Luminosity

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Notes (Please Read):

- print(df.to_latex()) will give a latex export of the dataframe in the jupyter notebook, you can use this to quickly copy paste into latex
- plt.savefig(¡path¿) will allow you to save your figure as a png so it can be used in the document/presentation
- Make sure to commit and pull as much as possible to avoid merge errors
- Don't edit the styles of this document yet, will do that at the end

1 Introduction

1.1 Summary

TODO Will do this last

1.2 Literature Review

1.2.1 Luminosity-based Approach

TODO Michael: Try to accumulate as much as possible. We have such a long list of papers anyway.

1.2.2 Natural Disaster Economics

TODO Viviana: obviously, as the expert.

2 Data

2.1 Data Description

TODO Micheal: Describe what the data looks like, how many observations there are, where we got it, who else has used it etc.

2.2 Data Preprocessing

By the nature of the data, certain hurdles must be overcome before it's possible to model the luminosity data in any way. These issues include especially:

Volume While the number of observations is extremely low, as only annual images are available from 1992 to 2013, the dimensionality of each observation (image) is considerable. With a size of 16801 by 43201, every image contains 725820001 pixels in total, which results in more than 700MB of disk-space required for only one image in uncompressed format. This also means that computations on the entire dataset are not possible with common personal computing architecture.

Noise The data is inherently noisy and contains measurement irregularities stemming from e.g. human activity, orbital body positioning, luminosity radiance etc. TODO:Jonas, literature onthis?

2.2.1 QGIS

TODO Viviana

2.2.2 Python Architecture

TODO Jonas

2.2.3 Denoising

3 Modelling

3.1 Disaster Impact Models

Exploratory analysis and some basic models are a first step to assessing the impact of natural disasters on the luminosity time series. For this, we need to make a modelling decision regarding how the disaster (represented only as a single point location) can be geospatially associated with pixel luminosity values. TODO Jonas, literature on this? One practical mathematical choice is a function decaying with distance affecting areas or even individual pixels on the grid. The advantage of this method is that it is simple to explain, easily tuneable and leaves a lot of flexibility for modelling. Additionally, it captures the notion that areas in the vicinity of a disaster event are more likely to be affected than those further away by default. However, this approach makes some strong assumptions about the nature of natural disasters that don't hold in reality. An important factor in how much impact a disaster has on a region are geographical features: An earthquake will affect different areas differently based on their rockbed and geological consistency while e.g. storms and floods depend strongly on the topography.

3.2 Panel Model

3.2.1 Region-based Panel

TODO Viviana

3.2.2 Section-based Panel

TODO Jonas

3.2.3 Dynamic Panel

TODO Viviana: Describe here how the model that you are using is constructed, where you got it, etc.

4 Results

4.1 Case Analysis

TODO Micheal: This is where your case analysis for different places goes, try to add some statistical tests etc. if possible. E.g. distribution of light one year vs the next compared to overall time series distribution changes (shocks).

4.2 Modelling Results

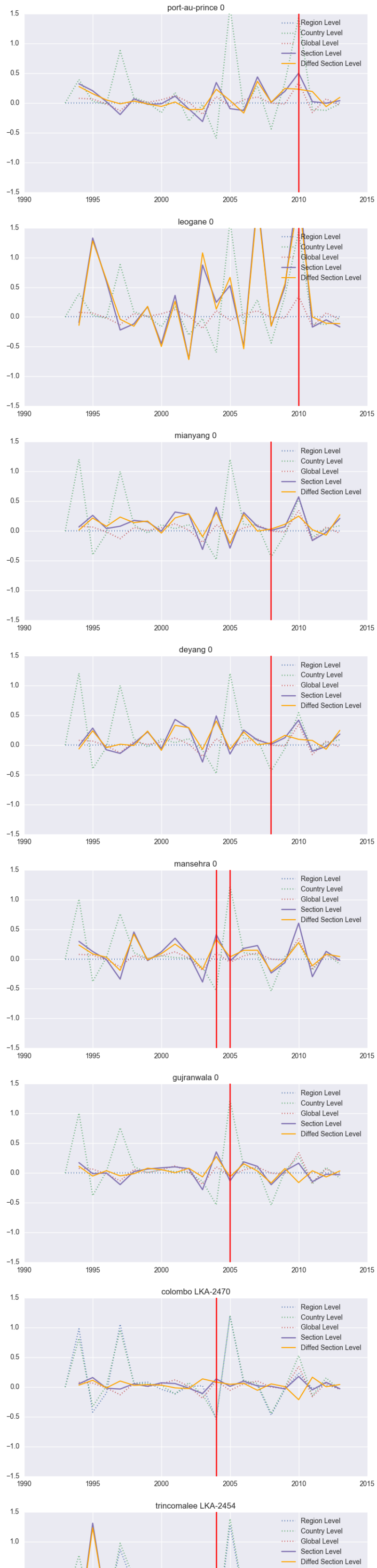
TODO Viviana: Describe the results of the regression here, significant values and what those values mean.

4.3 Conclusions

TODO Will do this just before the summary

4.4 Outlook

TODO Jonas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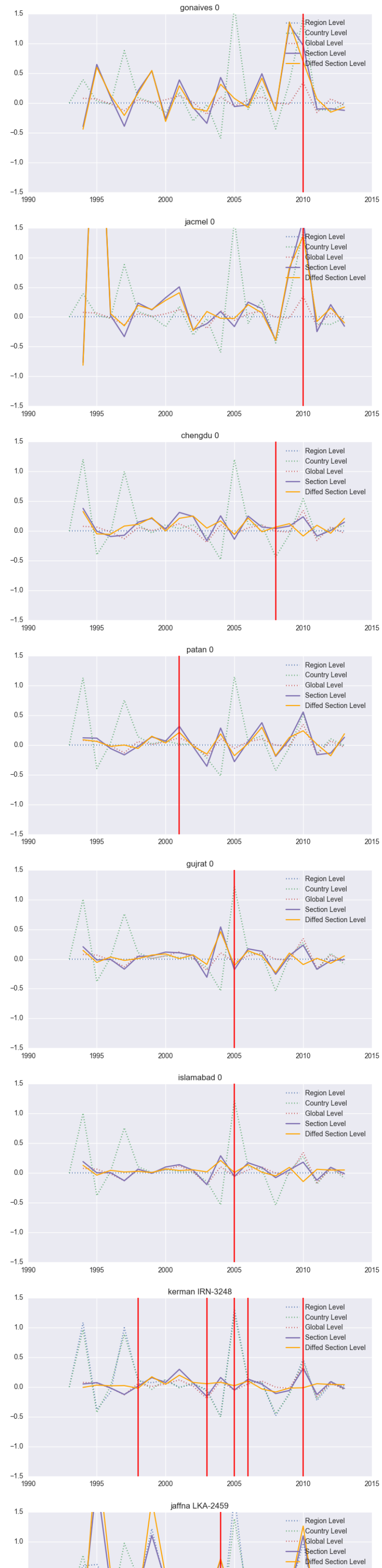
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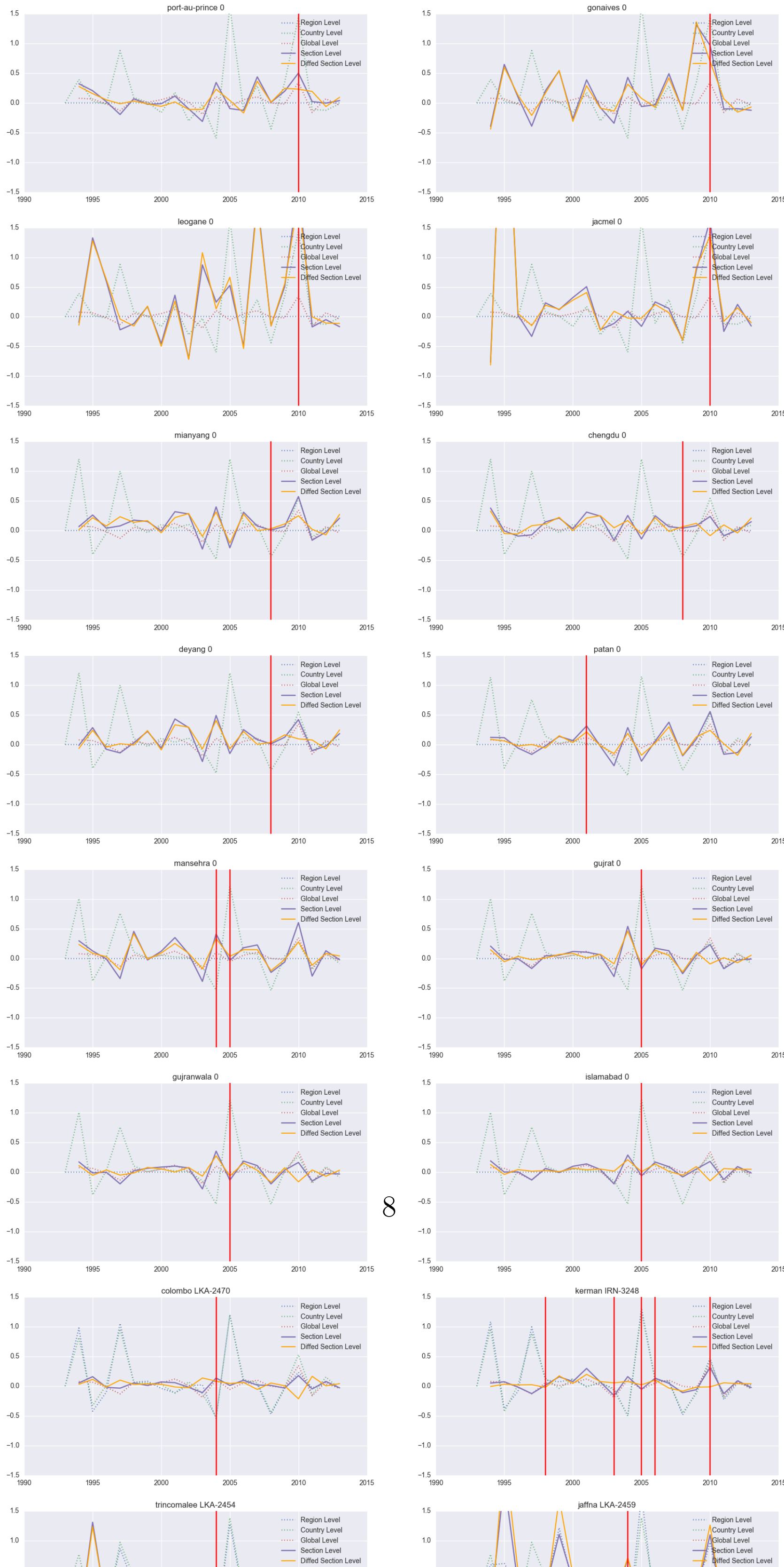
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