc | obs |
| GovServices NGEducat NGHealthSoc | GovSvc | osg |
| RecSport OthCommunSvc | PrvSvc | ros |

Note: Bauxite is the overwhelming mineral product of Jamaica. To avoid distinguishing just one mining sector, the other mineral products have been allocated to GTAP's Coal-Oil-Gas group. Mandatory splits: It is thought Jamaica's gdt sector is zero or tiny.

Table 3: Sectoral intermapping for Trinidad

| 97 OSEC | 43 COM | 57 GSEC |
|-----------------------------------------------------------------------------------|-------------|-----------------|
| Poultry Eggs PigsAndHogs | OthAnimal | oap |
| BeefCattle FreshMilk | Cattle | ctl rnk |
| Cocoa Coffee RootCrops OthAgricPrd | OthAgric | osd pfb ocr wol |
| CitrusFruit | Citrus | v_f |
| Rice | Rice | pdr |
| SugarCane | SugarCane | c_b |
| WoodRough | Forest | frs |
| FishFresh CrustMollusc | Fishing | fish |
| CrudePetrolm NaturalGas | OilNatGas | oil gas |
| DrillingSvc SandAsphalt | OthMining | coa omn |
| SugarEtc | Sugar | sgr |
| MeatPrd | MeatPrd | cmt |
| PoultryPrd | Poultry | omt |
| MilkAndCream | Dairy | mil |
| FruitVeg ProcFish Flour AnimalFeed FlourEtc BakeryPrd OthFood | OthFoods | per ofd |
| OilAndFats | OilsFats | vol |
| AlcoholicBev SoftDrinks Tobacco | BevTobac | b_t |
| ClothingShoe | WAPShoe | wap lea |
| Printing PulpPaperEtc | PPP | ppp |
| Furniture ElectApparat AppliancFixt PlasticEtc NCOfficeEqp | OthManuf | ele omf |
| Wood | WoodPrd | lum |
| CementBricks Concrete GlasswarePot | NMtlMin | nmm |
| Pharmaceutic FertInsectcd OthChemicals Paints PlasticsCnst RubbrLeather NCPlastic | CRP | crp |
| MVP MetalStruct | MVPFabMetal | fmp mvh otn |
| PigIron OthIronSteel NCIronScrap | IronSteel | i_s |
| RefPetrolPrd LNG IndustlGases ProcessedGas Petrochemical | PetrolRef | p_c |
| WovenKnitted NCTextiles | Textile | tex |
| Electricity | Electrcity | ely |
| Water | Water | wtr |
| Construction | Construct | cns |
| DistPetrPrd RetailWholsl FoodSvc Accomodation | Trade | trd |
| DistNatGas | DistNatGas | gdt |
| Taxi BusSvc Airlines PortAirport Trucking CarRental OthTranspSvc | Transport | otp wtp atp |
| Communicaton | Communcat | cmn |
| FinancialSvc | Finance | ofi |
| Insurance | Insurance | isr |
| BusinessSvc RentalEqp Advertising OthBusSvc RealEstate | OthBusSvc | obs |
| ImputedRent | Dwelling | dwe |
| Government Education HealthWelfre | GovSvc | osg |
| PersonalSvc | PrivSvc | ros |
| NCGrains | Grains | wht gro |
| NCIndustMach NCInstrument | MachinEqp | ome |
| NCNFMetals | NFMetals | nfm |

Note: the "NC" sectors were originally non-competing import rows. Mandatory splits: It is thought Trinidad produces no coal.

Table 4: Sectoral intermapping for Puerto Rico

| 92 OSEC | 38 COM | 57 GSEC |
|---------------------------------------------------------|-----------|------------------------------------------------------------|
| SugarCane OtherAgric | Agric | pdr wht gro v_f osd c_b pfb ocr ctl oap rmk wol frs fsh |
| Mining | Mining | coa oil gas omn |
| Construction BldMaint | Construct | cns |
| MeatPrd | MeatPrd | cmt omt |
| MilkPrd | MilkPrd | mil |
| FruitVegPrd | FruVegPrd | vol |
| GrainMill | GrainMill | pcr |
| Bakery MiscFood FishPrd | OthFood | ofd |
| SugarSweets | Sugar | sgr |
| AlcoBev SoftDrinks Tobacco | BevTobac | b_t |
| TextileMill | Textile | tex |
| Apparel | Clothing | wap |
| Lumber | Lumber | lum |
| PaperAllied PrintPublish | PPP | ppp |
| BasicChem DrugsPharma OthChemical RubbrPlastic | ChemPrd | crp |
| PetrolRefin OthPetroleum | PetrolRef | p_c |
| LeatherPrd | Leather | lea |
| OthNMM | OthNMM | nmm |
| PrimaryMetal | PrimMetal | i_s nfm |
| FabricMetal | FabMetal | fmp |
| NonElecMachn | NEleMachn | ome |
| ElecMachiner | ElecMachn | ele |
| TransportEqp | TranspEqp | mvh otn |
| ScientifInst MiscManuf | OthManuf | omf |
| LocalBusTaxi Buses RoadFreight TransportSVC | OthTrans | otp |
| TravelAgents | | |
| WaterTrnsprt | WatrTrans | wtp |
| AirTransport | AirTrans | atp |
| Telephone RadioTVBrcst | Comms | cmn |
| ElecIrrigSVC | Elect | ely |
| GasSantrySVC | GasDist | gdt |
| WaterSewage | Water | wtr |
| Trade TouristHotel OtherHotels AutoRepair | Trade | trd |
| CommBanks MortgageBanks SavingAssoc CreditUnions | Finance | ofi |
| LoanBrokers PersCredit CondLoans OtherCredit | | |
| LifeAccMedIn OthInsurance InsuranceSVC | Insurance | isr |
| RealEstate | RealEstat | dwe |
| Laundry PhotoStud BeautyBarber FuneralSVC | | |
| OtherPersSVC AutoLeasing AutoParking Films FilmTheaters | PrivSvc | ros |
| Theatres HorseRace OthRecSVC LegalSVC DomesticSVC | | |
| Advertising OthBusinSVC EngArchSVC AccountngSVC | BusSvc | obs |
| Doctors Dentists Hospitals MedDentalLab OthHealthSVC | | |
| EducSVC NonProfits Commonwealth MunicipalGov | GovSvc | osg |
| FederalGov | | |

Note: Original sector SugarCane is a zero-size dummy sector. Original data distinguished only "Agriculture".
Mandatory splits: Forestry and Fishing are part of "Agriculture".

Table 5: Sectoral intermapping for Dominican Republic

| 69 OSEC | 30 COM | 57 GSEC |
|--------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------|
| Cereals | Cereals | pdr wht gro |
| TradExprtCrp | SugarCane | c_b |
| Oilseeds TextFibers Legumes TubersEtc Vegetables Fruits OtherCrops | OthAgric | v_f osd pfb ocr |
| LiveStock OthAnimalPrd Forestry Fishing | AnimlForFish | ctl oap rmk wol frs fsh |
| Coal | Coal | coa |
| CrudeOil | CrudeOil | oil gas |
| MetalOres StoneSndClay Salt OthMinerals | OthMinerl | omn |
| ProcMeatFish OilsFats Dairy | AnimlFoods | cmt omt vol mil |
| GrainMills Bakery OthFoodProds | OthFoods | pcr ofd |
| Sugar | Sugar | sgr |
| AlcoBeverage NonAlcoBev TobaccoPrd | BevTobcco | b_t |
| TextWAP | TextWAP | tex wap |
| LeathShoes | LeathShoe | lea |
| WoodPrd PulpPaper PrintPublish | WoodPPP | lum ppp |
| CokeRefPetr | RefPetr | p_c |
| ChemicalPrd RubberPrd PlasticPrd | ChmRbrPls | crp |
| ONMetlMinPrd | ONMetlMin | nmm |
| BasicIronStl | BasIrnStl | i_s |
| NonFerrMetal Scrap | OthMetals | nfm |
| FabMetalPrd GenMachinery SpcMachinery HholdApplnce OfficeEqp MachnElecEqp CommunicEqp MedSciEqp TranspEquip FurnOthManuf | FabMtlPrd | fmp mvh otn ele ome omf |
| ElecWater | ElecWater | ely gdt wtr |
| Construction | Constrctn | cns |
| TradeSvc Hotels | TradeHotl | trd |
| Transport | Transport | otp wtp atp |
| Communicat | Communcat | cmn |
| FinancInsrnc | FinInsrnc | ofi isr |
| Dwellings | Dwellings | dwe |
| ORealEstate LegalSvc BusinessSvc | OthBusSvc | obs |
| GovernmentSvc EducationSvc HealthSvc | GovmntSvc | osg |
| RecSportSvc OtherSvc DomesticSvc | OthPrvSvc | ros |

Mandatory splits: It is thought the gdt sector is zero or tiny.