rate, do first anytime

```
In[17]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Data"]]
       itemTab = Import["ExtractionRates.xls", "Data"][[2]][[2 ;;, {1, 2, 5, 3}]];

       itemTab = Select[itemTab, #[[1]] ≠ "" &];
       itemTab[[;; , {2, 3}]] = Round[itemTab[[;; , {2, 3}]]];
       (*1st is name, 2nd is categories, 3th is item code, 4st is rate*)
       itemTab[[1 ;; 15]]
```

```
Out[17]= D:\Google Drive\Lorenzo\Data
```

```
Out[21]= {{Wheat, 1, 15, 1.}, {Flour, wheat, 1, 16, 0.79},
        {Bran, wheat, 1, 17, 0.18}, {Macaroni, 1, 18, 0.79}, {Germ of Wheat, 1, 19, 0.2},
        {Bread, 1, 20, 0.9085}, {Bulgur, 1, 21, 0.95}, {Pastry, 1, 22, 0.9085},
        {Starch of Wheat, 1, 23, 0.5056}, {Wheat Gluten, 1, 24, 0.0948},
        {Wheat-Fermented Beverages, 1, 26, 0.948}, {Cereals, breakfast, 1, 41, 0.85},
        {Wafers, 1, 110, 0.9085}, {Maize, 2, 56, 1.}, {Germ, maize, 2, 57, 0.06}}
```

```
In[22]:= cateItem = ConstantArray[{}, 26];
       Table[
        AppendTo[cateItem[[itemTab[[itemTabCnt, 2]]]], itemTab[[itemTabCnt, 3]]]
        , {itemTabCnt, Length[itemTab]}];
```

production

```
In[•]:= SetDirectory["D:\\"]
       orgProdDat = Import["Production_Crops_E_All_Data_(Normalized).csv"];
       orgProdDat = Select[orgProdDat, #[[5]] == 5510 &];
       prodDat = orgProdDat[[2 ;;, {1, 2, 3, 4, 8, 10}]];
       prodDat[[1 ;; 10]]
```

```
Out[•]= D:\
```

```
Out[•]= {{2, Afghanistan, 221, Almonds, with shell, 1976, 9800.},
        {2, Afghanistan, 221, Almonds, with shell, 1977, 9000.},
        {2, Afghanistan, 221, Almonds, with shell, 1978, 12000.},
        {2, Afghanistan, 221, Almonds, with shell, 1979, 10500.},
        {2, Afghanistan, 221, Almonds, with shell, 1980, 9900.},
        {2, Afghanistan, 221, Almonds, with shell, 1981, 8000.},
        {2, Afghanistan, 221, Almonds, with shell, 1982, 11000.},
        {2, Afghanistan, 221, Almonds, with shell, 1983, 9700.},
        {2, Afghanistan, 221, Almonds, with shell, 1984, 10500.},
        {2, Afghanistan, 221, Almonds, with shell, 1985, 9000.}}
```

```
In[•]:= prodCountryList = Sort[DeleteDuplicates[prodDat[[;; , {1, 2}]]], #1[[1]] < #2[[1]] &];
       prodCountryList[[1 ;; 10]]
```

```
Out[•]= {{1, Armenia}, {2, Afghanistan}, {3, Albania}, {4, Algeria}, {5, American Samoa},
        {7, Angola}, {8, Antigua and Barbuda}, {9, Argentina}, {10, Australia}, {11, Austria}}
```

```
In[•]:= yearCand = (*Range[1998,2002]*)Range[2012, 2016];
        prodYear = ReplaceAll[Table[Select[prodDat, #〚5〛 == yearCnt &]〚;; , {1, 2, 3, 4, 6}〛,
            {yearCnt, yearCand}], "" → 0];
        prodYear〚
          1〛〚
         1
          ;;
          10〛
```

```
Out[•]= {{2, Afghanistan, 221, Almonds, with shell, 62 000.},
         {2, Afghanistan, 711, Anise, badian, fennel, coriander, 12 500.},
         {2, Afghanistan, 515, Apples, 70 000.}, {2, Afghanistan, 526, Apricots, 83 500.},
         {2, Afghanistan, 44, Barley, 504 000.}, {2, Afghanistan, 558, Berries nes, 25 000.},
         {2, Afghanistan, 767, Cotton lint, 11 979.}, {2, Afghanistan, 329, Cottonseed, 23 595.},
         {2, Afghanistan, 569, Figs, 8250.}, {2, Afghanistan, 512, Fruit, citrus nes, 2000.}}
```

```
In[•]:= prodMat = ConstantArray[{}, Length[yearCand]];
        Table[
          prodMat〚yearCnt〛 = ParallelTable[
            row = prodCountryList〚prodCountryCnt〛;
            col = cateItem〚cateItemCnt〛;
            tmpVal = Flatten[Select[prodYear〚yearCnt〛, (#〚1〛 == row〚1〛 && #〚3〛 == col〚1〛) &]];
            If[tmpVal == {}, 0, tmpVal〚5〛]
             , {prodCountryCnt, Length[prodCountryList]}, {cateItemCnt, Length[cateItem]}];
          , {yearCnt, Length[yearCand]}];
```

```
In[•]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Result"]]
        sheetName = yearCand;
        sheetMat =
          Map[Join[{Join[{"", ""}, Range[26]]}, Join[prodCountryList, #, 2]] &, prodMat];
        Export[StringJoin["ProdMat", ToString[First[sheetName]],
          "~", ToString[Last[sheetName]], ".xls"],
         "Sheets" → MapThread[ToString[#1] → #2 &, {sheetName, sheetMat}], "Rules"]
```

```
Out[•]= D:\Google Drive\Lorenzo\Result
```

```
Out[•]= ProdMat2012~2016.xls
```

average

```
In[•]:= period = {"1998~2002", "2012~2016"}
        avgMat = Map[Mean[Import[StringJoin["ProdMat", #, ".xls"]]] &, period];
        Export["AvgProdMat.xls", "Sheets" → MapThread[#1 → #2 &, {period, avgMat}], "Rules"]
```

```
Out[•]= {1998~2002, 2012~2016}
```

```
Out[•]= AvgProdMat.xls
```

import matrix

preprocess

```
In[ ]:= SetDirectory["D:\\"]
    str = OpenRead["Trade_DetailedTradeMatrix_E_All_Data_(Normalized).csv"];
    (*StringSplit[Read[str,Record],","]⟦{1,3,8,9}⟧*)
    data = Rest[ReadList[str, Record]];
    Dimensions[data]
```

```
Out[ ]= D:\
```

```
Out[ ]= {33 239 905}
```

```
In[ ]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Data"]]
    CloseKernels[]
    LaunchKernels[]
    dataTmpVec = Partition[#, UpTo[Ceiling[Length[#] / $KernelCount]]] &[data];
    Table[
     Export[StringJoin["dataTmp", ToString[dataTmpCnt], ".mx"], dataTmpVec⟦dataTmpCnt⟧]
     , {dataTmpCnt, Length[dataTmpVec]}]
```

```
Out[ ]= D:\Google Drive\Lorenzo\Data
```

```
Out[ ]= {KernelObject[1, local, <defunct>], KernelObject[2, local, <defunct>],
     KernelObject[3, local, <defunct>], KernelObject[4, local, <defunct>],
     KernelObject[5, local, <defunct>], KernelObject[6, local, <defunct>],
     KernelObject[7, local, <defunct>], KernelObject[8, local, <defunct>]}
```

```
Out[ ]= {KernelObject[9, local], KernelObject[10, local],
     KernelObject[11, local], KernelObject[12, local], KernelObject[13, local],
     KernelObject[14, local], KernelObject[15, local], KernelObject[16, local]}
```

```
Out[ ]= {dataTmp1.mx, dataTmp2.mx, dataTmp3.mx, dataTmp4.mx,
     dataTmp5.mx, dataTmp6.mx, dataTmp7.mx, dataTmp8.mx}
```

```
In[◦]:= (*this step will cost too much time*)
      yearList = Range[1986, 2016];
      importYear = {}; SetSharedVariable[importYear];
      dir = NotebookDirectory[]

      AbsoluteTiming[
       ParallelTable[
         Print[$KernelID, " start"];
         dataTmp =
          Import[StringJoin[dir, "Data\\", "dataTmp", ToString[dataTmpCnt], ".mx"]];
         importYearTmp = ConstantArray[{}, Length[yearList]];
         Print[$KernelID, " size ", Dimensions[dataTmp]];
         Table[
          rec = StringSplit[dataTmp[[recCnt]], {"\",\"", "\""}];
          If[rec[[7]] == "5610" && rec[[1]] ≠ rec[[3]],
            AppendTo[
             importYearTmp[[First[Flatten[Position[yearList, ToExpression[rec[[10]]]]]]]],
             {ToExpression[#[[1]]], #[[2]], ToExpression[#[[3]]], #[[4]], ToExpression[#[[5]]],
                #[[6]], ToExpression[#[[7]]]} &[rec[[{1, 2, 3, 4, 5, 6, 12}]]]]];
          , {recCnt, Length[dataTmp]}];
         Print[$KernelID, " end"];
         AppendTo[importYear, importYearTmp];
         , {dataTmpCnt, $KernelCount}];
       ]

      importYear = Map[Flatten[importYear[[;; , #]], 1] &, Range[Length[yearList]]];
      Map[Dimensions[#] &, importYear]
Out[◦]= D:\Google Drive\Lorenzo\
```

(kernel 16) `16 start`

(kernel 15) `15 start`

(kernel 14) `14 start`

(kernel 13) `13 start`

(kernel 12) `12 start`

(kernel 11) `11 start`

(kernel 10) `10 start`

(kernel 9) `9 start`

(kernel 14) `14 size {4 154 989}`

(kernel 13) `13 size {4 154 989}`

(kernel 11) `11 size {4 154 989}`

(kernel 15) `15 size {4 154 989}`

(kernel 16) `16 size {4 154 989}`

(kernel 9) `9 size {4 154 982}`

(kernel 10) `10 size {4 154 989}`

(kernel 12) `12 size {4 154 989}`

(kernel 9) `9 end`

(kernel 14) `14 end`

(kernel 10) `10 end`

(kernel 13) `13 end`

(kernel 12) `12 end`

(kernel 16) `16 end`

(kernel 15) `15 end`

(kernel 11) `11 end`

Out[ ]= `{2828.73, Null}`

Out[ ]= `{{91 488, 7}, {92 723, 7}, {99 916, 7}, {104 660, 7}, {106 776, 7}, {124 753, 7}, {136 351, 7},`
`{146 327, 7}, {167 223, 7}, {180 728, 7}, {186 670, 7}, {197 181, 7}, {217 519, 7},`
`{230 106, 7}, {263 271, 7}, {286 954, 7}, {302 398, 7}, {304 601, 7}, {312 425, 7},`
`{325 151, 7}, {323 520, 7}, {344 161, 7}, {338 893, 7}, {335 682, 7}, {344 469, 7},`
`{353 640, 7}, {375 830, 7}, {390 326, 7}, {459 526, 7}, {462 413, 7}, {473 197, 7}}`

In[ ]:= **SetDirectory[StringJoin[NotebookDirectory[], "\\Data"]]**
Export["importYear.mx", importYear]

Out[ ]= `D:\Google Drive\Lorenzo\Data`

Out[ ]= `importYear.mx`

import

```
SetDirectory[StringJoin[NotebookDirectory[], "\\Data"]]
importYear = Import["importYear.mx"];

Dimensions[importYear]
Map[Dimensions, importYear]

yearList = Range[1986, 2016]
```

Out[●]= D:\Google Drive\Lorenzo\Data

Out[●]= {31}

Out[●]= {{91 488, 7}, {92 723, 7}, {99 916, 7}, {104 660, 7}, {106 776, 7}, {124 753, 7}, {136 351, 7},
  {146 327, 7}, {167 223, 7}, {180 728, 7}, {186 670, 7}, {197 181, 7}, {217 519, 7},
  {230 106, 7}, {263 271, 7}, {286 954, 7}, {302 398, 7}, {304 601, 7}, {312 425, 7},
  {325 151, 7}, {323 520, 7}, {344 161, 7}, {338 893, 7}, {335 682, 7}, {344 469, 7},
  {353 640, 7}, {375 830, 7}, {390 326, 7}, {459 526, 7}, {462 413, 7}, {473 197, 7}}

```
In[●]:= yearCand = Range[1998, 2002]
    yearPos = Flatten[Map[Position[yearList, #] &, yearCand]]
    countryList = ConstantArray[{}, Length[yearCand]];
    countryList =
      Sort[DeleteDuplicates[Join[Flatten[Map[importYear[[#]][[;; , {1, 2}]] &, yearPos], 1],
        Flatten[Map[importYear[[#]][[;; , {3, 4}]] &, yearPos], 1]]], #1[[1]] < #2[[1]] &];
    Dimensions[countryList]
```

Out[●]= {1998, 1999, 2000, 2001, 2002}

Out[●]= {13, 14, 15, 16, 17}

Out[●]= {241, 2}

```
In[●]:= impMat = ConstantArray[0, {Length[yearCand], 26, #, #} &[Length[countryList]]];

    Table[
      Table[
        row = Flatten[Position[countryList[[;; , 1]], importYear[[yearCnt]][[impCnt, 1]]]];
        col = Flatten[Position[countryList[[;; , 1]], importYear[[yearCnt]][[impCnt, 3]]]];
        tmp = SelectFirst[itemTab, #[[3]] == importYear[[yearCnt]][[impCnt, 5]] &];
        If[VectorQ[tmp], impMat[[yearCnt - First[yearPos] + 1, tmp[[2]], row, col]] +=
          importYear[[yearCnt]][[impCnt, 7]] / tmp[[4]]];
        , {impCnt, Length[importYear[[yearCnt]]]}];
      , {yearCnt, yearPos}];
```

```
In[◦]:= sheetName = Flatten[Table[StringJoin[ToString[yearCnt], " ", ToString[cateCnt]],
          {yearCnt, yearCand}, {cateCnt, Range[26]}], 1]
      sheetMat = Flatten[Table[Join[Join[{{"", ""}, {"", ""}}, countryList],
            Join[Transpose[countryList], impMat〚yearCnt, cateCnt〛]], 2]
          , {yearCnt, Length[yearCand]}, {cateCnt, 26}], 1];
```

```
Out[◦]= {1998 1, 1998 2, 1998 3, 1998 4, 1998 5, 1998 6, 1998 7, 1998 8, 1998 9, 1998 10,
      1998 11, 1998 12, 1998 13, 1998 14, 1998 15, 1998 16, 1998 17, 1998 18, 1998 19,
      1998 20, 1998 21, 1998 22, 1998 23, 1998 24, 1998 25, 1998 26, 1999 1, 1999 2,
      1999 3, 1999 4, 1999 5, 1999 6, 1999 7, 1999 8, 1999 9, 1999 10, 1999 11, 1999 12,
      1999 13, 1999 14, 1999 15, 1999 16, 1999 17, 1999 18, 1999 19, 1999 20, 1999 21,
      1999 22, 1999 23, 1999 24, 1999 25, 1999 26, 2000 1, 2000 2, 2000 3, 2000 4,
      2000 5, 2000 6, 2000 7, 2000 8, 2000 9, 2000 10, 2000 11, 2000 12, 2000 13,
      2000 14, 2000 15, 2000 16, 2000 17, 2000 18, 2000 19, 2000 20, 2000 21, 2000 22,
      2000 23, 2000 24, 2000 25, 2000 26, 2001 1, 2001 2, 2001 3, 2001 4, 2001 5, 2001 6,
      2001 7, 2001 8, 2001 9, 2001 10, 2001 11, 2001 12, 2001 13, 2001 14, 2001 15,
      2001 16, 2001 17, 2001 18, 2001 19, 2001 20, 2001 21, 2001 22, 2001 23, 2001 24,
      2001 25, 2001 26, 2002 1, 2002 2, 2002 3, 2002 4, 2002 5, 2002 6, 2002 7, 2002 8,
      2002 9, 2002 10, 2002 11, 2002 12, 2002 13, 2002 14, 2002 15, 2002 16, 2002 17,
      2002 18, 2002 19, 2002 20, 2002 21, 2002 22, 2002 23, 2002 24, 2002 25, 2002 26}
```

```
In[◦]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Result"]]
      Needs["JLink`"]
      ReinstallJava[JVMArguments → "-Xmx2048m"]
      Export[StringJoin["ImpMat", ToString[First[yearCand]], "~", ToString[Last[yearCand]],
        ".xls"], "Sheets" → MapThread[#1 → #2 &, {sheetName, sheetMat}], "Rules"]
```

```
Out[◦]= D:\Google Drive\Lorenzo\Result
```

```
Out[◦]= LinkObject[ [+] [⇄WL]  Name: "D:\Program Files\Mathematica\SystemFiles\Java\Wi ]
                                Link mode: Listen
```

```
Out[◦]= ImpMat1998~2002.xls
```

average

```
In[◦]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Result"]]
      impMat1 = Import[StringJoin["ImpMat", ToString[1998], "~", ToString[2002], ".xls"]];
      impMat2 = Import[StringJoin["ImpMat", ToString[2012], "~", ToString[2016], ".xls"]];
```

```
Out[◦]= D:\Google Drive\Lorenzo\Result
```

```
In[•]:= sheetName = Join[
          Map[StringJoin[ToString[1998], "~", ToString[2002], " ", ToString[#]] &, Range[26]],
          Map[StringJoin[ToString[2012], "~", ToString[2016], " ", ToString[#]] &, Range[26]]]
        sheetMat = Join[Map[Mean[impMat1[[# ;; ;; 26]]] &, Range[26]],
          Map[Mean[impMat2[[# ;; ;; 26]]] &, Range[26]]];
```

```
Out[•]= {1998~2002 1, 1998~2002 2, 1998~2002 3, 1998~2002 4, 1998~2002 5, 1998~2002 6,
         1998~2002 7, 1998~2002 8, 1998~2002 9, 1998~2002 10, 1998~2002 11, 1998~2002 12,
         1998~2002 13, 1998~2002 14, 1998~2002 15, 1998~2002 16, 1998~2002 17, 1998~2002 18,
         1998~2002 19, 1998~2002 20, 1998~2002 21, 1998~2002 22, 1998~2002 23, 1998~2002 24,
         1998~2002 25, 1998~2002 26, 2012~2016 1, 2012~2016 2, 2012~2016 3, 2012~2016 4,
         2012~2016 5, 2012~2016 6, 2012~2016 7, 2012~2016 8, 2012~2016 9, 2012~2016 10,
         2012~2016 11, 2012~2016 12, 2012~2016 13, 2012~2016 14, 2012~2016 15, 2012~2016 16,
         2012~2016 17, 2012~2016 18, 2012~2016 19, 2012~2016 20, 2012~2016 21,
         2012~2016 22, 2012~2016 23, 2012~2016 24, 2012~2016 25, 2012~2016 26}
```

```
In[•]:= Export["AvgImpMat.xls", "Sheets" → MapThread[#1 → #2 &, {sheetName, sheetMat}], "Rules"]
```

```
Out[•]= AvgImpMat.xls
```

list of the commodities

```
In[24]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Data"]]
        importYear = Import["importYear.mx"];

        Dimensions[importYear]
        Map[Dimensions, importYear]

        yearList = Range[1986, 2016]
```

```
Out[24]= D:\Google Drive\Lorenzo\Data
```

```
Out[26]= {31}
```

```
Out[27]= {{91 488, 7}, {92 723, 7}, {99 916, 7}, {104 660, 7}, {106 776, 7}, {124 753, 7}, {136 351, 7},
         {146 327, 7}, {167 223, 7}, {180 728, 7}, {186 670, 7}, {197 181, 7}, {217 519, 7},
         {230 106, 7}, {263 271, 7}, {286 954, 7}, {302 398, 7}, {304 601, 7}, {312 425, 7},
         {325 151, 7}, {323 520, 7}, {344 161, 7}, {338 893, 7}, {335 682, 7}, {344 469, 7},
         {353 640, 7}, {375 830, 7}, {390 326, 7}, {459 526, 7}, {462 413, 7}, {473 197, 7}}
```

```
Out[28]= {1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994,
         1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005,
         2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016}
```

```
In[29]:= yearCand = Range[1998, 2002]
        yearPos = Flatten[Map[Position[yearList, #] &, yearCand]]
        impItemList1 = Sort[DeleteDuplicates[Flatten[importYear[[yearPos]], 1][[;; , 5 ;; 6]]]];
```

```
Out[29]= {1998, 1999, 2000, 2001, 2002}
```

```
Out[30]= {13, 14, 15, 16, 17}
```

```
In[32]:= yearCand = Range[2012, 2016]
        yearPos = Flatten[Map[Position[yearList, #] &, yearCand]]
        impItemList2 = Sort[DeleteDuplicates[Flatten[importYear[[yearPos]], 1][[;; , 5 ;; 6]]]];
```

```
Out[32]= {2012, 2013, 2014, 2015, 2016}
```

```
Out[33]= {27, 28, 29, 30, 31}
```

```
In[35]:= prodItemList = Flatten[Table[Select[itemTab, #〚3〛 == cateItemCnt &],
            {cateItemCnt, cateItem〚 ;; , 1〛}], 1]〚 ;; , {3, 1}〛
```

```
Out[35]= {{15, Wheat}, {56, Maize}, {27, Rice, paddy}, {44, Barley}, {71, Rye}, {79, Millet},
    {83, Sorghum}, {236, Soybeans}, {267, Sunflower seed}, {116, Potatoes},
    {125, Cassava}, {156, Sugar cane}, {157, Sugar beets}, {254, [Oil palm fruit]},
    {270, Rapeseed or colza seed}, {242, Groundnuts, in shell}, {176, Beans, dry},
    {490, Oranges}, {577, Dates}, {560, Grapes}, {328, [Seed Cotton]}, {661, Cocoa beans},
    {656, Coffee green}, {216, Brazil Nuts}, {639, Grasses nes for forage}, {75, Oats}}
```

```
In[36]:= itemAllList = Sort[DeleteDuplicates[Join[impItemList1, impItemList2, prodItemList]]];
    itemAllList〚1〛
```

```
Out[37]= {15, Wheat}
```

```
In[38]:= itemFile = itemTab;
    Table[
       itemCodeCnt = 1;
       pos = Flatten[Position[itemTab〚 ;; , 3〛, itemCodeList〚itemCodeCnt〛〚1〛]];
       itemTab〚pos, 1〛 = itemCodeList〚itemCodeCnt〛〚2〛;
       , {itemCodeCnt, Length[itemCodeList]}];
```

```
In[44]:= SetDirectory[StringJoin[NotebookDirectory[], "\\Result"]]
    Export["itemList.xls",
      Join[{{"FAO Item Name", "Category", "FAO Item Code", "rate"}}, itemFile]]
```

```
Out[44]= D:\Google Drive\Lorenzo\Result
```

```
Out[45]= itemList.xls
```